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The New Year

In beginning 1910 we have an opportunity to talk to our readers that does not often occur—we mean to talk about some intimate matters. Ordinarily the first issue of the year is the statistical number, reviewing the previous year, and however large this is planned to be there turns out always to be a large surplus of material in type and a reluctant casting aside of some of it. So the New Year number is not only historically overcrowded, but also it seems to be inappropriate to inject anything but its special character of matter, and by the next issue the impulse that comes upon opening a new volume is gone. This year the first Saturday falls on Jan. 1. Although Saturday is nominally our day of publication the paper is out on Friday, usually in the morning, and inasmuch as we do no night work in our printery the forms have to be closed on Wednesday, which in this case was Dec. 29, obviously too early to complete the collection of our statistics.

We may pause for a moment to say a word about statistics. Formerly our industries were perpetually in the dark. Such statistics as were collected were so belated in appearance that they had only historical value. In order to help its readers the JOURNAL was inspired about 25 years ago to inaugurate its own collection and prompt publication, believing that figures within 5 per cent. of the truth right at the end of the year were vastly more valuable commercially than precise figures a year or two late. Our long campaign for prompt and reliable information has borne fruit and relieved us of much investigation.

The improvement in statistical information is but one of the reforms that have been inaugurated or promoted by the JOURNAL. In its existence that is now approaching the half-century mark we have steadfastly stood for the things that make for the welfare of the mining industry. The fact that we have sometimes had to take the unpopular side of a public question has never deterred us from advocating what we have deemed to be the right, and we may be pardoned the egotism if we say that we have not often seen reason to change our views respecting broad questions of public affairs affecting the mining industry. In the questions of the day, such as a sane consideration of the problem of conservation of resources, the opposition to bureaucratic interference, the leading toward publicity of the reputable mining companies, the elimination of the deceptive promoters from the mining business, the introduction of means and legislation for the lessening of accidents in mining, the opposition to combinations in restraint of trade, etc., we shall pursue the same activity that has characterized us in the past.

At the same time we shall lead the way, as ever, in the publication of the purely technical contributions and discussions that mark the advance in the arts of mining and metallurgy. Of the advance during 44 years the file of the JOURNAL is a complete record. We lead where others follow. We are generally the first and are always the most exhaustive. We serve the entire mining industry, not merely a part of it, and not merely our own country but also foreign countries, our subscribers being numbered among most of the countries, civilized and uncivilized.

This catholicity sometimes invokes

criticism. One subscriber wrote complainingly that he was not interested in more than 40 per cent. of the paper. We took this as a compliment. If we could interest every reader in 40 per cent., or even 20 per cent., we should think ourselves about ready to pass to some higher sphere. The paper is of great size. Each issue contains one-half the type of the average scientific treatise, or the equivalent of 26 ordinary volumes per year—a library in itself—and there is a great variety of matter. A good restaurant presents a lengthy bill of fare, but no one expects to eat it all; nor does anyone need to go hungry. It is just the same with the reading that is offered by the Journal. The man who is especially interested in zinc might like to see the paper devoted to the mining and smelting of that metal, but then the copper, coal, gold and iron people would have to starve. If any reader should take the trouble to reckon, as sometimes we do, he would find a pretty even distribution in the *menu* and plenty to read all around.

The chief function of a paper, whether popular or technical, is to tell the news. In matters of technical progress our contributors are naturally the mainstay. The pages of the paper are the forum wherein the telling of new methods and discussion of the same obtain the widest hearing, and progress in the arts is thereby advanced. When contributors upon any important subject are not forthcoming we spare no efforts to lead them on or send members of our own staff to see and report. Our regular correspondents in all of the important mining centers of North America and in many foreign countries are always alert to communicate new developments of all kinds. These are the things that go to make up a paper. It is the work of many hands —a coöperative institution. The editor simply directs and coördinates.

The Journal appears this week in a complete new dress. The new headings improve the appearance of the paper, we think, and the new type makes the text easier to read. By new arrangements in our printery it has become possible to restore the editorial pages, together with the table of contents, to the front of the paper, where they used to be. Many of our readers have requested this alteration in "make-up," and we ourselves have desired it, but heretofore it has been impossible.

Boston & Alta Copper Company

A new promotion of the last week is the Boston & Alta Copper Company, capitalized in 300,000 shares, of which 132,500 are issued and 167,500 remain in the treasury. Of the treasury stock 25,000 shares are offered at $8 per share by Dick Brothers & Co., a Stock Exchange house. The prospectus is accompanied by reports from George T. Wickes and Pearse, Kingston & Browne. The former was professionally connected with the mine from 1882 to 1896. Pearse, Kingston & Browne are a reputable firm of engineers.

We infer, although it is not so stated in any of the documents, that the property in question is the old Alta-Montana mine, which subsequently passed into the hands of the Helena Mining and Reduction Company and was shut down in 1893, upon the great decline in silver, since when it has been worked only by tributers. In its day this was a famous mine, but it was exploited chiefly for silver and lead and it is now somewhat of a surprise to find it figuring as a copper mine.

It is quite clear from the engineering reports that the old workings are mostly inaccessible and that the amount and character of the ore remaining in them, not to speak of the condition of the workings themselves, are chiefly matters of surmise. Pearse, Kingston & Browne say that the records of 1¼ to 1½ million tons of ore extracted previous to 1893 show that the average value of the ore was in the neighborhood of $22 per ton—a vague statement—but they consider it probable that the run of the mine was less than that. "The mine assay records during the last year's work of the company showed 1.75 per cent. copper, 4 per cent. lead, 9 oz. silver and $1.40 gold."

It would appear that ore of this character might present some difficulties in treatment; if our recollection be correct the treatment question was more or less of a problem in the former history of the mine. Reference to our files shows that in 1883 there was considerable trouble among the stockholders of the Alta-Montana company over the incapacity of the management in erecting a plant that could "not handle the low-grade and refractory through cheaply mined ores." The Alta-Montana does not appear to have been a dividend payer. Later in the same year its property passed to the Helena Mining and Reduction Company, which gave one share for 10 of the old, and assumed a bonded indebtedness of $600,000. The Helena company is on record as having paid $197,970 in dividends, the last—$39,780 —having been in July, 1886.

We are glad to see the reopening of the famous old mines, some of which give now some promise, as Eureka, Pioche and Tombstone, but we do not recall any of them that has yet developed into a remarkably profitable undertaking, and almost all of them have presented considerable engineering difficulties. We do not mean to say that this will necessarily be the case at the Alta, but considering the poverty of the data at their hands it seems to us that Pearse, Kingston & Browne were not justified in regarding it as "not so much as a mining venture as a manufacturing proposition on a large scale," or in saying "the mining risks are practically nil." We should like to become conversant with some new mining enterprise whereof the risks are practically nil. The Boston & Alta impresses us as being very much of a prospect and it is upon that basis that it should be presented to the public, not as the going, or almost going, concern that the advertising has implied.

Suggestions Regarding Mining Investments

We scarcely need to commend to our own readers the remarks by Mr. Hammond upon this subject. We wish, however, that they might be brought more widely to the notice of the general public, who are naturally less informed as to the principles of mining investments than are our own circle of readers, and consequently we commend them to the fullest measure of attention by the daily press.

He has explained the pitfalls and attractions of mining investments, and has emphasized the difference between the mine and the prospect, in a remarkably lucid way, and in language that ought to be intelligible to the most innocent of the laymen. If all of the genus of suckers and gobies would select one of his gems of advice, have it engraved on a charm for their watch chain and read it once a day they would less often be the victims of a bunco or confidence game.

Ludwig Mond

By Charles Baskerville*

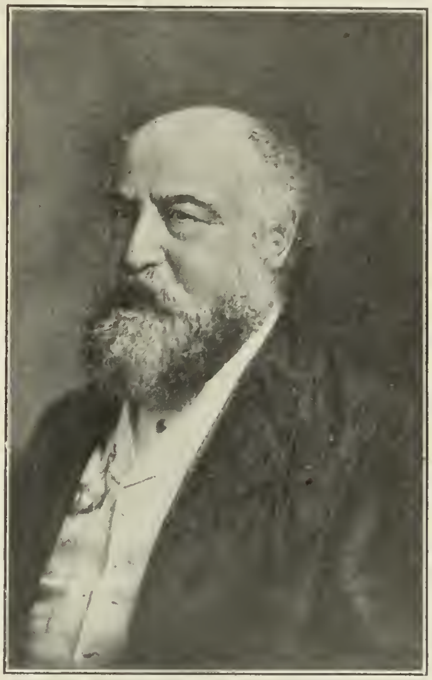
Ludwig Mond, the distinguished chemist, inventor, technologist and art connoisseur, died on Dec. 10 at his London residence, "The Poplars," 20 Avenue-road, Regent's Park, N. W. Doctor Mond was born at Cassel, Germany, March 7, 1839; and was educated at the Polytechnic School, Cassel, and at the Universities of Marburg and Heidelberg. In 1862, he went to England and engaged in the Leblanc soda industry, introducing his process for recovering sulphur from alkali waste. In 1873, he established, in partnership with T. T. Brunner, at Winnington, Northwich, Cheshire, the manufacture of ammonia-soda by the Solvay process, which he perfected; and the works there constitute the largest alkali establishment in the world. Among the inventions of Mond were processes for the manufacture of chlorine, a method of producing gas for heating and power purposes, and a process of making pure nickel. The latter was based on the formation of nickel carbonyl, a chemical compound which he discovered and investigated with Langer and Quincke. A list of his patents is found below.

Application of Research the Cause of His Success

At the inaugural meeting of the Society of Chemical Industry held in London in 1881, Mond read a paper on "Patent Laws as applied to Chemical Inventions," in which he remarked that, "Science tells us how very far we are from attaining our industrial aims with anything approaching the theoretical expenditure of force. Science also tells us in what directions we may look forward to arriving at improvements. I might say that we are on the eve of creating a science of invention, that is, of developing scientific methods for solving industrial problems." In 1889, in his presidential address before the same organization, Mond—in order to exemplify the application of methodical research to an industrial problem—presented an account of the work he had been engaged in for many years in relation to the procuring of new and abundant supplies of ammonia. His attention was called to this subject as early as 1861, but it was not until 1879 that he found abundant opportunity to investigate thoroughly the various processes which had been proposed for obtaining ammonia from the nitrogen of the air. This work led to the construction of gas producers and absorbing plants of various designs, and Mond and his assistants achieved great success in economically obtaining ammonia, tarry matters and combustible gases from coal. Then, too, they proved the delusiveness of some supposedly valuable processes; and the results obtained showed Mond to be, to quote Sir Lowthian Bell, "A man of exceptional intelligence and learning supplemented by that devotion of mind which qualified him to pursue his work with great energy and perseverance."

Discovery of Nickel Carbonyl

In the fall of 1895, Mond visited the United States and on Nov. 11 delivered an address on "The History of My Process of Nickel Extraction" before the New York Section of the Society of Chemical Industry. This process, it appears, was discovered in an accidental manner; to quote, in part, his own account: "Soon after I had satisfied myself that the ammonia-soda process was far cheaper than the Leblanc process for producing carbonate of soda pure and simple, it became evident to me that a time would come when the Leblanc process would produce carbonate of soda as a by-product of the bleaching powder manufacture, which it would have to dispose of at any price it would fetch. I therefore undertook a series of experiments with the object of producing bleaching powder as a by-product of the ammonia-soda process." He gave his attention to producing the chlorine direct from the ammonium chloride, separated from the solution in which it is originally obtained by refrigeration; and in developing this process, he said: "I had to construct a plant for volatilizing NH_4Cl, which I found an extremely difficult problem, as the vapor of this substance not only acts on oxides and salts, but also violently attacks the large majority of metals. I succeeded in lining iron vessels with glazed tiles in such a way that they would withstand this action, but I required valves for changing from the current of ammonium chloride vapor to hot air and *vice versa,* which had to be very tight to prevent a large loss of ammonia. I found that nickel was one of the few substances suitable for the construction of these valves, and that it was not at all attacked by ammonium chloride vapor. On the laboratory scale these nickel valves worked perfectly, but when I applied them on a manufacturing scale I found them to be acted upon and very soon to become leaky. The faces became covered with a black crust, which, on examination, was found to contain carbon. The source of this carbon seemed mysterious, the only difference between the work on the small scale and that on the large scale being that on the small scale we swept the ammonia out of the apparatus by means of pure CO_2, before admitting the hot air; while on the large scale, we used the gases from a limekiln, containing a few per cent. of CO. This led us to study the action of CO on nickel." Assisted by Langer, Mond discovered the curious compound nickel carbonyl, and for a long time they were engaged in an investigation of its physical and chemical properties. Finally Mond came to the conclusion that it ought to be possible to make use of the ease with which nickel is converted into a volatile gas by CO—while practically all other metals, and notably cobalt, were not acted upon by this gas—for separating nickel from cobalt and other metals on a manufacturing scale; consequently he "erected a plant on a large scale near Birmingham, and after several years of hard work, during which the apparatus had to be several times reconstructed so as to fulfil all the conditions of this rather delicate process," he succeeded in his object.



Ludwig Mond

Personal Traits and Incidents

Doctor Mond was an art lover, and his collection of early Italian masters is one of the finest in England. He was fond of Italy, and maintained a residence at 64 Via Sistina, Rome.

He founded and endowed the Davy-Faraday Research Laboratory of the Royal Institution in 1896. He was a fellow of the Royal Society; vice-president of the Royal Institution; a life member of the London Chemical Society, of which organization he served on the Council in 1885-6, and acted as vice-president in 1887-90, and 1894-98; an original member of the Society of Chemical Industry, of which he was president in 1888-89 and vice-president in 1890; a member of the British Association for the Advancement of Science, acting president of the Chemical Section in 1896; an honorary member of the Deutsche Chemische Gesellschaft since 1908; and a member of the Berliner Verein Deutscher Chemiker. He was also a fellow of the

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*Professor of chemistry, College of the City of New York.

Institute of Chemistry, and the recipient of the honorary D. Sc. degree from Victoria and Oxford Universities, and an honorary Ph. D. from Heidelberg University. He was vice-president of the joint organizing committee of the Seventh International Congress of Applied Chemistry, which was held in London from May 27 till June 2, 1909; and acted as president of Section II, Inorganic Chemistry and Allied Industries. During the session of the Congress, Doctor Mond held several receptions at his home. At one of these, which was given by Dr. and Mrs. Ludwig Mond and Robert Mond, their son—also a chemical engineer of prominence—on Sunday afternoon, May 30, about 1700 tickets were issued. These included the entire Italian delegation, which took advantage of the occasion to present Doctor Mond with a noble bronze in appreciation of his numerous gifts to the art and science of Rome. The garden party was not only complete in the most elaborate detail for the varied entertainment on a suitable scale for the large company, but was arranged to display some of the exquisite ancient art recovered in Egyptian excavations, the expenses of which were borne by the Mond family. In the adjoining home of Robert Mond there was perhaps the best exhibition of colored photographs—many taken by him—in any private collection. One also saw there pure nickel and cobalt in various forms, and the various carbonyls of nickel, iron, cobalt and palladium, some shown for the first time.

Royalty Reductions by the Ontario Government

By W. F. Boericke*

The Ontario government has at last yielded in part to the demands of the mine owners at Cobalt for a reduction of the royalty tax on the mines affected. The fight against the royalty has been carried on for some time, but this is the first real concession that has been made. It is of large significance not only to the half dozen mines which will benefit by the reduction, but to the entire camp as well, in insuring a more profitable basis on which the mines may be worked.

Under the old arrangement the so-called "royalty" mines, which include the Cobalt Townsite, City of Cobalt, Chambers-Ferland, Nancy Helen, Cobalt Station Grounds and one or two others of minor importance, paid a straight royalty of 25 per cent. to the government on the gross output of the mines; that is, the value of the ore at the shaft mouth. The government, however, paid its quota of the treatment charges on the ore received. Such an arrangement could yield a profit, under ordinary conditions, only to mines that had extraordinarily rich ore or very low working costs. In many cases it meant a prohibitive figure, practically, for the management, or at best a production leaving very small, if any, margin of profit for capital account.

Under the new arrangement, the same royalty (25 per cent.) is imposed, but is collected on the net profits at the end of the year. There is a further provision that if the profits do not exceed $10,000 no royalty will be imposed, this sum being set aside for capital account.

A typical case will make the situation clear, and show how much the mines will benefit. Suppose a mine is capable of turning out 1,000,000 oz. of silver per year, having a value, say, of $500,000. Formerly the government took 25 per cent. of this, or $125,000, but under the new régime all mining costs and treatment costs are first deducted. These may be taken as 10c. per oz. for mining and 10c. for treatment, and the total cost would then be $200,000. Deducting this from the value of the ore leaves $300,000. The government gets 25 per cent. royalty from this amount, which is $75,000 or about 15 per cent. of the gross value of the ore.

There is another point to be remembered. Suppose a reduction works or concentrator were to be erected. Formerly the company would have to pay the cost, after first paying the royalty. Now this cost may be entered under operating costs and improvements and taken out of gross profits. The government will get its royalty on the net proceeds after charging off such expense. For a company operating on a narrow margin of profit this would frequently mean whether the mine were to be a success or a failure. The owners of the mines affected claim to be entirely satisfied with the reduction, and state that their properties will be operated immediately to their full capacity.

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*Mining engineer, Cobalt, Ont.

California Oil Dividends for December

Below are tabulated the dividends declared payable in December by California oil companies, as reported in the *San Francisco Chronicle*, Dec. 13, 1909. The initial number in each case is the number of the dividend:

Company.	Div.	Total.
6 American Petroleum..	$1.00	$119,286
11 Brookshire	0.01	5,000
56 Caribou	0.25	20,175
34 Euclid	0.01	3,500
31 Illinois Crude	0.01	2,000
.. Mexican Petroleum...	0.01¼	81,740
2 Paraffin	0.01	3,000
7 Palmer	0.01	18,020
13 Royalty ...	0.02	100
6 Record	0.07½	7,500
15 Rice Ranch ..	0.01	3,000
2 Silver Tip .	0.10	7,500
22 Sterling ..	0.25	62,000
20 S. F. & McKittrick	0.30	15,000
161 Union	0.50	121,813
100 Western Petroleum..	0.50	10,000
Western Union.....	2.00	20,000

December Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during December, 1909, by a number of mining and industrial companies in the United States, Canada, South and Central America.

U. S. Mining Companies.	Situation.	Amt. per Share.	Total Amt. Paid.
Acacia, g	Colo.	0.01	14,500
Bunker Hill & Sullivan, sl	Idaho	0.15	45,000
Butte Coalition, c...	Mont.	0.25	250,000
Calumet & Arizona, c.	Ariz.	1.00	200,000
Calumet & Hecla, c..	Mich.	8.00	800,000
Colorado, l.g.s......	Utah	0.08	80,000
Colorado Gold Dredging..............	Colo.	0.25	25,000
Doctor Jack Pot....	Colo.	0.00½	15,000
Elkton Con., M. & M., g...........	Colo.	0.02	50,000
El Paso, g	Colo.	0.01	24,500
Federal, M. & S., pf..	Ida.	1.75	210,000
Grand Central, g....	Utah	0.04	10,000
Iron Blossom, s.l....	Utah	0.08	80,000
Jerry Johnson, g....	Colo.	0.01	25,000
Mary McKinney, g..	Colo.	0.01	13,042
North Star, g.......	Cal.	1.20	300,000
Nev. Con., c.........	Nev.	0.37½	431,700
North Butte, c	Mont.	1.00	400,000
Old Dominion, c....	Ariz.	0.50	146,623
Old Dominion M. & Sm..............	Ariz.	1.00	162,000
Oroville Dredging, g.	Cal.	0.12½	87,500
Phelps, Dodge & Co.	U. S.	0.04½	2,022,057
Quincy Mining Co., c.	Mich.	1.00	110,000
Round Mt., g	Nev.	0.04	32,000
Sioux Con., s.l.g....	Utah	0.03	22,391
Snow Storm, s.l....	Ida.	0.01½	22,500
Tennessee, c	Tenn.	1.25	250,000
Uncle Sam Con., g.s.l.	Utah	0.02	10,000
United Gold Mines, g.	Colo.	0.01	40,000
Utah Copper, c.....	Utah	0.50	366,812
Victoria, l.s.g......	Utah	0.02	5,000
Yukon Gold........	U.S., Can.	0.10	350,000

U. S. Industrials.	Situation.	Amt. per Share.	Total Amt. Paid.
Am. Smelters, pf., A.	U. S.	1.50	255,000
Am. Smelters, pf., B.	U. S.	1.25	375,000
Gen. Chemical, com	U. S.	1.00	74,103
National Lead, pf...	N. Y.	1.75	260,820
Standard Oil.......	U. S.	10.00	9,700,000
U. S. Steel, com....	U. S.	1.00	5,083,025

Foreign Mining Companies.	Situation.	Amt. per Share.	Total Amt. Paid.
Crown Reserve, s...	Ont.	0.10	175,000
El Rayo, g.s........	Mex.	0.06	21,601
Granby Con., c......	B. C.	2.00	270,000
Kerr Lake, s.	Ont.	0.35	210,000
Rio Plata, s........	Mex.	0.07½	28,007
Lucky Tiger, com., g.	Mex.	0.05	35,750
Santa Gert. y Guadelupe, g.s	Mex.	1.00	60,000
Trethewey, s ...	Ont.	0.15	15,009

The Himalaya chrysoprase mines near Porterville, Tulare county, Cal., are shipping considerable quantities of the crude stone to Germany. The material is more or less flawed and good pieces for cutting are scarce but the color is excellent. Many fine stones have been found from time to time. The deposit has been worked almost continuously since its discovery in 1889. The chrysoprase occurs in some abundance and associated with it are a number of other forms and varieties of quartz minerals capable of being used in the arts for ornamental purposes. Owing to the present fad for green stones there is a lively demand for chrysoprase from California.

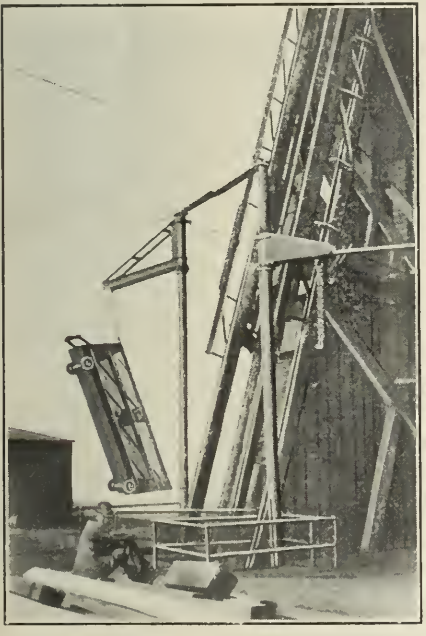
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

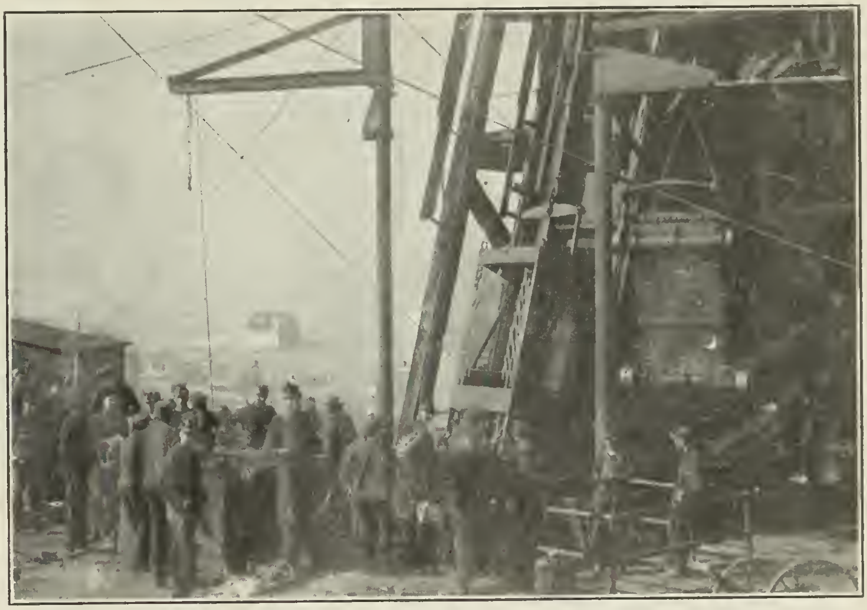
Readers of the Journal are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Crane for Changing Skips

At mines hoisting in skips it is advisable, and sometimes necessary, to have a specially constructed cage for lowering and hoisting men. The accompanying illustrations show the top arrangement for changing man and ore skips at the Burra Burra mine of the Tennessee Copper Company, Ducktown, Tenn. At this mine cages are interchanged and made ready for lowering in from 30 to 60 sec. A similar arrangement was successfully used for a number of years at the famous Gwin mine on the Mother Lode of California.



Man-skip Swung from Shaft



Skip-changing Arrangement at Burra Burra Mine, Showing Man-skip in Shaft and Ore-skip Swung Out

As shown, there are two cranes at the shaft mouth, one to handle each skip. The cranes are made up of iron-pipe verticals with channel-iron swinging arms stayed from the top of the uprights. The swinging arms carry small traveling crawls to which are attached the chains by which the skips are lifted. The cranes are connected across the top and are also stayed in several directions with wire cables. The chains can be attached to the skips by slipping the hooks at their ends into eyes which are provided on both the man and ore skips.

The operation of changing the skips is as follows: When a skip is raised to the surface the chains are attached to it, the cable secured (as will later be explained), the thimble removed and the skip then swung out of the way by a rope attached to the arm of the crane; the other skip is then swung in from the other crane, the cable attached to it, chains knocked loose, cable made free, and it is ready to lower.

A small winch, not shown in the illustration, is provided on the headframe above the shaft's mouth. When skips are to be changed, a couple of men must stand ready at this winch in order to fasten the cable so that there will be no danger of its being pulled over the sheaves. A hitch is thrown about the cable with a piece of rope secured to and drawn taut by the winch. As stated, the whole operation of changing skips occupies only about a minute, and from the added security obtained in raising and lowering employees, the small investment of installation is certainly warranted.

Hand Sorting of Ore

At a number of the milling plants in southeast Missouri a certain amount of hand picking of the ore is done. The scheme is as follows: The ore is hoisted from the mine in skips and emptied directly upon a metal link-belt conveyer, approximately 30 ft. long. The belt travels 25 to 40 ft. per min. Two men are usually employed at the picking belt. The amount of waste rock varies considerably. In one case about two 50-ton cars of waste material are picked out per week, at a shaft where the output is 5 to 7 cars per day. In this way at least 7 per cent. of the mine output is disposed of at a cost of 20 to 30c. per ton, which is cheaper than passing the barren rock through the mill.

The picking floor is usually placed directly over the railroad track and when cars are obtainable the waste rock is tossed into the car. Otherwise it is placed on the floor, which will hold at least a carload, and is shipped out when cars are at the disposal of the mining company. From the picking belt the ore passes over 3-in grizzlies. That which passes through goes to a storage bin, while the coarse rock goes through a crusher and thence to the same bin. From here it is delivered to the mill by railroad cars.

New Tipple and Hoist Installation

The accompanying photograph is a view of the new steel tipple frame erected by the Woodward Iron Company at its No. 3 slope on Red mountain, Alabama. The Republic company was first to erect a steel tipple frame on the mountain, but that company hoists in 10-ton skips after the practice of the Tennessee company, while the Woodward Iron Company will hoist in 5-car trains of 2-ton cars, dumping the entire train in a revolving tipple, which is shown plainly in the illustration. The bins are constructed of concrete reinforced with steel rails and discharge from either side toward the center. At this slope the Woodward company is installing an electric hoist which will be the first electric hoist equipment operated on Red mountain. The current will be generated at the company's furnaces from waste steam. In the picture the engine house is shown through the trees to the right of the tipple. The wooden incline shown in front of the new tipple is now used to shoot ore down from the slope entry to the narrow-gage railroad which conveys it to the No. 1 tipple and crusher around the hill.

New Steel Tipple of Woodward Iron Company

Disposal of Power-plant Ashes

The disposal of ashes from a large power plant is an item of expense that often amounts to hundreds of dollars per year. Any device that will reduce this expense adds just that much to the dividends of the corporation.

The power plant of the Federal Lead Company, Flat River, Mo., comprises six 150-h.p. Heine boilers, five of which are in use all the time. Automatic stokers are used and 100 to 110 tons of coal consumed daily. The cinders and ashes drop into a pit below the level of the firing floor. All the pits are connected with a tunnel into which the ashes were formerly scraped and wheeled out in barrows to the ash heap. Later a cable car was installed but this did not work satisfactorily as the car would jump the track, or go over the end of the track, due to overwinding.

The scheme now in use consists of an inclined 8-in. iron trough set in the concrete floor of the tunnel, so the ashes may be scraped into it direct from the ash pit. As the ashes are dropped into this trough, water is turned in at the upper end, washing the ashes to the boot of a bucket elevator. The elevator has a 14-in. rubber belt, with a 12-in. bucket. The ashes are elevated vertically about 50 ft. where they are emptied into a trough and sluiced out with water. The trough is a 12-in. water pipe split in two, and is inclined about 1½ in. per foot. This installation saves the labor of four men on each shift, or 12 men since three shifts are worked here. Thus a large saving is effected which will soon pay for the entire ash-disposal outfit.

At the Oronogo Circle mines, Oronogo, Mo., hoisting is carried on from a depth of 230 and 245 ft. At the 230-ft. level is a heavy door that is closed when the hoisting is from that level. This door forms a platform from which the buckets are hoisted. The door is 5x6 ft., hinged at one side and is made of 2-in. plank nailed to a strong frame. It may be opened by the cable which hoists the ore. When hoisting from the lowest level, the door is opened, and turned back far enough to be out of the way. At this mine when it is desired to close the door, the cable is attached to it, slowly wound up until the door reaches a vertical position, and then lowered to place.

New Ventilation System

In a number of the Cripple Creek mines, Colorado, some of which have been quite thoroughly opened, there is no production because of the foul air. To overcome this difficulty the Worcester system of ventilation has been placed in a few workings, and good results obtained. This method was lately installed at the Prince Albert tunnel. The superintendent, after giving it a fair trial, pronounced it an unqualified success. The method is simple and easily accomplished: Two bulkheads, including an air-tight entrance, are constructed. A pressure of two ounces per inch of compressed air has been found ample to ventilate thoroughly the 1400 ft. of tunnel workings and crosscuts thereupon. Prior to the equipment of the tunnel with the Worcester device work had been practically suspended in the heading and crosscuts.

The Conundrum mine on Gold hill is to be similarly equipped, but here the largest plant yet constructed will be necessary to properly confine the mine gases by air pressure. A fan, 7 ft. in diameter and driven by an electric motor, will be installed at the Conundrum incline in addition to the several bulkheads that will be built at stated points in the two miles of workings, this distance including the Moon-Anchor connections. The Chicken Hawk, on Guyot hill, and the Little Nell, on the Arequa townsite, south of Elkton, have been equipped with the Worcester system, and the deep workings of these mines are now well ventilated and free from mine gas.

Various means have been employed to expel noxious gases, and many mine workings were abandoned. The value of the system brought into use by Mr. Worcester, has been made apparent wherever it has been properly applied. There are many places in the district where it is needed. In many mines of other districts, there is little trouble from noxious gases largely because ventilation has been provided by underground connections with shafts, raises, etc., but it is well to know of the application of the Worcester system in cases of need.

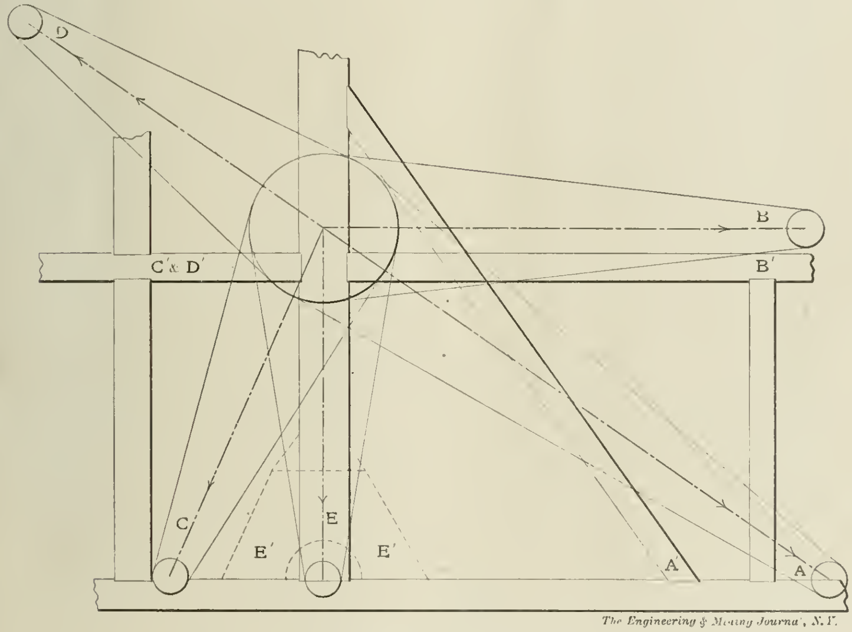
A Safety Hoisting Device

A safety device designed to prevent mine cages from being hoisted into the sheaves has recently been put in use at all of the principal mines of Butte district. The invention works automatically on the brakes of the hoisting engines so that when the engine is going at too high a rate of speed as the cage is approaching the surface the steam is automatically admitted into cylinders which apply the brakes. The device begins to operate when the cage is within 100 ft. of the surface and has proved itself able to stop the cage within a distance of 80 ft. A recent test, made when a powerful hoisting engine was going at full speed, has thoroughly satisfied the mine managers of its capabilities. Several serious accidents have happened in Butte by reason of the engineer hoisting a cage into the sheaves and it was this fact that caused interest to be given to devices of such a nature.

Position of Driving Power for Stamp Mills

By Algernon Del Mar*

In the Journal of Sept. 25 an article appeared under my name entitled "Battery Posts of Reinforced Concrete." This form of construction is the only one that will allow of a vertical pull on the cam shaft, therefore it needs no bracing and may be independent of the ore bin or other foundation. The illustration shows a composite picture of the different forms of construction. The A-frame is omitted. A is the direction of pull for an angle-brace construction and A' the brace; $B\,B'$ shows the front knee; $C\,C'$ the usual form of back knee; $D\,D'$ the overhead form where the slack belt is uppermost, and $E\,E'$ the concrete battery post. A 3-ft. semi-circular casting forms a hollow through the battery posts and mortar blocks in which the driving-shaft boxes are placed.



The Engineering & Mining Journal, N. Y.

Stamp-mill Frames and Method of Drive

Since the publication of the idea of concrete battery posts and cam-shaft cushions I have discussed the idea with many practical millwrights who without exception have declared it practical, and some were enthusiastic in its praise.

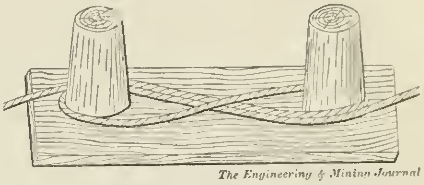
Taking Up Slack on an Alternating Current Cable

By James A. Seager*

I recently heard of a case where the cable which was to feed the motor of a sinking pump was wound round a drum at the top of a shaft in order to allow of a length being paid out as the pump had to be lowered. The result was that the cable on the drum got surprisingly hot in a few minutes, and it was only by a frenzied rush to the switchboard that the colliery electrician was able to save not a few yards of valuable cable.

It is therefore evident that for portable machinery such as drills, coal cutters, and similar plants driven by alternating-current motors, it is inadvisable to use a cylindrical drum for taking up the slack because the self-induction in the coil of cable on the drum may be considerable, and may not only cause the voltage at the motor to fall below the minimum working limit of the machine, but also lower the power factor of the supply. Moreover, should the drum be of iron, or should any metal masses be in the vicinity of the coil of wire, heavy eddy currents will be set up, heating the mass, and either drying or charring the insulation of the cable. Further, there is a practical difficulty to be encountered in putting the cable off the drum without kinking or straining it, unless the drum is mounted on an axle and provided with slip rings in order that it may revolve and yet keep contact on the electric circuit. A provision of slip rings, in addition to being expensive, involves the laying bare of live metal probably in an exposed position, and in an atmosphere where flying coal dust is abundant there is a great chance of dangerous sparking.

In order to meet the difficulty of lengthening or shortening a cable at will, the simple arrangement shown in the sketch overcomes all these difficulties and it has been found in underground working to be a useful appliance for coal-cutting and drilling, where the face advances a small distance every day and the cable has to be paid off a yard or two at a time. The device consists of a stout, flat board upon which are mounted two tapering uprights, circular in shape and securely fastened to the board by means of coach screws or bolts. The size of the uprights depends upon the diameter or stiffness of the cable so that it puts no undue strain at the bend. In order to deal with a cable 1 in. in diameter the centers of the uprights should be about 3 ft. apart and their diameters on the smallest portion should be not less than 9 in. In laying cables on the block they should be allowed to take an easy and natural bend without being pulled too tight.



The Engineering & Mining Journal

Device for Taking Up Slack Cable

The base is made of two or more 2½- or 3-in. planks, each about 9 in. wide with coach-screw heads countersunk. In the case of a three-phase machine supplied by three separate single-core cables, three of these holders, fixed horizontally one above the other against the wall, are very convenient, and when paying off the cable it is necessary only to draw off the front coil at each peg and allow it to untwist itself. The arrangement is also convenient in connection with portable pumps. Where the pumps are small and the cables are light, the slack-taking arrangement can be fixed to the pump frame so that it is unnecessary to make any electrical disconnection when moving the pump forward.

Swelling ground cannot be held by timber; means must be provided for relieving the pressure of the ground from time to time. It will cause little trouble if spaces are left between the lagging through which the pressure may be eased at intervals by removing some of the rock material. Expedients such as packing with straw are valuable only until the swelling becomes sufficient to pack tightly the cushioning substance. When this becomes packed solidly it transmits the pressure to the timbers.

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*Mining engineer, South Pasadena, Cal.

*Civil engineer, Newcastle-on-Tyne, Eng.

Suggestions Regarding Mining Investments

Difference between a Prospect and a Mine. Need of Engineers' Reports; Returns on Investment; Amortization; Some Don'ts for Investors

BY JOHN HAYS HAMMOND*

In a discussion of mining investments it is all important at the outset to distinguish clearly between the two general classes of mining properties, prospects and mines.

By the term prospect, the miner designates orebodies only partially explored or developed. Obviously investments in this class of mining are always of a speculative character, and for this reason are often referred to as mining gambles. The capital required to purchase and develop a prospect is, of course, much less than that required for the purchase of a developed mine and the installation of the mining and reduction plant necessary for its exploration. While financial loss in each particular case of failure in investments of this character is smaller, the losses are, nevertheless, more frequent because of the inherent risks involved compared with those of developed mines. In the event, however, of a fortunate selection of a good prospect, the result of subsequent development work may transform that prospect into a paying mine, and then the ratio of profits realized to capital invested becomes far greater than in the case of properties already developed. In other words, one may, if he be of a sanguine disposition, not unreasonably hope for—mind you, I do not say expect—a return of profits amounting to many times his investment in ventures of this kind. While, on the other hand, the most optimistic investor would not be justified in entertaining hopes, far less expectations, of such large profits from his more conservative investment in developed mining properties.

Development of Prospects a Field for Large Interests

A peculiar, indeed, unique, kind of mining talent is essential in "sizing up" a mining prospect to determine whether or not the investor is warranted in risking his money chiefly on the strength of surface indications of the orebodies, in default of more extensive and reliable developments. There are, as I have intimated, few engineers who possess what is called a "good nose" for a mine in connection with the experting of undeveloped, or partially developed, mining prospects. Nevertheless, it is from just such beginnings and by just such financial risks that the great mines of the world have been developed. And fortunate indeed is he who has had the ability or luck (for luck is admittedly an element in the issue) to invest his money in what ultimately proves to be a successful venture of this kind. Probably not more than one in six of what would reasonably be regarded by experts as prospects deserving exploration, proves ultimately to be a winner. That is to say, such risks may be regarded as a six to one shot! And yet it is my opinion, based on considerable experience in this class of mining, that no field of mining investment is more attractive, and at the same time, I venture to say, more safe than investments in prospects if carried out by men with good judgment and with the requisite experience. But this kind of mining should be confined to such capitalists or exploration companies as can afford to incur the risk of several failures before attaining final compensating success. Preferably such operations should be undertaken by those who have had mining experience, and, therefore, who have a proper appreciation of the degree and extent of the financial hazards involved.

At the risk of the imputation of "damnable iteration," I wish to emphasize the relative degree of hazard in investments of this character, and to urge the public to exercise due discrimination in the investment of money in the classes of mines referred to. Unscrupulous promoters and other financial sharks take advantage of the ignorance of the credulous invester to sell stock in a company, the assests of which are the undemonstrated potentialities of a prospect and not the reasonably assured income of a developed mine. *Caveat emptor!* Indeed, the great majority of alluring prospectuses issued to the gullible public, when analyzed by a mining engineer, show that the properties purporting to be mines are in reality only prospects of a highly speculative value.

Many Reduction Plants Installed before Warranted

A very common cause of the loss of money in mining is due to the precipitate action of companies in installing reduction plants upon the properties before the mines have been sufficiently developed to supply ore. Throughout all the mining districts of the world there are countless monuments to the folly of such investors in the ghastly shape of abandoned mills.

Those experienced in the investment in prospects almost invariably insist upon what is called a working bond, to enable them to determine the value of the prospect by actual developments before the payment for the property. Sometimes, for this privilege, they are willing to pay a reasonable sum to be applied to the purchase price of the property in case their option should be exercised, or as a forfeit if the results of the developments are adverse and they decide to "turn it down."

Differentiating between Prospects and Mines

It is often difficult, indeed at times impossible, to define at what point in its stage of development a prospect ends and a mine begins. But in general terms it may be stated that where a property is sufficiently developed to enable the engineer to make a calculation of the net value of the ore reserves, and in addition to this to form an opinion as to the continuation of the orebody in depth beyond the limits of the ore in sight, with such a degree of probability as to assure the return of the capital invested in the erection of the necessary mining and reduction plants, such a property may then be dignified by the appellation of mine.

It is not always the amount of development work upon a property that determines to which category it belongs. Indeed, a few classes of ore deposits, owing to their peculiar geological features, possess such reliability in respect to the persistency of the orebodies as to warrant the investor in regarding them as mines and not mere prospects, in spite of the relatively small amount of exploratory work actually performed.

The well known ore deposits of the Witwatersrand in the Transvaal are a case in point. The geological formation there is *sui generis* in the history of gold mining. By a deep level, as understood in the Transvaal, is described a property which lies in the direction of the dip of the vein away from the mining claim containing the outcrop of the vein. The veins situated below the deep-level areas can be reached only by sinking vertical shafts hundreds, indeed thousands, of feet in depth. And yet, so reasonably assured is the expert of the continuation in depth of payable orebodies in this vein system, that some of us have had what would be regarded by engineers not familiar with local conditions as extreme temerity in our recommendation of the investment of hundreds of thousands of dollars in the sinking of vertical shafts to strike the veins at

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Note—Address delivered before the Finance [illegible] at New York, Dec. 22, 1909.

*Consulting mining engineer, 71 Broadway, New York.

depths of from 2000 to 4000 ft. before even a speck of gold was visible. And to further emphasize our confidence in the success of such operations, many of us have actually started the erection of mills involving an outlay of capital of hundreds of thousands, indeed, upward of a million dollars in many instances, while the shafts were being sunk and before the veins had been cut.

Deep Level Mines of the Rand

If it will not be considered egotistical, I will briefly tell you, in this connection, the history of what are now known in the Transvaal as the deep-level mines of the Rand, and incidentally show you the manner of man that the late Cecil Rhodes, the great empire builder, was. His personality cannot fail to be of interest to those conversant with contemporaneous history. This will, I trust, justify the digression.

It was a starlight night—I recall the setting of the scene most vividly—on the plains of the country now bearing his name—Rhodesia. Mr. Rhodes, Doctor Jameson and I were on a wagon and horseback trip of several thousand miles, for the purpose of making an examination of what has since been proved to be the mines of King Solomon. In the course of our conversation and discussion of the great politico-economic question of the day, Mr. Rhodes asked my opinion as to the nature of the Transvaal gold mines. He was at that time the largest individual owner and the controlling spirit of the Consolidated Goldfields of South Africa, and I the consulting engineer of his companies. Much to his surprise, I told him that the mines of our company, though possessing merit, would not produce ultimately what he had been led to expect in the way of profits, having regard to the long time required for the realization of these profits. He then asked me what I thought of the probability of the veins extending in depth below the present deepest workings. I told him that it was my opinion, based on my knowledge of the geological conditions, that these veins would extend to a great depth. He then said, "Why not sell our shares in the outcrop companies and buy the deep areas which can be now purchased at a low price, since no one as yet regards them as valuable for other than agricultural purposes?" The outcrop companies he referred to were those I have previously described as prosecuting their mining operations from the surface down to a relatively small depth. I replied, "If the properties belonged to me I would do so." After a little further discussion on the subject he said, "We will do it." Thereupon we called one of our secretaries and dictated a cable to the London board of directors, instructing them to sell all the stock owned by the Consolidated Coldfields of South Africa in the outcrop companies. That very night we sent a trusted messenger on horseback 250 miles to the nearest telegraph station. About ten days afterward we received a cable from London to the effect that the London directors did not understand Mr. Rhodes' intentions, and asked whether it was his wish that the Consolidated Goldfields be liquidated. He thereupon immediately sent another cable to the effect that he was unable to explain more fully, but that they must follow out his recommendations without further question. Mr. Rhodes was inclined to be somewhat dictatorial—his certainly was a dominating though not domineering spirit. About a fortnight later we received a cable stating that the board of directors, though protesting, had begun to sell out the company's holdings. By the time we arrived at Johannesburg, a few weeks later, our company had many millions of dollars in cash to its credit. Without taking anyone else in the secret, I made plans to acquire thousands of acres of this undeveloped deep level area, situated below the most promising portion of the developed outcrop companies.

It required several months of patient and careful negotiations to acquire all this property, but finally we had it in our possession, and before I had left the Transvaal a few years later, many of these deep-level companies had been floated, shafts had been sunk, the veins had been cut, large mills erected, and dividends earned. With other deep-level mines since developed they are now yielding as much as $75,000,000 in gold per year. Indeed, upon the exploitation of the deep-level properties of the Rand depends its length of life, for the outcrop companies are becoming rapidly exhausted. Mr. Rhodes was much criticized at the time by the directors and others largely interested for having sacrificed, as they alleged, the interests of the shareholders of the Consolidated Goldfields company in thus disposing of these mining interests. But subsequent developments justified Mr. Rhodes' policy, for his company made millions of dollars in this transaction through the liquidation of its holdings in the outcrop companies, and within two years, by legitimate flotation of properties of undoubted intrinsic value, it was able to pay $10,000,000 annual dividends.

Engineer's Reports

In their reports, mining engineers and experts divide the ore of the mine into three classes. First, "ore blocked out." Second, "probable ore." Third, "possible ore." The ore blocked out can be very accurately determined by a competent expert through a careful and exhaustive system of sampling. In his estimates of probable ore, the engineer is confronted with different conditions, because here certainty stops and conjecture begins. I shall not weary you with the geology and other factors the engineer takes into his calculations in arriving at his estimate of probable ore. To a great extent this is a matter of the personal equation of the engineer. Some are inclined to allow as probable ore, that which is embraced in a block of ground lying below the ore actually blocked-out to a depth of, it may be 25 ft., or it may be in rare cases upward of 100 ft. The estimates will depend largely on the opinion of the engineer as to the persistency of the payable orebodies.

Estimates of possible ore are highly speculative, and yet I would prefer to take the conjecture, or guess if you please, of some engineers (because of their exceptional expertness) as to how much importance is to be attached to the occurrence of the possible ore, than to accept from others less qualified in this particular kind of mining clairvoyance an estimate of the probable ore. As I have said, here comes in the ability of the trained engineer to see beyond the end of the pick, which was the limit of the ore reserves and the probable ore of the old practical miner who was the mining expert of the past generation. I can well recall at the outset of my career the prejudice that prevailed against the educated mining engineer. In those days there were a great number of fakers who passed as mining experts, and the more illiterate they were the more practical they were regarded, and therefore absolved from any suspicion of being educated and inferentially a bookish theorist.

I am reminded of an important mining suit that was being tried on the Comstock, which involved some expert testimony on mine surveying. One of the witnesses, whose veracity was on a par with his technical knowledge, was asked by the opposing counsel how many degrees there were in a circle. Up to that time he had been too much for the opposing lawyers, who knew nothing about such procedure, and had given most convincing testimony in favor of his side of the case. It was a lucky inspiration on the part of the opposing lawyer to ask this question. With a contemptous smile the witness looked around the courtroom, and with one eye on the jury replied "Why, of course, everybody knows it depends on the size of the circle." Needless to say, the plausible testimony he had previously given was discredited.

As it is very seldom that a mine can be purchased on the basis of the net value of its ore-reserves, i.e., for the net value in sight, it is of great importance for the engineer to determine to what extent he can include "probable ore" in his determination of the net value of the mine. It is indeed upon the degree of risk assumed in his estimate of "probable ore" that the engineer has to decide whether or not he is justified in recommending the purchase of the property. "Possible ore" is, of course, not to be taken into the engineer's calculations. It may be, however, in many cases that the possible ore, i.e., the potentialities of the mine, is the extra inducement that determines his favorable report.

RETURNS ON MINING INVESTMENTS

Mining investments differ in one very important particular from those of nearly every other kind; that is, the comparatively short life—the instability of the investment. It is, indeed, because of this feature that the rate of dividends in mining should be higher than in other investments rather than because of the relative degree of risk involved. While it may be stated, broadly speaking, that whatever risks there may be in mining as to the uncertainty of the extent and persistency of the payable orebodies in depth, the risks are, nevertheless, not greater in the majority of mining operations than those that appertain to many other kinds of commercial investments where indeterminate factors likewise obtain. Especially is this true where commercial investments are liable to be affected by variable conditions. There are, on the other hand, many distinctly advantageous economic features in the exploitation of mining properties that one does not find in other classes of investments, and this is especially true as regards gold mining. The rate of interest that one should usually expect in mining investments depends primarily upon the safety of the investment and upon its life or stability. In many mines persistency of the ore deposits and, therefore, the reliability of the mines as dividend payers, justifies the investment upon a basis in some instances as low as 8 per cent. dividends, to which, of course, must be added a certain percentage to provide for the amortization of the capital. Generally speaking, however, investments in mining securities are not to be regarded as attractive unless they return from 10 to 15 per cent. in dividends, in addition to the profits to be set aside for amortization. I wish to strongly impress upon investors the wisdom of clearly realizing the fact that mines have a short life compared with that of other investments, and for this reason to urge the investor to set aside a part of the profits, figuratively speaking, at least, as a sinking fund to provide for the return of the original investment before the mine is worked out. That is to say, "to realize that one cannot have his cake and eat it, too." What remains to be applied to dividends after providing such a sinking fund is the real touchstone by which the attractiveness of the investment must be determined. It must also be borne in mind that the cost of the plant must likewise be amortized, because mining and milling plants, after the mine has been worked out, have usually very little market value.

ADVICE TO THE INVESTOR

Now, I wish to give you a few words of admonition under the caption "DON'TS:"

(1) Don't invest your money in a mining property simply because of the fact that a friend of yours (even if he be a blood relation) became rich through a fortunate investment made in mining stocks.

(2) Don't, on the other hand, be deterred from investing in a mining property because another less fortunate friend became bankrupt through some other mining investment.

(3) Don't allow any insinuating, slick, dishonest—not to apply the short and uglier word—promoter, or so-called stock broker, to overcome your natural modesty and convince you that because you have been successful in your own line of business you yourself are competent to determine the value of a mine. Many men of business ability in their own lines have made trips of self-deception to see for themselves that which existed only in their imagination. "Shoemaker, stick to your last!"

(4) Don't be influenced in your desire to purchase mining stock by the rich specimens that the mines have produced, even though you yourself have seen such specimens in the mine. Specimen rock of this kind is no criterion of the average grade of the ore upon which the success of the mine depends. I remember the story of old John Gashweiler, a well known mining capitalist of his day, when he was asked his opinion on the value of a property from which very rich specimens of ore were shown him. "You might as well show me the hair from the tail of a horse," said Gashweiler, "and then ask me how fast the horse can trot."

(5) Don't buy stock in a mine because it has produced a profit of millions of dollars in the past, for the mine is obviously so much poorer for the millions already abstracted.

(6) Don't buy stock in a mine solely because it is in a far off country, even though "distance lends enchantment to the view."

(7) Don't buy stock in a mining company simply because of the fact that it adjoins another mine of great value. That may be interesting, but it is not conclusive as to the value of the mine in question.

(8) Above all, don't buy shares in a mine unless you have the unqualifiedly favorable report made by a mining expert of integrity, ability and experience, and one who has made a success in investment of money for his clients. An engineer may have the best obtainable technical training, supplemented by considerable practical experience and yet lack certain qualifications in his professional make-up that determine success or failure.

(9) Don't buy stock in a mine unless you are sure that the board of directors is honest and competent, because good management is just as essential to success in mining as it is in other enterprises. In the early days of mining in the Transvaal, the ignorance of the boards of directors of mining companies was indeed lamentable, though sometimes comical. A well authenticated story is told of a certain board of directors in London, to whom the manager had cabled telling them the necessity of having another mining shaft upon the property, as the old one was out of repair and dangerous. They cabled in reply to the manager to endeavor to find a second-hand one.

(10) In short, don't abandon all your good common sense just because the investment happens to be one in mining and not in some other class of industrial securities.

Now all these admonitions you have undoubtedly heard before, and you might be inclined to criticize me as the young Englishman did at the play "Hamlet," because "he heard so many old quotations in it." I trust you will not regard these admonitions as tantamount to advice on my part to keep out of mining, for such is not my intent. In common with all mining engineers who are interested in the legitimate development of the great mining industry, I am zealous in my efforts to eliminate, or at least to minimize, that class of unscrupulous promoters and stock brokers who bring so much discredit upon the industry, and at the same time such lamentable disaster to their victims, the great majority of whom can ill afford to bear their losses.

NEEDED LEGISLATION

I think there should be some drastic legislation in connection with the flotation of mining companies (indeed, many other industrial companies should be included in this), to compel them to publish, before flotation, reports of engineers; to state the price at which the properties were acquired by the vendors; the amount of the promoters' commission, etc. And also to compel the companies to issue full monthly and annual reports as to their financial status, as to the ore reserves, the conditions of the lowest developments in the mines, etc.

I think it would be well also to compel such companies before going to flotation to have on printed prospectuses a conspicuous skull and bones, such as is used as a mark of danger in the case of poisonous medicines. The warning would not be necessary to deter the investor from the purchase of the stock of the companies, but to call his attention to the fact that such an investment must be deliberately considered before taking, and then only on the advice of his financial doctor, the mining engineer.

While in these remarks I have held out

to you the red flag of danger, nevertheless when the track is clear and in good condition I have great faith in the safety of mining investments. Indeed, speaking with a proper appreciation of the importance of the statement, I have no hesitancy in expressing the opinion that, conducted upon the right basis when extended over many operations, there is no business with which I am familiar, that offers such attractive and at the same time such safe investments as the mining industry.

You have all, probably, heard Mark Twain's definition of a mine as "a hole in the ground owned by a liar," but a fairer definition, I believe, is "a hole in the ground sold by a lying promoter to a stupid investor."

TRIBUTE TO THE PROSPECTOR

From my experience with the miner himself (and I claim to be able to speak authoritatively on this subject, having spent many years in close association and on the most intimate terms with the miners of several continents), I know him to be a man of exceptional probity, and it is but tardy justice to recognize this virtue. The miner, it is true, is hopeful and sometimes confessedly too sanguine, but these very qualities are indispensable to his vocation. This tribute applies particularly to the courageous, indefatigable prospector. I have met him on the ever frozen tundras of Siberia and in the impenetrable jungles of the deadly tropics. I have met him on the high peaks of the Andes and on the desert sands of Death valley. Wherever I have met him I have found him a man of hope, of courage, of generous impulse.

The prospector is above all others the real pioneer of civilization, antedating the missionary and the railroad surveyor, and his discoveries it is that have given the life blood to modern industry. Fnally, if you have not been successful, blame not the honest miner or the industry because of the fact that you have not used good business sense and discrimination in your mining investments.

Changes at Ducktown

W. H. Freeland, general manager of the Ducktown Sulphur, Copper and Iron Company, Ltd., of Isabella, Tenn., has announced that his resignation, made a year ago, takes effect on Jan. 1, and that he will retire from active work. Prior to his appointment as general manager of this company in 1898, Mr. Freeland was assistant manager of the Mountain Copper Company, of California. At Ducktown, in 1902, he developed and woked out to its first practical success, the pyritic smelting process which has ever since been the practice of the Ducktown company, and, since its adoption in 1904 by the Tennessee Copper Company, the exclusive smelting practice of the Ducktown district.

Mr. Freeland also invented and installed the Freeland mechanical charger which for the last five years has replaced 16 men per furnace in transporting the furnace charge from the bunkers, and charging the 400-ton stacks of the Ducktown company with great precision.

During Mr. Freeland's management this company has more than doubled its business, has rebuilt almost its entire plant, and in 1909 commenced the manufacture of sulphuric acid on a large scale.

Charles W. Renwick, assistant manager, and William F. Lamoreaux, construction engineer, have been appointed general manager and assistant manager, respectively, their appointments taking effect Jan. 1. Mr. Renwick has been with the company as assistant manager since 1899, when he came from the Mountain Copper Company, of California. Mr. Lamoreaux has been connected with the company since 1905, and is a graduate of the Michigan College of Mines.

Goldfield Consolidated

The monthly report of the general manager of the Goldfield Consolidated Mines Company, gives the production of that company during November, 1909, as 19,285 tons containing $724,451, or an average of $37.57 per ton, of which the whole was milled with an average extraction of $35.30 per ton, or 93.96 per cent. The total net profit was $499,767, or $25.92 per ton.

Development Work—On company account, 4354 ft. of development work were performed and 147 ft. by lessees.

Operating Costs—The total cost of mining, development, transportation, milling, office and general expense was $6.922 per ton, distributed as follows:

OPERATING COSTS IN NOVEMBER, 1909.

Stoping (including a portion of general expense)	$2.55
Transportation	0.115
Milling	1.907
Total cost of production	$4.572
Development (including a portion of general expenses)	2.35
Total cost of operation	$6.922

Costs are higher than normal on account of the large amount of development work performed. The footage driven is 611 ft. in excess of that during the previous month.

Combination Mine—The Hampton stope is now thoroughly accessible from all levels, and a good production of ore is being made. All effects of the cave have been corrected, and an extension of the orebody developed 70 ft. further south on the 280-ft. level. A stope has been started on the same orebody from the 350-ft. intermediate level. In the central portion of the mine a new stope on good ore is being opened up between the 380 and 280 levels, and the stopes in the southern end of the mine recently made a production of increased value. The crosscut on the 600-ft. level from the Combination Fraction has not exposed ore. In general, the Combination mine showed marked improvement over the previous month.

Mohawk Mine—A very large body of $12 to $15 ore is being exposed on the 250-ft. level between the old Hayes-Monnette and Frances-Mohawk workings. On the 450-ft. level, a drift recently exposed a considerable amount of low-grade ore in the hanging-wall of the old MacMillan lease on the Gold Wedge. On the 600-ft. level, drifts on the foot-wall orebody have continued on medium to low grades. During the month some of the richest stopes were allowed to remain idle in order to compensate for the very rich ore produced by the Jumbo.

Red Top Mine—Near the south end of the 260-ft. level the stopes are being widened to 20 or 30 ft. and the grade of ore produced remains at about the general mill average. A recent raise crosscutting the vein shows at one point a width of 50 ft. averaging about $40 per ton. Between these stopes and the surface, a promising territory is as yet undeveloped. On the 330-ft. level, the same oreshoot has been encountered and drifted on for a length of 150 ft. Its width is not yet determined. The north end of the 330-ft. level has connected with the stope of the old Mushett lease. During the month the stopes continued their excellent production.

Jumbo Mine—On the 600-ft. level from the Clermont shaft, exploratory work was continued from the north crosscut without results of comercial importance. Stoping was commenced on the 750-ft. level and the indications from drifting are fully confirmed. On an intermediate level about 120 ft. above the 750 level on the dip of the vein, ore of about $100 grade has been exposed for a length of 100 ft. Stopes are being started on the 900 level with good results. Raises will soon connect the 900 with the 750 level, and the 750 level at its extreme south end with the Mohawk 600-ft. level, insuring good working conditions throughout these levels. Crosscutting is progressing rapidly on the 1000-ft. level and the probable position of the orebodies should be reached within the next month. All preparations for production on a larger scale are complete. During the month of November, there were produced from the Clermont shaft 2422.7 tons containing $357,722, an average of $147.50 per ton.

Mill Construction—All of the material necessary to increase the equipment of the Consolidated mill has arrived, and its installation has been nearly completed without delaying or interrupting the regular operation of the mill. It is believed that by Jan. 1 the mill will be operating regularly under increased capacity.

Required, a New Pair of Glasses

BY FRED C. KEIGHLEY*

During the last eight or ten years there have been many mine accidents and the explanations given or advanced for the causes of these accidents have been numerous. I am going to grant right now that accidents happen from many causes, from carelessness, neglect and incompetency. Some accidents occur from the lack of properly gaging conditions and the failure to use good judgment when something out of the ordinary occurs. However, it would seem that one possible cause of some accidents has been overlooked, in fact, I might say that this particular cause of accident may be the very foundation of most of the causes for accidents.

As all coal-mining men know, there is only one gage in existence at this time which is generally taken as a standard for testing a man's ability and knowledge of mining operations, and that is the old-time cost sheet, a sheet that is made up each month or year and shows the cost per ton of producing coal. For the purposes of this article it will not be out of the way to consider this cost sheet in the nature of a pair of glasses through which the operator sees his business. We all know that a standard or gage of some kind is necessary, but if the standard or gage itself is not reliable it should be evident that everything that is built up or compared with such a standard or gage is liable to be very much in error. The truth of the matter is that there is nothing on earth more misleading than the ordinary cost sheet; in fact, I do not know of any cost sheet in existence at this time that will correctly determine the ability of the management or the real productive capabilities of the operation of which the cost sheet is popularly thought to be the gage. The question naturally arises that if the cost of producing a ton of coal is not the proper method of ascertaining the true status of the operations and the management connected therewith, what other method could be put in use? Or, what other method could anyone suggest?

Before taking up that side of the case it will be proper to see, if possible, why the old cost sheet does not tell the truth, and it certainly does not often do it unless it should be by accident. In the first place, the cost of anything does not cut much figure unless there is a selling price in connection therewith. It does not matter for what purpose coal is produced if there is not a selling price somewhere in connection with it. In other words, people are not in business for the purpose of seeing how cheap they can produce an article but for the purpose of trying to get all the profit possible out of the article in question. If a coal-mine operator could produce coal for 10c. a ton and could get but 8c. a ton for it, it is then evident that the cost sheet is no gage of the business. The present method of determining the efficiency of a mine's management wholly by the showings of the cost sheet is all wrong; therefore it is impossible to ever build up anything positively reliable from its showings.

One experience in the way of cost sheets in the earlier days of my mining experience came very near discouraging me with the mining business generally. It was my fortune or misfortune to follow a certain manager who had charge of a mining operation, and while this man was what was known as an old-time, solid, practical man, yet he seemed to have had a very impractical way of doing things; for instance, if the morning was fine and there were no other attractions, the manager would leisurely walk to his office in a pair of slippers about nine o'clock and the occasion for his being there promptly was the receipt of the morning paper which was thrown off the train at that time each morning. This paper pretty generally engrossed his attention until eleven o'clock when he would begin to get a little restless and would then walk toward his residence which was located a quarter of a mile away. About two o'clock the same old slippers would carry him down to the office again. By that time the operations of the day were pretty nearly over and he would join in a game of tennis or croquet, and this is a fair sample of the way he put in his time. Some remonstrance had been made about these peculiarities of his but he always met them with the statement that he was not paid for any work he might do but for his experience. There is no doubt the man did have experience, and I believe he was a man of more or less ability, but he was simply resting on the laurels of former cost-sheet determinations. However, his employers did not let him rest there very long.

As before stated, I succeeded him and about the first thing brought to my attention was that the cost sheet had been behaving very badly for sometime back and something must be done. Consequently, I tackled that cost-sheet problem with considerable vim, and as a natural consequence, the cost of producing coal was soon on the decline. Each month when the cost sheet was duly forwarded to the city office, a nice little note would be returned saying, that is good but can't you do a little better? I naturally tried to do a little better and in trying to do a little better, did some things that were not the wisest things in the world, but the cost sheet seemed to be the sole standard of my work and I was anxious to cultivate a pleasant acquaintance with such an important representative.

Things ran along five or six months, the cost going down, finally getting to a point where I did not see where it could go down any farther, but did have serious fears that there would be a turn in the tide and the cost would go up again. About this time, I began to do a little figuring for my own special benefit and in order to figure intelligently, I naturally looked back over the statements and the several notes of encouragement and recognition of my efforts to bring down the cost, and found that it did not seem to matter how much the cost went down in a certain month there was always the question, cannot a little better be done? Following along this line it occurred to me that if a continual reduction could be kept up, a time would arrive when the coal miner and working man would be paying the company for the privilege of working. It then dawned on me for the first time that it was impossible to reduce costs below a certain figure, no matter how much my employers wished a reduction, and long before that point was reached there was a point where danger would shove in its nose.

What I have just related took place nearly 30 years ago and since that time, the thought has often occurred to me that possibly many a mine and many a manager's reputation have been wrecked in the vain attempt to reduce costs to the point that some other mine operator claimed he was producing coal for. It will probably be admitted that the cost per ton of coal is not a safe standard for the mine operator to adopt as a sole gage of the ability or work of his officials, but the statement will likely be made that it is the only practical test or gage available.

A NEW WAY TO VIEW THINGS

Having in a way attempted to show that the mine operator needs a new pair of glasses, as it were, through which to scan his business and management, it will next be in order to suggest something in the way of a system or method that might be likened to a new pair of glasses through which the operator or mine owner would be able to judge of the work of his officials and the possibilities of his mining property. Up to this time the bulk of the coalfields under operation have been acquired by purchase; possibly 95 per cent. of all the coal lands operated in the United States today are owned in fee by the operators of the properties. When the properties were acquired, they were not purchased by the ton but were generally purchased by the acre. Such being the case then every acre of that property bearing workable, merchantable and profitable coal represented a unit capable of producing a certain amount of profit. If a firm buys 1000 acres of coal, that 1000 acres represents that many units of the possibilities that the future of their property has in store for them, and the possibilities of that future cannot be weighed out by the ton but may be designated by the acre unit or by the 1000 units or acres. Such being the case, would it not be best to take the acre of coal as the unit of measure of the profitableness of a mining property instead of taking a ton of coal as the unit of the cost of production and making it the gage of the results?

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*General superintendent, Oliver & Snyder Steel Company, Oliver, Penn.

Note—Paper read before the winter meeting of the West Virginia Coal Mining Institute.

Profit per Acre Is Best Way

I think it can be proved that the standard here proposed for determining the efficiency of a mine official will be far superior to the method now in use. The great difficulty about a cost sheet based on the ton of coal produced, is that the conditions in any one month's operations are rarely, if ever, exactly like the conditions of other months; therefore it is unjust to the mine official and possibly ruinous to the mine owner to adhere to and be governed alone by the showings of the tonnage cost sheet. On the other proposition the mine owner or the mine official knows positively that if he has 1000 acres of coal to begin with and he mines out 100 acres of coal during a period of 12 months, he will have only 900 acres left. Reverting to the tonnage cost sheet, the fact that coal costs so much per ton over a certain period does not indicate anything at all beyond the actual expenditure of money which may have been wisely or unwisely laid out, and in many cases without any consideration for the future whatever. It might be that the cost per acre would be a fairly good method, but I am inclined to think that the profit per acre is the only true way of gaging mining operations.

For illustrations we will say that a coalfield of 1000 acres has been operated for 12 months and has reduced its area 100 acres. It is a self-evident fact that 1/10 of the natural resources of that operation is gone forever. If the results as shown by the acre profit sheet demonstrate that no money has been made on the 100 acres, it is then very evident that the other 900 acres will have to carry what was lost on the first 100 acres. No cost sheet ever devised, based on a ton of coal, will demonstrate that fact so clearly. The monthly cost sheet, while showing the expenditures for that particular month, is extremely misleading inasmuch as coal may have been produced at such a low cost that coal was sacrificed, and when coal is sacrificed that means tonnage has been lost, and the cost being based on tonnage produced, the whole system is certainly misleading, while the reverse is the case with the acre system or method. It is not my intention to advocate the total disregard of the cost of production, as an account should be kept of the cost per ton, but the real question at issue is the profit that could be derived from the 1000 acres of coal. Capital was originally locked up in the 1000 acres and if that capital is not returned with good interest through skilful work and in a legitimate way, no matter how little the cost of coal per ton might be, the result would be failure, ruin, and probable disaster.

There are some, no doubt, who will say that even a statement based on profits per acre might be misleading. This to a certain extent may be true, but not if the idea is intelligently followed out. For instance, before determining the profit of the year per acre, the acreage of coal remaining unmined would certainly have to be accurately measured up, and if this is not accurately measured and the attendant conditions of the locality from which the coal was extracted during that period considered, it would be misleading. These conditions can be ascertained; the acreage can be ascertained, and therefore there could be no question as to the actual state of affairs in existence at the end of each year. This will not only afford a reliable gage for the work during the 12 months, but of what may be expected in the succeeding years, and more than that, what will absolutely have to be done before the full possibilities of the property can be attained. Each year's work and the accumulation of years would be indicative of what must be done the following years. No tonnage-cost scheme can possibly do this for the reason that it is impossible to tell what damage has been done to the future possibilities of the property by making an apparently low record for cost; but where the acreage system is used the damage would be shown up at once as the engineer in making his surveys would note how much solid coal was left, how much coal was available under development, how much remained in the form of pillars and protection to the property, and the conditions surrounding each particular item constituting the whole.

No doubt the question will be asked, How is one to know during the 12 months what is going on under the acreage system, as it would be necessary to wait for 12 months before having a tab on the business? The answer to this is that valuable as coal now is, important as mining operations now are, and the necessity for guarding against dangers of all kinds which are becoming more and more frequent each year, it is both expedient and profitable to make monthly measurements and thus approximate the acreage each month until the end of the year when such acreage can be determined by an instrumental survey. The acreage-profit system as a preventive to accidents is certainly far superior to any system or systems of cost determinations now in use, unless it should be that some mining concern has already adopted a similar method; and if such is the case, I have no doubt they are perfectly satisfied with the system.

The attempt to produce coal at phenomenally low rates has often not only deceived the mine owner, but in more than one known case has been the very creator of disaster to the operator and death to the worker; hence the great need of some other method of gaging mining operations, being adopted by the producers of coal.

A Coal Miner Brings Suit Under Peculiar Circumstances

Special Correspondence

A foreign miner has brought suit in the United States court against the Delaware and Hudson company for injuries received while at work in the Marvine mine near Scranton under peculiar circumstances. The miner was working in his chamber, he alleges, tamping powder in a hole when the shot was prematurely fired not through any carelessness on his part, but owing to the explosion of a small pocket of gas in the vicinity of the place in which he was working. He alleges it was negligence on the part of the fire-boss not to have discovered the pocket of gas, and that if he had discovered it, he should have reported the fact to the mine foreman, and the mine foreman should have in turn reported the matter to him. He does not know whether the fire-boss did his duty in the premises, but he claims that the inside foreman did not inform him of the presence of the gas, and that therefore he received his injuries through the negligence of the company through their servants.

Shipments of Mexican onyx from Lower California during 1909 will exceed in value those of any previous year, according to American Consul George B. Schmucker of Enseñada. For the 9 months ended Sept. 30, onyx to the declared value of $85,000 was exported to the United States, against only $66,647 for the full year 1908. This onyx, it is stated, will be used in the interior of the new peace-congress building at the Hague. The polishing of the onyx is done by a San Diego, Cal., firm.

A Detailed Study of Practical Fuel Values

BY W. P. YOUNG*

Everyone connected with a coal company is familiar with the fact that we receive complaints from the consumer. Generally speaking, are these complaints justifiable? Is the producer altogether at fault? How many troubles arise through selecting the wrong coals, or handling them wrongly when received?

As a sidelight on these and similar questions, it may be of interest to consider some of the effects accompanying relatively small and seemingly unimportant differences and changes in physical, mechanical and chemical properties of various fuels, with reference to their practical fuel value, more especially in metallurgical operations.

For many years there has been a persistent belief that coal should be very lumpy in order to be good. There are some grounds for this belief, but the better effects found with lumpy coals are nearly always due to furnace conditions and not to the fuel. The modern idea of selecting a fuel suited to local conditions is gaining ground and it should be observed that this does not always mean the selection of a fuel highest in heat units, as coals of lower theoretical value may give better results.

In a recent engine test on one of the Eastern roads, a fuel running under 13,000 B.t.u. replaced one of over 14,000, it being found necessary to use 25 per cent. more of the latter to make the same engine mileage. This was due to the lighter gravity and finer condition of the higher valued coal, a considerable quantity of which was lost by reason of the powerful draft.

In one of the large steel plants certain furnaces were heated by coal, the bed of fuel being about 2 ft. in depth. It was found to be more economical to use a coal running 5 per cent. higher in ash than another, on account of the clinkering of the latter and consequent loss in the frequent cleaning of fires. If the coal used be of a coking nature, the presence of fine coal does not usually cause any diminution of available fuel value.

When the blast-furnace man demands a coke that is solid and in comparatively large pieces, he is not actuated by any whim, but really needs such a fuel. To him the principal use of coke is to reduce iron from its ores, but as a matter of fact, the actual quantity so used is small compared with that used in heating the slags resulting from the earthy matters of the ores, limestone and coke ashes, together with the losses of fuel in burning to carbon dioxide in the upper zone of the furnace, without doing practical work. By far the larger amount of ores now in use are very fine and if the coke be in large pieces, it tends to prevent the packing together of the ores and the obstruction of the blast.

SMALL COKE IS SOMETIMES BEST

Large coke presents much less surface, per ton, to the action of the blast, than does that in small pieces, with a corresponding minimum loss, by burning to carbon dioxide, before doing reducing work. The film of graphite, found on some well burned and well drawn cokes, prevents the penetration of the blast and thus saves fuel. On the other hand, if the coke be spongy, the loss from the above cause will be high, if indeed a good deal of fuel is not crushed by the weight of the stock and blown through the gas passages.

In the carriage and storage of soft coals, the presence or absence of slack is an important factor. When moderately lumpy coals are handled roughly, as in dumping cars by turning them over, a small percentage of slack mixed through the lump prevents breakage to a degree that is surprising, though if the coal is to be stored for any length of time later, this good effect may be more than offset by the increased liability to spontaneous combustion, by reason of the slack preventing the access of air to the interior of the pile, as well as the fact that the slack gives up its hydrocarbons more readily and in greater volume at ordinary temperatures than does the lumpier coal. In fact it would appear that there is a decided tendency in some slack coals for the hydrocarbons to assume the gaseous form whenever the coal is finely enough divided.

This seems to be more particularly the case with those coals whose breakage produces a very fine greasy kind of slack, from which water runs without leaving a trail of wet coal. This greasy nature is probably due to both chemical and physical conditions and is a deciding factor in spontaneous combustion on storing. Slack of this nature results from the breakage of a coal that is tough rather than hard, the harder coals usually breaking down into a coarser slack and one having more definite cleavage planes.

It would appear that the composition of the coals, in the seam, is gradually changing, this change being more marked where the coals are exposed in the outcrop, or penetrated by streams of water. The hydrocarbons composing the volatile matter seem to undergo more or less decomposition with resultant changes on the rest of the coal and the production of various gases, which are either occluded, or mechanically held in the crevices of the seam. While the real nature of the volatile matter, as it exists in the solid coal, is not well understood, if indeed at all, yet it is known that various compounds were formed according to the heat and pressure, when the coals came to their present condition, and generally the volatile matters of superimposed seams are similar in total percentage and character if the seams have the same physical properties; for instance, the same hardness, cleavage and appearance of slack.

There is a relationship between the physical properties of the coal and the state of combination of its volatile contents and may I suggest that possibly the very high explosive power of some coal dusts may be due to their being loosely held together in some higher organic compounds.

The coking process depends more on the nature of the volatile matter than upon its quantity, provided there be enough present to keep the ovens in condition to fire the succeeding charge of coal.

When the charge in the beehive oven catches fire quickly, the coke will be solid in structure, while if the coal remains in the oven for an hour or more after the charge is leveled before catching up, and if it then comes to a semi-plastic state slowly, the coke will be spongy and carry more of the sulphur from the coal. A simple wetting of the slack before charging, will materially reduce the sulphur contents of the coke.

Coke men are apt to consider complaints of slightly higher sulphur and phosphorus as being whims, claiming that the furnace man uses ores running many times as high in both these elements without much trouble, but the cases are entirely different, as the sulphur and phosphorus in ores, mill cinder, etc., are liberated from them before they pass below the tuyeres of the furnace and consequently have a chance to get away, either in the gaseous state, or in the form of slags combined with lime, while the same elements in the coke pass with a certain amount of the solid coke down into the crucible of the furnace and are there greedily absorbed by the iron and it is then too late to remove them by means of lime.

THE CAUSE OF CLINKERING

The clinkering of coals in furnaces is

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*Superintendent of Inspection, Consolidation Coal Company, Meyersdale, Penn.

NOTE—Abstract of paper read before the West Virginia Coal Mining Institute, Huntington, W. Va., December 7, 1909.

a source of great losses in efficiency. Clinkering is caused by the presence of iron, or lime in the ash, or by the melting of the coal before combustion. The results of clinkering are direct losses of solid fuel dragged out in cleaning fires and the heating to the melting point of slags of various compositions, requiring the use of fuel otherwise doing efficient work. Red coal, which commonly carries a notable percentage of iron oxides, combined with water, is an illustration of these sources of loss. The iron oxide is reduced to metallic iron, with attendant formation of silicate of iron, and forms a particularly mean clinker with its attendant losses of heat and solid fuel. As most of the red coal is also soft and will melt under heat without complete combustion, we have a combination causing much complaint. It is surprising, however, to note the relatively great loss of heat in a coal that is so slightly different from the original solid, black fuel, as to be almost unnoticeable. This loss of heat is more frequently found where boilers are being overloaded and as a rule the consumer has no real idea of his trouble, simply complaining that the coal "won't make steam" or that it has no "life." Red coal, however, has one good point, in that it usually carries very little sulphur, and consequently can be used where an excess of this element is prohibited.

On account of the fact that the red coal has undergone changes in its volatile contents, it does not make good coke in the beehive oven.

The amount of foreign matter, as slates, bones and sulphur streaks, is usually overestimated, the total percentage in any half decently prepared coal being very small. It is rarely the case that the total visible foreign matter in soft coals reaches two-tenths of one per cent. of the whole, yet one-half of this amount will bring forth strenuous complaint and the assertion that the coal "was half bone and slate."

If the foreign matter is a light bone, it will do no harm in ordinary practice and will not reduce the available heat units at all.

Slate is inert and only causes real losses by interfering with the draft when lying on the grates. The total quantity is too small to materially lower the available heat units.

While slates and sulphurs should be removed in all cases, it is doubtful if we should yield altogether to the whims of the consumer in the matter of the removal of the lighter bone coals, as they have a definite fuel value and should therefore be used. Some day those following us will reproach us for the wanton waste of many thousands of tons of good fuels in days gone by in order to satisfy the unreasoning demands of consumers.

Influence of the Underground Mine Manager

BY JOSEPH VIRGIN[*]

Twenty-five years ago, when laws relating to coal mining in this country were enacted, most of the States passed a law compelling the employment of a certificated mine manager, or foreman for each mine of 10 or more men. The result was a lot of small-caliber men, salaried at from $50 to $75 per month. It also produced some fine men, who studied hard; but salaries were low, because the mines were small, and the labor unions and the various mine departments insisted on the one mine one man principle.

Soon, however, the companies began to assemble these small properties under one head. The broader, and more astute managers soon found these men too small, and the better men would not work for the salaries paid. Hence they soon developed the mine superintendent, the general mine foreman, the company mine inspector, or underground manager. All different names with the same kind of a job, with certificated men under their charge.

In West Virginia they have not yet reached the certificate stage; but the law compels a practical overseer who has had practical experience, to manage one or a dozen mines. It is of this man that I wish to speak.

This manager is surrounded by a peculiar pressure from three points—law, labor and owner. He is everlastingly prodded by these three forces. The law says keep your mines in a strictly safe and sanitary condition, and is full of Thou Shalts and Thou Shalt Nots. Labor says: We want the mine perfectly safe and sanitary; however, we cannot see why the miner shall not shoot from the solid, or leave timber out, get off the sights, or use any old kind of powder, or lay out his shots to suit himself; he is doing the digging piece work, and it's a free country, isn't it? The owner says: "Well, Mr. Jones, we are very glad to note that the inspectors give our mines a fine report. This is all that can be desired. You are getting on fine with your bosses and assistants; but, can't you reduce your cost sheet a little?" This, then, is the underground manager's dilemma; and thrice blessed is he that can satisfy law, labor and owner!

Since the development of modern methods, the manager must have larger qualifications, and salary. He must thoroughly understand ventilation; know how to erect a fan; construct overcasts; build permanent stoppings, and have doors properly adjusted. There are lots of mines putting 40,000 to 100,000 cubic feet per minute in the intake, and not one-quarter of it reaches the faces of the entries! I remember going to a mine where a Crawford & McCrimmon fan was erected with the blades turned to hook the air out instead of throwing it off at a tangent, as the makers intended.

Necessary Qualifications

Then, in these days the manager should be a fair electrician; not to do the work, but to understand the diseases of locomotive and stationary motors, with the remedies for the same. Many mines have been kept at work the remainder of the day because the underground manager could point out a remedy for a disabled fan motor, or locomotive, until it could be got to the repair shop at night, or another part supplied. The manager must also understand hydraulics, and pumping arrangements; he must know where a siphon can be used instead of a pump.

I remember visiting a mine for a company which had a man pumping water every day at $1.75—about $600 a year. He was pumping over an 8-ft. rise, with a 40-ft. fall. We placed the pump on the outside and siphoned the water out. I can point you to a mine where they used a steam pump and paid 22c. per hour for labor 24 hours per day 365 days per year. The underground manager insisted the water could be drained. The surveyor said no; but the manager still insisted. The company bought him a transit. He took levels, and spent $300 cutting a ditch. That pumping plant has been cut out for the last 5½ years, saving $2000 yearly for the company; the manager got $300 a year more salary, too.

The underground manager should thoroughly understand the nature of the roof, the coal and the floor. His influence is for good or bad to the general safety and economy of a mine in direct proportion to his knowledge of existing conditions. The manager must also know a great deal about the diffusion of gases, for as the workings get farther in, they produce more blackdamp and more firedamp. How to take care of the blackdamp and firedamp from a thousand

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[*] General superintendent, Plymouth Coal and Coke Company, Plymouth, W. Va.

acres of old workings without carrying it over your men has bothered more than one brain. The probabilities are that blackdamp has brought more men to a premature death than firedamp; this has occurred one at a time, however, and therefore has not produced public spasms, like those resulting from explosions.

I can point to a mine where there is one-half square mile of old workings in one panel, with provisions being made to close all apertures, but one, to this block, circulating 5000 to 10,000 ft. of air around this and over the overcast to the return. This block will give off 500 to 1000 ft. of CO_2 per minute, giving 5000 to 10,000 feet of blackdamp. The safety of such a mine is directly proportional to the underground manager's knowledge of these matters; for, as the miners advance, block after block must be separately ventilated, requiring, say 10,000 ft, at each block; therefore, in five blocks you have lost 50,000 ft. of air; and you must still have the 50,000 ft. to ventilate the working faces with pure air. Of course, you could, and many men do, as a noted expert advised us to, hermetically seal these blocks off; however, with the ever impending danger of falls breaking open the seal, and suffocating or burning lots of men, it seems best to blow this gas outside for the vegetation to absorb.

PROBLEMS THAT SHOULD BE UNDERSTOOD

The underground manager must understand various systems of haulage, such as ropes, electric motors, air motors or gasolene motors, not to mention the original tandem-compound mule team. When to use one, or the other, or several of them, is also a problem worthy of the best thought of any man. Then he must be acquainted with gradients, know practically what a machine can haul, or he may advise his company to buy the wrong machine. Hence he should know the virtues and failings of these engines.

The manager should know a great deal about track, the weight of rail, the size of tie to carry a given weight, always considering as he advances he is liable to need larger engines, and longer trains. He should know what number of frog to use to turn off at a given angle at any entry, how long the rails must be to complete that switch, the number of frog and length of rails for a siding switch, etc., so that he may be able to give the blacksmith the proper dimensions. The great problem today is, not how to reduce the cost of production, but how to keep the cost stationary as the workings get a mile or two from home.

The underground manager must also be a man of indomitable courage and not easily worried, or he will fall by the way. As a rule, this man can and does command a salary from $125 to $200 per month. When he commences his reforms, he will have all the old traditions to overcome. There will be head-shakings, and heart-burnings and dissensions, and more than one of his assistants and workmen will visit the office at opportune times and prophesy dire calamities. The underground manager, therefore, has troubles that try men's souls, but if he has courage and hope, and good judgment, and the above qualifications with a little backing from headquarters, he will succeed.

A successful manager must also be a good judge of human nature; for, although he does not come in as close contact with the men, as does the inside foreman, he must be able to adjust troubles between these two forces. He must have assistants that believe in him and his methods. In a word, he must be a practical rather than a technical mining engineer. He must be conscientious, letting his word be his bond among his workmen. His men will then look up to him and respect him. As a rule, the more technical books he reads and the more mining methods he has seen, the better he is.

Some years ago the chief mine inspector sent letters to various West Virginia operators, asking their opinions as to examining mining officials. One large operator replied that the best mine foreman he ever had could not read or write. With due respect to that statement, I wish to say he would have been a much better foreman if he could read and write.

Senate Asks for Information on Mine Accidents

SPECIAL CORRESPONDENCE

In response to a resolution presented by Senator Cullom the Department of the Interior, which in this instance means the Geological Survey, has been called upon for a report with reference to the number of rescue stations that have been established for the purpose of preventing loss of life in mine disasters, the number of such stations needed and the probable cause of the numerous recent disasters in mining. It is supposed that this information, when delivered, will lead to a thorough discussion of the question of Federal intervention in mining in such a way as to secure the application of supposedly safe methods wherever possible The resolution was opposed by Senator J. W. Bailey who said:" I deny the power of the Federal Government to undertake in any manner to supervise a mining operation within a State. Mining, manufacturing and agriculture, at least up to this time, are free from Federal interference and Federal supervision Just how long they will remain free under the modern tendency I am not able to say but it shall be as long as I have a vote to cast, at least so far as that vote might be effective."

The resolution was finally adopted (Dec. 16) on the ground that it merely called for information. It reads as follows:

Whereas disasters are of frequent occurrence in the mines of the country, resulting in appalling loss of life and injury among men engaged in this industry;

Whereas there has occurred at Cherry, Ill., a disaster of terrible magnitude, resulting in the death of about 300 persons: Therefore be it

Resolved, That the Secretary of the Interior be requested to inform the Senate:

1. The number of Federal stations equipped with rescue appliances which are in operation in the mine fields.

2. The number of Federal stations essential to the proper safeguarding of life which should be established in the mine fields, with an estimate of the cost of their construction and operation during the next fiscal year.

3. The opinion of the mine experts of the Department of the Interior as to th causes of the numerous accidents and their views as to the action the Federa Government should take to prevent or a least minimize them in the future.

A reply will probably be made at a early date.

The American company operating a zinc mine at Boquillas, Coah., has made application at Washington for a subport of entry for the purpose of admitting the zinc ore into the United States by means of a tramway across the Rio Grande from the mine on the Mexican side. The property was at one time extensivel worked for lead for the St. Louis and Kansas City smelteries, but was abandoned until about a year ago, when i was taken up by Carlos Mosher and a company formed to exploit the zinc and to provide for transportation across the Rio Grande and to the railroad point in Texas, a distance of about 90 miles The property has a large tonnage o zinc ore developed and is considered a possible steady producer of zinc ore.

The Center Star Group of Mines, Rossland, B. C.

Ores in Monzonite; Incline Shafts Used; Shrinkage System in Narrow Veins, Square Sets in Wide Veins; Large Drills in Stopes

BY ROY HUTCHINS ALLEN*

The Center Star group includes the Center Star, War Eagle and Iron Mask mines of the Consolidated Mining and Smelting Company of Canada, Ltd. The mines are in the heart of the mineralized territory at Rossland, and are among the most important of the Boundary district.

GEOLOGY

The country rock of this region is a westerly-dipping series of Carboniferous sediments, chiefly slates, which at Rossland has been intruded by an elongated, roughly oval-shaped mass of monzonite. This mass, which underlies the city of Rossland and the hill immediately to the north, is surrounded by a border of varying width of augite porphyrite and diorite porphyrite. There are also many occurrences of porphyritic monzonite, both adjacent to and also separated from the main mass of monzonite. All of these rocks are regarded as derivatives of the same magma.

This monzonitic mass, together with its rim-rocks, has been intruded by a large number of nearly vertical dikes, from a few feet to 250 ft. thick, and with a general north and south trend. The dike rock is a dark, almost black rock of medium to fine grain, and contains many flakes of biotite. It is locally termed mica trap, and from superficial examination it may be a kersantite, or altered basalt. The dikes are somewhat softer than the country rock and are occasionally slickensided, as was noted particularly in the Josie mine of the Le Roi No. 2 company.

The veins, which are at nearly right angles to the larger dikes, are cut off completely by them. They occasionally pass through the smaller dikes, but more frequently stop at one side of the dike and continue in the same line on the other side. At the point of intersection there is often a large and important orebody. The indications are that the veins were formed subsequent to the intrusion of the dikes, and that the ore was deposited from heated solutions immediately following this period of igneous activity.

The veins have since been cut by a series of faults nearly parallel to the dikes. These faults, for the most part, have a strike of approximately north 10 deg. west, intersecting the veins at nearly right angles, and are vertical or have a steep dip to the east. They are normal faults and produce apparent horizontal displacements of the veins varying from almost nothing up to 100 ft. or more.

THE VEIN SYSTEM

The veins are roughly parallel to each other and have a strike varying from north 40 deg. east to north 75 deg. east. All have a dip toward the north. They are found in both the monzonitic mass and in the surrounding sedimentary rocks, but those portions which have proved most productive lie almost wholly within the border of porphyritic rock on the western side of the main mass of monzonite. It is within this portion that the important mines of the district are situated.

The Center Star mine has one vein, the Center Star, upon which the shaft was sunk. This vein has a strike of about north 60 deg. east and a dip to the northwest varying from 70 deg. in the upper workings to about 20 deg. in the lower levels. In the War Eagle mine there are two principal veins: the War Eagle, having a strike of north 10 to 20 deg. west with a dip of about 50 deg. to the northeast; and the Josie vein which intersects the War Eagle at an angle of 60 deg. and dips toward the northwest at an angle of 74 deg. The Iron Mask claim has three important veins, two of which are nearly parallel and are intersected by the third at about right angles. In addition to those mentioned there are several smaller veins upon which no work is being done at present.

Where there are intersections there is usually a swelling of the veins and also a slight displacement of both. Orebodies of considerable size, 25 to 30 ft. in width, are often found at these intersections. The veins show little or no banded structure and are to be regarded as impregnations and replacements of the country rock along planes of fracturing. In only a few instances is there a definite wall to the vein.

The ore minerals are pyrrhotite, pyrite and chalcopyrite, named in the order of their importance. All are auriferous, but the greater part of the gold occurs in the pyrrhotite. The ores of the district average from 0.7 to 2 per cent. copper and from $10 to $20 in gold, though ore worth $50 to $100 per ton is not uncommon. The metallic minerals occur as solid masses of the mixed sulphides, as small stringers and ramifications and as disseminations through the vein rock. The gangue is chiefly the altered country rock with an addition of silica. The ore occurs in shoots from 50 to 500 ft. in length and from 3 to 50 ft. in width, though in some places the latter width has been exceeded.

WAR EAGLE MINE

The War Eagle mine has a three-compartment shaft, 1650 ft. deep, sunk on the War Eagle vein at an inclination of 50 deg. There are two hoisting compartments, one 4 ft. 6 in. by 5 ft., the other 5x5 ft., and a manway 5x5 ft. in the clear. The shaft is provided with cages, completely housed on three sides and open in front, which are operated in balance by a geared hoist of 300 h.p. The hoist is run by compressed air received from the compressor at the Center Star mine at a pressure of from 90 to 100 lb. per sq.in. This air is reheated at the War Eagle shaft before being used by the hoist.

The shaft house is connected by an incline tramway with the railway ore bins which are about 1100 ft. distant and 300 ft. lower than the shaft. The incline is no longer used, for all ore from the War Eagle mine is trammed through crosscuts 1200 ft. to the Center Star shaft. The hoist at the War Eagle shaft is used solely for handling men and supplies, and for hoisting waste from the development work. The surface plant on the Iron Mask claim has been dismantled and the mine is worked through the Center Star shaft.

CENTER STAR USES CAGES AND SKIPS

The Center Star mine has a three-compartment shaft, with two hoisting compartments and a manway, each 5x5 ft. in the clear. The shaft is 2300 ft. deep and ha a dip of about 69 deg., having been sunk on the Center Star vein. The hoisting compartments are provided with cages 10 ft. high, boxed on three sides and open in front, and having a hinged bottom which is thrown back when hoisting ore. To the bottom of the cage is attached a 4-ton skip. Men and supplies are lowered in the cage, and on such occasions a cage tender always accompanies it. Electric signals are used, operated with current from the lighting circuit. The shaft has guide timbers, 6x6 in. in section, and both cages and skips are provided with guide shoes, and the former with safety catches.

The cages are operated in balance by a Nordberg first-motion hoisting engine, having cylinders 28x60 in., and two cylindrical drums each 10 ft. in diameter with a 5-ft. face. The hoist is rated at 1100 h.p. and hoists a load of 10 tons from a depth of 3000 ft. at a speed of 2000 ft.

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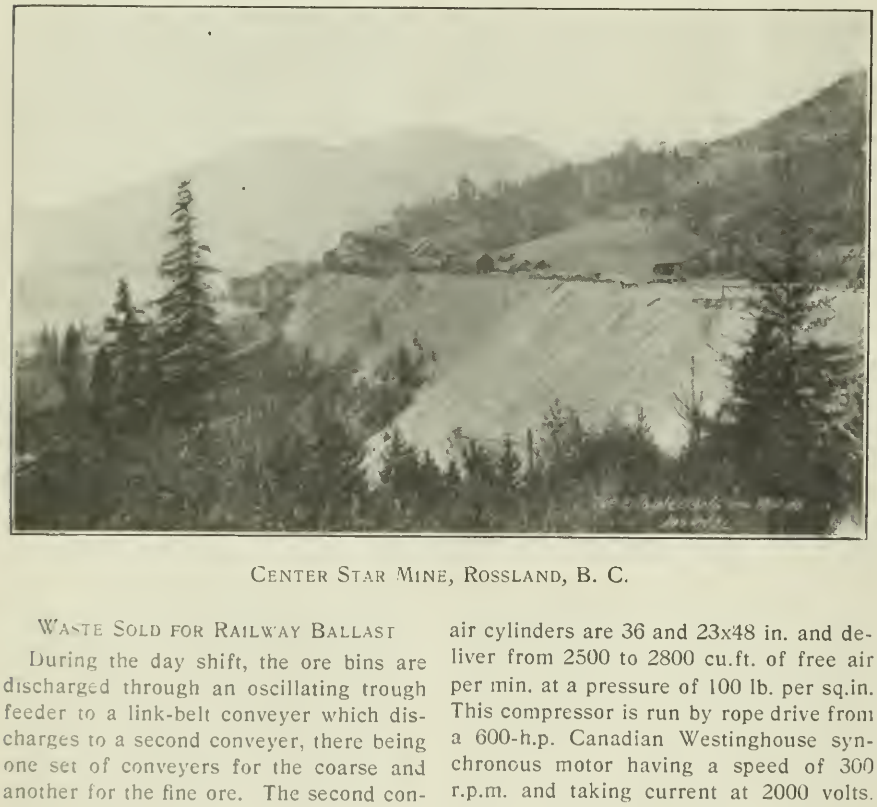
*Mining engineer, Lunenburg, Mass.

per min., with steam pressure at 120 lb. per sq.in. A 1¼-in. plow-steel hoisting rope is used. The steam for the hoist is furnished by three internally fired boilers, but on account of the high price of fuel it is planned to discard these and operate the hoist by compressed air, reheated at the engine room.

The shaft house is 106 ft. high, built of heavy timbers strongly braced. The sheave wheels are 11 ft. in diameter. The ore skip dumps over a grizzly into a bin of about 160 tons capacity, from which a 24x36-in. Farrell-Blake crusher is fed. The crusher is driven by a 75-h.p. alternating-current motor. A belt conveyer delivers the broken ore to a distributing conveyer which discharges into the bins. There is a large bin for waste, two bins for coarse ore (1 in. to 4 in. in size), and two for fine ore (1-in. and under).



Center Star Mine, Rossland, B. C.

Waste Sold for Railway Ballast

During the day shift, the ore bins are discharged through an oscillating trough feeder to a link-belt conveyer which discharges to a second conveyer, there being one set of conveyers for the coarse and another for the fine ore. The second conveyers carry the ore up an incline into the sorting house, where the waste is removed by ten men, nine of whom work on the coarse ore and one on the fine ore. The conveyers deliver the cleaned ore to a Vezin sampler which takes one-tenth of the ore as a sample.

The sample passes through the sampling plant, directly underneath this point, while the bulk of the ore falls on a link-belt conveyer of different style which travels over the railway bins and by a dumping arrangement delivers the ore to any bin The conveyers are all driven by electric motors. The waste which has been removed from the ore falls into bins and is taken to the dump in trains of side-dumping cars drawn by an electric locomotive The waste from the mine is hoisted and crushed separately and is sold to the Canadian Pacific Railway for ballast.

The compressor plant contains two compressors. One is a Canadian Rand, duplex, corliss compound steam, two-stage air compressor, with steam cylinders 22 and 40 in. in diameter, and air cylinders 38 and 22 in., with 48-in. stroke. The rated capacity is 3000 cu.ft. of free air per min., compressed to 100 lb. pressure. The steam cylinders have been disconnected and the machine is driven by a rope drive from a 650-h.p. Westinghouse constant-speed induction motor, having a speed of 180 r.p.m. and taking current at 2000 volts. The other compressor was originally an Ingersoll straight-line machine, but it has been built over and a duplex machine formed by the substitution of two Canadian Rand cylinders. The air cylinders are 36 and 23x48 in. and deliver from 2500 to 2800 cu.ft. of free air per min. at a pressure of 100 lb. per sq.in. This compressor is run by rope drive from a 600-h.p. Canadian Westinghouse synchronous motor having a speed of 300 r.p.m. and taking current at 2000 volts. The compressor room also contains a 120-kw. direct-current generator, driven by an alternating-current motor, which supplies current at 250 volts for the electric locomotives, both on surface and in the mine and for the lighting circuits.

The company has a large carpenter shop containing circular and band saws, and a timber-framing machine made by the Denver Engineering Works Company; a blacksmith shop with power shears and punch, power hammers, and two Word Brothers drill sharpeners; and a machine shop well equipped with drills, planer, lathes, pipe threaders and cutters, etc. A special room is fitted up for repairing the rock drills. The company makes its own cars and skips, and in addition to doing all of its own repair work does a considerable amount for other mines.

The electric power is furnished by the West Kootenay Power and Light Company from its plant at Bonnington falls on the Kootenay river, 30 miles distant. Current is transmitted to Rossland at 60,000 volts, and from there distributed to the mines at about 2000 volts.

Mining Methods

The Center Star mine is opened up by 16 levels, the War Eagle mine by 11 levels. The workings of both the War Eagle and Iron Mask mines are connected with those of the Center Star by crosscuts and drifts. The methods of mining are the same for all of the three mines.

The prospecting underground is done largely by diamond drills, and when orebodies are located drifts and crosscuts are run to them. The drift is cut out for the full width of the orebody and at least 10 ft. high to allow room for the placing of the first set of timbers. If the vein is narrow, that is, not over 12 ft. in width, stulls 12 in. to 18 in. in diameter are placed about 9 ft. above the bottom of the drift and closely lagged with 6-in. poles, spaces being left for the chutes. Stoping is then carried on until at a hight of 8 to 10 ft. above the first row of stulls a second row is placed. This is also closely lagged except that spaces are left next the footwall between the chutes. The ore passing through one of these spaces spreads out in a fan shape on the footwall and supplies two chutes. By this method a free space is left along the hanging-wall between the two rows of stulls, allowing the ready removal of any piece of drill steel or timber which might clog the chute, and also to break or bulldoze rocks too large to pass the chute opening.

The vein is worked out by overhand stoping, the ore falling on the second row of stulls and lagging and being allowed to accumulate there. Only sufficient ore is drawn off to give the men room in which to work. A manway which contains both ladders and air pipes is left at the end of the stope, and is protected by a vertical row of stulls and lagging. The drills used in stoping are nearly all 3⅝-in. Rand machines, a few 2½-in. machines being used in special cases and for work in very narrow veins.

The chutes are of the common type, and the fact that there is little pressure upon them from the ore makes heavy construction unnecessary. The chute openings are 30 in. wide and 20 in. high, and are, for the most part, provided with arc gates.

Practice Now Favors Square Sets

In the newer stopes, even those only 8 to 10 ft. in width, the method which is being introduced by Mr. Purcell, the superintendent, is to put in square sets for two floors in hight starting from the sill floor, then above the second set to carry the stope up on the broken ore as described previously. This method of timbering gives a stronger support for the broken ore and facilitates repairs and replacements of broken timbers, but as the stope from below approaches this level and breaks through the floor it is necessary to catch up these sets. If the vein is sufficiently narrow stulls are used for this purpose, but if too wide square sets must be carried up from the level below.

Shaft House of Center Star Mine

In all of the wide stopes square sets are used, and are carried up from level to level. The ore is usually removed as fast as it is broken. The chutes through the sets are staggered to prevent excessive wear of the timbers, and in no case is the ore allowed to drop from a hight of more than three sets. The chutes are placed in every third set along the levels, thus reducing to a minimum the labor of handling the ore in the stopes.

The square sets are made of round timbers, 12 to 15 in. in diameter. The sill posts are 9 ft. in the clear, making a total hight of 10 ft. from the sill floor to the first floor of the stope, while in the stopes the posts are 7 ft. high in the clear, giving a hight of 8 ft. from floor to floor. The sets are 5 ft. 4 in. by 5 ft. 4 in. from center to center of the posts. The sill posts are 10 ft. long over all and have a horn 10 in. square and 6 in. long at each end, while the posts of the stope sets are 8 ft. long over all and have a horn 6 in. square and 5 in. long at each end. The caps and girts are each 4 ft. 10 in. in length. The ends of the former are framed 10x10 in. for 6 in. from each end; the latter are cut 6 in. back for the post seats and 2 in. for the cap seats. The squared end is 6x10 inches. The country rock is firm and stands well, and the levels require almost no timbering. However, the ground in and adjacent to the dikes is very heavy and all openings require strong supports.

The ore from the War Eagle mine is hauled by electric locomotives in 2-ton side-dumping cars through crosscuts to the Center Star shaft, where it is dumped into the ore pockets. Electric haulage is also used on the principal levels of the Center Star mine, but much of the ore is trammed by hand in 1-ton end-dumping cars.

Large Machines for Stoping

The ore pockets are cut out on the hanging-wall side of the shaft. There are two pockets on each level, one directly behind the other, separated by a vertical row of stulls. The front bin has a capacity of about 70 tons and is used principally for waste, while the other holds 150 tons and is used for ore. Each pocket is provided with rack-and-pinion gates, below each of which is an arc gate of sheet iron to catch any fine material which might leak through the other gate.

There are 36 air drills employed in the mine, most of which are 3⅝-in. Rand machines. Of these drills 10 to 16 are constantly employed on development work. In the stopes a pair of miners, with one machine, will drill from 30 to 40 ft. of holes in an 8-hour shift, 30 ft. being the rule. The holes are from 6 to 8 ft. deep, the longest steel in use being 10 ft in length. Each drill in the stopes averages from 20 to 30 tons of broken ore in the two 8-hour shifts.

From 1200 to 1600 ft. of development work is done each month. In a drift 6x9 ft. in the clear, the monthly advance is from 120 to 180 ft., the latter figure being the record. The round consists of 10 holes 5 to 6 ft. deep, which advances the drift from 4½ to 5 ft. A round is usually drilled in two shifts. In addition to the air drills two diamond drills are kept constantly at work in prospecting for new orebodies. The diamond drilling is done by contract at $2 per foot, while the drifting, which may be done by contract or not, averages about $16 per foot.

The Center Star group of mines employs about 425 men who average a little better than 1½ tons of ore broken per man. Two 8-hour shifts are worked, the first crew going underground at 7 a.m., and the second at 3 p.m. The change is made underground at the work. At 11 p.m. a crew of four blasters for each mine goes on, and these men load and blast all the holes drilled during the previous two shifts. Any missed holes are reported and listed on a blackboard in the shaft house. This system has greatly reduced the number of accidents, and also makes it possible for the miners to work in good air; for there is ample time for the stopes and drifts to become cleared of powder smoke and gas before the day shift comes on.

The water at the Center Star shaft is handled by a 250-gal. electric pump working 18 to 20 hours per day. A stream of 150 to 250 gal. per min. which enters from the Nickel Plate mine is raised to the Iron Mask adit by a centrifugal pump. The mines are excellently equipped and have an able management. The miners are well paid and there is little dissatisfaction among them. Most of the men own their homes and there is a degree of civic pride in Rossland that is not seen in most mining communities.

Petroleum in Mexico

The future of Mexico as an important oil producer is somewhat dubious. The indications from the extensive development work thus far prosecuted are not so favorable as originally anticipated. The policy of the two large companies is to suppress authentic data on the various fields along the gulf and isthmus; but engineers returning from investigations in these fields for independent interests state that far more brine is coming in than one would like to see. The deposits do not yet promise to be extensive, and in the other wells salt water is appearing in quantity. The famous Dos Bocas well is now little more than a lake of salt water, although during its destruction by fire a comfortable fortune in oil was absolutely lost to the operators. Considerable trouble has been experienced at times with the oil delivered the railroads for fuel because of the brine present. It is difficult to get a contract on fuel oil for any length of time, as the hoped for surplus does not materialize.

Ore Dressing in the Coeur d'Alene District—IV

Elevator Design Good but Speed Too Low; Wash Water Supply Poor; Trommels not Inclined Enough and Driving System Unsatisfactory

BY EDWARD S. WIARD*

Some details concerning Cœur d'Alene elevators will be found in the table which accompanies this article. It will be noticed that many figures are lacking, the majority of such cases being due to insuperable difficulties in obtaining data: The drawings and sketches from which the elevators were erected have long disappeared. In wooden elevator construction the practice is far superior to any of which I have cognizance and my own practice is founded largely upon it. On many minor points of construction there appears to be differences of opinion among the millmen of the region and to reconcile them and treat more fully the points meagerly covered by the table I substitute an outline of my personal experience with bucket elevators for a description of Cœur d'Alene practice. The plans for an elevator fed by a spout passing into the side of the boot and raising ore and water to a vertical hight of 35 ft. are shown in Fig. 2. The housing there shown bears a very close resemblance to that often seen in the district.

FIG. 1. SNOWSTORM MILL NEAR LARSON, COEUR D'ALENE MINING DISTRICT, IDAHO

FRONT FEEDING FOR ELEVATORS OF LITTLE ADVANTAGE

In the paragraphs which follow, the remarks unless otherwise specified relate to elevators for raising ore and water, in the Cœur d'Alene region the elevators generally doing this kind of work. No attempt is made to lead one or more spouts around to the front of the housing so that the stream of material will discharge directly into the buckets. At first though this seems to be an admirable way of feeding an elevator but experience has taught that it possesses few advantages. If more than one spout has to be diverted to the front of the housing the loss of head room usually becomes very serious. I have seen the boots of elevators sunk 20 to 30 ft. in pits to obtain this doubtful advantage. Even with a single spout there is a decided loss of head room unless the spout enters the front of the boot, because it will be found advisable to raise the spout so as not to interfere with repair operations at the bottom of the elevator. It cannot be stated too positively that, except with coarse dry ore, elevator buckets will fill just as readily dipping into the material to be raised as when it flows into them. In the matter of wear and tear of buckets, belts pulleys, etc., there is little to choose between the two methods of feeding.

If front feeding is resorted to, and by that I mean that the material enters the front of the housing at some point above the boot, the housing in the vicinity of the feeding spout may be made more trim than shown in the accompanying figures. In these it will be noticed the housing extends out sharply at the wing doors. I have found this extension necessary where elevating large quantities of water and ore which have been spouted into the sides or front of the boot to prevent undue wear from ore cast up by buckets. With front feeding the wing-door portion might properly be drawn in and the boot made shorter than shown in the drawings. Considerable caution should be exercised in doing this. It will be best to err on the side of too roomy a housing. For a front-fed elevator, the housing will have to be, however, wider than shown in the drawings.

The stereotyped design of elevators shown in the catalogs of manufacturers of mining machinery certainly falls short of filling all the variable requirements in elevating material in a large concentrating mill. They are practically the design which has existed without change for a long period in the cereal trades. Practically all the cuts in the catalogs show front-fed elevators, a boot and housing placed as snugly as possible around the buckets, and proboscis-like receivers. In some cases toy hinged boots are shown and, often mounted with screw belt-tightening devices which in darkness, dampness and grit do not work as planned.

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*Mining engineer, Denver, Colo.

Details in Construction of Elevators

Beginning at the top, an eye should be secured to a timber above the center of the head pulley for removing broken shafts or loosened head pulleys. These are not infrequent casualties in the best designed elevators. In elevating ore and water the hood should always be left open at the top and be of the lightest possible construction. For very small elevators the hood can be made in a single piece if desired but even in these cases a two-piece hood is more easily handled. In Fig. 3 is shown in detail a corner of the rear or left-hand half of the hood. Stiffness in the hood is secured by the liberal use of angle irons. If acid water must be contended with, the frame and angle irons had better be placed on the outside of the boarding. It is essential that the hood be of the lightest possible construction, for in service its weight increases from water logging and adhering slime.

A cover should not be allowed upon the hood, neglect to inspect the interior surely following such a procedure. If material splashes over the sides of an open hood it is usualy because it has not been carried up to a sufficient hight. A cover on a hood of insufficient hight will be the cause of noteworthy amounts of material being thrown back into the boot. The same objection applies to hinged circular hoods. A board cover on a square-topped hood gains weight from water and slime and even when new and of the lightest construction it is difficult for one man to prevent its falling into the hood while removing it.

According to my rule for belt travel where raising ore and water, the proper hight for carrying the open hood above the center of the head pulley is 1¼ times the diameter of the head pulley. With a 48-in. head pulley and following the ratio just given the top of the hood would be about 62 in. above the top of the timber supporting the pulley bearings. On this timber the inspector will naturally stand in performing his duty and the top of the hood for the measurement given would be too high for its comfortable performance. A permanent foot rest for inspection purposes should be built at the receiver for elevators having large-diameter head pulleys. The unsightly appearance of the outside from slimy water cast over the side of the hood may be obviated by nailing on each side of the hood over the center or crest of the discharging stream two horizontal, parallel strips of wood on which to lay two short lengths of board, the strips being sufficiently far apart so that the boards can slide over or under one another.

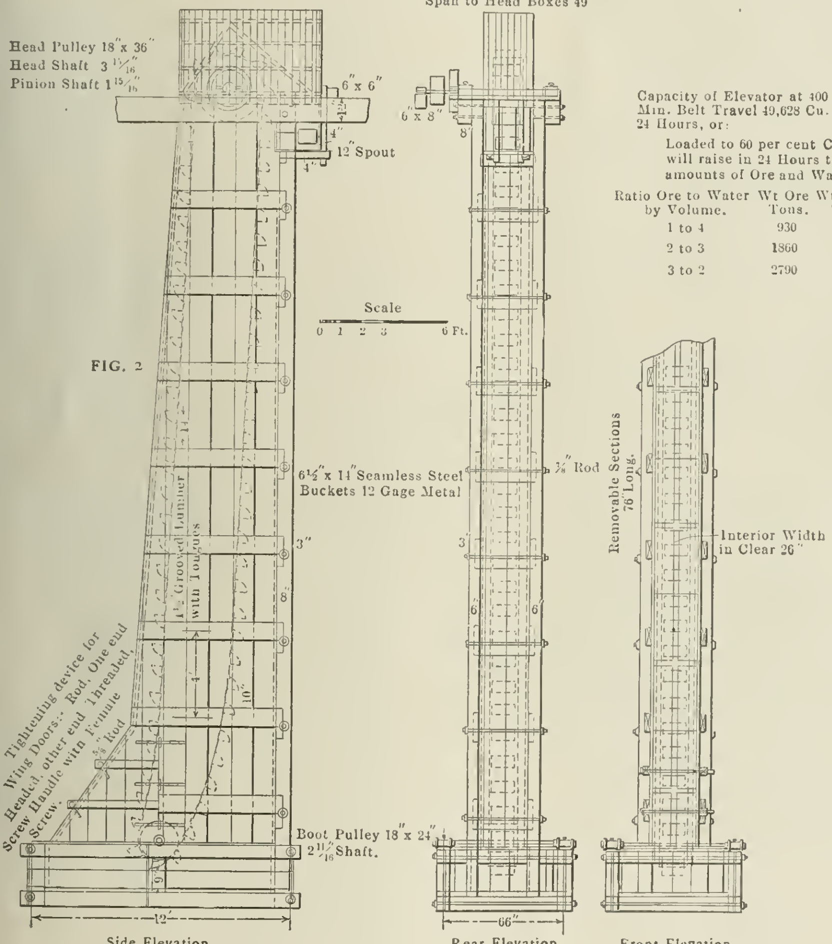

Head Pulley 18" x 36"
Head Shaft 3 15/16"
Pinion Shaft 1 15/16"
6" x 6"
12
4"
12" Spout
4"
6" x 8"
8'
Span to Head Boxes 49"
Scale
0 1 2 3 6 Ft.
6½" x 14" Seamless Steel Buckets 12 Gage Metal
1½" Grooved Lumber with Tongues
3"
8'
4'
10'
9'
Tightening device for Wing Doors:- Rod, One end Headed, other end Threaded, Screw Handle with Female Screw. ⅝" Rod
Boot Pulley 18" x 24", 2 11/16" Shaft.
12'
⅝" Rod
3'
6'
6'
66"
Removable Sections 76" Long.
Interior Width in Clear 26"

FIG. 2

Side Elevation Rear Elevation Front Elevation

Capacity of Elevator at 400 Ft. per Min. Belt Travel 49,628 Cu. Ft. per 24 Hours, or:

Loaded to 60 per cent Capacity, Elevator will raise in 24 Hours the following amounts of Ore and Water.

Ratio Ore to Water by Volume.	Wt Ore Tons.	Wt. Water Tons.
1 to 4	930	1240
2 to 3	1860	930
3 to 2	2790	620

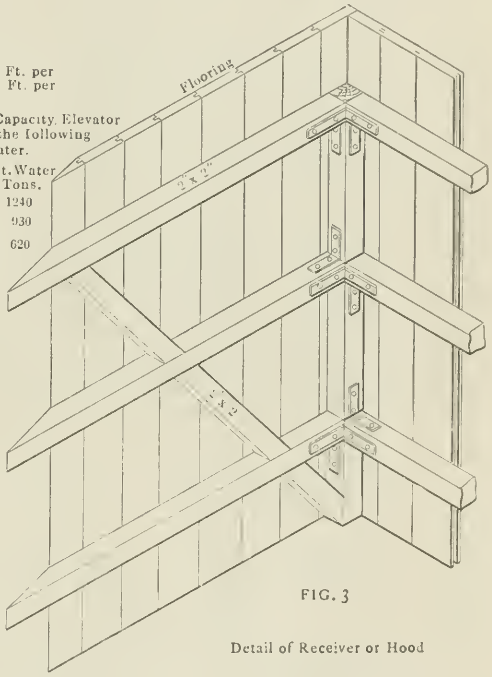
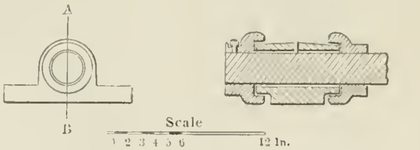


FIG. 3

Detail of Receiver or Hood



Side Elevation Section through A-B Showing Grit Proof Collars.

FIG. 4

Solid Boot Bearings, For 2 11/16" Shaft

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Details of Construction of Elevator for Raising Ore and Water

Elevators Raise Much More Water than Ore

In wet concentrating mills the tonnage of water to be raised in the elevators far exceeds that of ore, the latter often being a mere bagatelle in comparison. In the Cœur d' Alene district the ratio of water to ore entering elevators is unusually high. An idea of this can be gained from the extreme case of the last elevator in the tabulated statement to be found at the beginning of this section. In this case the theoretical horsepower required to raise the water is 10.31 while that for the ore is but 0.84. To keep the size of the elevator in raising ore and water as small as possible it is necessary to have

DATA ON COEUR D'ALENE BUCKET ELEVATORS.

Mill	No. Elev.	Head Shaft Span C. to C. Boxes, In.	Diam. Head Shaft, In.	Diam. Head Pulley, In.	Width Head Pulley, In.	Belt Travel, Ft per Min.	Batter Front Casing, In. per Ft.	Belt.		Spacing Buckets.	Kind and Size Buckets.	Vert. Ht. C. to C. Pulleys.	Vert. Angle Inclin. Pulley Centers.	Boot Shaft Diam., In.	Boot Shaft Span, Ft.	Diam Boot Pulley, In.	'Width Face, In.	Receiver, In. Below C Head Pulley.	Dimension Receiver, In. (Inside).	Dimension Boot, In. (Inside).	Tons Ore, 24 Hr.	Tons Water, 24 Hr.	Range Size Material.	Center Head Pulley to Top Hood, In.
								Width, In.	Ply.															
Mammoth	1	17	3 15/16	48	16	110	1 3/8	14	8	18	7x12AA	33′5¾″	11°24′	2 15/16	67¼	24	16¾	25	28¼ l. x 24 w. x 13 d.	56¼ w.	675	800	1¼″—0″	49
Mammoth	2	42	3 15/16	39	16	160	1¼	14	6	...	7x12A	50′11″	11°35′	2 15/16	...	..	16	24½	13x22x36	...	..			..
Standard	1	41	3 15/16	35	16	112	1¾	14	8	16	......	39′4¼″	5°41′	2 15/16	...	..	...	22⅞	29 l. x 24 w.	...	..			
Standard	2	...	3 15/16	35	16	458	1 3/16	14	6	14	......	......	......	...	...	..	...	...	......	...	...	...	1¼″—0″	47
Morning	1	41½	3 15/16	36	14	...	1¼	14	10	16	8x12AA	31′5½″	11°36′	3 15/16	68	28	14	17	17½x16½	...	...	...	1¼″—0″	..
Morning	2	37½	...	36	12	...	1¼	12	8	16	7x12AA	......	......	...	...	..	...	...	11x16	...	...	...	......	..
Hunter	1	40½	3 15/16	40	16	350	¾	14	..	...	7x12AA	......	......	...	...	..	...	22½	......	...	..	...	......	..
Hunter	2	36.0	3 15/16	40	14	350	¾	12	..	...	6x11AA	......	......	...	...	..	...	21¼	......	...	..	...	......	..
Hunter	3	...	3 7/16	40	14	350	¾	12	..	...	6x11AA	......	......	...	...	..	...	...	......	...	..	...	......	
Hercules	1	15	2 15/16	40	16	100	¾	14	10	14	6x12AA	38′10″	5°53′	...	...	..	...	27½	......	...		..	......	39
B. H. & S	1	27½	...	.	12	...	...	10	..	16	riveted steel	......	......	...	...	..	...	...	......	...		...	......	
B. H. & S	2	45½	3 7/16	37	18	185	1	16	8	18¾	8x15A	48′	......	...	...	..	...	37¾	46x28½	...	600	...	1¼″—0″	50
B. H. & S	3	...	3 7/16	30	..	...	0	..	..	...	......	......	......	...	...	24	12	...	51x21	...	..	...	......	..
B. H. & S	4	17	3 15/16	40	.	...	0	..	..	...	......	43′0″	3°20′	3 15/16	...	..	...	...	......	...		...	......	..
B. H. & S	5	17½	3 7/16	.		...	...	..	..	...	......	......	......	...	...	..	...	26½	50x28½					
Last Chance	1	.	3 7/16	40	18	440	...	16	8	16	8x14AA	47.85′	8°20′	3 7/16	...	30	18	...	......		700	601	60—0 m.m.	55
Last Chance	2	.	3 7/16	40	18	440	...	16	8	16	7x14 steel	42.77	11°6′	3 7/16	...	30	18	...	......		100	601	4—0 m.m.	..
Last Chance	3	...	3 7/16	40	18	440	...	16	8	16	8x14AA	31.67	5°7′	3 7/16	...	36	18	...	......	.....	350	2,105	40—0 m.m.	..
Last Chance	4	...	4 7/16	48	22	500	...	20	10	20	8x18AA	56.92	7°31′	3 15/16	...	40	22	...	......		350	1,305	40—0 m.m.	..

as high belt travel as is permissible. There seems to be in existence an absurd rule of 300 ft. per min., regardless of the diameter of the head pulley, which receives acceptance whether dry ore or ore and water is being raised. As a matter of fact the employment of this rule in elevating ore and water with head pulleys greater than 36 in. in diameter would lead to failure and it would not be entirely satisfactory for this size pulley. On a number of occasions when increasing the speed of elevators I have been warned that the course I was pursuing would lead to disaster. These warnings have generally been accompanied by vague statements that the centrifugal force would carry the ore around the head pulley and back into the boot. Where did such a rule and conception originate? Possibly in seeing sticky material carried over the head pulley and back into the boot (an elevator is not the proper contrivance for raising material of this kind). Possibly from experience gained with head pulleys of small or medium diameter.

SPEED OF ELEVATORS

The rule I use for determining the proper belt speed for raising ore and water which discharges freely from the elevator buckets is: The diameter of the head pulley in feet times 100 plus 100. For pulleys of various diameters the belt travel in feet per minute is as folows: 24-in., 300 ft.; 30-in., 350; 36-in., 400; 42-in., 450; 48-in., 500. In an accompanying diagram, Fig. 5, are shown four curves. Curve *A* is the path taken by a particle in moving outward from the crown of the pulley in the simplest form of elevator bucket, a vane attached at right angles to the belt. In curve *A* the downward effect of gravity is not taken into account. In curve *B* the path of the particle is shown where both the effect of central forces and gravitation are measured. Curves *A* and *B* are drawn to scale for a pulley 36 in. in diameter and a belt speed of 400 ft. per min. Curves *C* and *D* are a similar pair of curves for a pulley 48 in. in diameter and a belt travel of 500 ft. per min. All the curves are drawn about the center of the pulley as origin. The expression from which curves *A* and *C* were plotted contained no factor or member involving in any way the belt travel. In other words the effect of gravitation and friction being neglected, the path of a particle would remain the same for a pulley of any given radius regardless of the speed of the belt.

It will readily be seen, all retarding factors considered, that as the belt travel increases the path of the particles approach the limiting positions of curves *A* and *C*. The retarding effect of gravity would increase with time. The retarding effect due to friction between the particle and the vane I have not considered in an elementary analysis of this kind. It will be evident that the resistance to sliding of the particle will diminish as the vane rotates, being a maximum when it is in the zero position and nothing when in the 90 deg. position.

A bucket filled with ore and water exhibits different retardation phenomena than does the single particle and vane under discussion. For example the frictional resistance to the rise of the water in the bucket will be much less than to the ore particles and the water will be cast higher and farther into the receiver than the ore. There will be a gradation in the discharging streams from water and sand at the far end of the receiver to coarser ore and water at the bucket end. Dry ore will drop into a receiver in a more condensed mass than when mixed with water. If the receiver be too short in elevating ore and water the end will be unduly worn. After the particles shown in the diagram leave the edge of the vane or bucket they will describe parabolas, the angle of projection being the tangent to the curve at the point of emergence of the particle from the vane. The resultant velocity at this change in curvature will be nearly directly proportional to the belt travel. It must be evident that the effect of increasing the travel of the belt is to cause the particle to rise higher and land farther from the buckets in the receiver. As the diameter of the head pulley is increased the belt travel must necessarily be made greater because the particle has a greater distance to pass in reaching the receiver. The rule for belt speed which I give satisfies this condition in a rule-of-thumb way. It can be safely exceeded if desired. As the belt travel is increased the hood must be made higher and the length of the receiver increased. To some extent these considerations limit the belt travel. But where great capacity is desired it is better to err on the side of high belt travel.

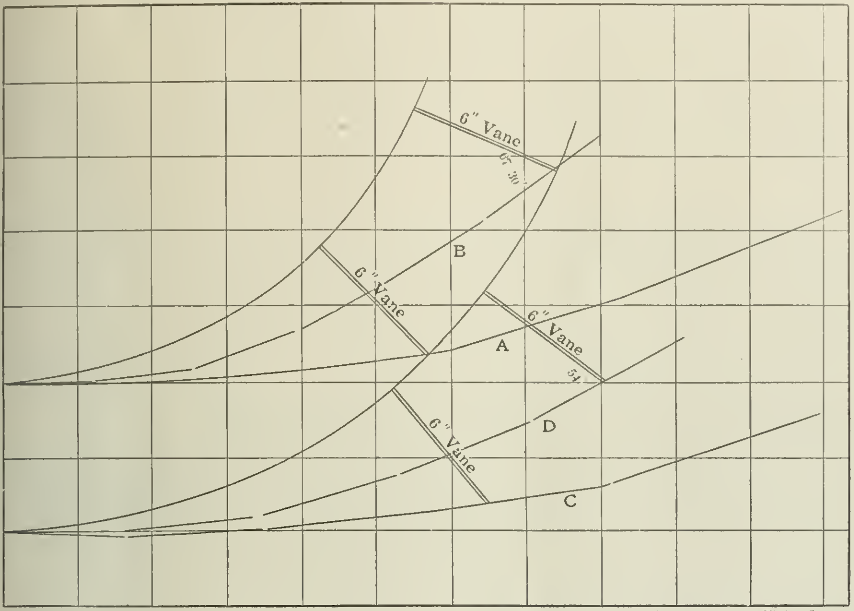

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FIG. 5. CURVES SHOWING PATH OF PARTICLE MOVING FROM CROWN PULLEY OF ELEVATOR

In elevating dry ore a high belt travel is unnecessary and an undue amount of dust would be created by its use. With ordinary size pulleys 200 to 300 per min. belt travel is sufficient. With these low belt speeds the discharge is partly or altogether effected by the ore falling out of the bucket as it nears the receiver. In elevating dry ore the edge of the receiver is placed lower than in ones elevating ore and water and as the receiver is but an enlargement of a spout placed at a high angle little head room is lost.

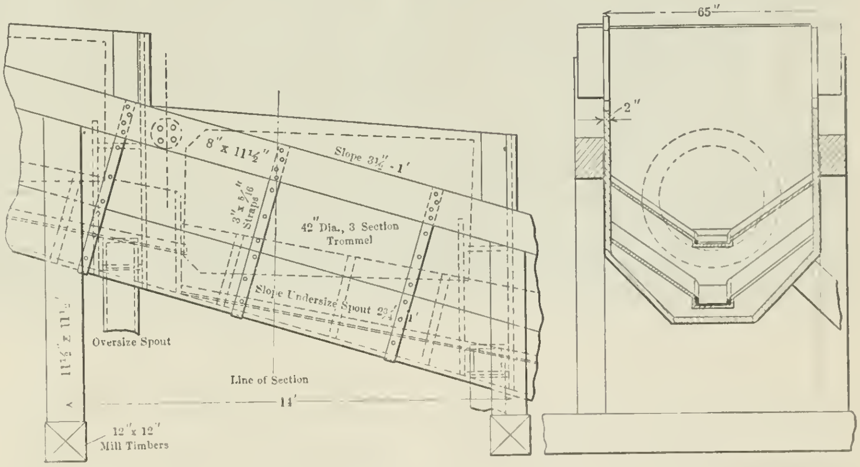


FIG. 6. HOUSING OF TROMMELS IN COEUR D'ALENE MILLS

If the vane shown in the diagram were inclined upward or toward the crown of the pulley the path of the particle would be flattened and the angle of projection and the resultant velocity on emergence from the vane lessened. In general it may be stated that the more open the bucket the better the discharge, a shallow bucket, however, has little capacity. The vane in the diagram has no practical capacity. On acount of these considerations the problem of determining the best cross-section or curvature of the front of the bucket cannot be solved.

DIMENSIONS OF RECEIVER VARY WITH DIAMETER OF HEAD PULLEY

If the rule for belt travel be followed the upper edge of the receiver iron should touch a horizontal line tangential to the lowest point of the crown of the head pulley. The buckets should just clear the receiver iron. These directions are entirely empirical. The most important factors in determining the position of the receiver iron appear to be the diameter of the head pulley and the belt travel. A length of receiver equal to two-thirds the diameter of the head pulley will be found sufficient for ordinary conditions. The lower edge of the receiver spout should be raised from 3 to 9 in. above the bottom of the receiver so as to allow ore to accumulate to protect the bottom of the receiver from wear. It is a good plan to suspend a piece of sheet iron from the top of the hood at the far end of the receiver to prevent undue wear at that point.

The width of the receiver will, of course, be the interior width of the housing proper. This should be made as small as possible to give a minimum unsupported span of the head-pulley shaft. If the head pulley has a clearance equal to a quarter the width of its face the interior of the housing will be found sufficiently wide for conveniently making repairs. With a 16x36 head pulley the interior width of the housing and receiver following this direction would be 24 in. If the unsupported span of the head shaft be too great considerable difficulty will be encountered from its springing and rupturing in the hub of the head pulley or of the latter becoming loose on the shaft. In the design of the elevator accompanying this section the dimension of the boxes of the head pulley is 49 in. center to center. The face of the head pulley is 16 in. and the housing is built of 1½-in. tongue-and-groove lumber. The exterior width of the housing is 29 in. The front vertical timbers are 6 in. and the bridge trees 8 in. wide. This makes the dimension of bridge trees as above, 49 in. center to center. In the second column of the accompanying table will be found figures showing the dimension from center to center of the head pulley boxes of Cœur d'Alene elevators.

HEAD PULLEY SHAFTS SHOULD BE OF LARGER DIAMETER

On the score of extra stiffness head pulley shafts should be of greater diameter than those to be seen in the Cœur d' Alene mills. For an elevator of from 50 to 60 ft. vertical lift, 20x48 head pulley, 8x18 A A maleable-iron buckets loaded to 60 per cent. of their capacity, and an 18-in. 10-ply belt, a 4 15/16-in. shaft is required if it be provided with a keyway. If the pulley is hydraulically forced on the shaft the hub being reinforced by shrunk-on bands, which is the better practice, the diameter may be reduced to 4 3/16 in. For an elevator of 20 ft. vertical lift, 14x30 head pulley, light steel buckets and 12-in. 6-ply belt the head shaft need not be of greater diameter than 2 11/16 in. For geared elevators a pinion shaft of 1 15/16 in. diameter will be found of ample size for moderate lifts. For heavy duty the diameter of the pinion shaft should be increased to 2 7/16 in. These recommendations are dependent upon the ratio of teeth in the gear wheel and pinion being not less than four to one.

An inspection of the table will show that the batter of the front of the housing varies from 0 to 1¾ in. per ft. The tendency of late years has been to make the back of the housing vertical, it being found that wear at this point increases with the slope. In the elevator design shown it will be noted that as a further precaution against grit cutting the back of the housing the receiver extends into the housing. To maintain the contact of the belt with the boot pulley the universal practice in the region is to advance the head pulley in the direction of the receiver and away from a vertical line carried upward from the center of the boot pulley. As the belt stretches there is merely a shifting of the position of the arc of contact with the boot pulley.

In column 14 will be found values for the angle made with the vertical by a line passing through the centers of the elevator pulleys. If the center of the head pulley be advanced from the center vertical line of the boot pulley a distance equal to the diameter of the former a satisfactory and automatic taking up of the slack is obtained. Following this direction, the vertical angle made by the line passing through the pulley centers is, for an elevator of 60 ft. vertical lift, about 3 deg. 49 min. If the lift be but 20 ft. the angle becomes about 11 deg. 18 min. As the lift increases the weight of belting also increases and a lesser inclination is sufficient to make the belt warp and cling to the boot pulley.

SIZE OF BOOT PULLEY

A pulley of approximately two-thirds the diameter of the head pulley will be found satisfactory for service in the boot. If the elevator is fed from the side the boot pulley should be provided with an extra-thick rim and the arms made extra heavy where they merge into the rim. A light shaft will answer for the boot pulley as there is but little stress upon it. Take-up boxes on an elevator raising ore and water are an abomination; there is no practical system of taking care of the slack of the belt but by inclining it. I prefer this method for elevating dry ore.

In the matter of boot bearings attention is invited to the solid bearings with enwrapping collars shown in Fig. 4. It is well nigh impossible to keep the cap of two-piece boot bearings in place; also with this style of bearing and plain collars openings are exposed for the entry of grit. Sufficient grease should be forced into the bearing shown in the drawing to insure that it will ooze out between the end of the bearing and the collar and completely close the bearing. The boot bearings are always cold and no difficulty is experienced in keeping the grease coagulated.

The boot is always made wider than the housing proper when elevating ore and water. An interior width of 2¼

FIG. 7. LAST CHANCE MILL, COEUR D'ALENE MINING REGION, IDAHO

times that of the housing proper will be found ample for the boot. The length of the boot will be dependent upon the slope of the back end of the housing and if the elevator be side fed upon the number and size of the spouts entering the boot. In the drawings shown the back end of the housing is vertical and the interior length ahead of the center of the boot pulley is the diameter of the head pulley plus the overhang of the receiver, the thickness of the belt, the width of a bucket and the clearance of the bucket with the receiver iron, or a total of 5 ft. 3 in. The length in front of the center of the boot pulley is the same.

Proper Speed Important

I found one elevator in the district which had a spray pipe in the receiver for the purpose of loosening the ore in the buckets. This elevator raised fine material mixed with a comparatively small amount of water to a considerable hight. While being elevated the fine ore settled and packed in the bucket. I have encountered this difficulty on a number of occasions, especially when raising fine concentrates through even a moderate hight. Two cures can be practised, one the spray mentioned, the other, boring tiny holes in the bottom of the bucket; this will cause water to work down through the mass of ore and keep the grains apart. The spray is the more effective method of the two. Packing of ore in the buckets can frequently be cured by increasing the belt speed.

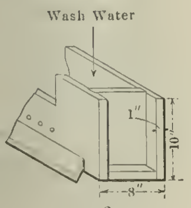


FIG. 8

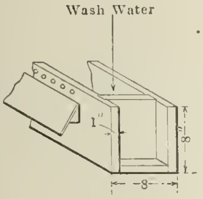


FIG. 9

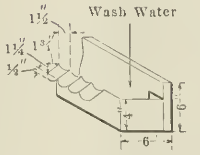


FIG. 10

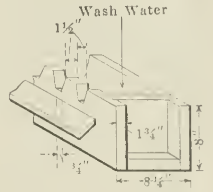


FIG. 11
The Engineering & Mining Journal

Types of Water-feed Boxes in Coeur d'Alene Mills

In an overloaded elevator there will be found to be a curious selective action. At the start of operations ore and water in the ratio entering the boot are raised, gradually, however, the quantity of water raised diminishes until finally the buckets arrive at the receiver filled with a packed mass of ore. The explanation of this action, if the belt speed be too low, is that at the start a certain proportion of ore falls back into the boot while the bulk of the water drops into the receiver. Finally the ratio of ore to water in the boot becomes so great that the elevator is overloaded with a mass of sticky coherent ore. An elevator which has insufficient belt speed has a characteristic discharge: The loads of each bucket rise out of them separately and appear to lag behind the bucket from which they came.

In designing elevators a greater load than 60 per cent. of the catalog capacity of the buckets should not be aimed at. Buckets loaded by dipping into the boot will not fill to more than 70 per cent. of the rated capacity.

Little additional explanation is needed to make the accompanying plans of an elevator comprehensible. At the back of the housing are two vertical 6x8 members resting on the sills of the boot and bolted to the bridge trees at the top. Framed into these are 3x10 timbers to which are spiked the boards of the housing. The boards of the housing are entirely supported by these timbers, having no footing in the boot. The front of the housing consists of light sections 76 in. long which are secured by wood screws to strips of wood nailed to the interior of the housing. These can be quickly removed for repairs. Access to the interior for ordinary repairs can be had by throwing back the wing doors at the bottom of the elevator.

Revolving Trommels

The trommel lines in Cœur d' Alene mills are invariably placed at one side of the elevator feeding them. The spouts from the elevator have a generous width, usually 12 to 16 in. The usual slope of these spouts is 3½ in. to 1 ft. To reach the trommel line, the receiving spout of the elevator makes a right-angle turn. The trommel end of the spout is brought as close to the arms of the hood spider as possible.

All of the old mills of the district were provided with trommel lines driven from a single countershaft fixed above them. This countershaft drove by bevel gearing a center trommel, and motion was transmitted to others by means of gearing. This mode of driving is still to be seen in a few places; in others it has been changed to sprocket, or other forms of drive. In the newer mills individual driving of the trommels is practised. In the old mode of driving, each trommel except the lowest was provided with three gear wheels; one at the top, an idler in the center, and a lower gear wheel. The upper gear wheel was keyed to the end of the trommel shaft and the lower gear wheel to the reverse end of the trommel shaft below. The shafts rested in bearings set in slots in the vertical arm of a cast-iron cross. The idler between the gear wheels was supported on a pin inserted in the center of the cross, the latter being supported by bolts passing through the ends of the horizontal arm and the inclined timbers of the trommel line.

The supporting surface for the pin in the cross, on which the idler rotated, was entirely inadequate and in service, the racking movements produced in the idler speedily loosened the nut which held the pin in the cross, and the idler dropped upon the lower gear wheel; also the teeth of the wheels were more worn at the edges than in the centers. Then too the lower gear wheel received the splash from the launder below it, and grit was transmitted from it to the other gear wheels. In making repairs on one trommel it was necessary to turn over the whole trommel line and I have frequently seen a great portion of a mill crew exerting all their strength, on a crowbar placed in the spokes of the drive pulley, vainly endeavoring to turn over a trommel line driven in this way. Why such a wretched piece of design still persists is a mystery to me.

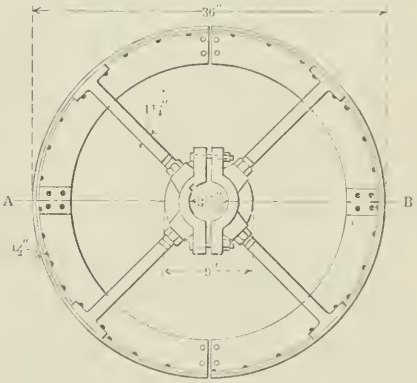
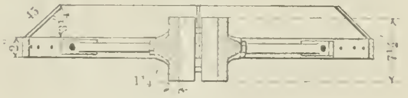


FIG. 12



Section through A-B
The Engineering & Mining Journal

Split Spider used in Coeur d'Alene Mills

Trommels Should Be Separately Driven

The best system of driving trommels is to have a belt for each trommel, motion being transmitted by a bevel pinion. If there is a double trommel line, two trommels can be driven by one belt. In some places outside the Cœur d' Alene, trommels have been successfully driven by direct belting from a slowly revolving countershaft. In the Cœur d' Alene mills where sprocket drives are employed, the drive shafts are placed horizontally and in the plane of the long axis of the trommel line. An inclined drive shaft would entail complications of support. The chains in this mode of driving are very long for the lower trommels.

In individual driving with bevel-gear wheels and pinions, the pinion shaft can either be provided with tight and loose pulleys, or the pinion can be made to slide over a fixed key by means of a lever; the key and key-way must then be kept well slushed with grease. If the sliding pinion device be employed the trommel can always be disconnected from the drive shaft while with a tight and loose pulley, if the mill shuts down suddenly, the belt must be thrown before the trommel can be turned around freely by hand.

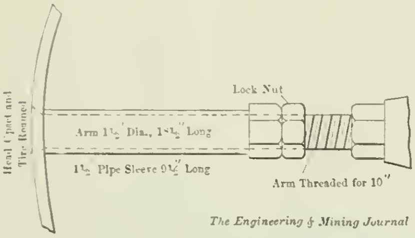


FIG. 13. SPIDER ARM WITH PROTECTIVE PIPE SLEEVE

WOODEN HOUSING FOR TROMMELS

A riveted steel housing is a nuisance. It is bound to wear through sooner or later anyhow and, if made of wood, a temporary patch can be quickly applied and a neat permanent repair made when the mill is shut down for general repairs, while with a steel housing the temporary cure is a wad of waste and the permanent repair requires a blacksmith, repair plate and rivets. Not all mill blacksmiths understand boiler making.

The usual type of housing employed is shown in Fig. 6. The drawings also illustrate the mode of connecting the trommel timbers with the mill framing. The slope of the undersize spouts varies from 2½ to 4 in. to 1 ft. The slope of the bottom boards and supporting timbers is usually 3½ in. to 1 ft., and in one extreme case 5¼ in. to 1 ft. The housing, as indicated in the drawing, is one long continuous trough supported from inclined timbers. The method of supporting the housing shown is excellent. The boards are bolted to iron straps, shown in section, and these are in turn bolted to the inner sides of the sloping timbers. The only criticism that can be made of this style of housing is that the sides rise too high. This is another of the baneful effects of the cast-iron cross device. To support the cross the inclined timbers must be high, and the housing depend from these timbers. With the single drives the housing could be placed lower and high removable side boards provided to prevent splash. When the trommel is being repaired the side boards could be removed and a greater portion of the trommel thus be exposed. A greater width of housing than at present prevails in the district would also facilitate repairs.

WATER BOXES FOR TROMMELS

With very few exceptions all the mills are bothered by dirty water for which neighboring mills higher up stream are responsible. There is usually an excessive amount of dirt and trash in the wash water and even in the clearest water to be obtained in the district, there is a large amount of iron salts, which, when exposed to the air, precipitate hydrated iron oxide in the form of a reddish slime or ooze. If spray pipes were employed on the trommels, as is the practice in many camps, the comparatively small holes would speedily become clogged with iron. The use of spray pipes being out of the question, water boxes are consequently exclusively employed. The usual types are shown in an accompanying illustration. All these boxes after being put into service quickly fill up to the outlets with slime and dirt. That shown in Fig. 8 is the poorest of all. The far holes quickly fill up with muck and only those holes at the end where the wash water enters remain open. It will be noticed that the box is cut out above the spray holes as a safety measure, but even with this precaution the water has a tendency to issue at the end where the wash water enters. The box of Fig. 9 is open to the same objection, the only advantage being that after the box is cleaned out a little more time will intervene before it is necessary to repeat this operation. Fig. 10 is the best of all the types shown. This box, while it fills up with trash and slime, always remains open from one end to the other, back of the curved surfaces secured to the front. With the exception of the back this box is made of steel. The curved spouts are made separate and soldered to one another and to the steel box. Each curved blade has a flange at one side to assist in soldering to its neighbor. This is not shown in the drawing.

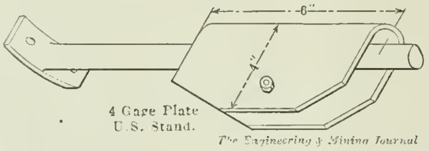


FIG. 14. DEVICE FOR PROTECTING SPIDER ARM

When repairs are being made care should be taken to see that the water box is set back on its brackets in a perfectly level position. All forms of water boxes should be either provided with apron or projecting spout, as otherwise the water passes by capillary action, or falls, into the undersize in an irregular mass. In a number of mills I observed water boxes from which the apron had been broken, and all the water was passing into the undersize.

A spray or box on the outside of a trommel is a very ineffective device. From observation in the Cœur d'Alene, and elsewhere, I am of the opinion that not more than 10 per cent. of the wash water enters the trommels, and does effective work, the remaining 90 per cent. serving only to dilute the pulp. Just as long as mill men are content with trommels consisting of spiders, shaft and plate this trouble will continue. A spiderless trommel would allow of a spray being used inside where it would do the most good.

SPLIT SPIDERS IN GENERAL USE

The size of shafts used for trommels range from 2 15/16 to 3 11/16 in. in diameter. The latter shaft would be ample for a trommel of say zero gage plate (U. S. standard) and four sections each 30 in. long; the former for a two-section trommel of the lightest plate. Of late years the split spider and hood have come into general use and I am under the impression that this form of spider originated in the district. Fig. 12 illustrates a split spider and hood. The built-up steel hoods are more durable, cheaper, and lighter than cast-iron ones. The advantage of the split spider is manifest. If a solid-hub spider becomes loose on the shaft, there is nothing to prevent it from shifting uneasily on the key, and eventually sliding clear of it. Once loose, grit will lodge between the hub and the shaft and wear will increase rapidly.

The center spiders are most likely to become loose, and if the hubs are solid all the others must be driven off the shaft before the loose one can be removed. Solid spiders either loosen on the shaft, or else become so firmly rusted in place that all efforts to dislodge them are frequently ineffectual. The procedure in the case of a solid-shaft spider which has become loose is to treat the shaft with sand paper, and kerosene, accompanied by intervals of sledging the hubs ahead of it which must be removed. Pieces of giant powder are occasionally resorted to to start refractory keys and frequently the hubs have to be broken off with charges of powder.

When the spokes of the spider shown are worn through near the tire, the spider is sent to the blacksmith's shop and new spokes welded to the cross pieces secured to the tire. Fig. 13 shows a spider arm used in Mexico which allows for worn arms and the protecting covering being removed and replaced by new ones without removing the hub from the shaft. Fig. 14 shows a protective piece for the spider arms, in general use on the hood spiders in the Cœur d'Alene. Figs. 15, 16, 17, 18 and 19 show various forms of trommel-band lugs. The designs shown in Figs. 15 and 18 have the same size openings from one end of the ug to the other. The rest have tapering oles. Fig. 17 shows the best form of ug. The holes are tapering, and the ugs being short they lie flat on the tromnel. The lug is made of steel and has o be finished by the blacksmith in a nold made for the purpose.

In putting on new trommel plate logging chains are used. The chain is laced around the trommel plate, and after he hook is caught in some convenient ink, the plate can be drawn up by slipping a bar under the chain and twisting t. Patches are put on with elevator bolts, nd are cut from old pieces of trommel late. The band patch, entirely encircling the trommel, is used in some of the nills, and is quickly applied—owing to he small slope of the trommels the wear f the plate occurs in peripheral streaks. t is secured by a bolt passing through wo lugs riveted to the ends.

Trommels Given Insufficient Slope

The slope of the trommels in this district varies from ⅜ to 1⅛ in. to the foot. In most of the mills all the trommels were originally given the same slope, ut owing to wear of the boxes and other auses, considerable variations are to be noticed. In a few of the mills a descending scale is employed, of which the following figures will furnish an example: Trommel No. 1, 11/16 in. to 1 ft., gage of plate, 6 U. S. standard, 15-mm. round holes; No. 2, ¾ in. to 1 ft. 8-gage plate with 10-mm. holes; No. 3, 13/16 in. to 1 ft., 12-gage plate with 7-mm. holes; No. 4, ⅞-in. to 1 ft., 12-gage plate with 4-mm. holes; No. 5, ⅞-in. to 1 ft., 16-gage plate with 2½-mm. holes. Approximately 600 tons per 24 hours enters the head of this trommel line.

In the matter of slope, I am heartily in accord with Richards' recommendation of 2 in. or more to 1 ft. It is almost impossible to make mill men see the force of Richards' arguments for increasing the slope over the practice which now prevails. The almost invariable, scornful dictum given in response to such suggestions is that to improve the screening the length of the trommel must be increased. If mill men were provided with trommels the slope of which could be altered at will, and while the machine was running, I am confident that the slopes would be materially increased.

The limits of the trommel sizing are 2½ mm. minimum, and 36 mm. maximum. The usual practice is to break, then crush in No. 1 rolls to a limiting size of 1 to 1¼ in. and elevate the crushed material to a trommel line with maximum size of holes from 34 to 36 mm. in diameter, the oversize from this latter screen being returned to the rolls for further crushing. In some of the old mills this oversize passed directly to bull jigs, and the middlings from these to rolls. The first practice is, of course, the better. The usual diameters of the trommels used are 36, 42 and 48 in. The 36-in. size is only used for screening fine jig middlings.

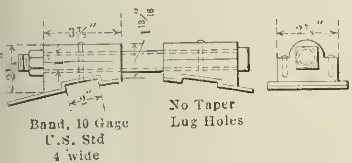


FIG. 15

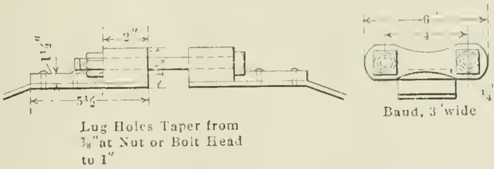
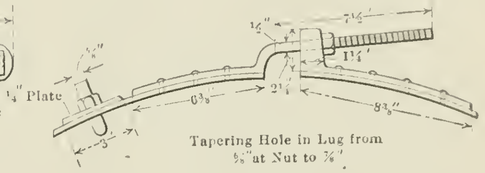


FIG. 16



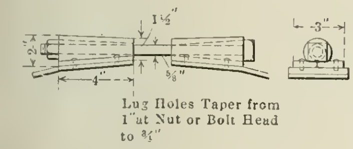


FIG. 17

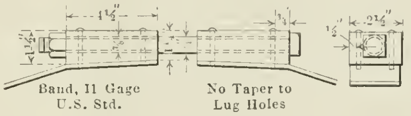


FIG. 18

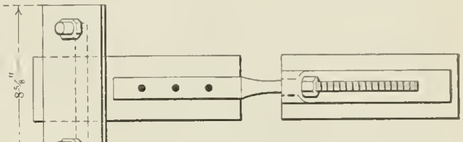


FIG. 19

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METHODS OF FASTENING TROMMEL PLATE BANDS IN COEUR D'ALENE MILLS

Trommels Over Burdened

A single trommel line, 42 or 48 in. in diameter, receives during 24 hours at its head end from 150 to 500 tons of direct feed, and, in addition, from 75 to 300 tons of coarse middlings. For mills with any capacity up to 500 tons per day a single trommel line has usually been provided. In a few larger mills a double line of trommels is provided. With such enormous tonnages as are usual in the Cœur d'Alene passing into the trommel, good screening is not to be expected. Sizing tests showed in extreme cases only 50 per cent. of perfect work; that is to say, the oversize contained 50 per cent. material which properly belonged in the undersize. Screening to a limiting size of 30 to 36 mm., it is my opinion that not more than 250 tons of ore should be fed in 24 hours to a trommel line of from 42 to 48 in. diameter.

These statements do not cover the whole matter of over-burdening the trommels. Frequently large amounts of fine middlings are returned to trommels at the lower end of the line, and the oversize so made passes to jigs, thence to rolls, and back to the same trommels. As pointed out under the head of rolls, the percentage of finished product, or product which will pass the trommel, diminishes with the decrease in the size material fed to the rolls, and with the decrease of the set of the rolls. With fine middlings, therefore, and with such a circuit, the burden returning to the trommel increases by leaps and bounds. I have seen a case of this kind where, with an original tonnage of about 200 tons fed to the mill, the stream of material flowing to a trommel at one point was at the rate of 900 tons per day. As Richards has pointed out, the circulation of middlings in the way mentioned above produces great blinding of the trommels, because there are a large number of grains of ore of very nearly the diameter of the plate openings. Blinding in the trommels with small openings is more difficult to cope with than in trommels with large openings, because the grains rust in the holes very quickly, and unless the screens are constantly beaten out become so firmly lodged that they can only be driven out with a hammer and punch.

If no middlings are returned to the trommel line it will be found that the screening in the fine-hole trommels is no better, if not worse, than in the coarse ones and this despite the fact that the amount of arriving ore has been diminished by the removal of oversizes by the trommels above. In such a case inferior screening cannot be attributed to blinding because there is no reason why there should be a greater amount of grains near the size of the openings in the fine-hole screens than in the coarse ones. This statement will also apply to dry screening. In dry screening some method is usually adopted for keeping the whole screen in vibration. If the ore be bone dry this is unnecessary. With perfectly dry ores I have got good results with ordinary trommels. In one case the screening was so perfect that the water in the jigs was clear.

Wash Water Ineffective in Screen Sizing

Little of the wash water used on trommels enters them and does effective work. What little does enter the trommel runs down the inside and under the bank. If wash water, as at present used on trommels, does any material work in thoroughly loosening the cohesion of the grains, transporting fine undersize grains through the interstitial passages in the bank, in pointing the long diameter of the grains toward the openings in the trommel, or assisting in lubricating the grains in passage through the screen openings, I have failed to note it. When the stream of ore enters the head trommel of the line it loses all the water brought in with it before it has traveled to the end of the first section; also, a greater proportion of the slime and markedly under-size ore. What then remains may be considered a mass of coarse-grained material. With such a high upper limit of screening as prevails in the Cœur d'Alene, there is little coherence in a mass of this kind. The bank tends to rotate as well as advance and grains slide down the bank where momentarily they are in contact with an uncovered portion of the trommel plate. If they fail to pass through the openings they are carried up under the bank ultimately to appear again and go through another cycle.

Trommels Suited for Coarse Sizing

The path of a grain of coarse material in a trommel is a helix. And with the active tumbling about caused by this motion through the trommel, grains arrive at the trommel plate in various axial positions. This is a decided advantage as more opportunities are afforded each particle to pass through the screen openings. The larger the proportion of material very nearly the size of the apertures of a screening apparatus which will pass the holes, the more efficient is the apparatus, and for the reason that, with coarse sizes, the action of the trommel tends to eliminate pieces of very nearly the diameter of opening, its adaptability lies in this class of work. In a flat screen the pieces of ore tend to ride through on their flat sides.

As the feed to the trommels diminishes in size of grain, coherence of the particles increases rapidly. To see the force of this statement one has only to squeeze in his hand some wet sand and notice how it packs. In fine trommels after the elimination of the water the bank tends to swing back and forth in a mass, and screening only takes place where the bank is immediately in contact with the trommel plate. At one time, milling an ore the gangue of which consisted of quartz and a dark trap rock, in the fine trommels, the grains of dark trap rock were noticeable against the white background of the quartz and it was perfectly possible to fix attention on one particular grain of dark ore, and observe its passage through the trommel. Grains on top the bank would frequently ride through without disappearing in the mass below, the paths being long, flat saw teeth.

In dry screening, there is cohesion of the grains, but not to so marked a degree as in wet work. If the whole mass of ore in the screening apparatus is under water the coherence is entirely destroyed, and with proper means perfect screening should be obtained. Everyone is familiar with the ease and rapidity with which hand screening may be accomplished if the screen and its contents are held down in a pan of water. Below 4 mm., because of the effect of coherence, I am of the opinion that a flat screen of some form will give better results than a trommel.

Heavy Plate for Coarse Trommels

The general practice in the Cœur d' Alene is to have the gage of the heavy plates greater than recommended by the manufacturers. On the other hand, the finer sizes conform rather closely to the manufacturers' recommendations. The ratio of thickness of plate to diameter of hole decreases as the hole becomes smaller. If the holes in trommels be considered as tubes filled with solid streams of material, owing to friction, the discharge will be relatively less with the fine screens than with the coarse ones.

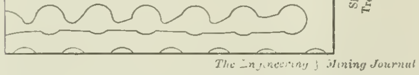

Fig. 20. Wear of Trommel Plates

Fig. 20 shows a sketch of the actual wear of a portion of trommel plate. The motions due to rotation and the slope are indicated by arrows. As shown wear starts from the edge of the holes farthest from the ore bank as they rotate. Owing to the small slope of the trommels the tendency of wear, once started at a point is in a circular line, the planes of which are almost at right angles to the axis of the trommel. Ultimately if wear is allowed to proceed the trommel plate is cut into circular sections. If the slope of the trommel were greater the wear would be more uniformly distributed.

The design of a spiderless trommel so arranged that the slope could be altered while the machine was running should not offer any serious difficulties. Such a trommel would be supported, of course, by friction rollers, and means would have to be taken to protect the rolling surfaces against grit. A trommel line provided with such revolving screens could have an overhead crawl to remove the trommels needing repairs, the removal and substitution of a new one being a matter of a few moments. The other advantages are manifest. The traveling belt screen is the only other form of screening apparatus to be seen in the Cœur d'Alene. The Callow screen is largely used in retreating middlings and tailings and has given excellent service.

Pocket Edition of Geologic Folios

The U. S. Geological Survey has just adopted an octavo field or "pocket" edition for its geologic folio publications. The results of the detailed geologic surveys necessary to the preparation of the geologic map of the United States have heretofore been published by the survey in folio form, 168 such folios having been already printed. Each folio contains the topographic base map of the quadrangle under consideration and maps showing the areal and structural geology, while in some folios are maps showing the economic geology and in others the underground water resources of the region. The map sheets are about 18x21 in. and are accompanied by brief descriptive texts printed on sheets of corresponding size, making the folios extremely cumbersome for field use.

While the folio form has given general satisfaction for office and library use, it has been recognized for some time that a more convenient and if possible a "pocket" edition would add greatly to the value of the publication for field work. It has therefore been determined to continue the folio form of this publication and also to print a field edition in octavo size—about 6x9 in.—in which the maps are folded and inclosed in a pocket.

The folios in the new form can easily be preserved on ordinary shelves with other books. Five folios in this form have been printed by the survey and are now ready for distribution, namely, the Belle Fourche (S. D.), the Aberdeen-Redfield (S. D.), the El Paso (Tex.), the Trenton (N. J.), and the Jamestown-Tower (N. D.), numbered respectively 164, 165, 166, 167 and 168. They are bound in substantial covers provided with pockets that hold securely the accompanying maps. The maps are printed on a special paper that will bear refolding and handling and the books will slip into a good-sized coat pocket.

The price of the folios of the field edition is the same as that of the library edition, 25c. each—the cost of paper and printing. Another slight departure in connection with the publication of the geological atlas, beginning with the above five numbers, is the printing of separate maps (unfolded) showing the areal geology of the quadrangle. These can be obtained for five cents each so that those who desire geologic wall maps can procure them at nominal cost.

e Geological and Physical Condition of Tonopah Mines

By Walter P. Jenney*

A cluster of low volcanic peaks mark site of the mining camp of Tonopah. has in the past been an area of con- ntrated volcanic activity; of repeated uptions and outpourings of lava, one cceeding another, beginning in the rly Tertiary and continuing until com- ratively recent geologic time. With dying out of the eruptive phase of lcanic activity, there followed a pe- od of intense dynamic action; of fis- ring and faulting of strata, accom- nied by the formation of deposits of ld and silver ore. So recent has been e cessation of volcanic outbursts in this strict that the rocks, like the eruptive rmations of the Comstock, still retain a ortion of their original heat. Notwith- anding the comparatively late deposition the ore, there are evidences in the ines that the formation of the deposits tended over a long period, with many sturbances and interruptions.

An Area of Igneous Rock

Tonopah conforms to the general law f areal distribution of mining districts, amely, that "ore deposits have been ormed only in local areas of disturbance nd faulting and in direct association with ruptions of the igneous rocks." So in- nse and concentrated has been the ormation of the ore in this basin among he volcanic hills that the deposits are f a richness and size seldom equaled.

Examined more particularly, it is seen hat the rocks of the district are all of gneous origin; the successive eruptions f lava, of varying composition, having een outpoured from a number of vol- anic vents, in sheets superimposed one ipon another. In places the structure is ot so simple, and the successive flow heets of lava are broken through by later ntrusions of volcanic rock. Further, he strata, after the sheets were laid own, have been extensively faulted.

Of the many igneous formations in this area, it is only necessary to describe those which directly influence the occurrence of ore. These, in the order of their eruption, are the earlier andesite, the later andesite and the rhyolite. The earlier andesite is white or light gray in color, soft, breaking with a rough fracture; the later andesite is darker in color, weathering near the surface with a deep brown or purple tint, so that it is usually readily distinguished from the earlier andesite; the rhyolite is largely composed of quartz, breaks with a fine-grained, splintery fracture, and is commonly light greenish-gray in color. The general dip of the andesites is to the north, at angles usually from 15 to 45 deg.; the rhyolite sheet, being intrusive in the older lavas, often does not conform to this dip, and in some areas is nearly horizontal.

The Earlier Andesite

It is, however, when the ore-bearing character of these different rocks is considered, that this distinction between the several flows becomes important. The earlier andesite is the great ore-bearing formation of the district, and for this reason is called by the miners the "lode porphyry;" the rhyolite in places carries workable deposits of ore, while the later andesite, known as "cap rock," is usually barren. Owing to causes which it is not necessary to here discuss, the veins are larger and more regular where traversing the earlier andesite, and often contract in width, or pinch out altogether on entering the rhyolite. In some instances, however, the veins pass from the lode porphyry into the rhyolite without material change in the breadth or richness of the ore.

The favorable nature of the earlier andesite as a wall rock is shown by the production; more than 90 per cent. of the ore extracted from the mines of Tonopah has been stoped from veins in that formation. In this the ore deposits conform to the general law of a selective deposition, namely, that "some geological formations appear to be everywhere barren of ore; others occasionally carry small deposits, workable where the conditions are exceptionally favorable; but in each mining region certain strata are ore bearing in a degree exceeding all other formations combined."[1]

The earlier andesite appears at the surface in a limited area, in ground owned by the Midway and by the Tonopah Mining Company, where it extends to a depth of 500 to 600 ft.; elsewhere it is capped by the dark-colored later andesite, or by flows of rhyolite. Beneath these capping formations, the earlier andesite has a much greater areal extension and stretches east and west in a broad belt, extending from the Belmont mine, at the extreme east of the district, to the Tonopah Extension and Golden Anchor mines on the west, a distance, as now explored, of nearly a mile. In the Tonopah and Midway workings, the belt is developed over a breadth of 1000 feet.

The Rhyolite

In prospecting the Tonopah mines, the problem is largely the exploration of the lode porphyry, or earlier andesite. All the ore deposits known in the district are subsequent in formation to the intrusion of the youngest rock in the series, the rhyolite. In following the veins to the deep, certain places are found where conditions have been such that the ore departs from the earlier andesite and cuts through the underlying rhyolite; or, in other words, in particular places, the highly heated waters and vapors that deposited the ore have broken through the sheet of rhyolite in their upflow from the depths, and have penetrated and laid down the ore in the earlier andesite resting upon it. In their ascent toward the surface, the veins usually terminate on reaching the cap rock; from this cause, many of the productive veins are blind and do not appear at the surface. Only in the area mentioned, on the Tonopah and Midway properties, where the earlier andesite flow covers the surface, do the veins outcrop in pay ore. Other orebodies spring from the contact of the rhyolite with the earlier andesite (which forms the footwall or south boundary of the lode porphyry belt), and extend upward in the andesite. In the West End and MacNamara mines, sheet deposits of high-grade ore occur on this contact. Some of the larger veins when followed on the dip go down in a series of flats and pitches (like a flight of giant steps), in which the horizontal travel of the vein to the north is greater than the vertical descent on the normal dip. This is the result of faulting, and tends to carry the ore-bearing fissures, in their descent to the deep, toward the north side of the earlier andesite belt.

There remains to describe a peculiar, early formed, fault fissure filled with volcanic mud and which cuts through all the igneous flows and outcrops at the surface, from the Belmont mine west to beyond the Midway. It is known as the Mizpah dike (or fault), and while in itself not ore-bearing, has influenced the deposition of the orebodies along its course. In the deeper levels of the mines there are evidences that the ascending waters, which formed the ore, in some instances came up through fissures and channels alongside the dike.

Closely Spaced Fissure Veins

The ore formation may be described as a broad belt of fissure veins, often closely spaced, traversing the district in a general east and west course. The extent of this mineral belt is undetermined; continuous stopes and connected levels reach from the Belmont mine, westerly through the Tonopah, Jim Butler, Montana, Midway, MacNamara, West End and Tonopah Extension mines. The Belmont is following the ore easterly beneath Mount Oddie; the Tonopah Extension is exploring the belt to the west toward the McKane property, and in depth to the north, in the direction of the Golden Anchor. With present development, ore deposits are opened along the course of the belt for nearly a mile, and are distributed over a breadth, north and south, of 3000 ft. The veins vary widely in width and often subdivide into branch veins, which not infrequently equal in size the original fis-

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*Mining geologist, Box 696, Tonopah, Nev.

[1] "The Chemistry of Ore Deposition," by Walter P. Jenney. *Trans.* A. I. M. E., Vol. 33, p. 473.

sure. The great output of the camp is drawn from stopes averaging 4 to 5 ft. in width; where the ore is high grade, even the smaller veins are worked at a profit. In the Belmont, Tonopah and Tonopah Extension mines, some of the fissures are of great size, with orebodies 15 to 35 ft. in breadth, measured at right angles to the walls.

The ores are largely quartz, carrying silver glance (argentite), ruby silver (pyrargyrite), and the so-called "brittle silver" (polybasite, etc.), together with chalcopyrite and other sulphides bearing gold and silver. The ratio of silver to gold in the ores is quite uniform throughout the district, being 90 to 100 oz. of silver to one ounce of gold; in the bullion produced, about one-third the value is gold. The grade of the ore as sent to the mills ranges in assay value from $12 to $50 per ton.

The Tonopah ores resemble in mineral character and in the ratio of gold to silver the ores of the Comstock. It is also noteworthy that in certain mines, particularly the West End, the ore deposits occur largely in the country rock, exterior to the fissures through which they were formed—in places reaching out 50 ft. or more beyond the fissure walls, a type of deposit characteristic of the Comstock lode.

What is claimed to be the first rolling mill in America was the Rokeby mill, four miles south of Coatesville in Chester county, Pennsylvania. It was built in 1799, by Isaac Pennock.

The Salt Lake Stock and Mining Exchange

The association known as the Salt Lake Stock and Mining Exchange recently took possession of its new building which has been erected at a cost of approximately $80,000. The site for the building was donated by Samuel Newhouse. The new exchange is situated on Exchange place close to the new Commercial Club, and the Boston and the Newhouse buildings, and within a half block of the post office.

There were no formalities at the opening call other than an address by James A. Pollock, president of the association.

The stock exchange has been renting quarters on Second South for about 12 years, and in that time has built up an association that stands high among the mining exchanges of the country. The trading on this exchange during the ten months, January to October, 1909, inclusive, amounted to 30,453,068 shares of a total value of $16,297,610. The totals of 24,180,043 shares worth $14,610,059 represent the same period of the previous year.

New Quarters of the Salt Lake Stock and Mining Exchange

Pittsburg Coal Company

The dividend outlook for the Pittsburg Coal Company appears still to be uncertain. The company next April will owe 35 per cent. to preferred stockholders, having paid nothing since the 1¾ per cent. in April, 1905. Recent activity in the company's stocks on the New York Stock Exchange is thought to have reflected buying for control, but it is expected that the present management wi be continued. The company will soon b rid of floating debt, and a small dividen may be paid in April.

Copper in the Philippines*

By Warren D. Smith†

During 1908-9 there was practically n production of copper, in spite of the important deposits existing in the islands The Mancayan copper mines in Lepant have been visited by a representativ from a large company in the Unite States, but unfortunately no satisfactor arrangements could be made as regard price. It is reported that recent development work has shown the existence o ore in the lowest level of this mine. The Lepanto Mining Company had been granted a franchise to construct a railroad from the mines to the coast, but this has been allowed to lapse. Assessment, prospecting, and some development work are being carried on on other claims in the vicinity. A good road with fairly low grades is now being built from the coast at Tagudin, to Cervantes, and Baguio is being connected with Cervantes by another road which will pass through Suyoc and Mancayan. The construction of these roads will be of great advantage, as the lack of transportation facilities has greatly hindered the development of this district, which will now have two outlets to the coast.

In Masbate prospecting has been carried on in the newly discovered copper district northeast of the town of Milagros. The felsitic rock carrying native copper has been found to extend over a considerable area and 500 kg. of picked specimens of this rock which were shipped to a smelter at Tacoma showed, besides copper, gratifying returns in gold and silver. This deposit of native copper was known to the Spaniards and prospecting has been carried on intermittently since the beginning of the last century.

More promising, however, is the new field discovered by Mr. Brobst about 6 km. to the southeast of the native copper deposit. Here there is a series of several small veins, some of copper sulphides carrying values in gold and silver and others of silver-bearing galena. These veins have not as yet been opened up to any extent, but prospecting and development are being carried on vigorously.

Copper ores are also known to exist in the provinces of Ilocos Norte, Pangasinan, Ambos Camarines and Batangas on the island of Luzon, on the island of Marinduque and in the subprovince of Bukidnon and the province of Misamis on Mindanao.

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*From "Mineral Resources of the Philippines," Bureau of Science, Manila.

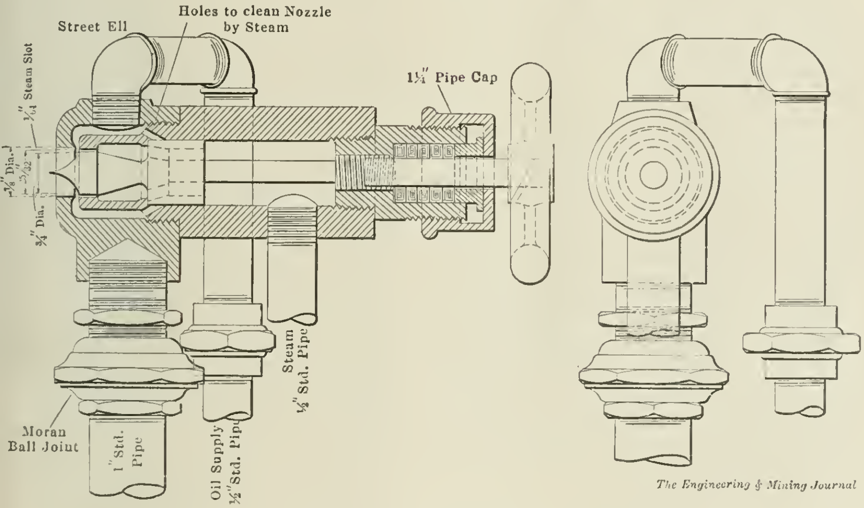
†Chief of Division of Geology and Mines, Manila.

Oil Burners for Reverberatory Furnaces

By Charles F. Shelby*

Among the many points that enter into ne operation of an oil-fired reverbera-ory furnace, one that should be given onsiderable attention is the design of ne burner. It is true that almost any nakeshift of a mechanical device for the urpose of atomizing the oil and in-ecting it into the furnace will perform ne work in some sort of a manner. But seconomy and efficiency are all-important oints for successful operation, the de-ign of the burner should receive the ame consideration as any other feature nat is brought into action.

At the works of the Cananea Consoli-ated Copper Company there has been : operation since Aug. 1, 1908, an oil-red reverberatory furnace the inside neasurements of which are 19 ft. wide y 100 ft. long. When this furnace was tarted up there was no one in the com-any's organization who had had any spe-ial experience in this line before, and the nowledge of our staff as to the effi-iency of burners was confined to those nat had been proved under boilers. Ac-ordingly, operations were commenced 'ith burners of the Hammel type. These re very common, especially in the South-vest, and are used with great success nder boilers generally and in the fire-ox of locomotives. The same may be aid of the Kittle burner, which was lso given a trial on this furnace. Both hese burners gave what might be con-idered fairly good satisfaction, and were conomical in the consumption of steam; owever, as more proficiency was gained n handling this furnace it was noticed hat the heat was much more intense at he firing end than near the flue leading from the furnace. This might indicate that the furnace was too long, but the experience at other places indicated coal-fired furnaces even longer than the Cananea furnaces were operated satisfactorily, and with an abundance of heat at the farthermost end of the furnace. If this could be done with coal, there was no reason why it should not be accomplished with oil.



The Engineering & Mining Journal

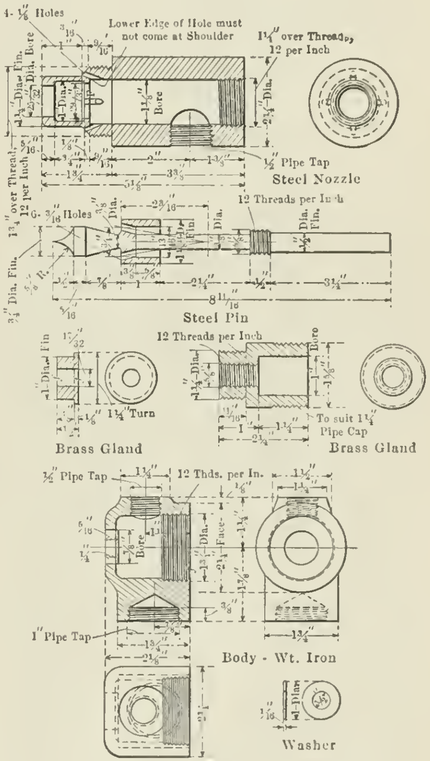
Shelby Oil Burner for Reverberatory Furnace

The design of the Hammel and Kittle burners, and in fact nearly all good burners that are used for atomizing oil under boilers, is such as to get immediately the finest atomization of the oil possible, in order to get quick combustion and to spread the flame. With the long Cananea furnace this was not what was wanted; on the contrary, what was needed was an atomizer that would impart velocity to the stream of atomized oil and tend to prevent immediate expansion.

The illustrations herewith show the burner that was finally adopted as most efficient. The burner is mounted on a pedestal and with a universal joint in order that the direction of the flame may be controlled. The oil enters through the pipe marked "oil supply," and passes into the annular chamber shown and is discharged therefrom through an orifice 7/8 in. in diameter; this is done with a pressure pump at about 40 lb. pressure gage. The steam, at about 125 lb. pressure, comes in through another pipe which fits within the oil chamber, thereby partially heating the oil before it is discharged into the furnace. The steam passes out through an annular opening (the outside diameter of which is 25/32 in., the internal diameter being 3/4 in., thus giving an aperture 1/64 in. wide), and comes in contact with the film of oil, forcing it into the furnace with great velocity and thoroughly atomizing it at the same time.

There is a steel pin or piston that forms the inner portion of this steam circle, and which is movable by means of a handwheel and screw threads, so that the operator can at any time enlarge this steam opening to its full size of 25/32 in., the increased volume of steam freeing the steam compartment of any scale or sediment from the pipe, or from other places in which it may have collected and tended to stop up the permanent steam opening. While doing this he automatically admits a large volume of steam into the oil chamber also blowing this clean in the same operation.

The general design of the burner and details thereof are shown in the accompanying engravings. There is also shown a modified form of nozzle that gives practically the same results except that it has a tendency to throw the flame still farther into the furnace. The steam aperture in this case has been reduced to an opening 7/32 in. in diameter, in place of the annular opening previously described, both having approximately the same area. At Cananea the modified form of nozzle has given the better results, possibly in view of the fine machine work that is called for in connection with the other design, and which is difficult of execution. Unless the greatest care is exercised in its manufacture, the annular steam aperture will not be true, and the flame will then be exaggerated considerably on one side.



The Engineering & Mining Journal

Details of Shelby Burner

The dimensions of this burner were arrived at after a careful study of the quantity of steam that is required to properly atomize a given quantity of oil; and these burners, when handling from 50 to 60 bbl. of oil per 24 hours, will atomize it perfectly with 0.3 to 0.4 lb.

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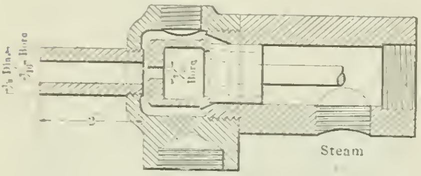
*Superintendent, reduction division, Cana-ea Consolidated Copper Company, Cananea, onora, Mex.

of steam per pound of oil. Or, figuring exactly 0.35 lb. of steam per pound of oil, and an evaporating efficiency of the oil in the boilers of 14 lb. of water per pound of oil, these burners then require about 2 1/2 per cent. of the oil for their operation.

There are all kinds of oil burners on the market; some are simple in construction, and, when properly handled, are also efficient. I have seen many boiler rooms fitted up with nothing more nor less than an elbow screwed into a 3/4-in. pipe, the other end of the elbow being stopped with a plug and a hack-saw slot in the elbow in line with the central axis of the 3/4-in. pipe This would be the oil supply. Inside of the oil pipe would be a 1/4-in. steam pipe, both being controlled by simple valves. In many instances the elbow is replaced by simply flattening the end of the pipe. Even these crude affairs in the hands of proper operators give efficient and economical results under boilers; at the same time, if the fireman is not attending to his business, they can be exceedingly wasteful of steam.



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MODIFIED NOZZLE

With the burner described in this article, the maximum quantity of steam that can pass through the same is beyond the control of the operator, and is only changeable with the pressure of the steam, which seldom varies to any considerable extent in well operated plants. At Cananea, the steam valves to these apertures are left wide open all the time, and the quantity of steam consumed is considered beyond the province of the furnaceman; the oil being held at a constant quantity, the results are then proportional. As far as I know the design is original and it is not patented. Aside from its use in reverberatory furnaces, I should think a burner embodying these same principles would be efficient in rotary cement kilns or other places where a long flame was desired.

The American Vanadium Company of New York owns the Minaragra mine in the Province of Cerro de Pasco, Peru, considered to the one of the richest vanadium deposits in the world. It is in this mine that the mineral rizo-patronite, a vanadium sulphide was discovered by the Peruvian engineer, Antenor Rizo Patron. The company has been shipping ores averaging 20 per cent. vanadic acid.

Mining Methods at the Cabin Branch Mine, Virginia

By John Tyssowski

The Cabin Branch mine, situated about a mile from Dumfries in Prince William county, Virginia, has been operated with few interruptions since 1889. It is essentially a sulphur (pyrites) mine, although a 50-ton smeltery was erected at Barrows siding, where the company's six miles of narrow-gage railroad connects with the main line of the Richmond, Fredericksburg & Potomac Railroad. The idea was to treat the copper ore sorted from the run-of-mine pyrites. Heap roasting was tried, but almost immediately abandoned, and from that time only cinder has been treated at infrequent intervals. At present the smeltery is not in operation.

The orebody at the Cabin Branch, the nature of which has not been definitely proved, dips at from 45 to 60 deg. and strikes in the northeast and southwest direction, varying from 6 to 14 ft. in thickness and having a horizontal extent, ranging up to 1000 ft. The single compartment shaft is sunk in the ore, and as a consequence, is rather irregular in grade, thus limiting the speed of hoisting. A depth of approximately 1500 ft. has been reached on the slope, and sinking at the rate of 20 ft. per month is still in progress. Near the bottom of the shaft several normal faults were encountered, so that the ore crosses the shaft, being above it at the date of this writing. The ground is fairly good, both walls being of a rather tough slate which stands with little timbering.

Stope Methods

Drifts are run from the shaft in either direction to the end of the orebody at intervals of 100 ft. or less. A raise is then driven from the end of each drift to the level above, if it has not caved; or, if the ground above is treacherous or heavy, from two to six feet of ore are left as a pillar to hold the drift floor above and keep material from coming down upon the men in the stope. This pillar is kept as narrow as the nature of the ground will permit, as it only forms a temporary protection for the men while stoping below it. The raise is carried about 20 ft. wide.

After opening up the raise a sort of modified system of retreating-longwall mining is carried on. Beginning at the end of the drift, the ore is mined back to within about 30 ft. of the shaft in successive strips across the face of the stope from the drift below to the pillar above. One four or five-foot hole loaded lightly with 40 per cent. dynamite usually suffices to break the ore from foot to hanging. The ore is all mined by contract, and the fact that drill runners, working two men to the drill, using light tripod machines and furnishing their own powder, caps and light, can earn good living wages breaking the ore at about 20c. per ton, proves that the mining method is well adapted to the conditions met. By this method of mining probably nine-tenths of the ore is recovered.

The ore runs and is mucked down the stopes and loaded into 1-ton end-dump cars from the floor of the drift. Owing to the steep dip of the footwall in most places in the mine, the broken lump ore runs freely to the bottom of the stope. The ore makes a comparatively small percentage of fines, which have to be mucked down the stopes. By thus taking advantage of the slope of the orebody a minimum amount of labor is necessary to deliver ore to the haulage levels.

Timbering

No timbers are used in the drifts but stulls or props of Virginia pine are used in the stopes, the usual space between timbers being 6 to 10 ft. No attempt is made to pull these timbers, but the ground is allowed to cave behind the working face as it will. The hanging-wall, however, sometimes holds for years. In the steeper stopes some difficulty is experienced from the lump ore knocking out props as it bounds down the foot-wall.

The air in the Cabin Branch mine is good and the ventilation almost takes care of itself. For about three-quarters of the way down the incline a ladder and pump way is maintained in the shaft but in the lower levels, this is run through small raises driven in the ore at about 20 ft. from the shaft. It is claimed that by carrying these connections between levels in this manner better air circulation is promoted.

Natural Gas in Hungary

The first important discovery of natural gas in Europe is reported from Kis-Sarmas, in the district of Klausenburg, in Hungary. Its presence first became known two years ago when shepherd boys used to light the vapors rising from the marshes.

Upon a geologist's report the ministry of finance directed borings to be made, when large quantities of gas were discovered at a depth of 60 ft. The borings were continued to a depth of 600 ft., when the gas was found in such volume that big stones were thrown into the air by it. At the present time the gas is flowing out of a pipe with a noise that can be heard six miles away. The flow is estimated at 6,000,000 cu.ft. per 24 hours.

Analysis shows that it is a peculiarly clear methane gas, containing scarcely 1/2 per cent. of nitrogen. Upon the advice of experts the Hungarian ministry of finance has bought the gas-mining rights for $21,000. It is proposed to utilize the gas supply in running a large central electrical plant to be built on the ground.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. P. Hutchins recently returned to New York from Siberia, and has now gone to the West.

Thomas L. Lewis has been reëlected president of the United Mine Workers of America by a large majority.

Desaix B. Myers, of Los Angeles, Cal., will be at Culiacan, Sinaloa, Mexico, from Jan. 1 until Feb. 15, and will then return to Los Angeles.

J. W. Millar, of New York, is constructng a mill and cyanide plant for the Maria Gold Mining Company at Chinacates, Durango, Mexico.

T. C. DeSolar has succeeded R. Sheldon Smillie as chief engineer for the Quincy Mining Company at Houghton, Mich. Mr. Smillie has gone to Colorado.

Robert B. Brinsmade has been appointed professor of mining engineering n West Virginia University, at Morganown, and will begin work there in January.

Hartwell Jalonick has returned to El Paso, Texas, from a trip to Sonora, Mexco, where he installed electric light and elephone systems for the Minas Pedrazina Gold and Silver Company.

F. F. Sharpless has returned to New York after making an examination of the Santa Gertrudis mine, at Pachuca, Mexico. Early in January he expects to start or the west coast of Africa, to be there bout six months.

Thomas W. Woodbridge, for the past wo years chief chemist and assayer for he Western Ore Purchasing Company, as resigned in order to accept a similar osition with the Arizona Consolidated Copper Company, at Humboldt, Arizona.

Obituary

Patrick Harley, one of the pioneers of he Comstock, died Dec. 15, at Virginia ity, Nev., where he had lived since 1860. e was connected at different times with nearly all the leading Comstock comanies.

Thomas J. Morrell, who a number of years ago was in charge of the chemical boratory of the Cambria Steel Comany, at Johnstown, Penn., died in Bosn, Dec. 16, aged 68. He was a nephew the late Daniel J. Morrell, one of the uilders of the Cambria Iron Company, nd was an authority on the metallurgy iron and steel.

James W. Friend died at Pittsburg, Penn., Dec. 26, aged 64 years. He was orn and educated in Pittsburg, being a andson of James Wood, who was long prominent iron maker. When a young man Mr. Friend entered business as an iron broker and was successful. In 1886, in connection with F. M. Hoffstot, he bought the Southside plant of the old firm of Graff, Bennett & Co.; to this they added in 1900 the Schoen plant at McKees Rocks. They then organized the Pressed Steel Car Company, of which Mr. Friend remained vice-president until his death. He had also considerable investments in banks, and was prominent in several clubs.

William Clark Magee died at Pittsburg, Penn., Dec. 26, aged 54 years. He was born at Enon Valley, Penn., but early removed to Ohio. As a boy he began work as a telegraph operator on the Cleveland & Pittsburg railroad, and worked 10 years for that road and the Baltimore & Ohio. In 1880 he entered the coke business, at first with the Schoonmaker Coke Company and later with the H. C. Frick Company; finally becoming vice-president of the latter company. He retired from the Frick company in 1903, and later organized the Consolidated Connellsville Coke Company and the Pickands-Magee Company, being president of both companies, which are largely owned by Cleveland iron interests. Mr. Magee never married; he took much interest in the Pittsburg Art Society, and other local associations.

John Valentine Bohn died of typhoid fever at Copperhill, Tenn., Dec. 22. He had been general superintendent of mines for the Tennessee Copper Company since June 15. Mr. Bohn was born in Dayton, O., April, 1868. He spent two years at Washington University, St. Louis, one or two years at Cornell, and graduated as a mining engineer at the Colorado School of Mines. His father, Maj. A. V. Bohn, has been identified with Leadville from its first days, and John spent some time there. He was also with the Braden Copper Company in Chile, at Trail, B. C., in Butte, Mont., and in California. He was with the American Smelting and Refining Company under Pope Yeatman for a time. Mr. Bohn leaves a wife but no children. He married Miss Belle Howell, daughter of Admiral J. A. Howell, U. S. N. He was a man of considerable force of character and was beloved by all those who worked for him and came in contact with him. He leaves a splendid record of hard work and successful management of whatever was entrusted to him.

John Wellington Nesmith, president of the Colorado Iron Works Company, died Dec. 17, aged 76. He had been in splendid health and attending to his usual business occupations until a few days before, and his death came as a shock to his relatives and friends. Mr. Nesmith had been identified with the progress of the West from the early days, coming to Colorado in 1860, engaging in mining and milling in Gilpin county. He subsequently became interested in Langford & Co.'s foundry, the nucleus of the Colorado Iron Works, of which he became manager in 1879 and president in 1886. In the advance in ore-treatment methods he took an active interest, and specialized in the blast-furnace smelting of lead and copper ores from the time of the first application of the process, achieving a wide reputation for the Colorado Iron Works in this line. Mr. Nesmith was a pastmaster mason and past high priest of the Royal Arch masons, vice-president for Colorado of the National Association of Manufacturers, a member of the American Institute of Mining Engineers, the Colorado Scientific Society and of various other organizations.

William Dunham Kelly, president of the Clearfield Bituminous Coal Corporation, died Dec. 9, at Atlantic City. He was a native of Geneva, N. Y., and his business life was entirely devoted to the work of the exploitation and development of the bituminous coalfields of Pennsylvania, in which he was largely interested. His first business experience was gained in the office of Jervis Langdon. While still a young man he became secretary of the McIntyre Coal Company, which for many years prosecuted mining operations along the line of the Northern Central in Lycoming county, Penn. The exhaustion of that field led him to turn his attention to the territory tributary to the Beech Creek, Clearfield & Southwestern, then in process of development, and he cast his lot with the notable group of men back of that project, of whom S. Richard Peale, of Lock Haven, is sole survivor. In the course of the several reorganizations that never fail to go hand in hand in such undertakings, the Beech Creek railroad emerged as the successor of the original railroad corporation and the Clearfield Bituminous Coal Corporation as that of the original coal company that was formed to acquire lands along the railroad right of way. Upon the reorganization of the coal company, Mr. Kelly became its president and the chief factor in its long and successful career. In addition to his coal interests he was a director in many railroad and banking corporations.

Societies and Technical Schools

Iowa Coal Operators' Association—At the annual meeting at Des Moines a new constitution was adopted which makes the president commissioner and working head of the association. The officers elected are: President and commissioner, John P. Reese; vice-president, David Dinning; secretary and treasurer, E. M. Gray. The executive committee is as follows: First district, L. L. Lodwick, Mystic; Second district, H. L. Waterman, Ottumwa; Third district, H. M. Schuler, Des Moines; Fourth district, H. H. Canfield, Boone.

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MINING CENTERS OF THE WORLD

San Francisco

Dec. 22—One of the Sacramento newspapers recently sent a communication to the chief of army engineers at Washington, which was subsequently referred to the United States Engineers' office in San Francisco for a reply, in which the question was asked as to the jurisdiction of the California Débris commission over the dredge-mining industry and its power to prevent further obstruction to the river channels. Col. John Biddle, of the corps of engineers, and president of the California Débris commission, has answered this letter quite fully. He calls attention to the fact that the Caminetti act, which created the commission, requires it to mature and adopt such plans as will improve the navigability of the Sacramento and San Joaquin river systems, deepen their channels and protect their banks to prevent encroachment and damage from débris resulting from mining operations, with a view of restoring as far as practicable the conditions existing in 1860. Colonel Dibble also quotes the river and harbor bill of June 3, 1896, which provides that a board of three officers of the corps of engineers be created to examine into possible plans to improve the rivers named and to maintain navigation thereon. The members of the California Débris commission are members of this same board, thus acting in a double capacity. The act of March 3, 1899, Colonel Biddle says, also prohibits the creation of constructions in rivers or discharging into them any material which shall be deposited on the banks of rivers so as to probably interfere with navigation. Therefore, it is the contention of Colonel Biddle that even if the California Débris commission itself, in its official capacity, does not undertake to impose regulations on dredge mining, its members have authority to insist upon the observance, by those engaged in gold-dredging operations, of the laws of the United States for the protection and preservation of the navigable waters, whether such operations are carried on in or on the banks of a tributary of a navigable stream. The Government engineers composing the California Débris commission, either in their capacity as members of the commission, or as Government engineers, therefore contend that they have authority over dredge mining as well as any other form of mining which may cause impairment of the navigable waters of the United States in the State of California. Thus far these engineers have in no way interfered with the dredge men, or made any extended professional examination into their work as far as the mining operations themselves are concerned.

There is complaint throughout the mining sections of the State that mineral lands are being constantly taken up by people filing agricultural homesteads upon them. Some of these fraudulent homesteads even cover claims which are taking out and sacking ore to be shipped to a mill. The whole trouble about this is that the mining people who know of such transactions do not take the trouble to appear before the land office and offer testimony as to the mineral character of the land. The agricultural claimant brings friends to testify that the land is not mineral who would not know mineral if they saw it, so they freely give the testimony desired. But unless some interested party comes and states his knowledge of the mineral character of the land, it ultimately passes to the agricultural locator, and in nine cases out of ten no one is directly interested enough to go to the trouble and expense of coming to the land office with his testimony. If, of course, some man may have a claim on the land he will go, but if no one owns any mining claim on the land located, even though hundreds know it is really agricultural, there is no contest and the lands drift out of the mineral domain. All through the mining counties are hundreds of "ranches" a thousand times more valuable for mining than for agriculture, and they were obtained because nobody protested against agricultural entry. The evil is one of long standing The California Miners Association tried to prevent illegal locations, but it was found that each one must stand alone, and no general law covered the situation aside from those existing. Provision is made to prevent mineral land being taken up as agricultural, but certain testimony is required and this is seldom forthcoming, owing to lack of general interest among the mining people.

The creditors of the Trinity-Bonanza King Mining Company, of Trinity Center, Trinity county, have filed a petition asking that it be adjudged bankrupt for the reason that its directors at a regular meeting on Nov. 30 admitted in writing that the company was unable to pay its debts and its willingness to be adjudged bankrupt. The Safe Deposit and Trust Company is owed some $10,000, and the Trinity Power and Water Company has a balance due of $230,000, among other creditors. This is the mine which the Treadwell Brothers, formerly of Alaska and later of the Tesla coal mines in California, financed. They put in a magnificent equipment and, among other things a 40-stamp mill. but there was never ore enough to keep things going so the mine shut down. When the California Safe Deposit and Trust Company failed it involved the Treadwell Brothers, and this involved the mining company.

Further proceedings in the suit of the Kennedy Extension Mining Company against the Argonaut Mining Company of Jackson, Amador county, are in the nature of subpœnas and motion for an order for a survey of the Argonaut's underground works. The subpœna agains E. V. Zumbiel, the secretary of the Argonaut, commands him to bring into cour maps, diagrams, sections and other drawings relating to the mining operations underground having any bearing on operations conducted through the Argonau shaft, and particularly underneath the surface boundaries on the Muldoon and Jackson quartz claims.

An order has been obtained from the court giving the administrator of the estate of the late John Philips the power to sign the bond and lease given on the Serita mine in Masonic district, Mono county. The mine lies adjacent to the Pittsburg-Liberty group and is considered quite valuable. It will now be developed The persons taking the bond are Messrs Shearer and Perrini, of Masonic.

Denver

Dec. 26—The methods of handling ores in the Cripple Creek district are somewhat peculiar. They are based entirely along practical lines. In the first place, it should be noted that the tellurides being friable, the valuable minerals go almost entirely into the fines, so that the first process is screening, the fines invariably running pay.

The coarse rock is next hand sorted and in part cobbed, the remaining coarse rock being, at the small mines, thrown over the dump. In recent years, however a washer of the trommel variety is included in the equipment of the larger mines, the object of which is to recover a further paying product, by washing the fines off the coarse rock. This is a standard practice today.

Various attempts have been made from

ime to time to treat the old unwashed lumps by trommel washers, with more or ess success. At least one attempt was nade at the Last Dollar mine to crush he rocks so as to increase the quantity f fines, but it was not successful. This s the only case I know of where crushing vas tried.

The tonnage that is now going to the alley mills and smelteries is in the eighborhood of 40,000 tons per month.)f this tonnage the smeltery gets about 000 to 5000 tons per week; the Golden ycle cyanide plant about 21,000; the ortland about 8000; the U. S. Reduction nd Refining plants 7000. From which may be observed that the valley mills re not running up to capacity, and the ractice of at least one of the plants is to ake up the deficiency from the dumps, e paying qualities of which are largely njectural.

Butte

Dec. 23—There seems to be doubt in utte as to the feasibility of the creation a department of mining by the Federal overnment. While it is generally con- ded that the idea is a good one, yet is thought that inexperienced college en will be put in charge and allowed to ctate to the practical mining men who w have charge of most of the mining operties. Of course, if the Government uld pay enough to secure the services able men in that line, then the de- rtment would no doubt be a beneficial stitution, but it is an accepted fact that Government does not pay enough to ract the most able man. The frequent ishes between Chief Forester Pinchot d those who are using the national re- urces has in a measure taught the West look with suspicion upon any active at- npt by the Government to regulate the lustries of the West.

Deputy Mining Inspector W. B. Orem, ving the Butte district under his imme- te supervision, has submitted his an- al report to the governor. The report tes that ventilation fans have been in- lled in a number of the Butte mines h admirable results. In addition to t at the Rarus, the fan at the Coali- n's Cora, with a capacity of 180,000 ft. per min., has greatly improved tilation at the Diamond and East Gray ck mines, the mining cost of the latter ing been reduced 60c. a ton as a re- t. At the 1200-ft. level of the Penn- vania mine, a fan having a capacity of 000 cu.ft. per min. is giving good re- ts. Mention is also made of the cross- d invented by Superintendent Bryant the Original Mining Company for the vention of mine accidents due to the -style crosshead hanging up in the ft and then getting loose and falling the miners riding on the bucket. The ant crosshead is constructed on the s of a skeleton cage with a deck for the men, protected by a bonnet and having safety dogs.

It is rumored that the Butte & Superior Copper Company is negotiating for the control of the Butte-Milwaukee property. The control of the Butte-Milwaukee company is held by the Butte & New York Copper Company, which owns about 80 per cent. of the operating company's stock.

Scranton, Penn.

Dec. 27—The supply shaft of the Capouse colliery, owned by the Scranton Coal Company, in Keyser valley, near Scranton, was destroyed by fire on Dec. 23, and as a result over 500 men and boys are thrown out of work. The shaft was used not only for the lowering of supplies and workmen into the mine, but coal from the lower veins was also hoisted through it. One of the two mine fans was in the shaft, and this fan was destroyed, so that the ventilation of the mine is cut off by half, rendering operations in the mine for the present impracticable. There were a number of men at work in the mine at the time the fire was discovered. The first intimation that the miners had of the fire was the sudden attenuation of the circulation of air through the workings, by the stoppage of the destroyed fan. The other fan was, however, kept in full operation, and the men employed in the workings were able to escape. Four of the men climbed through the shaft for 150 ft. to another vein. According to the officials the miners behaved with coolness.

Unlike the breaker fires that have occurred recently in this locality, which, unfortunately, have been numerous lately, the origin of the fire at the Capouse colliery shaft admits of partial explanation. Engineer Albert Thomas, who was in charge of the machinery at the time the fire broke out declares that in his opinion the fire was started from a hot box of the fan axle. Before he could do anything, however, after he observed indications of a fire, the tower, which was entirely of wood, was a mass of flames. The engineer then turned his attention to the rescue of the men in the mine. The fireboss, John Morris, at the imminent risk of his life, was lowered through the burning shaft to the China vein 560 ft. below, where five men were employed at rock work. Then after systematic effort all the men in the mine were taken out. The supply shaft was built about 25 years ago. It was overhauled and modernized about two months ago at a cost of $30,000. The shaft will again be repaired, probably this time reinforced by concrete.

The Lackawanna company has intimated that it will not employ in its mines or around its breakers any boy under the age of 16, although the law permits it. A boy may work in the breaker at the age of 14 and become an inside worker at 16. General Superintendent Loomis, of the coal department of the Lackawanna, believes that a boy should be at least 16 before he is permitted to work in or around the mines in any capacity. In his opinion, it is an injustice to the boy, is uneconomical for the company, and is a disadvantage to society. Other coal companies will probably follow the example of the Lackawanna.

Toronto

Dec. 24—Gold bricks of the value of $50,000 have been received from the Yukon at the royal mint, Ottawa, where they will be coined into the first Canadian gold currency as yet issued. Last summer a few English sovereigns were coined at the mint from Larder Lake gold, but no Canadian pieces have hitherto been issued. Hon. W. S. Fielding, finance minister, recently announced that arrangements were being made for the issue of Canadian $5 and $10 gold coins. At present practically all the Yukon gold is marketed at Seattle, or other American cities, but it is now proposed to establish a government purchasing office in Dawson, where miners can get full value for their gold, saving the 2 per cent. charged by the banks for handling it, and enabling the mint to make a small profit on its coinage as is done in other countries.

As a result of the continued rush to the Porcupine Lake goldfields three new townsites are to be laid out. These are Frederick House, at the entrance of the Frederick House river into Night Hawk lake; Redstone at the entrance of the Redstone into Night Hawk lake; and Porcupine in Whitney township on Porcupine lake. Milepost No. 222 on the Temiskaming & Northern Ontario Railway, now known as Kelso Mines, is coming into favor as the most convenient point of departure for the Porcupine Lake region, as the distance to be traveled by team is approximately only 30 miles, being 10 miles shorter than the road from Matheson. Many outfits continue to leave for the goldfields from Cobalt, Haileybury and other northern mining towns, and there is great activity in road construction, building, forwarding of supplies and other preparations for an active winter season.

Mexico

Dec. 24—Pozos is an old camp in the eastern part of the state of Guanajuato, Mexico. The entire camp is in the hands of Mexican capitalists, having never yet attracted foreign capital. The most famous mine in the district is the Santa Brígida, which was first opened by the Jesuits and worked by them until their expulsion from the country. The ore is complex, containing copper, gold, silver and some blende. Santa Brígida has produced in the past several famous *bonanzas* and an effort is now being made to adapt some process to the economical extraction of the metal contained in its ore. The property is equipped with steam hoists, tramway and other mine-working machinery, and furnaces for smelting the high-grade ore from the mine. The Cinco Señores property, comprising several different mines in the district, has just finished installing a cyanide plant. The company has a large tonnage of low-grade ore which it expects to mill profitably by cyaniding.

Compañia Minera Angustias, Dolores y Anexas, owns several good mines in the Pozos district. These mines have just been unwatered, and the Dolores vein shows especially good values. Milling ore is being accumulated, preparatory to starting milling operations. The milling ore averages 500 grams silver and 20 grams gold per ton. The mill belonging to this company is located in San Luis de la Paz, five miles from Pozos, to which plant the ore is transported by a narrow-gage road. The mill is now being remodeled and rebuilt for cyanide treatment, under the direction and after designs of H. A. Megraw.

Formerly all the mills and haciendas pertaining to the Pozos mines were in San Luis de la Paz, as being more accessible and a better situation for the plants. The Cinco Señores company is the first to remove its mill to Pozos. In San Luis de la Paz are now only two operating mills, that of Santa Elena, belonging to the Compañia Minera Angustias, Dolores y Anexas, and the Ojo de Agua mill, belonging to Bermejillo y Cia., of Mexico City. The latter is strictly a custom mill and operates on Pozos ore. This mill is under the direction of W. C. Buchanan.

The Guanajuato Electric Company will build a transmission line to Aguascalientes, Mexico, to supply the American Smelting and Refining Company and the mines at Asientos and Tepezala with power. Bonds to the extent of $800,000 have been placed in England and the funds will be devoted to bringing up the capacity of the company to 23,000 h.p. A third power plant is to be built on the Angulo river in Michoacan.

The state government of Durango, Mexico, has made a contract with Harris Walthal, representing foreign capital, for the construction of a railroad from the city of Durango to the mining town of San Dimas. The line will open the San Dimas, Guarisamey and other important Durango mining districts.

London

Dec. 22—A proposal has recently been made by a representative of one of the leading financial houses of the Rand that the system of reporting monthly the working results of the mines should be discontinued. It was urged that the present system did not make for economy. In order to maintain a regular production, it was necessary to move the labor force underground about more than would otherwise be necessary. If the statistics were prepared to cover longer periods than one month, there would be a saving of time and labor. Arguments of this description are not very convincing and it is not surprising to find that the proposal has been generally condemned. By the publication of monthly returns, shareholders are kept in touch with what is going on much better than if the figures were given once a quarter or once a year. Statistical records have to be kept on every mine and whether they are totaled up and averaged over short periods or over long can make little difference as far as expense is concerned. Indeed, it is an advantage to have them prepared for short periods as it enables a closer watch to be kept by the manager over variations in costs or output. There is something to be said for curtailing the information that is cabled monthly to London. It is, for example, questionable whether there is any advantage in publishing the different sources of the gold; whether it comes from the plates or from the cyanide works does not interest the average shareholder, who only desires to know the working profit for the month.

The weak point about the returns of the South African mines, and that which curiously enough has not been noticed in the discussion in the press that the new proposal has drawn, is that the returns are not accurate, at least in a good many cases. This arises from the policy, which the Rand mining houses have adopted, of aiming at nonfluctuating outputs. They wish to prevent shareholders being unduly elated or depressed by fluctuating returns, and so, in order to keep up this pretense of regularity of output, they maintain what is called a reserve gold account, which is drawn on or added to according as the fluctuations of the monthly production require. There is no secret about it, because the position of the gold reserve is announced every month so that any shareholder who takes the trouble can see whether the month's work has been a good or a bad one. This system, although very praiseworthy in theory, breaks down in practice, in fact, whenever the true average production of the mine has been miscalculated. Then, when the annual report comes out, the shareholder finds that his monthly profits as advertised have been either under or overstated.

The maintenance of a fairly even grade is, of course, desirable; but no one has any justification for grumbling if fluctuations occasionally occur and the confidence of the public in the mine and its management would be quite as strong if not stronger, were the actual results published, instead of fictitious results; as they are now in many cases. Another change in the system of reporting results that might be made with advantage is a clearer definition of the word "profits." The profits published are the difference between the amounts charged to working costs at the mine and the value of the yield. The figures are far from being divisible profits. As a round figure, the dividends are only about 70 per cent. of the declared profits. It ought not to be difficult to estimate closely the amounts required for depreciation, head-office expenses and taxes, so as to show more accurately than at present the true profit made. This practice is carried out by several of the mining companies of Mexico and the United States that are controlled from London.

As regards the reporting of ore reserves it would be an advantage if the mining companies practised greater uniformity. In some cases the ore developed is calculated over the stoping width, while in others it is over the milling width. The milling width, it may be explained, is the estimated width of ore actually milled, that is to say, it is the stoping width less the amount sorted. Ore calculated over the milling width is, of course, the best way of reporting ore reserves, as it gives the actual tonnage that will be milled. A further step toward avoiding confusion as to the value and tonnage of ore developed would be the conversion of pennyweights into shillings. Instead of reporting the ore reserve, for example, as having a content of 8.1 dwt., it would be better to state the value as 0.34s., the pennyweight being equal to 4.2s. This would give the gross value. The net value, which also might be stated, would be the gross value multiplied by the percentage of extraction.

The ups and downs of mining are well exemplified in the case of the Ashanti Goldfields Corporation. It was only a year ago that the corporation was unable to raise the funds necessary to increase the milling plant owing to objections raised by the debenture holders. During the past year the development of the mine has been of a most satisfactory character and a large increase of the ore reserves has been obtained. Today the company would have no difficulty in raising a large amount of fresh capital if it required it. A year ago the corporation's shares were valued on the market at 12s.; today they are over £2. This change in the fortunes of the mine is due to a vigorous policy of mine development and to the employment of a trained engineer and geologist in prospecting work. Justice's Find, a large ore deposit of refractory ore of great value, escaped the notice of the untrained native and perhaps of the untrained white prospector, but received proper attention from the technically trained graduate.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY·
INSTALLATIONS·DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

New discoveries in the Squirrel River istrict are reported to be exceptionally ich. The location of the new camp is bout 100 miles from Candle in the Kotebue Sound region.

Brooklyn Development Company—The roperty of this company at Knik is in ood condition and has encountered rich re in the tunnel. K. A. McKean, Knik, manager.

It—This mine at Ketchikan, John C. arber, superintendent, is in ore in the rift from the 175-ft. level.

Goodroe—A shipment of 2700 tons has een made by this mine at Karla bay to acoma.

Jumbo—The mine at Sulzer promises be a large shipper. A lot of 2500 tons awaiting movement.

Alabama

Tennessee Coal, Iron and Railroad ompany—Henry Ellen, the last idle oal mine of the company, has been arted up. Work has been begun on e new No. 13 Pratt mine, which will be shaft opening 2¾ miles northwest of ylam, on the Pratt seam. Work is in rogress on the big pumping plant which to furnish water to Ensley; steam will furnished for the pumps by the boiler lant at the mine. At Blocton, in Bibb unty, 150 coke ovens have been arted, and 200 more are being put in rder to start. No. 1 furnace at Ensley, hich has been out of blast several onths, will be blown in as soon as a pply of coke is on hand. In the steel lant at Ensley two additional openearth furnaces are under construction. is understood that the American Bridge ompany will put up works at Ensley, king its steel from the Tennessee comany's plant.

Arizona

COCHISE COUNTY

Bunker Hill—The mine is being orked between the 200 and 565 levels d is making a shipment of a car a week El Paso. Development work is being rried on. W. J. Wallace is manager.

GILA COUNTY

Miami—By the middle of January the undation work for the new concenator and power house will have been mpleted, and the erection of the eel framework for both structures will under way. These buildings will be of inforced concrete. Practically the only woodwork figuring in the construction will be in the launders for the concentrator. Each of the six units of the concentrating plant will have an ore bin with a capacity of 1000 tons. From these bins the ore will be run through rolls and classifiers and thence to the concentrating tables. H. Kenyon Burch is the designer of the mill and has charge of the construction.

Superior & Globe—The station cutting at the 650-ft. level has been completed and crosscutting north and south will be started. The 60-h.p. hoist will be installed at the shaft.

Arizona-Michigan—The north and south crosscuts from the 500-ft. level of the Telfair shaft measure 315 ft. and 340 ft. respectively. The latter has passed from the diorite into conglomerate. The south crosscut is in diorite containing considerable pyrite in stringers. N. A. Nelson is in charge.

Inspiration—The company still has two Star drills on its property in the Miami district. More than 25 holes have been drilled on this property since last spring. Tunnel work will be started in Keystone gulch as soon as the 185-h.p. compressor arrives. A station is being cut at the 275-ft. level of the Scorpion shaft. Crosscutting will be started here to cut the orebody which the shaft went through sometime ago. The orebody dips to the southward. T. R. Drummond, in charge, has 95 men employed.

Silver Queen—This property, at Superior, is under negotiation to representatives of the Thompson-Gunn interests of New York and Salt Lake City. This is one of the first properties worked in Arizona.

Ray-Arizona—P. T. McGrath, manager of this property, in the Ray district, announces that extensive development work will be carried on. About $20,000 has been spent and $50,000 of the purchase price of $75,000 paid.

Old Dominion—The four Nordberg pumps on the 1200-ft. level are nearly installed. These pumps have a capacity for handling 8,000,000 gal. per day for 24 hours, as against a present flow of water of about 3,500,000 gal. The new pumps are expected materially to reduce pumping expenses and permit of development work being carried on in a much more rapid and economical manner. A contract to supply 1,000,000 gal. a day to the Miami mill has been made and the revenue from this will greatly reduce the pumping charge. It is rumored that the company is considering the closing of the smeltery at Globe and the transport of all ore to Douglas.

California

AMADOR COUNTY

Dane & Mitchell—This property near Jackson has been purchased by San Francisco men and Edwin A. O'Donnell of that city will be manager and will equip and reopen the mine.

BUTTE COUNTY

Cherokee Gold Drift—Deeds have been passed making this company the owner of the Cherokee mine, formerly known as the Spring Valley, at Cherokee. The purchase includes all the reservoirs, ditches, etc. The mine, at one time worked by hydraulic process, will now be drifted.

Skyhigh—Arrangements have been completed by which Mayo & Smith will have charge of these mines at Inskip and improvements will be made.

CALAVERAS COUNTY

Scossa—At this mine near Railroad Flat, recently bought by Senator Smith of Hutchinson, Kan., a 10-stamp mill is being erected. The mine is developed.

ELDORADO COUNTY

Orum—A strike of good ore has been made in this mine near Eldorado and a mill will be provided.

Mt. Pleasant—This mine, Grizzly Flat district, formerly a large producer and for a long period idle, has again come into the producing list under a new management. The company, after expending about $50,000 was forced to close down during the financial panic for a few months, has since resumed operations and finally started its 10-stamp mill on good ore.

INYO COUNTY

Four Metals—The smelter has not resumed operations on this property at Keeler but the tramway is receiving new buckets ready for starting up.

Lucky Boy—In ground of this company covered by the Balzar & Stevens lease, an ore shoot 4 ft. wide carrying mainly silver but with a small quantity of gold, has been found.

Burgess—At this new camp at an elevation of 9000 ft. on the summit of the White mountains, some litigation is expected in connection with the richest claim, the Ironsides. No leases have yet been let in the camp though many miners have applied for them.

SHASTA COUNTY

Uncle Sam—In this mine formerly owned by the Sierra Buttes company, but now the property of J. O. Jilson, the crosscut tunnel has broken into what appears to be the lost vein which the Sierra Buttes company failed to find before it gave up the mine.

Milkmaid Mining Company—This company has sold its mine at French Gulch to Eric Lindbloom of San Francisco, formerly of Alaska. The purchase price is $300,000. The four-stamp mill is to be materially enlarged.

Carnegie Mines Company—This company which owns the Clipper group near Kennett has bought a 20-stamp mill.

SIERRA COUNTY

Standard—From this mine near Downieville, they are shipping high grade "sulphurets."

Rio Antiqua—Superintendent F. W. Kuhfeld of this property at Forest, reports that the raise in the eastern end of the south-fork tunnel is in material which appears to be the bedrock of the much-sought gravel channel.

Oriflamme—The tunnel being run in this property at Alleghany has already cut two veins and is expected to reach the main Irelan vein in 150 feet.

Gray Eagle—At this mine, Gold Point, a strike has been made which is richer than that of a few weeks since. The machinery for the drills has been delivered.

Colorado

Colorado's output of precious and other metals for 1909 is estimated by the U. S. Geological survey to be worth approximately $33,872,631. Of this amount, $22,321,745 is gold, $4,721,786 silver, $1,576,835 copper, $2,674,964 lead, $2,177,418 zinc and $400,000 tungsten.

CLEAR CREEK AND GILPIN COUNTIES

Chase—Boston capital has taken hold of this property and will carry on developments, as the Gilpado Mining Company, Forbes Rickard, manager.

Columbia Tunnel and Mines Company—Gilpin county and Denver men have organized to operate the Moody property in Hamlin gulch. R. L. Hedden, Central City, is manager.

Denver Mining and Reduction Company—The company has a lease on the mill on North Clear creek and will install crushers and Wilfley and Horn concentrating tables, to handle creek dirt and custom ores.

CHAFFEE COUNTY

Vivandiere—This mine at Turret is shipping a car a week.

LAKE COUNTY—LEADVILLE

Cleveland—A 112-h.p. electric hoist is being installed for the company by the Leadville Power and Light Company and will be in operation early in January.

Penn Shaft No. 1—The lessees are shipping 25 tons per diem of good-grade iron-oxide ore.

Colonel Sellers—This old-time zinc producer, which has been idle for some years, is rapidly being put in shape for production again. It is stated that shipments will commence with 100 tons per diem, the ore going to Canon City.

Garbutt—This mine on Breece hill is shipping 75 tons daily with values increasing.

Robert E. Lee—This mine on Fryer hill is shipping iron ore and also sending a fair tonnage of silicious ore to the local smelteries.

LAS ANIMAS COUNTY

Commercial Coal and Coke Company—This new company, with headquarters in Denver, has arranged to open a coal mine and to build 200 coke ovens at Sopris. The company has secured coal lands extending into Huerfano county. F. H. Heath is manager.

SAN JUAN DISTRICT

The heavy snowfalls having closed Animas Forks and Red Mountain to railway traffic, the work on the mines in these districts is confined for the winter to development and creating ore reserves. Indeed, this may be said to be the case in the great majority of the mines of what is known as the San Juan district, excepting, of course, a few whose exceptionally rich ores or proximity to the Denver & Rio Grande railroad, permit their shipment through the winter at a profit. In the mines tributary to Silverton, it is stated that the San Antonio, Congress, Frank Hough, Bonanza, Columbus, Shamrock, Highland Mary, Shenandoah-Dives, North Star and Trilby, will do steady development work all winter. The same may be said of those Poughkeepsee, Gulch, Bear Creek and Sneffels mines which are tributary to Ouray, and by spring an enormous amount of ore will be ready for shipment.

Golden Fleece Consolidated—Lessees on this one-time bonanza mine of Lake City are reported to have made a strike of 18 in. of ore, 8½ tons of which has been shipped and runs 16 oz. gold to the ton. The character of the ore is not given, but is probably petzite, from which a rich output was obtained some years since.

TELLER COUNTY—CRIPPLE CREEK

Stratton's Independence—Results for October, just available, were as follows: Production, 2322 tons, averaging 21 dwt., 19 grains per ton; dump ore milled, 5800 tons; net working profit to the company at the mine from mine and milling departments, $13,000; expenditures on new mine development account, $1150.

El Paso Consolidated—The company has mailed checks for the Decemb dividend of 1c. per share, a total $24,000, making a total paid to date the shareholders of $1,163,700. Th total production for the last three month to Dec. 16 was about 5000 tons.

Findley—Another good find at 1000 f in depth is reported from the Shurtlo mine of this company on Bull hill. Th width of the vein is given at 6 ft. an the contents about $30 in gold per to

Ajax—Three feet of 3-oz. gold ore reported from this mine on Batt mountain, worked by lessees.

Vindicator—The Vindicator on Bu hill, which has been a steady produce for many years, is sending out abou 2000 tons per month.

Georgia

Pigeon Mountain Iron Company—Thi company has begun work on the development of a tract of 3500 acres of red-or land in Walker county. M. T. Singleton, Atlanta, Ga., is engineer and superintendent.

Idaho

BONNER COUNTY

Idaho Continental—The Idaho Continental Mining Company has been reorganized as the Idaho Continental Company. The mine between Priest lake an Kootenay contains high-grade silver The company plans to build a mill in the spring. The lower tunnel upon which work is now being done will tap the main ledge at 500 ft. depth.

COEUR D'ALENE DISTRICT

Lucky Friday—A shaft will be sunk at the end of the 700-ft. tunnel on the property near Mullan.

Blaine & Emmet—The company has been organized by Charles A. Smith, Amos Watkins, and Roy J. Houghtaling, of Murray, and will operate claims near Murray.

Trapper—The vein on the group of claims situated near Wardner shows a width of 50 ft. at the surface. A contract for an additional 80 ft. of work has been let.

Hercules—The Tiger mill leased by the company ran its first full 8-hour shift recently. Adjustments will be made before three shifts are put on.

Lucky Calumet—Work on the lower tunnel will be begun as soon as the power line from the upper to the lower workings is completed. The machinery, which includes two motors and a five-drill compressor, has already been moved from the upper to the lower workings. The lower tunnel will tap the vein in 1900 ft. and will give a depth of 1500 feet.

Bunker Hill & Sullivan—The company has appealed the case which the United States recently won against it in the Circuit court involving the question of whether the company had the right to cut mber from a homestead entry which was ineral in character.

Butte & Coeur d'Alene—The vein has een drifted on 60 ft. and carries 2½ t. of shipping ore and about the same mount of milling ore. The shaft is down 00 ft. and will be sunk another 300 feet.

Valentine—A contract has been let for 50-ft. extension of the drift now in 50 ft. An assessment of one-half mill share has also been levied on the stock.

Hypotheck—A recent report to stockolders states that since the ore in the est drift on the 800-ft. level did not nprove as the drift progressed, it was ecided to discontinue work at that point nd sink the shaft 200 ft. This sinking ould be completed by Jan. 15 when a rosscut will be run to tap the vein at that epth.

Indiana

Greene County

The Summit mine, in which there was ecently a fire, resumed work Dec. 23. he mine has been overhauled, and when starts it will be in a better and safer ondition than when it was shut down. ll the other mines in this county are nning full time. There is no shortage f cars.

Gibson County

The threatened strike at the Princeton oal mine has been averted by the signng of an agreement by the officials of e mine workers and of the mining comany, following a conference. The local oal companies have agreed to pay the iners extra for "sticky top" coal.

Sullivan County

For the first time in five years every al mine in this county is being oprated full time. More miners could be mployed but they are not obtainable. The assessor of the county has comleted figures showing that there are 6,872 acres of coal land in the county nd the average appraised price is $45 er acre.

Kentucky

Crittenden Coal and Coke Company—sale has been arranged by R. L. Coffy a New York syndicate. The sale inludes a large tract of coal land around turgis, in Union county.

Michigan

Iron

Florence—The company controlled by adenberg, Thalman & Co., of New York, s exploring in the western Menominee ange near the Delphic mine and on the all-Yakel property.

Armenia—The pumping capacity at is property controlled by Corrigan, cKinney & Co., will be enlarged to andle the unexpected water flow. The djoining McDonald mine of the Huron ompany is also being unwatered by the rmenia operation.

Iron Belt—This property on the Gogebic range of the Cleveland Cliffs company will be closed owing to exhaustion of the ore.

Minnesota

Iron

Work of drilling the Murray ground near Tower is underway in charge of James Cardle and Paul F. Chamberlain. Work on Pine island will also be done.

Mississippi—The work of opening this mine belonging to the Steel corporation at Keewatin is being pushed. A number of drills are at work.

Missouri

Joplin Zinc-lead District

The greatest lead strike ever made in the Seneca camp was made recently on the Gallemore land in several drill holes. A good strike was also made on the Hotel land adjoining this tract.

The B. W. Realty Company has purchased the 80-acre tract of Charles Schifferdecker in the West Joplin sheet-ground district for $80,000. On this tract are the Paragon, West Seventh Street and Kitty Mack mines.

James F. Gallagher, of Joplin, will erect a 400-ton mill on a 50-acre lease of the Taylor & Glover land in the West Joplin sheet-ground district. Fourteen drill holes and the shaft have demonstrated the ore.

S. S. Bissill, of St. Louis, has purchased a 10-acre lease and mill on the Robb land, south of Joplin, for $20,000.

Athletic Mining Company—J. C. Squires of Joplin and A. F. Dexter of Chicago have organized this company, capital $50,000, and have taken over the Seigfreid mine and mill north of Webb City in the sheet-ground belt. This lease is one of the few on a sliding scale of royalty. The lease is for 20 per cent. with jack at $50 to $60 per ton and 25 per cent. with jack $60 or above.

Morning Hour—This mine south of Joplin, which was one of the greatest soft-ground mines in the district and which worked out under the Frisco and electric railway's tracks and caved them, has resumed operations together with the Big 3 and the railways are building changes of line around the mines.

Rockefeller—The Empire Zinc Company has reopened the mine at Wentworth and is getting the mill in shape to run.

Lima—This 40-acre lease at Prosperity has been sold to Tharp, Potter & Tharp of Webb City for $25,000. A 200-ton mill will be erected.

Samson—William Grower, of Chicago, has purchased for $30,000 the fee of 40 acres of land from Luke & Ash. On this tract is the Samson mine and 400-ton mill.

Nowata Mining Company—This company, W. N. Squires, of Joplin, manager, has purchased a 50-acre mining lease on the Gray land, southeast of Joplin, for $16,000. Eleven drill holes have been put down and two runs of ore developed which are unusually rich.

Montana

Butte District

Davis-Daly—Work is being done on the 1400-, 1500- and 1800-ft. levels, but shipments have been suspended while the Basin concentrator is being fitted up. The management states that shortly, shipments will be begun at the rate of 250 tons daily.

Butte-Superior—The gravity tramway from the shaft to the Great Northern spur, 400 yd., is nearly completed. Work on the spur will be begun at once. Shipments to the Basin concentrator will probably begin in January.

Deer Lodge County

Silver King—Joseph Freudenstein has leased the group of claims, situated at the head of Lost creek.

Jefferson County

Boston & Alta—The recent sale of the Alta mine to this company by the Helena & Livingston company, former owners, has been ratified by the stockholders of the latter company. The sale was made for $200,000, $15,000 being in cash and a note given for the balance, payable Jan. 15, 1911, and secured by a mortgage.

Missoula County

Big Elk—A 50-h.p. boiler, a three-drill compressor, cars and rails have recently arrived. A 30-ft. shaft has been sunk and a lead of 2000 ft. has been opened up. John H. Miles is in charge.

Powell County

Fairview—On the 260-ft. level of the property near Ophir, a 6-ft. vein of rich gold and silver ore has been cut.

Nevada

Elko County

Interest is being turned to the new camp of Contact, about 100 miles north of Ely. Development is underway on several copper properties and much is claimed for the district as a future copper camp.

Esmeralda County

Combination Fraction—The management has decided to sink the shaft an additional 200 ft., giving it a total depth, when finished, of 800 ft. The mine is out of ore, but it is hoped with the new development outlined that the property will again enter the list of shippers.

Goldfield Annex—The shaft of this company has reached 700 ft. and it is the intention of the management to push sinking to 1000-ft. The company holds a lease upon the Polverde claim of the Jumbo Extension company.

Yellow Tiger—A consolidation of the Elk Consolidated Mining and Leasing Company with this company has been about perfected. The Elk company, of which John F. Campion of Denver is president, has spent about $100,000 developing the Yellow Tiger. The basis of consolidation has not been made public, but with the new arrangement there will be a fund of about $40,000 for development. Under the lease the Elk company sunk a three-compartment shaft 770 ft. and also did much lateral work.

Goldfield Mining and Ore Reduction Company—A 25-h.p. gasolene hoist has been installed upon this property at Gold Reef and a 36-ft. gallows frame. Sinking has been resumed and the shaft is 130 ft. deep. The vein upon which this company is working is traceable for 2600 ft. upon the surface. At certain intervals cross veins intersect the main vein and at these points of intersection a good grade of milling ore, some running as high as $30 per ton, is discovered. Marvin Arnold is manager.

Lyon County

Wire Gold—This company is developing at Ramsey, about fifteen miles northeast from Virginia City. An experimental mill is being installed. B. J. Kennedy is president.

Nye County

The estimated value of the Tonopah production for week ended Dec. 18 is $129,750, the tonnage being divided among the various mines as follows: Tonopah, 3150; Tonopah-Belmont, 620; Montana-Tonopah, 950; MacNamara, 250; West End Consolidated, 130; Tonopah-Midway, 90; total, 5190 tons.

Tonopah—At the meeting of the directors in Philadelphia, Dec. 16, the regular quarterly dividend of 25c. per share and an extra dividend of 10c. per share were declared and made payable Jan. 21 to stockholders of record Dec. 31. This makes the fourth dividend of 35c. per share declared this year, distributing $1,400,000 among the stockholders, and a total to date of $5,300,000. There is still a substantial sum in the treasury and the ore reserves are of such extent that the management expects to maintain the present rate of dividends for an indefinite period. The mill keeps between 95 and 100 stamps dropping constantly. The average grade of the ore is close to $22 per ton with a 90 per cent saving.

Montana-Tonopah—Upon the 565-ft. level the management has been successful in picking up the Triangle vein, which was faulted some distance to the east. The ore in the vein has also improved

MacNamara—J. W. Chandler, superintendent, submitted his report to the annual meeting Dec. 14 for the year ended Dec. 1. The salient features are as follows: Mined and marketed ore, 16,220 dry tons; average gross value, $22,131 per ton; total gross value, $359,022; average mining cost of ore, $4.58 per ton; average sorting and loading cost, $0.34 per ton; cost of development, per ton of ore sold, $1.69 per ton. Development: Sinking (costing $19.50 per ft.), 315 ft.; all other forms of development, 3119 ft.; total development, 3434 ft.; Cash on hand and cash and ore in transit, $67,335. The report states that the mine is looking better than at any other time in its history. The development work of the past year opened a large tonnage of marketable ore.

Tonopah-Belmont—The full crew of men is now at work in this property, following the shutdown for repairs. The Belmont shaft has attained a depth of 835 ft. below the collar, and is being sunk 15 ft. per week. A raise, from the east crosscut on the 1000-ft. level, is being driven to connect with the above shaft. When completed to the 1000-ft. point, it is the intention to continue sinking until a depth of 1500 ft. is reached.

Pioneer—The shipments from this lease at Bullfrog are from 35 to 40 tons per day. The production for November was $20,000 and the average value of the ore $50.53 per ton. It is estimated the December output will run about $40,000. The ore deposit is an immense lens, faulted greatly, and entirely surrounded by rhyolite.

Mayflower Consolidated—At the annual meeting of the company at Pioneer, Dec. 15, it was decided to lease the entire property for 25 years to the Mayflower Consolidated Leasing Company at a royalty of 5 per cent. on the net profits. The Leasing company agrees to assume the indebtedness of the parent company amounting to $50,000 and to maintain the present efficiency of the mine and mill. Stockholders holding the stock of the parent company can exchange it for stock in the Leasing company by paying an assessment of 2½c. per share. The stock of the Leasing company is assessable and assessments will be levied whenever necessary. Jerry Rourke will be retained as manager of the lease.

Storey County

Ophir—The production for the week ended Dec. 18, was 433 tons, assay value $46.40 per ton or a total value of $20,098. A car load of concentrates was shipped to Selby. The three-compartment winze is down 47 ft. below the 2300 level.

C & C—The water in the shaft was held at 148 ft. below the 2350 station. A new throat piece has been placed in the No. 2 elevator and the No. 1 is to be likewise repaired. The two elevators will then be in condition to resume lowering the water in the shaft.

New Jersey

Alpha Copper Company—This company, capital $2,000,000, is developing the copper property on Watchung mountain, near Somerville. J. C. Reiff, of New York, is president. The report to the New York curb market claims $1,555,899 of ore blocked out.

New Mexico

Rio Arriba County

Tusas Peak—This company has installed a pump and hoist and is developing. Col. F. Randall is in charge.

Socorro County

Cooney Consolidated Mining Company—The company organized by Nova Scotians has taken over the Cooney mine 90 miles north of Silver City. The property will be developed.

Oklahoma

King Jack—This mine at Miami has been sold to Pennsylvania parties by Chapman and Lennan. The mine has been one of the best in the camp and the mill was burned down and rebuilt. A deeper run of ore is now being worked.

Omaha-Petersburg—This company has bought the fee of 160 acres including the old M. K. & T. mine at Quapaw and is drilling. The mill is to be enlarged and made over into a modern plant of 250 tons.

Mission—This mill has been completed. Foust jigs have been installed and all the latest machinery and as the mill is of large capacity and the ground well opened up, large results should soon be forthcoming.

Lancaster—This mill recently burned will be rebuilt.

Good Luck—The mine at Quapaw is making the best run of any mine there. The ore will average over 60 per cent. and the dirt is rich.

Heap-O'Brien—The mill has been completed and will add to the production of the Quapaw camp.

Emma Gordon—The tailing mill at Miami is making a splendid run.

New State—A tailing mill has been erected to run the tailings of this mine at Miami.

Mason—This mill at Baxter-Quapaw is ready to run.

Tennessee—This company at Quapaw has completed the sinking of the new shaft.

Oregon

Baker County

Humboldt—This gold mine, Mormon basin, is running night and day. John Arthur, Baker City, is manager.

Douglas County

Continental—This mine will install compressor and drills. W. B. Stewart, Myrtle Creek, is manager.

Pennsylvania

Mill Creek Coal Company—Warren Delano, president of this company, writes us as follows: "Referring to your notice n JOURNAL for Dec. 18 will you kindly tate in your next issue that this company –which has been operating for 20 years s lessee of the Lehigh Valley Coal Company—has arranged to take the en- ire output of the Buck Mountain and 'ulcan collieries and will sell the same ereafter as in the past."

South Dakota

Gold Mountain Mining Company—he company will operate in the Dome lountain district. J. R. Russell, of ead, is in charge.

Utah

F. Augustus Heinze is credited at Salt ake City with "merger" plans concern- ig the Ohio Copper property and the lascotte tunnel in the Bingham camp. he Fortuna ground, adjoining the Ohio, involved in the report and other Bing- am areas made more or less tributary to ie Ohio by the control of the tunnel.

JUAB COUNTY

American Star—The mine near the entennial-Eureka has done 1000 ft. of rifting through the Eagle & Blue Bell orkings in new territory. A shaft will ow be sunk east of the Chief Consoli- ated. A. U. Holding is manager.

Opex—This property after three years' ork during which 2300 ft. of work has een done is reported to have good in- cations on the 1000 and the 2100 levels. Will Knight is manager.

Provo Mining Company—The company as encountered the ore from the level om the bottom of the 300-ft. shaft. It reported 7 ft. thick with high lead ntent.

TOOELE COUNTY

Buffalo Consolidated — Connections ave been made between the old work- gs and the widened winze. A 5-ft. ore- ody was disclosed by the work.

Washington

STEVENS COUNTY

Royal Copper—L. J. Winslow, man- ger, Chewelah, states that work will be ntinued all winter. Work will be arted on the tunnel at once.

Oriole—This property under charge of seph Lancaster, Spokane, is being uipped with a boiler, compressor and ills.

United Copper—This company under e direction of Conrad Wolfe, manager, s spent about $100,000 in developing property near Chewelah. A com- essor and drills are being installed.

West Virginia

Merchants' Coal Company—A mine is be opened near Reedville, the opera- ns being in charge of J. D. O'Neil, neral manager. The company owns about 8000 acres of land, adjacent to the Morgantown & Kingwood railroad.

Orr Coal and Coke Company—The mine and plant at Terra Alta has been sold by the receiver to W. A. Stone, of Uniontown, Penn. He will organize a new company.

Wyoming

Plans are under way for an aërial tramway to connect with the tramway which runs from Rudefaha to Encampment. The spur is to run to Rambler. This will improve the transportation facilities of the West Virginia-Wyoming, Doane and other mines.

United Copper Smelters and Railway Company—This company, successor to the Penn-Wyoming company in the Encampment district, will reopen the Ferris-Haggarty mine in the spring. Nothing is being done now.

Fremont Exploration Company—The company has been financed in Boston and Michigan to develop a property 18 miles north of Shoshone, formerly owned by M. C. McGrath. The property was examined by C. W. Pritchett, of Denver, who recommended an expenditure of $60,000 for development.

Canada

BRITISH COLUMBIA

Hidden Creek—This mine, a short distance from Port Simpson, has been purchased by M. K. Rodgers, of Seattle.

ONTARIO

Lucky Godfrey—In the course of putting down the shaft on a promising silver vein at Elk lake, 65 bags of ore have been taken out. The vein is 4 to 6 in. wide, and yields high-grade ore.

ONTARIO—COBALT

Beaver—A second shipment of ore of 25 tons has been made, which was raised and sacked in 18 days. The vein is showing great strength. The winze sunk 50 ft. from the 200-ft. level proved it to be rich. At the 250-ft. level drifting has been done for 50 ft., proving the orebody on three sides and indicating it to be extensive.

Crown Reserve—The Crown Reserve has distributed $14,000 among its 180 employees as a Christmas bonus. The output of the year is estimated at about 4,000,000 oz. of silver.

NOVA SCOTIA

Barium Production Company — This New York company, operating at Lake Ainslie, has assigned, owing, it is said, to the difficulty encountered in separating the fluorspar from the barytes.

YUKON TERRITORY

Canadian Klondike Mining Company—The past season has been a successful one and the company is in the market for additional machinery. Joseph W. Boyle, Dawson, is manager.

Mexico

CHIHUAHUA

American Zinc Extraction Company—This company of Kansas City is installing an experimental concentration process for treating the Parral zinc ores. The plant is not yet in operation, and the results obtained in the experimental work are not made public. B. D. Rowe is president.

Batopilas — During the first four months' operation of the cyanide plant, to Nov. 30, 1909, 717 tons of second-class concentrates and pan tailings were treated containing 90,406 oz. of silver, of which 87,372 oz. were recovered, or an actual average extraction of 96.64 per cent. The increased saving has been approximately 60 per cent. in treatment costs and over 11½ per cent. in silver contents.

COAHUILA

The Mexican Coal and Coke Company is building 50 coke ovens, and will start work soon on a power plant using steam turbines and generating electric power.

The Agujitas and Lampacitas coal companies have merged into a new company, with 7,750,000 pesos capital, known as La Compañia Carbonifera Agujitas.

DURANGO

Mexican Consolidated—This company, operating at Guanacevi, reports profits for the year to Nov. 1, $350,000. The new mill will start Jan. 1. The ore reserves are reported as $1,795,500, or five times as much as a year ago.

HIDALGO

La Blanca—The contract for the cyanide plant has been let to Barker & Empson, of Pachuca and Mexico City.

Santa Gertrudis—Camp Bird, Ltd., has issued notice of a meeting to be held in London, Dec. 30, to vote on the following resolutions: (1) "That the company hereby authorizes the formation of a separate company to acquire the option over the Santa Gertrudis mine and the subscription of the whole or any part of the capital of such company." (2) "That the capital of the company be increased to £1,350,000 by the creation of 250,000 additional shares of £1 each."

JALISCO

San Pedro Analco—The Manuel Cuesta interests have acquired control of the water power plant on the Santiago river installed by this company. Power for the Hostotipaquillo mines is guaranteed for July 1.

SONORA

Greene-Cananea—Equipment for framing mine timbers, heretofore situated at the entrance of the Capote and Oversight mines, will be transferred to the main timber yard on the mesa.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Dec. 29—The coal market in the West is reported everywhere active. Steam coal is in steady demand, and the cold and stormy weather which has prevailed over a large area has kept up an extremely active demand for domestic fuel. Orders are being rushed to the mines everywhere, and the only point which troubles operators is the difficulty in getting cars. Car shortage in the West has not been acute by any means, but just now storms have caused some delay in getting cars to the mines, and transportation is slow.

In the East the demand for bituminous coal is improving still, but car shortage and railroad blockades are interfering with transportation and delaying deliveries. The coastwise trade is temporarily demoralized by the Christmas blizzard which caused a number of wrecks, with more to be heard from, probably. It was the worst storm since 1898, and resulted in the loss of some fine coal carriers. Notable among them is the five-masted schooner, "Davis W. Palmer," which is reported to have gone down somewhere near the entrance to Massachusetts bay, with 5000 tons of West Virginia coal.

The anthracite trade is suffering temporarily from transportation difficulties, but is otherwise steady and quiet, with a good demand consequent upon the weather.

Pittsburg Coal Company—The voting-trust question is still unsettled. A new report has it that the buying of the stock is in the interest of the Western Maryland Railroad, the owners of which are planning an extension of the line to Connellsville and Pittsburg. This rumor, however, lacks confirmation. There is also a report that the large block of stock which the Pittsburg owns in the Monongahela River company—the river coal combine—is under option to the Steel Corporation. This also lacks confirmation.

COAL TRAFFIC NOTES

Receipts and shipments of coal at Cleveland, O., 10 months ended Oct. 31, short tons:

	1908.	1909.	Changes.
Receipts	1,779,666	2,313,653	I. 533,987
Shipments	3,141,825	2,333,742	D. 808,083

Shipments are mainly by lake. Of the total receipts 133,243 tons in 1908 and 277,899 in 1909 were anthracite.

Coal tonnage of railroads in Ohio Coal Traffic Association, 10 months ended Oct 31, short tons:

	1908.	1909.	Changes.
Hocking Valley......	2,691,554	2,650,165	D. 41,389
Toledo & Ohio Cent.	1,309,875	1,109,519	D. 200,356
Baltimore & Ohio....	1,184,887	1,253,547	I. 68,660
Wheeling & L. Erie..	2,257,118	2,552,756	I. 295,638
Cleve., Lorain & Wh.	1,996,796	2,966,434	I. 69,638
Zanesville & Western	1,050,341	897,329	D. 153,012
Toledo Div., Pen. Co.	1,278,968	1,509,622	I. 230,654
L.Erie,Alliance&Wh.	870,081	890,832	I. 20,751
Marietta, Col. & Clev.	43,967	64,898	I. 20,931
Wabash-Pitts. Term.	....	27,152	I. 27,152
Total...............	12,683,587	13,022,254	I. 338,667

The total increase in tonnage this year was 2.7 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

The Southwestern Interstate Coal Operators' Association reports shipments for two months, September and October, as below, in short tons:

	1908.	1909.	Changes.
Missouri..........	538,452	471,277	D. 67,175
Kansas...........	1,028,267	1,020,762	D. 7,505
Arkansas.........	392,021	428,599	I. 36,578
Oklahoma........	598,031	470,147	D. 127,884
Total...........	2,556,771	2,390,785	D. 165,986

The total decrease this year was 6.5 per cent. The heaviest loss was in Oklahoma.

Including 344,555 tons coal after Dec. 1, the season tonnage of coal passing through the Sault Ste. Marie canals was, in short tons:

	1908.	1909.	Changes.
Anthracite.....	1,384,743	1,412,387	I. 27,644
Bituminous....	8,517,717	8,527,639	I. 9,922
Total.........	9,902,460	9,940,026	I. 37,566

The total increase was only 0.4 per cent.; a much smaller gain than was expected.

Norfolk & Western tonnage for the 10 months ended Oct. 31, in short tons:

	Coal.	Coke.	Total.
To line points.......	8,847,589	2,016,103	10,863,692
To tidewater.......	2,635,319	92,399	2,727,718
Total...............	11,482,908	2,108,502	13,591,410
Total, 1908....	9,153,681	1,571,202	10,724,883

Total increase, 2,866,527 tons, or 26.7 per cent. The tidewater deliveries were 20.1 per cent. of the total tonnage.

Bituminous coal and coke tonnage of leading railroads in Pennsylvania and West Virginia, 10 months ended Oct. 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio..	18,931,775	3,764,098	22,695,873
Buff., Roch. & Pitts.	5,477,719	396,279	5,873,998
Buff. & Susqueh'na	1,204,464	265,329	1,469,793
Penn. lines N. Y. C.	6,073,579	79,224	6,152,803
Pitts. & L. Erie.....	7,930,711	4,441,136	12,371,847
Pitts., Shawmut & N.	742,339	14,367	756,706
Norfolk & Western.	11,482,908	2,108,502	13,591,410
Ches. & Ohio.	11,118,863	377,530	11,496,393
Total.	62,962,358	11,446,465	74,408,823
Total, 1908...	54,708,326	7,181,872	61,890,198

Total increase this year 12,518,625 tons, or 20.2 per cent. In addition to the above the Baltimore & Ohio carried 632,013 tons anthracite in 1908 and 664,999 in 1909; increase, 32,986 tons.

New York

ANTHRACITE

Dec. 29—As for a month past, anthracite is a weather market, and cold weather has brought about an active demand, while storms have made deliveries slow and difficult. There are prospects of a good and steady trade for some time.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are, f.o.b., New York harbor points: Pea, $3.10@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. Some small lots are reported sold at special prices, but not in important quantity.

BITUMINOUS

The bituminous trade along the seaboard is good, and demand continues to develop well, so far as orders are concerned. The far East is naturally quiet, as much of its buying is over for the season. The Sound ports are doing well and all-rail trade is active. In New York harbor trade has resolved itself temporarily into a struggle to get the coal that is wanted; but deliveries are very uncertain for the time being.

The car shortage has been, of course, intensified by the great storm, which struck the railroads throughout this territory pretty hard. Transportation was temporarily blocked, and it will take some days to straighten out the tangle and permit coal to come through in anything like schedule time.

Nominally, quotations are unchanged. There are reports of high prices paid for stray lots in New York harbor that were badly needed. These, of course, are exceptional and do not permanently affect the market. In a week or so, probably, matters will come back to a normal condition.

The coastwise trade is in a state of suspension owing to the storm of Dec. 21-26, which was the worst for nearly 12 years. Cape Cod is reported lined with wrecks of coal-carrying schooners, and it will take some time to ascertain the full damage done.

Birmingham

)ec. 28—Coal output is limited this ɔk by the usual holiday stoppages. ɛse will be made as short as possible, view of the continued active demand the product, and inducements are ɛred to the men to cut short the holi- ɾs, by some companies. There is a l for all the coal that can be mined ɦt now. Not only are the manufactur- all busy, but the unusually cold ather has made a big demand for coal the use of household consumers in ; district.

Chicago

)ec. 27—Cold weather continues to ke the demand for both domestic and am coals brisk, with retailers buying gely in the city to provide against possibilities of a coal famine through nsportation troubles. The weather ficulties in the way of the railways ve been such as to give rise to news- ɔer reports of a shortage of coal, and se have influenced many consumers o in turn influence the retailers. But only marked result of the extraor- ıary snowstorms yet, has been holding of prices on smokeless, Hocking l other coals from east of Indiana, ɔause of delayed consignments, Illinois l Indiana coals have been largely in mand in the last week, for all sizes, mp to screenings, and the demand ɔmises to continue active in the week st opening, for the public has awakened the need of large stores in consumers' ıs. Illinois and Indiana bring $2@3 r lump and egg, $1.75@1.85 for run- -mine, and screenings $1.25@1.45, the ɡh price of the screenings being due large demand for this size for steam- ıking purposes and difficulty of trans- rtation.

Hocking continues very strong and in od demand, while Pocahontas and New ver have been comparatively scarce, ving to railroad delays, and have ought $3.65@3.75 for lump and 3.05@ 15 for rn-of-mine, these conditions con- ıuing into the present week. Youghio- ıeny is in good demand at $3.15@ 25 for steam lump, with gas at $3.30. ıthracite sales are brisk, with chest- ıt continuing scarce and in large de- and.

Cleveland

Dec. 28—Steam trade is steady and ɔod. The domestic trade is booming. old weather and a shortage in gas sup- y have combined to give dealers all ey can do.

M. A. Hanna & Co., of this city, have ranged to build a receiving dock at 'est Duluth, Minn., which will be 375 . wide by 3000 ft. long and will be ɔnstructed of concrete and piling. It ill have a capacity of 300 cars a day nd will be equipped with the latest electrical machinery both for unloading ships and for loading cars.

Quoted prices for coal, f.o.b. Cleveland, are: Middle district, $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.60 for slack; No. 8 district, $2.15 for 1¼-in., $1.95 for ¾-in., $1.85 for run-of-mine and $1.65 for slack; Massillon domestic, $2.95 for lump and washed nut; Pittsburg, $2.35 for 1¼-in., $2.25 for ¾-in., $2.15 for run-of-mine and $1.75 for slack.

Indianapolis

Dec. 28—Cold weather is the keynote of the coal trade. The belated domestic demand is coming in actively, and dealers in all the cities and towns are rushing orders to the mines. Operators have hard work to keep up with these orders, in addition to supplying the steam trade, which continues good and steady.

Car supply has been good, except where railroad transportation has been interrupted by stormy weather. The railroads have done pretty well so far, and while some complaints are made, they are not loud.

Pittsburg

Dec. 28—The car supply was very poor last week, and is not improved this week, while there is the added trouble of a sharp shortage of men, the men not having entirely recovered from the holiday. Prices are very firm on mine-run and screened coal, while slack is quotable 5c. per ton higher. The supply, particularly of slack, is limited, and sellers generally quote outside prices to buyers of prompt lots who are not their regular customers. We quote prices very firm at $1.15 for mine-run and nut, $1.25 for ¾-in. and 80@90c. for slack.

Connellsville Coke—The coke trade has worked itself into a peculiar position. There is surface adherence to previously quoted prices but it has been made evident that some sellers are willing to make quiet concessions if they can book any desirable tonnages. Thus an inquiry for 5000 tons of prompt furnace coke last week brought out the regular quotation of $2.75, but on negotiation the seller finally secured the lot at $2.50. There appears to have been only one seller at this figure, but others quoted $2.60 and $2.75. This week the market is firmer, as the car supply is very short, but it is probable that as low as $2.60 could be done on a desirable lot of prompt coke. Nothing definite has been done on contract coke, the quoting market remaining at $2.75@2.80. Two meetings were held in Uniontown last week by operators who desired to arrange an understanding that no furnace coke should be sold at less than $2.75, but apparently without final result, and previous experience with such attempts among the operators hardly encourages the expectation that practical results can be obtained by this means. Consumers have not been actively inquiring and have not developed the lowest that could be done. Monday the Pennsylvania railroad notified coke operators that they need not expect more than half the regular car supply, as there was much trouble from the snow, particularly in the East.

The market is quotable at $2.60@2.75 on prompt furnace coke, and nominally at $2.75@2.80 on contract furnace, with 72-hour foundry coke $3@3.25 on prompt and $3.25@3.50 on contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Dec. 18 at 452,735 tons, an increase of 14,000 tons over the previous week; shipments at 5237 cars to Pittsburg, 8787 cars to points west of Pittsburg and 993 cars to points east of Connellsville, a total of 15,017 cars, an increase of 2000 cars over the previous week.

St Louis

The coal market as a whole is stronger and in better condition at the present moment than at any time during the last two years. The market is practically bare of coal and prices are consequently advancing. The car shortage has been so acute during the past two weeks that some of the larger producers in the State were unable to keep up with their contract requirements. There is a heavy movement of freight of all kinds and consequently railroads have more business than they can handle. The terminals around St. Louis are terribly congested and cars are delayed in St. Louis three or four days longer than usual on this account. Owing to the extreme difficulty in getting delivery made a number of the larger plants have been uneasy about their coal supply for the past week and have been buying anything that was offered. It is reported that last night at 12 o'clock 20 of the larger consumers in town had their representatives in one railroad yard trying to get their coal switched into their respective plants. This will give an idea of the conditions that exist here. The railroads as well as large consumers have all been in the market during the past week as they realize there will be a shutdown for about three days on account of Christmas.

The market has advanced until Standard 2-in. lump coal is now bringing $1.25 per ton at mine. The weather still remains cold which makes the demand from dealers continue to be heavy. Carterville coal has also advanced and prices in general are 25 cents per ton higher than prevailed last week.

Every road tributary to St. Louis is now short of cars. Even the electric lines which bring coal from the Belleville mines 20 miles distant are short. These mines nearly always have all the cars they can use. The Illinois Central and

Iron Mountain are practically out of business and the mines on these roads were not able to work more than 1½ days last week.

Standard 6-in. lump or egg held at $1.35 per ton mine or $1.87 St. Louis; 2-in. lump is worth $1.25 per ton mine or $1.77 St. Louis; mine-run is bringing $1 mine or $1.52 per ton St. Louis; 3-in. nut is $1 mine or $1.52 St. Louis; 1½-in. steam nut and pea bring 75c. per ton mine or $1.27 St. Louis; 2-in. screenings 65c. per ton mine or $1.17 St. Louis; ¾-in. pea and slack are 40@50c. per ton mine or 92@$1.02 St. Louis. Most of the activity in the coal market during the last week has been in the Standard coal as this is the coal that can be depended upon to arrive at destination quickly owing to the proximity of the mines.

Staunton, Mt. Olive and Springfield district 6-in. lump is worth $1.60 per ton mine or $2.12 St. Louis; 2-in. lump is held at $1.40 per ton mine or $1.92 St. Louis. Mine-run is worth $1.10 per ton mine or $1.62 per ton St. Louis; 2-in. nut is $1 per ton mine or $1.52 St. Louis.

Carterville coal is now bringing $1.75 per ton mine or $2.42 St. Louis for 6-in. lump or egg; while nut is again being held at $1.50 per ton mine or $2.17 St. Louis. Operators are holding to these prices, which are sure to advance if the weather continues to remain the same.

Franklin county 6-in. lump or egg is $2 per ton mine or $2.67 St. Louis; 3- to 2-in. nut is worth $1.60 per ton mine or $2.27 St. Louis.

The anthracite market is again in a healthy state. Circular is being strictly adhered to. Grate and egg are coming forward freely but are readily being absorbed. Chestnut is very scarce.

Foreign Coal Trade

Nova Scotia Coal—Shipments of coal by Nova Scotia companies, 11 months ended Nov. 30, long tons:

	1908.	1909.	Changes.
Dominion	3,049,091	2,250,386	D. 798,705
Nova Scotia Steel	601,620	734,241	I. 132,621
Acadia	294,409	252,522	D. 41,887
Intercolonial	226,067	232,798	I. 6,731
Inverness	240,871	209,184	D. 31,687
Total	4,412,058	3,679,131	D. 732,927

Total decrease, 16.6 per cent. The loss was due to labor troubles.

Transvaal Coal—The total coal mined in the Transvaal for the 10 months ended Oct. 31 was 3,089,844 tons. Nearly all this coal is used by the Witwatersrand mining companies and in local cities and towns.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Dec. 18: Best Welsh steam, $4.02; seconds, $3.84; thirds, $3.66; dry coals, $3.81; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.22; seconds, $1.86. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Dec. 29—While the iron and steel markets, as might be expected at this season, are quiet for the time being there is no lack of underlying strength and activity. Mills and furnaces are busy everywhere, and preparations for increasing capacity and output are reported from many quarters.

In pig iron there is little spot demand, but many inquiries, and the indications are for an increased business as soon as the new year is fairly opened. Prices for the time are rather nominal, but seem to be quite firmly held. The inquiries received are mainly for foundry and basic pig.

In finished material there is talk of some large contracts for structural steel pending. Some good orders for steel rails are also heard of. The aggregate of the last quarter's orders for railroad equipment is large, and more are reported to be coming. Small business everywhere is good.

Steel Corporation Bonus—More than $2,000,000 will be distributed by the United States Steel Corporation as a bonus to its officers and employees, 60 per cent. of which will be in cash, according to the official announcement of Chairman Gary. The bonus was first announced as $1,000,000, but Chairman Gary corrected this in his official announcement in which he said: "The amount is determined, as usual by the annual earnings. The sum distributed for 1909 amounts to a little over $2,000,000. This will be paid 60 per cent. in cash and 40 per cent. in preferred stock at 124, or common stock at 90, in accordance with the wishes of the recipients, so far as practicable and convenient. Also, the usual opportunity will be given to subscribe for 25,000 shares of the preferred stock of the corporation at 124, upon the usual conditions."

Lake Superior Iron Ores—It is definitely settled that there will be an advance on bessemer ores for the season of 1910. The advance is 50c., making the price for Old Range bessemer $5, and for Mesabi bessemer $4.75 per ton, f.o.b. Lake Erie ports. It has also been decided that there will be no change in the base contents, which will remain 55 per cent. iron for bessemer and 51.5 per cent. for nonbessemer ores. The prices for nonbessemers are not yet finally determined.

Baltimore

Dec. 28—Exports for the week included 1666 tons steel rails and 1,042,713 lb. rail fastenings to Guaymas, Mexico. Imports included 22,000 tons of iron ore from Cuba and 5800 ton from Spain.

Birmingham

Dec. 28—The iron market in Alabam is in a dull condition this week, owing t the holidays partly, and partly to th usual period of stock taking and preparing for next year. There are reports o large inquiries, and sellers look for a bi business next month. Resale iron i nearly all out of the way, and shipment of iron that have been held in the yard are being completed. Not much iron i in the furnace yards outside of this. Th inquiries now coming in are for second quarter and third-quarter deliveries i next year.

The quotations remain at $14.50 fo No. 2 foundry for first-quarter iron Most sellers expect $15 on later deliveries, but this will not be settled for week or so. President Maben, of th Sloss-Sheffield company, has just returned from New York and reports mos favorable indications for next year.

The Tennessee company is arrangin for large improvements at the Ensle steel works next year, and their capacity will be greatly enlarged.

Chicago

Dec. 27—The iron market continue quiet and firm, as is natural for th holiday season when no extraordinar influence acts upon the market. It i the expectation of furnace agents tha this condition will continue until at leas the middle of January and that smal sales for needs actually in sight rathe than speculative will obtain until tha time. Northern iron continues firme than Southern, little of it being obtainable for needs of the first quarter, a $18.50@19, with Southern bringing $1 Birmingham, or $18.35 Chicago, on th same class of sales. Some Southern i being sold at 25 or 50c. less, it i rumored, on contracts favorable to th furnaces, but there does not seem to b any tendency toward weakening o Southern generally. Agents are holdin up the market by professing not to b inclined to sell at the $14 price fo second- and third-quarter business, o the ground that the market is practicall sure to strengthen after the middle o January.

Business in nearly all lines of finishe iron and steel products continues good with something of a lull due to the holidays, but every prospect that the activit will continue after the first of the yea unchecked. Coke is firm, transportatio troubles making supplies irregular bu not greatly affecting the market, at $5.5 for the best Connellsville.

Cleveland

Dec. 28—Some sales of bessemer ore have been made at 50c. advance ove season's prices, and that is now the ɛpted figure. The prices of nonbes- er ores are not fixed, but they will pably take the same advance.

ig Iron—Some iron has been taken pipe foundries; otherwise there is e new business. Makers seem to be ɛkening a little on prices, and there reports of shading 10 to 25c. per on good orders.

'inished Material—Specifications on tracts continue large, but little new iness has been closed. Some large ers for plates and bars are pending. all trade is exceedingly active.

Philadelphia

Dec. 29—The last week of the year ows the customary quiet and indif- ence. Very little business has been ne. There is no anxiety on the part of yers as to the immediate outcome. The prehension of speculative prices on undry and forge has been largely al- ved. At the same time the tone of the arket is strong and an optimistic spirit evails. A renewal of activity is pre- cted in local pig-iron circles. There es not appear to be much basis for it as many of the larger users are pretty ell covered by contracts. Forge would obably respond better as most mill eople have pursued the policy of close ying. Some Southern furnace inter- ts have been quietly canvassing around ut are not backing any propositions they ay make by concessions. In fact the end, if there is any, is to stronger prices. uotations are $19 for Northern No. 2X nd 50c. less for Southern; $18 for orthern forge and $18.50@19 for basic.

Steel Billets—The diminution of stocks the main feature. Much material has ecently been called on in anticipation of greed dates of delivery.

Bars—Not a single feature has de- eloped. Prices are regarded as definitely ixed, and manufacturers regard their po- ition as secure.

Sheets—The mills have been catching ıp with orders and of late are able to promise earlier deliveries when requested. The larger sheet-iron users are anxious to have their material in their own possession, according to contract.

Pipes and Tubes—Reports from mills point to an accumulation of orders and prospects for further calls.

Plates—The mills are largely oversold. Small buyers have been advised to get their orders in as manufacturers are less able to make quick deliveries. A revival of demand is expected by all well-informed office men.

Structural Material—Quiet conditions prevail in this branch as all urgent necessities have been covered. Small local orders are showing up.

Scrap—Local dealers have arranged for the control of considerable heavy steel scrap and some No. 1 railroad scrap which they will deliver to their customers in January. As a rule mills have enough for current wants either in hand or promised at fixed prices.

Pittsburg

Dec. 28—The iron and steel market is naturally dull at this season, but does not seem to have lost any strength. The opinion has become more general, however, that even should the new year bring forth considerable market activity it can hardly raise the trade to a higher level of prices or productive activity than has already been experienced, for without doubt some of the material shipped in the past few months has been to replenish stocks.

The mills are well sold up; on plates, shapes and bars for from four to five months' production, a large part of the bar tonnage being actually specified; on sheets and tin plates for about the same period, and on wire and pipe products for a considerably smaller period.

Pig Iron—A decided weakness developed in basic pig iron last week, and $17, Valley, was shaded, probably to $16.75, in several quotations and one or two sales. There are reports that two merchant firms in Pittsburg bought 18,000 and 20,000 tons respectively, for forward delivery, at $17 or less. The tonnages are probably exaggerated, but there is little doubt that considerable iron was picked up. This week the market is stronger and it is not certain that any iron could be obtained at $17, Valley; for any extended delivery $17.25 or possibly higher would have to be paid. Bessemer remains pegged at $19, Valley. Foundry iron is extremely quiet and not over strong. It is nominally quotable at $17@17.25, Valley, with forge 75c. less.

Steel—Odd lots of bessemer billets may possibly be picked up at $27, Pittsburg, with open-hearth 50c. higher, but for any extended delivery $27.50 and $28 respectively would probably have to be paid. Sheet-bars are $28.50@29.50, depending on delivery.

Ferromanganese—The market is quiet and possibly not as strong as it was. Prices are quotable at $45@45.50, Baltimore, depending on delivery, the freight to Pittsburg being $1.95 per ton.

Sheets—There is not much new business, but buyers are taking material out well on old contracts, and the market is firm all along the line. Prices remain quotable at 2.40c. for black and 3.50c. for galvanized, with painted corrugated roofing $1.70 per square and galvanized corrugated $3 per square.

St. Louis

The pig-iron market for the last week has been absolutely featureless. No one expected much this week, however, and little business will be transacted until after the holidays. Producers have all the business they need; consequently while the market is dull the situation is entirely healthy. The same prices prevail as heretofore, $15@15.25 per ton f.o.b. Birmingham or $18.75@19 f.o.b. St. Louis for No. 2 foundry.

Foreign Iron Trade

British Iron Production—The British Iron Trade Association reports the make of pig iron in Great Britain in the first half of 1909 at 4,715,679 long tons; which compares with 4,635,851 tons in the first half of 1908 and 4,653,989 tons in the second half. The average number of furnaces in blast during the half year was 313, showing an average make of 15,066 tons per furnace.

German Steel Syndicate—The Stahlwerks Verband reports deliveries for the 11 months ended Nov. 30 as follows: Blooms, billets and other half-finished material, 1,350,779; railroad material, 1,691,125; plates, shapes and rolled material, 1,513,850; total, 4,555,754 metric tons; an increase of 140,855 tons over 1908 deliveries.

German Iron Production—The German Iron and Steel Union reports the make of pig iron in the German Empire in November at 1,119,051 metric tons, an increase of 6422 tons over October. For the 11 months ended Nov. 30 the total was, in metric tons:

	1908.	1909.	Changes.
Foundry iron....	1,978,775	2,260,743	I. 281,968
Forge iron........	585,537	600,394	I. 14,857
Steel pig..........	836,840	1,002,075	I. 165,235
Bessemer pig.....	339,285	374,085	I. 34,800
Thomas(basic)pig	6,976,548	7,504,554	I. 528,006
Total........ ...	10,716,985	11,741,851	I. 1,024,866

Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. The total increase was 9.6 per cent.

Metal Markets

New York, Dec. 29—The last week in the year shows a quiet condition in the metal markets for the most part, though more strength is expected to mark the opening of the new year.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Dec. 25: Gold, $1,389,550, to Haiti and Argentina; silver, $601,059, chiefly to London. Imports: Gold, $49,200; silver, $14,117, both from Cuba, South America and Mexico.

Gold and silver movement in Great Britain, 11 months ended Nov. 30:

	Imports.	Exports.	Excess.
Gold	£48,870,125	£43,101,383	Imp. £5,768,742
Gold, 1908...	41,539,849	45,197,929	Exp. 3,658,080
Silver	10,844,404	11,557,834	Exp. 713,430
Silver. 1908.	9,588,542	11,804,119	Exp. 2,215,577

Of the silver imported this year, £9,124,510 came from the United States.

Gold and silver movement in France, 10 months ended Oct. 31:

	Imports.	Exports.	Excess.
Gold ..Fr.	356,668,000	F.127,679,000	Imp. Fr.228,989,000
1908..	789,825,000	18,447,000	Imp. 771,378,000
Silver.	122,829,000	105,989,000	Imp. 16,840,000
1908..	123,891,000	129,130,000	Exp. 5,239,000

During 1908 France accumulated gold at an extraordinary rate.

Exports of tin from the Straits, 10 months ended Oct. 31, were: United States direct, 14,523; Great Britain, 27,414; Euopean continent, 5272; China and India, 1681; total, 48,890 long tons, a decrease of 2586 tons from last year.

Gold—No special demand developed on the open market in London, and prices remained at 77s. 9d. per oz. for bars, and 76s. 5d. per oz. for American coin. In New York gold continues to go to South America, but none has been taken for Europe yet, though some exports are expected.

Platinum—Just at the moment business is dull, as might be expected the last week in the year. Prices are unchanged at $29.50 per oz. for refined platinum and $35 per oz. for hard metal. Dealers look for good business in January, especially from jewelers, whose stocks are generally low.

Silver—The market continues steady and the prospect for the present is that it will continue so. The distribution of silver in India continues favorable. Continental orders have been in the hands of the London brokers for considerable amounts during the current month.

SILVER AND STERLING EXCHANGE

Dec.	23	24	25	27	28	29
New York....	52¾	52⅝	.....	52½	52⅝	52⅝
London.. ..	24¼	24¼	......	.....	24¼	24¼
Sterling Ex..	4.8775	4.8750	......	4.8750	4.8750	4.8720

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Dec. 16, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India	£8,412,000	£6,521,400	D. £1,890,600
China	641,400	1,885,000	I. 1,243,600
Straits......	164,285	114,000	D. 50,285
Totals ...	£9,218,675	£8,521,000	D. £697,675

India Council bills in London sold at an average of 16.125d. per rupee.

Copper, Tin, Lead and Zinc

Dec.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
23	13⅝ @13⅞	13¼ @13½	60⅜	33½	4.70	4.60 @4.65	6.02½ @6.07½
24	13⅝ @13⅞	13¼ @13½	60¾	33⅞	4.70	4.60 @4.65	6.02½ @6.07½
25	......	......	....	....	....	......	......
27	13¾ @13⅞	13⅜ @13⅝	....	33⅞	4.70	4.60 @4.65	6.05 @6.07½
28	13¾ @13⅞	13⅜ @13⅝	60$\frac{13}{16}$	34	4.70	4.60 @4 65	6.05 @6.07½
29	13¾ @13⅞	13½ @13⅝	61¼	34	4.70	4.60 @4.65	6.05 @6.07½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Notwithstanding the holiday season, the copper market has been active and a good business was done both for domestic delivery and export. Prices advanced steadily, and close at 13¾@13⅞c. for Lake copper, and 13½@13⅝c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13¼@13⅜c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is fair.

The standard market in London was also strong and advancing and there was a larger turnover than for some time past. The market closes at £61 5s. for spot, and £62 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £63 10s.@£64 10s.; strong sheets, £73 10s.@£74 10s. per ton.

Exports of copper from New York and Philadelphia for the week were 5945 long tons. Our special correspondent gives exports from Baltimore at 2163 tons copper.

Tin—The holidays in London, which lasted from Friday of last week until Tuesday of this week, interfered with any great activity in this metal. While on Thursday last the London market suffered under an attack from the bears, it recovered just as rapidly. Apathy among consumers in the United States is still apparent. Naturally, this season of the year, with approaching stock-taking, always interferes with purchases and buyers are also somewhat apprehensive as to future consumption of tin in the United States. They are inclined to believe that it will show a falling off during the next few months. The London market closes firm at £154 for spot and £155 10s. for three months, while tin in this market can be purchased at about 34c. per pound.

Arrivals of tin at Pacific ports of the United States, 10 months ended Oct. 31, were 1934 long tons; 253 tons more than last year.

Lead—The market is strong at last prices, 4.60@4.65c. St. Louis and 4.70c. New York, at which figures there has been a good steady demand.

The London market has advanced further, and Spanish lead is quoted at £13 8s. 9d. and English at £13 11s. 3d. per ton.

Spelter—This metal remains quiet and neglected. There has been little business offering and this has been taken at about last figures. The market closes at 6.05@6.07½c. St. Louis, and 6.20@6.22½c. New York.

New York quotations for spelter on Dec. 23 and 24 were 6.17½@6.22½c.; Dec. 27-29, inclusive, 6.20@6.22½ cents.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The London market is unchanged at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Other Metals

Antimony—The market is dull and prices are nominally unchanged. Cookson's is quoted at 8⅛@8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—The market is strong, and an advance in prices is expected next month. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 17s. 6d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 200-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Dec. 25—The base ice paid for zinc ore was $48@49 per n; no premium price reported. The ghest price paid for lead ore was $60; e base price was $57@59 per ton.

Shipments for week and for year to ec. 25: Zinc ore, 1,981,050 lb. week, 4,860,630 lb. year; lead ore, 471,045 . week, 9,691,528 lb. year; sulphur ore, 8,456 lb. week, 15,680,366 lb. year. eek's shipments to separating plants, 483,470 lb. zinc ore.

Joplin, Mo., Dec. 24—The highest price id for zinc-sulphide ore was $52, the se $47@49 per ton of 60 per cent. nc. Zinc silicate sold at $26@28 per n of 40 per cent. zinc. The average ice, all grades, was $46.52 per ton, a neral reduction of $1 per ton, or $3 r the month. Lead ore remained steady $56, and this price was paid for ades ranging from 78 to 81 per cent. etal contents. Average price, all grades, 5.92 per ton.

Nearly all mines close down operaons tonight, some to resume Monday, me Tuesday, while some will produce ore until Jan. 3, utilizing the time in overhauling and repairing the mills. Weather conditions continue unfavorable for the small producers, but the larger mines have increased their production during the month enough to offset any curtailment by the weather. Mines where operations were temporarily suspended early in the month, while making changes necessary to conform to the fuel supply, have resumed and some mines that were idle several weeks during the late fall are again in operation.

SHIPMENTS, WEEK ENDED DEC. 25.

	Zinc, lb.	Lead, lb.	Value.
ebb City-Carterville	3,312,560	610,590	$ 96,597
plin	1,755,160	208,890	49,719
osperity	612,800	10,070	14,989
ami	691,880	......	14,183
lena	396,840	53,280	11,014
anby	617,540	13,280	10,945
enweg	466,930	......	10,229
onogo	187,840	83,230	8,516
ginaw	281,520	11,500	6,072
ba-Neck	242,190	......	6,054
rthage	214,050	......	5,351
rora	233,300	......	5,240
dger	212,280	......	5,200
urgeon	282,460	15,550	4,916
ve Springs	196,390	......	4,713
apaw	184,840	.. ..	4,158
ckson	151,860	4,930	3,624
rl Junction	92,960	8,730	2,662
rcoxie	75,440	......	1,810
ncite	29,630	......	740
Totals	10,238,470	1,020,050	$266,732
e year	590,742,700	87,327,980	$14,534,674

c value, the week, $238,202; the year, $12,152,372
ad value, the week, 28,530; the year, 2,382,302

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
nuary	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
bruary	36.63	36.94	34.92	34.37	49.72	50.50
arch	36.19	37.40	34.19	34.71	49.90	50.82
ril	35.40	38.63	34.08	37.01	52.47	55.63
ay	34.19	40.06	33.39	37.42	56.05	56.59
ne	33.06	44.15	32.07	40.35	60.48	57.52
ly	34.55	43.06	31.67	41.11	59.90	53.74
gust	36.53	48.25	33.42	44.54	60.34	57.60
ptember	37.63	47.70	34.44	44.87	54.59	56.11
tober	35.95	49.50	33.28	45.75	52.63	55.02
vember	39.13	51.31	35.02	48.29	54.53	53.94
cember	42.75	......	39.63	......	49.68	. ..
Year	$36.63	......	$34.31	......	$53.93	......

NOTE—Under zinc ore the first two colnns give base prices for 60 per cent. zinc e: the second two the average for all ores ld. Lead ore prices are the average for l ores sold.

Chemicals

New York, Dec. 29—The market is very quiet, as might be expected in the closing week of the year. A slight weakening tendency is apparent.

Copper Sulphate—There is little doing, but prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller parcels.

Arsenic—White arsenic is still quoted at 2¾@2⅞c. per lb. for spot; but it is said that slight concessions have been made, and 2.70c. per lb. can be done for January delivery.

Cobalt Oxide—A great drop has been registered in the prices quoted on this chemical. Where formerly $1.10@1.75 was quoted dealers are generally offering it for 80@85c. now, and it is rather easy to get it at the lower figure. The drop is generally attributed to an industrial clash between the North American Lead and the International Nickel companies. It is expected that the Coniagas Mines, Ltd., of Cobalt and St. Catherines, Ontario, will also soon enter this field as a producer of cobalt oxide, in which event a return to the former quotation is unlikely.

Sulphur—Messrs. Parsons & Petit, New York, report the recent importation of 1700 tons Sicilian crude sulphur by steamship "Sicilia," 1500 tons delivered at Baltimore and 200 tons at New York.

Nitrate of Soda—Spot sells for 2.10c. per lb., but there has been a little weakening in futures, and 2.07½@2.10c. per lb. must be quoted for such deliveries.

Mining Stocks

New York, Dec. 29—On the general stock market attention has been absorbed by the rush with which Rock Island stock was put up 30 points in an hour, only to drop back again later. As is usual in such cases, this episode was followed by a degree of dulness in stocks generally, and the close is uncertain and without definite tendency.

On the Curb copper stocks were active, Miami, Ray Consolidated and Ray Central being the leaders, with considerable gains in price. Other coppers were in fair demand. Cobalt stocks and Nevada gold shares were only moderately in evidence. There was some inquiry for Golden Star.

Lehigh Coal and Navigation, which is only dealt in on the Philadelphia Exchange, was strong and active there. On Monday the directors declared a special dividend of 15 per cent., payable in scrip convertible into stock at par. As the stock is paying 10 per cent. dividends and sells at about $125 per share of $50 par, this is equivalent to at least a 30 per cent. dividend.

Some echoes from the past appeared in an auction sale this week, at which the following shares were offered in one lot: 2160 shares Poland-American Gold, of Arizona; 500 Verde King Copper, of Arizona; 5000 Great Republic Copper and Gold, of Arizona; 1000 Lincoln Gold, of Arizona; 2050 Great Central, of South Dakota; 1200 Little Louise, of Colorado; 500 Argentum-Juniata, of Colorado; 500 Irene Mill and Mining, of New York; 507 Freedom Oil, of Delaware. This total of 13,417 shares sold at $48 for the lot, or an average of 0.358c. per share.

Boston, Dec. 28—Continued weakness in North Butte and Parrot have been marked features during the week. Otherwise strength and good tone have predominated. The trading continues to run to specialties and profit taking has been indulged in to quite an extent, but this has tended to solidify the market. Public interest seems to be increasing and the trading continues to be in large volume. All told, 1910 promises big things marketwise, especially if the long-talked of copper merger is put through. Sentiment on State Street favors the belief that the deal is on and that something definite will be known early in the year.

Lake Copper stock, which had a sensational run, is now on a more even keel and fluctuations are less violent. Lake touched $73.50 for high, closing at $70.75 tonight. Hancock, Ojibway, Keweenaw, Franklin and Arcadian were especially active issues among the Lake Superior stocks, while East Butte, Miami, Arizona Commercial and American Zinc have rendered a good account of themselves in the week's operations.

Miami is up $4 to $26.25 on buying which emanated from New York. North Butte and Parrot have been the exceptions. The former broke $8.25 to $47, recovered to $51, and fell back to $48 again today. The status of this mine is unknown and holders of the stock are much perplexed. Parrot has dropped $8.75 to $19.50 and no definite explanation can be given. Osceola rose $7.50 to $170 on the increase in the semi-annual dividend rate from $4 to $6. Mohawk has risen $3 to $68. Copper Range has advanced $2 to $84.50. By increased dividends from its constituent companies this holding company will have more income than it did last year.

The Curb has witnessed a broad and active market with materially higher prices for many specialties. Ray Consolidated and Live Oak both made record prices. Cactus, Yuma, Rhode Island Coal and Indiana have also had conspicuous advances.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	......	22.493	...
Total	52.864	......	24.402	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56[illegible]	12.928	12.93[illegible]	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	[illegible]	12.870	13.600	13.210	[illegible]	59.021
October	[illegible]	12.700	13.646	13.030	60.139	57.551
November	14.130	13.12[illegible]	14.386	13.354	63.417	58.917
December	14.111	....	14.411	..	62.943	.....
Year	13.208	.....	13.424	.....	59.902	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	
			Av. year	29.465	

Prices are in cents per pound.

LEAD

Month.	New York. 1908.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	......	......	13.166	......
Year	4.200	......	......	13.439	......

New York and St Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	......	4.987	......	20.625	......
Year	4.726	......	4.578	......	20.163	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 29

Name of Comp.	Clg.
Amalgamated	.89⅛
Anaconda	.53½
Balaklala	‡2⅛
Braden	4⅞
British Col. Cop.	7⅞
Buffalo Mines	3½
Butte Coalition	28¾
Colonial Silver	½
Combination Fra.	.43
Con. Ariz. Sm.	2 15/16
Cum. Ely Mining.	9
Davis-Daly	4 11/16
Dominion Cop.	7
El Rayo	2 11/16
Florence	2⅝
Furnace Creek	‡.05
Giroux	11
Gold Hill	2
Goldfield Con.	8¼
Granby	109¾
Guanajuato	2
Guggen. Exp	255
Hanapah	‡15
Kerr Lake	8⅝
McKinley-Dar.	89
Miami Copper.	25¾
Mines Co. of Am.	.50
Monteza. of C. R.	3½
Mont. Sho. C	1⅜
Nev. Utah M. & S.	1½
Newhouse M. & S.	3½
Nipissing Mines	10⅞
Ohio Copper	5 11/16
Old Hundred	½
Pacific Sm. & M	1¼
Silver Queen	.25
Stewart	¾
Tennessee Copp'r.	38
Tri Bullion	[illegible]
United Copper	8¼
Utah Apex	5⅛
Utah Copper	59⅞
Yukon Gold	4 1/16

‡Last quotation.

BOSTON Dec. 29

Name of Comp.	Clg.
Adventure	6
Allouez	56½
Am. Zinc	39⅞
Arcadian	7
Arizona Com.	49¾
Atlantic	11⅞
Boston Con.	21⅞
Calumet & Ariz.	102½
Calumet & Hecla.	680
Centennial	37
Con. Mercur	.10
Copper Range	84
Daly-West	8¾
East Butte	14
Franklin	18
Greene—Can	11⅝
Hancock	33
Isle Royal	27¾
Keweenaw	6¾
La Salle	18⅛
Mass.	6½
Michigan	‡7½
Mohawk	67
Nevada	26½
North Butte	48
Ojibway	12¼
Old Dominion	54¾
Osceola	168½
Parrot	19½
Quincy	88
Rhode Island	10½
Shannon	16½
Superior	63½
Superior & Bost	16
Superior & Pitts.	16
Tamarack	68
Trinity	9¼
U. S. Smg. & Ref	54
U. S. Sm. & Re., pd	53
Utah Con.	45¼
Victoria	5¼
Winona	10¾
Wolverine	115
Wyandotte	2⅝

‡Last quotation

N. Y. INDUSTRIAL

Am. Agri. Chem.	48¾
Am. Smelt. & Ref.	103¼
Am. Sm. & Ref., pf.	111⅜
Colo. Fuel & Iron.	50⅛
Federal M. & S., pf.	‡87¼
National Lead	88¾
National Lead, pf.	110¼
Pittsburg Coal	28¾
Republic I. & S	4. ⅜
Republic I. & S., pf.	104
Sloss-Sheffield	87¼
Standard Oil	‡666
U. S. Steel	90⅝
U. S. Steel, pf.	125½
Va. Car. Chem	56⅛

BOSTON CURB	Low.
Ahmeek	225
Chemung	14
Chino	11¾
Gila	10
Indiana	9
Mason Valley	2 1/16
Ray Central	3⅞
Ray Con	26¼
San Antonio	8½
Yuma	1⅞

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Dec. 24

N. of Com.	High.	Low.
Adams	.40	.38
Am. Nettie.	.09	.07
Center Cr'k	2.00	1.80
Cent. C. & C.	87.00	86.00
C. C. & C. pf.	85.00	84.00
Cent. Oil	115.00	100.00
Columbia	9.00	7.00
Con. Coal	19.00	17.00
Doe Run.	110.00	100.00
Gra. Bimet.	.35	.30
St. Joe	12.50	11.00

LONDON Dec. 29

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 8 0
Esperanza	2 18 0
Tomboy	1 0 0
El Oro	1 6 9
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 29.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.25
Best & Belcher	‡.84
Caledonia	.64
Chollar	.28
Comstock	.29
Con. Cal. & Va.	1.55
Crown Point	1.05
Exchequer	.30
Gould & Curry	.30
Hale & Norcross	.50
Mexican	1.70
Ophir	1.90
Overman	‡.67
Potosi	‡.64
Savage	.50
Sierra Nevada	.56
Union	.86
Utah	‡.11
Yellow Jacket	1.15
TONOPAH STOCKS	
Belmont	.60
Extension	.68
Golden Anchor	...
Jim Butler	.10
MacNamara	.28
Midway	.16
Montana	.82
North Star	.02
Tono'h Mine of N.	7.43¾
West End Con.	.20
GOLDFI'D STOCKS	
Adams	.01
Atlanta	.10
Blue Bell	.02
Booth	.08
C.O.D. Con	.06
Columbia Mt.	.05
Comb. Frac.	.41
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.62½
Goldfield Belmont	.04
Goldfield Daisy	.08½
Great Bend.	.03
Jumbo Extension	.11
Kendall	‡.03
Lone Star	.02
May Queen	.04
Oro	.02
Red Hill	.03
Sandstorm	.04

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King.	.01
Mont. Shoshone C.	1.25
Tramp Cons.	.04
MISCELLANEOUS	
Cumberland Ely.	8.00
Giroux	11.12½
Greenwa'r Copper	.09
Nevada Con.	26.87½
Nevada Hills	.65
Nevada Smelting.	1.00
Nevada Wonder.	.60
Nevada-Utah	1.37½
Penn-Wyoming	.
Pittsburgh S. Pk.	.85
Ray Central	3.83¾
Ray Con	27.00
Round Mt. Sphinx	.05

COLO. SPRINGS Dec. 17

Name of Comp.	Clg.
Acacia	.06
C. C. Con	.03⅛
Dante	.07½
Doctor Jack Pot.	.08
Elkton	.68½
El Paso	.63
Findlay	.10
Gold Dollar	.10½
Gold Sovereign	.04¼
Isabella	.19
Jennie Sample	.08
Jerry Johnson	.08⅜
Lexington	.48½
Mary McKinney	‡.48
Old Gold	.04
Pharmacist.	.03⅛
Portland	.87
U. G. M.	.08⅝
Vindicator	.73½
Work	‡.06½

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.	....	Feb. 1	$1.00
Arcadian Copper, Mich.	....	Mar. 1	0 50
Chemung Copper, N. M.	Jan. 1	Jan. 2	1 00
Con. Imperial, Nev.	Jan. 11	Feb. 3	0.01
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Gordon M. & M., Utah	Jan. 15	Feb. 4	0.002
Hancock Min., Mich.	....	Feb. 1	1.00
Mineral Flat Colo.	Dec. 11	Jan. 6	0.01
Mountain Dell Con., Utah.	Dec. 21	Jan. 10	0.01
Palmyra G. & C., Utah	Dec. 29	Jan. 19	0.002
Precious Metals M. & M., Cal.	Dec. 27	Jan. 31	0.01
Reindeer C. & G., Ida	Dec. 31	Jan. 19	0.003
Seven Bros.-Pioche, Nev.	Jan. 15	Feb. 4	0 002
Sheba Gold & Silver, Utah	Jan. 19	Feb. 23	0.05
Sierra Nevada, Nev.	Jan. 11	Feb. 3	0 10
Silver Hill, Nev.	Dec. 23	Jan. 14	0 05
Silver King Con., Utah	Jan. 17	Feb. 5	0 10
Union Con., Nev	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah.	Feb. 1	Feb. 20	0.00
Winona, Mich	Dec. 1	Jan. 1	1 00

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these atents Issued by the United States Patent ffice will be mailed by The Engineering nd Mining Journal upon the receipt of 25 ents. British patents are supplied at 40 ents. In ordering specifications, correspond- nts are requested to give the number, name f inventor and date of issue.

ALUMINUM

MANUFACTURE of Alumina. Gilbert Mc- ulloch, East St. Louis, Ill., assignor to luminum Company of America, Niagara alls, N. Y., a Corporation of Pennsylvania. U. S. No. 941,799; Nov. 30, 1909.)

COAL AND COKE

BRIQUETTING — Process of Briquetting oal. Charles E. Hite, Burlington, N. J. U. S. No. 941,454; Nov. 30, 1909.)

COAL-PUNCHER-SHARPENING MACHINE. ohn B. Word and William W. Word, San rancisco, Cal., assignors to Word Bros., San rancisco, Cal., a Corporation of California. U. S. No. 941,484; Nov. 30, 1909.)

COAL WASHING—Coal or Ore Washer. rnst Prochaska, Alton, Ill. (U. S. No. 942,-61; Dec. 7, 1909.)

COAL WASHING—Improvements in Coal ashing Machines and the Like. E. A. avies, Trealaw, and Heenan Froude, Ltd., lanchester, England. (Brit. No. 20,759 of 908.)

COKE HANDLING—Apparatus for Hand- ng Coke. Donald McDonald, Louisville, Ky. U. S. No. 942,341; Dec. 7, 1909.)

COKE OVENS—Door for Coke Ovens. Wil- ard O. White, Republic, Penn. (U. S. No. 41,398; Nov. 30, 1909.)

COKING PROCESS. Leland L. Summers, hicago, Ill. (U. S. No. 935,177; Sept. 28, 909.)

PEAT—Machine for Condensing Peat. Wil- ur L. Shepard, Elmwood, Conn., assignor of ne-half to Horace J. Wickham, Manchester, onn. (U. S. No. 940,944; Nov. 23, 1909.)

SEPARATOR—Centrifugal Dry Coal Sep- rator. Alfred Ernst, Pittsburg, Penn., as- ignor to the Coal and Coke By-Products ompany, a Corporation of West Virginia. U. S. No. 942,251; Dec. 7, 1909.)

COPPER

CONVERTER — Copper-Matte Converter. lias A. C. Smith, Baltimore, Md. (U. S. o. 942,675; Dec. 7, 1909.)

CONVERTER — Metallurgical Converter. illiam H. Peirce, Baltimore, Md. (U. S. o. 942,661; Dec. 7, 1909.)

CONVERTER—Method of and Converter essel for Bessemerizing Copper Matte. Wil- am H. Peirce and Elias A. C. Smith, Balti- ore, Md. (U. S. No. 942,346; Dec. 7, 1909.)

CONVERTER HOOD AND FLUE. Almon . Turner, Copper Cliff, Ontario, Canada, as- ignor to International Nickel Company, New ork, N. Y., a Corporation of New Jersey. U. S. No. 942,801; Dec. 7, 1909.)

GOLD AND SILVER

AMALGAMATION—Apparatus for Distil- ng Mercury from Gold Amalgam. William . Bennett, London, England. (U. S. No. 37,356; Oct. 19, 1909.)

AMALGAMATOR. Herbert A. Corliss, rants Pass, Ore. (U. S. No. 941,560; Nov. 0, 1909.)

AMALGAMATOR. Merritt F. Lansdale, enver, Colo., assignor of one-half to Hiram . Fowler, Denver, Colo. (U. S. No. 941,371; ov. 30, 1909.)

CONCENTRATOR AND AMALGAMATOR. ohn I. E. Nelson, Bettles, Alaska. (U. S. o. 942,584; Dec. 7, 1909.)

ELECTRO-CYANIDATION — Process of reating Ores. John R. Parks, Spokane, ash. (U. S. No. 940,821; Nov. 23, 1909.)

ORE TREATMENT—Process of Recovering recious Metals. James H. Reid, Newark, . J. (U. S. No. 937,387; Oct. 19, 1909.)

PLACER MINING—Apparatus for Wash- ng out Placer Gold.. Samuel Rachelman, St. aul, Minn., assignor to Northern Placer Machine Company, St. Paul, Minn., a Corporation of Minnesota. (U. S. No. 942,663; Dec. 7, 1909.)

IRON AND STEEL

FERRO-ALLOYS — Process of Producing Ferro-Alloys. Edgar F. Price, Niagara Falls, N. Y., assignor, by mesné assignments, to Central Trust Company of New York, trustee, a Corporation of New York. (U. S. No. 942,-349; Dec. 7, 1909.)

HARDENING—Method of Hardening and Toughening Metal. Henry W. Partin, Portsmouth, Va. (U. S. No. 937 263; Oct. 19, 1909.)

MANGANESE STEEL—Process of Treating Manganese-Steel Ingots. Winfield S. Potter, Rahway, N. J., assignor to Manganese Steel Rail Company, Rahway, N. J., a Corporation of New Jersey. (U. S. No. 938,892; Nov. 2, 1909.)

MANUFACTURE — Improvements in the Manufacture of Steel and Similar Metallurgical Operations. Alleyne Reynolds, London, E. C. (Brit. No. 14,933 of 1908.)

SLAG CEMENT—Improvements in or Relating to the Manufacture of Cement from Furnace Slag. G. F. Metzger, Manchester. (Brit. No. 15,164 of 1909.)

LEAD

LEAD OXIDE—Improvements Relating to the Manufacture of Lead Oxide. William Eckford, Rhyl, England. (Brit. No. 26,257 of 1908.)

RARE METALS

TITANIUM ALLOYS—Process of Producing Low-Carbon, Low-Silicon Titanium Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 941,553; Nov. 30, 1909.)

TIN

DETINNING—Process of Detinning Tin-Plate by Means of Chlorine. Hans von Schütz, Wetzlar, Germany. (U. S. No. 940,-898; Nov. 23, 1909.)

MINING—GENERAL (Including Machinery)

CONVEYER—Wall Conveyer for Mines. Patrick J. Riley, Hallsville, W. Va. (U. S. No. 942,750; Dec. 7, 1909.)

CONVEYING—Improvements in and Relating to Appliances for Elevating and Conveying Stone, Ores, Coal and Other Minerals and Materials. Robert F. Pechin and Harry S. Pechin, Leicester. (Brit. No. 22,155 of 1908.)

ELECTRIC DRILL. Purd J. Lincoln, Birmingham, Ala. (U. S. No. 942,396; Dec. 7, 1909.)

MINE-DOOR-OPERATING DEVICE. John M. Sausser, Osnaburg, Ohio. (U. S. No. 941,-102; Nov. 23, 1909.)

MINER'S LAMP. John Van Liew and Adletia M. Van Liew, Houghton, Mich. (U. S. No. 941,897; Nov. 30, 1909.)

ORE CAR—Car for Transporting Ore or Other Material. William C. Carr, Buffalo, N. Y. (U. S. No. 941,405; Nov. 30, 1909.)

PUMPS—Improvements in Pumps for Mine Shafts. Richard Heidecke and Otto Lellan, Neudorf, Germany. (Brit. No. 24,527 of 1908.)

ROCK DRILL. Herman L. Hibschle, Victor, Colo., assignor to the MacCormack Drill and Manufacturing Company, Cripple Creek, Colo., Incorporated. (U. S. No. 941,251; Nov. 23, 1909.)

ROCK DRILL—Internal-Combustion Rock Drill. Lewis L. Scott, Joplin, Mo. (U. S. Nos. 941,731 and 941,732,; Nov. 30, 1909.)

ROCK DRILLS—Improvements in Rock-Boring Machines. Hermann G. Spengel, Johannesburg, Transvaal. (Brit. No. 20,267 of 1908.)

SHAFT SINKING. George R. Moore, Chicago, Ill. (U. S. No. 941,087; Nov. 23, 1909.)

STADIA-ROD. Julian H. Granbery, East Orange, N. J. (U. S. No. 940,007; Nov. 16, 1909.)

ORE DRESSING—GENERAL (Including Machinery)

CONCENTRATION—Improvements in Apparatus for Washing and Separating or Concentrating Metallic Ores, Minerals and the Like. Charles W. Lyon, Dewsbury, England. (Brit. No. 20,752 of 1908.)

CONCENTRATION—Means for the Concentration by Amalgamation of Values of Metallic Ore Matter. Royer Luckenbach, Colwyn, Penn., assignor to Borindum Extraction Company, a Corporation of Arizona. (U. S. No. 9?8,676; Nov. 2, 1909.)

CONCENTRATION — Ore Concentrating Table. Thomas W. Scott, Morenci, Ariz. (Brit. No. 23,443 of 1908.)

CONCENTRATION — Ore Concentrator. Charles L. McKesson and Orville S. Black, Colorado Springs, Colo. (U. S. No. 941,251; Nov. 23, 1909.)

CONCENTRATION—Slime-Feeding Device for Concentrators. Joseph B. Green, Wallace, Idaho, assignor of one-fourth to Harvey A. Houston and one-fourth to Henry Lieb, Wallace, Idaho. (U. S. No. 941,918; Nov. 30, 1909.)

SCREENING—An Improved Form of Construction for Reciprocating Screens, Conveyers and the Like. William Bardill, Wantage. (Brit. No. 15,832 of 1909.)

SCREENING—Improvements in or Relating to Machinery or Apparatus Empolyed for Screening Stone, Ore and Like Material. William H. Baxter, Leeds. (Brit. No. 17,245 of 1909.)

SCREENING — Vibrating Shaker-Screen. Loyd C. Dibert, San Francisco, Cal. (U. S. No. 941,862; Nov. 30, 1909.)

SEPARATOR—Magnetic Separator. Walter B. Moore, Walla Walla, Wash. (U. S. No. 940,266; Nov. 16, 1909.)

SEPARATOR—Ore Separating or Concentrating Apparatus. George F. Godley, Philadelphia, Penn. (U. S. No. 941,634; Nov. 30, 1909.)

SEPARATOR—Sand and Slime Separator and Classifier. Charles Allen, El Paso, Tex. (U. S. No. 942,697; Dec. 7, 1909.)

WASTE ROCK ELIMINATOR—Apparatus for Waste-Rock Elimination. Henry L. Kramer, Kramer, Ind. (U. S. No. 942,083; Dec. 7, 1909.)

METALLURGY—GENERAL (Including Machinery)

BLAST FURNACE for Treating Ores. Herman C. Bellinger, Salt Lake City, Utah, assignor of one-half to G. E. Elvis, Salt Lake City, Utah. (U. S. No. 942,052; Dec. 7, 1909.)

CHARGING APPARATUS — Improvements in Means for Charging Gas Producers and Blast Furnaces. Thomas Elcoate, Stockton-on-Tees, Eng. (Brit. No. 2986 of 1909.)

ELECTRIC FURNACE. Charles A. Keller, Paris, France. (U. S. No. 941,419; Nov. 30, 1909.)

ELECTRIC FURNACE. Frederick T. Snyder, Oak Park, Ill., assignor to Electric Metals Company, Chicago, Ill., a Corporation of West Virginia. (U. S. No. 942,110; Dec. 7, 1909.)

ELECTRIC SMELTING—Method of Working Metals, Ores and the Like. Otto Frick, Saltsjöbaden, Sweden. (U. S. No. 938,752; Nov. 2, 1909.)

LIME BURNING—Process of Burning Lime and Apparatus Therefor. Henry L. Doherty, New York, N. Y. (U. S. No. 938,987; Nov. 2, 1909.)

MELTING FURNACE—Metal-Melting Hydrocarbon-Burning Furnace. Garnet W. McKee, Chicago, Ill. (U. S. No. 940,710; Nov. 23, 1909.)

ORE-ROASTING POT. Frank D. Baker, Denver, Colo. (U. S. No. 942,810; Dec. 7, 1909.)

ORE TREATMENT—Process for Treating Certain Ores. Herbert S. Auerbach, New York, N. Y. (U. S. No. 941,904; Nov. 30, 1909.)

REFRACTORY ORE TREATMENT—Method of Securing the Chloridization of Ores. William Koehler, Cleveland, Ohio. (U. S. No. 942,569; Dec. 7, 1909.)

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—	
Carbons, good drill quality, carat	$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd.........lb.	.08
Grains................. "	.10@.17
Corundum .... "	.07@.10
Crushed Steel, f.o.b. Pittsburg.................. "	.05¾@.06
Emery, in kegs; Turkish flour.................... "	.01¾@.02
Grains.............. "	.03½@.04
Naxos flour............ "	.01¾@.02
Grains.............. "	.03½@.04
Chester flour.......... "	.01½@.02
Grains.............. "	.03½@.04
Peekskill flour, f.o.b. Easton, Pa.......... "	.01¼@.01¾
Grains, in kegs....... "	.02¾@.03
Garnet, per quality..sh. ton.	25.00@35.00
Pumice Stone, Am. Powd., 100 lb.	1.25@2.00
Italian, powdered..per lb.	.01½@.01¾
Lump, per quality.. "	.03½@.30
Rottenstone, ground.. "	.01¾@.04
Lump, per quality.. "	.04@.30
Rogue, per quality... "	.05@.30
Steel Emery, f.o.b. Pittsburg............ "	.07½@.07¾
ACIDS—	
Acetic 28%...............lb.	.02⅜
Boric.................... "	.07
Hydrofluoric, 30%........ "	.02½@.03¼
" 48%........ "	.05½
" 52%........ "	.06½
" 60%........ "	.08½@.09
Hydrochloric acid, 20° per 100 lb.	1.15@1.50
Nitric acid, 38°........per lb.	.04¼@.04½
Sulphuric acid, 50°, bulk per ton.	$12 up
60°, 100 lb. in carboys.	.85@1.12½
60°, bulk, ton.........	16.00@18.00
66°, 100 lb. in carboys.	1.00@1.10
66°, bulk, ton.........	18.00
Oxalic...............per lb.	.07¼@.07½
ALCOHOL—Grain 95%.....gal.	2.61
Denatured............... "	.42@.44
Refined wood 95@97%... "	.52@.57
ALUM—Lump..........100 lb.	$1.75
Ground............. "	1.85
Chrome Alum......... "	.04⅜@.04½
ALUMINUM—Sulphate, com'l. lb.	1.50@1.75
AMMONIA—24 deg. lb...... "	.04½@.05½
" 26 deg. lb...... "	.04¾@.05¾
AMMONIUM—	
Bromide.................lb.	.28
Carbonate.............. "	.08@.08⅜
Muriate grain.......... "	.05⅜@.06¼
Lump................. "	.09¼@.09½
Sulphate, 100 lb........ "	2.60@2.65
Sulpho-cyanide com.........	.30
" " chem. pure...	.40
ANTIMONY—needle, lump..lb.	.04⅜@.04¼
Oxide .... "	07⅜@.08
ARSENIC—white.......... "	.02¾
Red, Outside brands...... "	.07
Saxony............... "	.07½@.08
ASPHALTUM—	
Barbadoes...........per ton.	50.00@80.00
West Indies.......... "	20.00@60.00
Egyptian...............lb.	.11@.16
Gilsonite, Utah ordinary per ton.	32.00@40.00
Trinidad............ "	20.00@25.00
California...........per ton.	25.00@30.00
BARIUM—	
Carb. Lump. 80@90% .lg. ton.	26.00@35.00
Precipitated, 96@98% "	34.00@36.00
Chloride com'l...........ton.	35.00@38.00
Nitrate powdered, in casks .lb.	.05@.06½
Blanc Fixe, dry, bbl....per lb.	.02¾@.03½
BARYTES—	
Am. Ground.........sh. ton.	12.00@15.00
Floated........... "	17.00@19.00
Foreign floated....... "	20.00@23.00
BLEACHING POWDER—35% 100 lb..........	1.40@2.00
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.	4.10@4.35
BONE ASH..........lb.	.02¾@.04
BORAX, sacks.......... "	.03¾@.05
CALCIUM—Acetate, gray, 100 lb.	1.90@2.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.......sh. ton.	65.00
Chloride, f.o.b. N. Y. "	11.00@14.10
CEMENT—	
Portland, Am. 500 lb....bbl.	1.50@1.60
Foreign........... "	2.25@2.90
"Rosendale," 300 lb....... "	85
In sacks........... "	65
Slag cement........... "	.75@1.25
CHROME ORE—	
New Caledonia 50% ex ship N. Y.........per lg. ton.	11.00@16.00
Bricks, f.o.b. Pittsburg, per M.	175.00
CLAY, CHINA—Am. common ex-dock N. Y.........ton	7.00@10.00
Foreign............ "	10.00@20.00
COBALT—Oxide.........lb.	.80@.85

COPPERAS—Bulk.....100 lb.	$0.55
In bbls............... "	.65@.80
In bags............... "	.60@.75
CRYOLITE (carload).......lb.	.06@.07
FELDSPAR—Ground..sh. ton.	5.00@14.00
FIRE BRICK—	
American...............per M.	30.00@40.00
Imported............. "	30.00@45.00
St. Louis............. "	16.00
Extra................ "	20.00@23.00
Special extra.......... "	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.	
St. Louis, extra quality.per ton.	5.00
" ordinary.... "	2.50
FLUORSPAR—	
Domestic f.o.b. shipping port:	
Lump................ ton.	8.00@10.00
Ground............... "	12.00@14.00
Foreign crude ex. dock. "	8.50
FULLER'S EARTH—Lump, 100 lb.	.80@.85
Powdered.......... "	.80@.85
GRAPHITE—Ceylon.	
Flying dust, finest to best...lb.	.02@.04
Dust.................... "	.02¼@.05
Chip.................... "	.04@.08
Lump.................... "	.05½@.12
Large lump.............. "	.08¼@.10½
GYPSUM—	
Fertilizer............sh. ton.	5.00
Ground.............. "	4.00@7.00
INFUSORIAL EARTH—	
Ground Am. Best..........lb.	.01¾@.02¼
German................. "	.02¼@.02⅝
LEAD—Acetate (sugar of) brown, ...lb.	.07¾@.08
Nitrate, com'l.......... .. "	.07⅞@.08½
MAGNESITE—Greece.	
Crude (95%)..........lg. ton.	7.50@8.50
Calcined, powdered....sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg...............M.	160@200
MAGNESIUM—	
Chloride, com'l.........100 lb.	.90@1.25
Sulphate (Epsom salt)..100 lb.	.90@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide.......lb.	.01@.01¼
75@85% binoxide....... "	.01¼@.01½
85@90% binoxide....... "	.01½@.04
90@95% binoxide....... "	.06½
Ore, 80%-85%........sh. ton.	16.00@32.50
MARBLE—Flour.......sh. ton.	8.50@9.00
MINERAL WOOL—	
Slag, ordinary........sh. ton.	19.00
Selected............ "	25.00
Rock, ordinary....... "	32.00
MONAZITE SAND—	
Guar. 97%, with 5% Thorium oxide, normal............lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained...........	.47
Sulphate, single...........lb.	.10¼@.11
Sulphate, double.......... "	.05⅞@.08
NITRATE OF SODA—	
100 lb. 95%..................	2.10
95% for 1910.........	2.10
96% is 2½@7½c. higher per 100 lb.	
OZOKERITE—best.........lb.	.14@.17
PAINTS AND COLORS—	
Litharge, Am. powdered....lb.	.05¾@.06¼
English glassmakers'..... "	.08¼@.09¼
Lithopone................ "	.03½@.07
Metallic, brown.......sh. ton.	16.50@22.00
Red............... "	14.00@18.00
Ocher, Am. common... "	8.50..9.00
Best............... "	16.00
Dutch, washed...........lb.	.02¾@.03
French, washed......... "	.01¾@.02
Paris green, pure, bulk..... "	.17½@.20½
Red lead, American........ "	.06¼@.06½
Foreign .... "	.08¼@.09¼
Turpentine, spirits bbl., per gal.	.58½@.60
White lead, Am., dry.......lb.	.05½@.05⅝
American, in oil........ "	.06¾@.07
Foreign, in oil.......... "	.07⅛@.09¾
Zinc white, Am. extra dry.. "	.05¼@.05⅝
French, proc's, red seal, dry "	.06¾@.07½
French, process, green seal, dry.................. "	.07¼@.10¼
PHOSPHATES—Acid........55@60c. per unit	
*Fla., hard rock 77%.......	6.50@9.00
land pebble 68%.......	3.75@4.00
†Tenn., 78@80%.............	5.00@5.50
75%...............	4.75@5.00
68@72%............	4.25@4.50
‡So. Car. land rock 60%......	3.50@4.00

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—	
Bicarbonate crystal........lb.	$.07½
Powdered or granulated.. "	.08
Bichromate, Am........... "	.07½@.08
Scotch............... "	.10¾
Bromide.............. "	.20
Carbonate (80@85%)...... "	.03⅝@.04
Caustic, ordinary.......... "	.05¼
Elect. (90% KOH)...... "	.06
Chloride (muriate), 100 lb..	1.90
Chlorate, powdered........ "	.09⅛@.09⅜
Crystals.............. "	.08⅞@.09⅛
Cyanide (98@99%)	
Carloads (30,000 lb.)..... "	18c.
5-ton lots................	18½c.
Less than 5 tons...........	.20
Kainite, long ton, bulk, 8.50; bags,	9.50
Permanganate............lb.	.09¼@.10½
Prussiate, yellow.......... "	.13@.13¾
Red.................. "	.29@.32
Sulphate (basis 90%)...100 lb.	2.18@2.21
PYRITE—	
Domestic, non-arsenical, furnace size, f.o.b. mines....per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines........	10@10½c.
Imported, non-arsenical, furnace size, ex-ship, per unit.......	.12@.12½
Imported, arsenical, furnace size, ex-ship, per unit............	.11½@.12
Imported fines, arsenical, ex-ship, per unit....................	.09
Imported fines, non-arsenical, ex-ship, per unit..........	10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl.	.72@1.13
N. Y. agricultural.....sh. ton.	3.80@4.50
SALTPETER—Crude...100 lb.	4.00@4.50
Refined, crystals.......... "	5.50@7.00
SILICA—	
Ground quartz, ord'ry..lg. ton.	10.00@15.00
Silex, ground....... "	13.00@15.00
Silex, floated....... "	35.00@40.00
Lump quartz....... "	5.00@5.50
Glass sand.......... "	2.75
SILVER—Nitrate, crystals...oz.	.33¼@.36¾
SODIUM—Acetate...........lb	.04½@.05
"Alkali," per 100 lb., 58/48...	.80@.87½
Bicarb. soda, per 100 lb......	1.00@1.30
Soda, caustic, per 100 lb., 78/60	1.80@2.00
Soda, caustic, powdered......	.02½@.03
Salt cake, per 100 lb., bulk....	.60
Salt cake, bbl...............	.65@.85
Soda, monohydrate, per lb....	1.40@1.75
Bichromate...............lb.	.05⅝@.06¼
Bromide.................. "	.20
Chlorate, com'l........... "	.08½@.09½
Cyanide, 120-130% KCN, per 100%	
Carloads (30,000 lb.).....lb.	18c.
5-ton lots............. "	18½c.
Less than 5 tons......... "	.20
Hyposulphite, Am......... "	1.30@1.50
Phosphate............100 lb.	2.10@2.40
Prussiate............. "	.08½@.09
Sal soda, f.o.b. N. Y... "	.65@.75
Foreign, f.o.b. N. Y.. "	.80@1.00
Silicate, com'l.......... "	.65@1.00
Sulphate, com'l (Glauber's salt) ....100 lb.	.60@.80
Sulphate, com'l, calcined.....	.65@.85
STRONTIUM—Nitrate......lb.	.07¼@.08
SULPHUR—Louisiana (prime) to New York..........lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore.......... "	22.50 up
Roll...............100 lb.	1.85@2.15
Flour.............. "	2.00@2.40
Flowers, sublimed... "	2.20@2.60
Powdered commercial, bags	1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York......lg. ton.	$22.00
TERRA ALBA—Fr.&Eng. 100 lb.	.70@1.00
TALC—Domestic.......sh. ton.	12.00@20.00
French.............. "	15.00@25.00
Italian, best.......... "	30.00@40.00
TIN—Bi-chloride, 50°.......lb.	.09¾
Crystals................ "	.22@.23¼
Oxide, lb................ "	.37@.40
URANIUM—Oxide.......... "	2.20@4.25
ZINC—Chloride sol., com. 20° "	.02¼
Chloride, granular......... "	.04¼
Dust .... "	.06¾
Sulphate................ "	.02@.02½

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as mattesr of private contract.

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January 1.............. 9,000
January 8.............. 13 000
one sent free regularly, no back numbers. ures are live, net circulation.

n the accompanying table we sum- rize the production of the more im- tant minerals and metals in the United .tes in 1909 so far as it has been pos- le to collect the statistics at so early a e. The figures for copper, lead and lter are based on reports received di- tly from the producers, who have nmunicated their actual output dur- the first 11 months of the year, to- her with their estimates of probable duction in December; in many cases estimates are for only the last few 's of December. The other statistics based chiefly on the reports of pro- ers, State mine inspectors, and special respondents.

t will be observed that in some cases re are differences between the statis- given by the various contributors to number and our editorial statistics. s is because the articles of our outside contributors were necessarily written and put into type before our own statistics were available, which in some cases was not until Jan. 5, 1910, and consequently the statistics of our contributors are generally estimates. This explanation will account for discrepancies, though the reason will be so obvious to our readers that an explanation is hardly required.

We thank the producers of metals and minerals for their courteous coöperation by promptly and fully furnishing us with statements of their production in 1909 and we thank the many other persons who have aided in the preparation of this number.

The metal industries revived in 1909 from the depression that began in 1907. About the middle of 1909 the demand for copper, lead, spelter and iron began to be buoyant. Except in the case of spelter, which was influenced by special conditions, prices ruled during 1909 at a little below what are commonly considered to be the normal averages. This was obviously due to the marketing of the accumulated stocks with which the year began, and also the greatly increased current production. In copper, lead and spelter the highest previous records of production were greatly exceeded. Indeed, the gain in the statistics of these metals is but little short of marvelous.

In spite of this result it was the common talk during 1909 that the mining industry was slack. The sellers of mining machinery and supplies complained generally respecting unsatisfactory business. Yet the developed mines were producing more than ever before and much new construction was going on. The complaint arose, we think, because less than ordinarily was done toward the development of new mines. The reason for this was obviously that times had not yet become propitious for the financing of new enterprises calling for men, machinery and supplies. However, toward the end of 1909 there was a noteworthy improvement in this particular, as was evidenced by the introduction of a large number of new concerns upon the stock exchanges and open markets and an increased display of interest on the part of the public.

MINERAL AND METAL PRODUCTION OF THE UNITED STATES.

Preliminary Statistics, Subject to Revision.

Product.	Customary Measure.	1908.			1909.			Changes in Quantity.
		Quantity.	Value.		Quantity.	Value.		
			Total.	Per Unit.		Total.	Per Unit.	
-METALLIC:								
oal, bituminous	Short ton	337,929,632	$387,678,972	$1 14	360,076,905	$414,448,517	$1.15	I. 22,147,273
oal, anthracite	Short ton	80,329,578	159,122,961	1.98	77,099,336	153,757,678	1.99	D. 3,230,242
ron ore	Long ton	33,789,987	60,821,976	1.80	53,033,873	954,609,714	1.80	I. 19,243,886
.imestone flux	Long ton	9,563,158	4,720,485	0.47	14,070,000	7,316,400	0.52	I. 4,506,842
etroleum	Barrel (*b*)	184,711,413	136,347,831	0.74	180,717,696	133,864,299	0.74	D. 3,993,717
TALLIC:								
opper	Pound	948,196,490	127,438,536	13.424c	1,098,287,425	146,456,628	13.335c	I. 150,090,935
ron, pig	Long ton	15,936,018	267,540,378	16.80	25,711,846	437,101,382	17.00	I. 9,775,828
.ead	Short ton	318,876	26,785,584	84.00	374,579	32,011,521	85.46	I. 55,703
uicksilver	Flask (*d*)	17,969	805,690	44.90	20,000	926,000	46.30	I. 2,031
inc (*e*)	Short ton	210,511	19,897,500	94.52	267,069	29,660,683	111.06	I. 56,558

(*b*) Barrels of 42 gal. (*d*) Flasks of 75 lb. (*e*) Includes zinc from foreign ore.

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Metal Markets

New York, Jan. 5—The metal markets in the first week of the year are not specially active, but prices are generally firm.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1909..	$15,649,281	$ 3,863,637	Exp. $11,785,644
" 1908..	2,967,795	2,909,883	" 57,912
Year 1909..	122,301,517	42,003,194	" 80,298,323
" 1908..	73,857,749	45,123,561	" 28,732,188
Silver:			
Nov. 1909..	4,951,483	4,691,807	Exp. 259,676
" 1908..	3,951,987	3,275,609	" 676,378
Year 1909	52,294,314	41,981,006	" 10,313,338
" 1908..	47,111,582	37,814,676	" 9,296,706

Exports from the port of New York, week ended [illegible] 29: Gold $260,200, principally to Panama; silver, $713,525, to London and Paris. Imports: Gold, $202,993; silver, $202,625 from Australia, South America and Mexico.

Gold—Prices on the open market in London have remained at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin.

Platinum—Quotations for refined platinum are unchanged, at $29.50 per oz. For hard metal there is an advance, $36 per oz. being asked.

Silver—The market continues steady with good demand. Silver is being disposed of and distributed as produced. There are no special stocks held on this side, though we understand the accumulations in China have been large owing to the trade imports being much less than the exports. The large difference of £9,000,000 in them readily accounts for the great stock of sycee in Shanghai.

SILVER AND STERLING EXCHANGE

Dec.-Jan.	30	31	1	3	4	5
New York....	52⅝	52⅝	......	52½	52⅝	52⅝
London.. ..	24¼	24¼	24¼	24 3/16	24¼	24¼
Sterling Ex..	4.8705	4.8695	......	4.8675	4.8670	4.8695

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Dec. 23, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India........	£ 9,147,390	£6,567,600	D. £2,579,790
China.......	641,400	1,930,000	I. 1,288,600
Straits......	164,885	114,600	D. 50,285
Total......	£ 9,953,675	£8,612,200	D. £1,341,475

India Council bills in London sold at an average of 16.09d. per rupee.

Copper, Tin, Lead and Zinc

Dec.-Jan.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
30	13¾ @14	13½ @13⅝	61½	33¾	4.70	4.60 @4.65	6.05 @6.07½
31	13⅞ @14	13½ @13¾	61¾	33¾	4.70	4.60 @4.65	6.05 @6.07½
1	......	......	....	....	....	......	......
3	13⅞ @14	13⅝ @13¾	62	33⅜	4.70	4.60 @4.62½	6.05 @6.07½
4	13⅞ @14	13⅝ @13¾	61⅛	32½	4.70	4.60 @4 62½	6.05 @6.07½
5	13⅞ @14	13⅝ @13¾	61 9/16	33¼	4.70	4.60 @4.62½	6.05 @6.07½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—There has been a good demand, particularly from the home trade, and considerable business has been done at advancing prices. The manufacturers are very busy and are booking much new business. At the close, Lake copper is quoted at 13⅞@14c., and electrolytic copper in cakes, wirebars and ingots at 13⅝@13¾c. Casting copper is quoted nominally at 13⅜@13½ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is fair.

The market for standard copper in London has been firm. It advanced on Monday to £62. On Tuesday, under considerable sales by speculative holders who wanted to realize, it declined to £61 2s. 6d. and closed on Wednesday at £61 11s. 3d. for spot £62 10s. for 3 months.

Refined and manufactured sorts we quote: English tough, £65; best selected, £65@£65 10s.; strong sheets, £75@£76 per ton.

Tin—When the unfavorable statistical position of tin, showing increased shipments from the Straits, smaller deliveries for consumption in the United States and an increase in the visible supplies of about 900 tons for December, became known at the beginning of this month, the London market declined sharply. The decline made further progress on Jan. 4, when the low point of £148 5s. for spot and £149 12s. 6d. for three months was reached. After this severe decline, a reaction was due, and at the close the market is cabled as firm at £151 7s. 6d. for spot and £152 15s. for three months.

Interest in this market is still lacking, and the little business which took place was for retail lots only. The lowest point reached on Jan. 4 was 32½c. while the close is quoted at about 33¼ cents.

Lead—There is a good business doing from day to day at about last prices, 4.60@4.62½c. St. Louis, and 4.70c. New York.

The London market is strong and advancing, and Spanish lead is now quoted at £13 13s. 9d. and English lead at £13 16s. 3d. per ton.

Spelter—The market remains quiet. Galvanizers are busy but are well covered with raw material. Prices are unchanged at 6.05@6.07½c. St. Louis, and 6.20@6.22½c. New York.

New York quotations for spelter, Dec. 30 to Jan. 5, inclusive, were 6.20@6.22½ cents.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The London market is unchanged at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Antimony—The market is quiet. Cookson's is quoted at 8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask with £9 17s. 6d. asked by jobbers.

Gold, Silver and Platinum in 1909

Review and Statements of the Production of the Three Precious Metals. Conditions Which Influenced Their Commercial Movements and Values

WORLD'S GOLD PRODUCTION $457,567,280

The different gold-producing countries f the world in 1909 not only kept up ie great output of recent years, but gain increased it in a marked degree. he return from the gold mines was reater than had ever before been re-orded in a single year. Gold mining as successfully prosecuted in many ountries and most of them increased ieir returns, by the opening of new ines, by the intensive working of old nes or by closer recovery of metal from ie ores—in some cases by a conjunction of all three methods. The total results are summarized in the accompanying table.

GOLD PRODUCTION OF THE WORLD.

IN DOLLARS.

Country.	1908.	1909.
ransvaal	$145,819,016	$151,900,000
nited States	94,560,000	96,500,000
ustralia	73,314,671	71,980,780
ussia	30,944,561	34.160,000
exico	24,518,548	26,000,000
hodesia	12,276,394	12 605,000
ritish India	10,424,067	10,566,500
anada	9,559,274	10,750,000
ina, Japan and Korea	10,618,850	11,000,000
est Africa	5,773,514	4,625,000
adagascar	1,136,850	2,480,000
ther countries	24,488,752	25,000,00
Total	$443,434,527	$457,567,280

The total increase in the world's production in 1909, as compared with 1908, was $14,122,753, or 3.2 per cent. The larger gains came from the Transvaal, Russia and Mexico. Australia alone of the prominent producing countries showed a decreased output.

The figures for 1908 include the corrected official returns. For 1909 for nearly all the prominent countries—as the Transvaal, Australasia, Rhodesia and India—we have the official returns for 11 months, from which it is possible to estimate the month of December very closely. From Mexico and Russia there are partial returns, and from several other countries information showing the general course of production. In all cases where estimates are required they have been made on a conservative basis, so that we believe the revisions later will increase rather than diminish the total given.

The second table gives the total gold production of the world for 20 years past, during which period it has increased nearly fourfold.

This shows an almost continuous growth, with only a setback during the years of the Boer war when the Transvaal production was cut off almost entirely. The year showing the greatest increase over the preceding one was 1898, when gold from Alaska and the Yukon first came out in large amounts.

GOLD PRODUCTION OF THE WORLD FOR TWENTY YEARS.

1890	$118,848,700	1900	$258,829,703
1891	130,650,000	1901	260,877,429
1892	146,292,600	1902	298,812,493
1893	158,437,551	1903	329,475,401
1894	182,509,283	1904	349,088.293
1895	198,995,741	1905	378,411,054
1896	211.242,081	1906	405,551,022
1897	237,833,984	1907	411,294,458
1898	287,327,833	1908	443,434,527
1899	311,505,947	1909	457,567,280

PRODUCTION IN THE UNITED STATES

From State reports and other information we have estimated an increase of a little less than $2,000,000 in the gold production of the United States during 1909. Owing to some delay in collecting the statistics the preliminary estimates of the United States Mint, which are usually completed in the first week of the New Year, are not yet in shape. We hope to receive and publish them next week.

The Commercial Movement of Gold and Silver

BY FREDERICK HOBART

The continued great production of gold gain brings up the question as to the isposition made of the supplies which ie mines of the world have furnished. t is a question which gives rise to ndless discussion, and probably will ever be susceptible of exact determinaon, since there are elements in the roblem for which no exact figures can ver be obtained. There is no room, at ast in this review, to enter into the iscussion.

COMMERCIAL MOVEMENT OF GOLD

The additions made to the world's isible stocks of gold in 1909 were, as early as can be ascertained, between 5 and 75 per cent. of the total producon; that is, not far from $300,000,000. his includes gold actually coined and assing into circulation, and gold apearing either as coin or bullion in the ank and Government reserves which orm the basis of circulation and credit. he uncertain elements in the disposiion of the gold mined are the quantities used in the arts, for which no definite figures are attainable; the quantities directly hoarded or concealed; and the quantities needed to replace gold lost. These loses arise from actual destruction, as by fire or wreck; from concealment in private boards; from actual disappearance in the many minor forms which are constantly recurring and always escape record.

Large as was the increased monetary stock provided it seemed hardly sufficient to meet the commercial demand, and there were at times during the year calls for gold from the important financial centers which could not be promptly supplied. European markets had the call, and took gold from the United States instead of sending it there as in some previous years. That the new supplies of gold helped the general improvement in business there can be no doubt. That the betterment in conditions ran ahead of the increase in those supplies is another refutation of the theories of those who believe that the production of gold is the sole or the chief factor in commercial prosperity.

GOLD MOVEMENT IN THE UNITED STATES

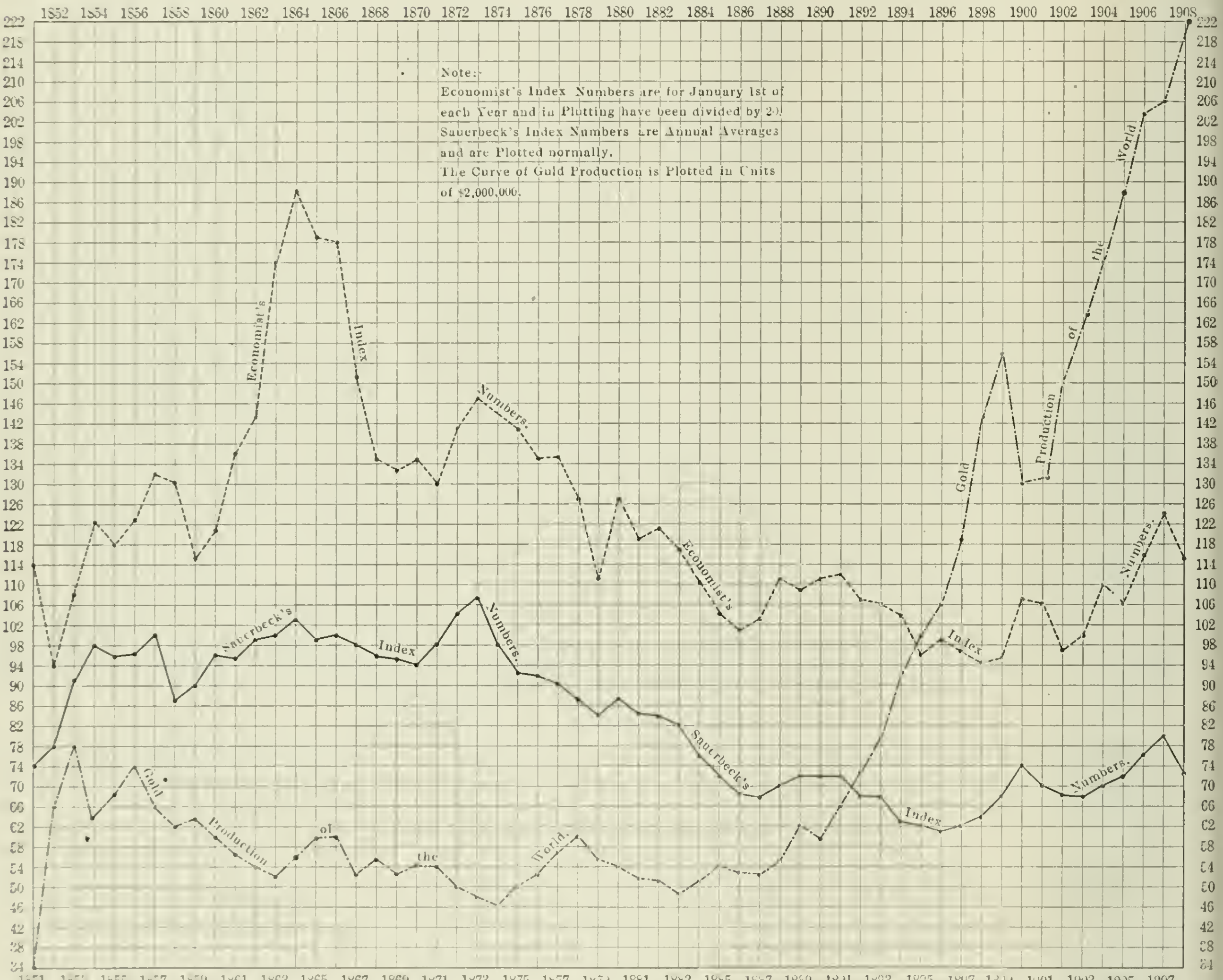
The gold movement in the United States for the 11 months ended Nov. 30 was as follows:

	1907.	1908.	1909.
Exports	$54,211,240	$73,857,749	$122,301,517
Imports	98,949,557	45,123,561	42,003,194
Excess	I. $44,738,317	E. $28,734,188	E. $ 80,298,323

In 1907 the United States drew gold from abroad to an amount equal to nearly half its own production. In 1908 the movement was reversed, and the net exports of gold were about 30 per cent. of the home production. In 1909 the outward movement not only continued, but increased, and the net exports were over 80 per cent. of the gold produced. This reversal of the gold movement was due to a variety of causes. The merchandise exports from the United States in 1909 were rather below those of 1908, and considerably less than those of 1907;

on the other hand, the imports this year increased enormously, being the largest on record for many years. During 1909 there was a strong demand for gold from nearly all the great European banks. Loans made in this country were called in and accommodations were withdrawn. High rates of interest were established by the Bank of England for several months of the year, and its example was followed by the Bank of France and to a greater extent by the Bank of Germany. The rates for money all over Europe were so high as to make it difficult for New York to secure accommodations abroad, and there was less foreign money in use here either in the shape of loans or of speculative accounts in 1909, than for several years.

Much of the gold exported from this country did not go to Europe directly, but was sent to South America on European account. The amount of gold shipped to South America in this way in 1909 was about $62,000,000, five-sixths of it going to Argentina and the rest to Brazil.



Production of Gold and Commodity Prices

Japan took $23,354,000 gold from this country in 1909, against practically nothing in 1908. This movement was mainly in the later months of the year, and its cause is not altogether clear. It was a material contribution to the outward movement. Canada, on the other hand, took less gold than in 1908.

Gold Movement in Great Britain

The movement of gold in Great Britain for the 11 months ended Nov. 30 was as follows:

	1908.	1909.	Changes.
Imports....	£41,539,849	£48,870,125	I. £7,330,276
Exports.....	45,197,929	43,101,383	D. 2,096,546
Excess..	E. £ 3,658,080	I. £ 5,768,742	....

The excess of imports in 1908 was a very unusual condition, and was mainly due to the large demands from France, which is usually a creditor in the London market, and which in that year called in its balances to a large extent. In 1909 the gold was, in turn, attracted to London by the strong demand for money there and the consequent high rates of interest prevailing. Of the imports in 1909 the United States contributed only £2,950,388; but it relieved the Bank of England of the necessity of supplying large amounts for South America.

Gold Movement in France

The gold movement in France for the 10 months ended Oct. 30 was as follows:

	1908.	1909.	Changes.
Imports..	F.789,825,000	F.356,668,000	D.F.433,157,00
Exports..	18,447,000	127,679,000	I. 109,232,00
Excess..	F.771,378,000	F.228,989,000	D.F.542,389,00

The Bank of France in 1909 discontinued the persistent accumulation of gold which had marked its policy for a year previously. Apparently its reserves had reached a total which was deemed sufficient to provide for any possible economic or political contingency. Last year it ceased to reach after all available supplies of gold, and moreover it parted with considerable amounts for loans or investments abroad. At several times during the year it helped the London and Berlin markets when they were in need. France is the great creditor ation of Europe and can always se- ure gold when it is needed. Although ssistance was given to European money arkets, it is reported that French bank- rs declined more than once to aid the peculative position in New York, al- ough tempting offers were made.

Bank Gold Holdings

The gold reserves of the great banks ' Europe were reported as follows in e closing weeks of 1908 and 1909. It iust be understood that these sums ractically represent the banking re- erves of the respective nations, the istom being for them to hold the gold wned by private bankers, as well as ieir own. In the table the amounts are duced to dollars:

	1908	1909.
ank of England . .	$153,662,010	$167,160,405
ank of France . . .	697,645,445	701,397,400
np. Bank of Germany	191,965,000	187,395,500
ıstro-Hungarian Bank	245,730,000	284,070,000
ank of Russia. . . .	607,255,000	701,450,000
etherlands Bank .	42,089,000	50,405,000
elgian National . .	21,413,335	21,233,335
ank of Italy	187,335,000	192,400,000
ank of Spain.	79,030,000	80,570,000
vedish National. .	21,195,000	22,340,000
orwegian.	8,280,000	8,885,000
vitzerland.	23,535,000	24,920,000
Total.	$2,279,134,790	$2,415,226,640

The Bank of Spain, alone of all the uropean banks, carries a large silver eserve, which amounted to $153,910,000 : the end of 1909. The Bank of France eported $175,202,800 in silver coin, but iat amount is small in comparison with s gold. The Bank of Russia includes its statement gold bills on foreign anks, and to that extent there is a uplication, the amount of which can- ot be ascertained. The Bank of Russia lso acts as agent for the Imperial reasury, which to some extent explains ie large amount of its gold reserve.

The total increase during the year in iese visible stocks of gold during the ear was $166,091,850, or about 40 per ent. of the production of the year. It iay therefore be accepted that at least iat proportion of the gold output be- ame an addition to the world's money upply as a basis for currency circula- on, most of these bank reserves being sed in that way. In addition to this iere must have been a considerable mount used as an addition to gold coin circulation.

The specie holdings of the New ork banks declined during the year from 279,129,400 to $251,390,400, a loss of 27,739,000. These holdings include ilver coin as well as gold. The United tates Treasury holds about $1,200,000,- 00 in gold coin and bullion. Of this ver $1,000,000,000 is locked up, being eld against outstanding gold certificates circulation, or as the statutory reserve gainst outstanding United States notes, r greenbacks, as they are popularly alled.

THE [illegible] OF SILVER

The commercial movement of silver in 1909, while not differing greatly in volume, was again represented by rather lower values, owing to the lower range of prices which prevailed. There was, however, little variation in these prices during the year, the market having been steady, though at a low level.

The movement of silver in the United States for the 11 months ended Nov. 30 was as follows:

	1908.	1909.	Changes.
Exports. . .	$47,111,382	$52,291,344	I. $5,182,962
Imports. . .	37,814,676	41,981,006	I. 4,166,330
Excess,E.	$9,296,706	$10,313,338	I. $1,016,632

At the average prices of the year the net exports represented approximately 17,586,000 oz. in 1908, and 20,034,400 oz. in 1909; so that there was an actual increase in quantities of 2,448,400 oz. By far the larger part of the exports went to London, the central market where the buying of silver for the East is done In 1909 there were also considerable shipments of silver to Paris, partly on purchases for the French Mint, and partly on account of increased buying for use in the arts. Direct exports to the East are still comparatively small, the total sent from San Francisco to China having been only a little over $4,000,000 in value. The East is always conservative and prefers to buy its silver in London, no matter where the supplies may come from originally.

The imports of silver are chiefly in ores, base bullion and matte brought to this country to be refined. Mexico is the principal source of these imports, but considerable quantities come from South America, Central America and other countries.

Silver Movement in Great Britain

The silver movement in Great Britain for the 11 months ended Nov. 30 was valued as below:

	1908.	1909.	Changes.
Exports	£11,804 119	£11,557,834	D. £ 246,285
Imports.	9,588,542	10,814,404	I. 1,225,862
Excess, Ex. .	£ 2,215,577	£ 743,430	D. £1,472,147

Of the imports of silver in 1909 a total of £9,124,510 was credited to the United States. A special statement of the exports to the East, as reported by Pixley & Abell, of London, brings the figures up to Dec. 16, only two weeks from the close of the year. The figures are as follows:

	1908.	1909.	Changes.
India. . .	£8,412,390	£6,521,400	D. £1,890,990
China . .	641,400	1,885,000	I. 1,243,600
Straits. .	164,885	114,600	D. 50,285
Total	£9,218,675	£8,521,000	D. £ 697,675

The values given represent, at the average prices of the year, 90,668,000 oz. in 1908, and 86,200,000 oz. in 1909; a decrease of 4,468,000 oz., or 4.9 per cent. in quantities, against a decrease of 7.6 per cent. in values.

India, it appears from this statement, took less silver in 1909 than in 1908. The deficiency was partly made up by a large increase in Chinese buying. It also appeared that the stocks which were reported to have been accumulated in India at the close of 1908 were largely absorbed in 1909. The Indian government was not a heavy buyer in London during the year, its volume of coined silver requiring only moderate additions. At the same time there were lighter shipments of silver from Australia to India, owing to the reduced production from the Broken Hill mines.

Price of Silver

The following table shows the range of prices by months in New York and London for two years:

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April.	55.505	51.428	25.133	23.708
May.	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50 703	22.933	23.351
December	48.766	52.226	22.493	24.030
Total.	52.864	51.503	24.402	23.726

New York, cents per fine ounce; London, pence per standard ounce.

The average yearly quotation of silver in New York for 10 years past has been as follows in cents per fine ounce:

1900.	61.330	1905.	60.352
1901.	58.950	1906.	66.791
1902.	52.160	1907.	65.327
1903	52.570	1908.	52.864
1904.	57.221	1909.	51.503

The average price in 1909 was lower than that for any one of the preceding years. It was 1.361c. below that for 1908, and 0.657c. below the previous low level reached in 1902. It was 15.288c. less than the high point of 1906.

The monthly averages show a fair recovery in January from the extremely low prices of November and December, 1908 There were no great variations until an advance came which covered the months of April and May, but was followed by a reaction in June. Thenceforward there was little change, the lowest average being reached in November. In December there was an upward reaction, and the year closed with a promise of better prices.

The smaller purchases for India were the weak point in the market. In that country there was for the greater part of the year comparatively little surplus to pay for the silver, which is, as it has been for centuries, the chief investment for the savings of the people. Late in the year came the promise of good crops and larger exports, and the distribution of silver increased accordingly. In the latter part of the year China was the sustaining force in the market. The Chinese banks bought largely and must at times have held large stocks; but they were absorbed or held, as they were not returned upon the market.

Other Conditions

Buying of silver for coinage purposes was not heavy. The United States Mint took little silver. Only the usual purchases by France and other nations in the Latin Monetary Union were reported. The demand for silver for use in the arts showed an increase with the returning prosperity in business. Supplies of the metal were about the same as in 1908, the decrease in Australia being made up by the larger output of Canada and Mexico.

Platinum in 1909

The production of platinum in the United States in 1909, so far as can now be ascertained, was about the same as in 1908, when a total of 510 oz. was reported. Most of this was obtained through the mint, where a certain quantity is recovered every year as a by-product in the refining of gold and silver bullion, mainly from California. A much smaller quantity is saved in treating the nickel-copper mattes brought here from the Sudbury district in Ontario to be refined.

Imports into the United States in 1909 increased largely over those for the previous year. For the 11 months ended Nov. 30 they were 105,340 oz., while those for the full year 1908 were only 49,168 oz. The total for the year 1909 was probably about 115,000 oz. A large part of these imports is crude metal, which is refined here. Most of the imports are Russian platinum, usually received here from Paris, where the control of the Russian industry rests. During the latter part of the year there was a considerable increase in the receipts from Colombia. Two dredges are now at work on the placers in that country, it is reported, with successful results.

Platinum in Russia

The production of platinum in Russia in 1909, taking the actual returns for 11 months and estimating the output for December, was 350 poods, equal to 184,240 oz., or 5730.55 kg., of crude metal, containing 83 per cent. platinum. This is an increase of 50 poods, or 16.7 per cent., over 1908. The gain was made chiefly in the later months of 1909 the activity in mining being stimulated by the larger demand for the metal and the higher prices realized for it.

The concentration of the industry made much progress during the year and the Russian platinum business is now almost completely syndicated. During the year an agreement was completed, the parties to which are the Société Anonyme d'Industrie du Platine, of Paris; Count P. P. Shouvaloff's Sons and the Estate of Prince Demidoff. The terms of the agreement are such that the Société du Platine controls the production and sale of more than 300 poods, or 85 per cent. of the total production.

This excited much feeling among the smaller producers, which found expression in the newspapers. As a result the government appointed a special commission to inquire into the conditions of the industry. After a number of sessions this commission made a report recommending: (1) That the export of crude platinum from Russia be prohibited; (2) That all platinum mined should be delivered to the government and refined in a plant to be built for the purpose either by the government or by a company specially licensed for the purpose; (3) That the National Bank be authorized to make loans or advances to miners on the metal. These measures were recommended as aids to the smaller producers to enable them to continue at work.

The Markets

New York—The year opened with a light trade, dealers asking $23.50@24.50 per oz. for refined metal and this condition, with an unchanged quotation, held until the middle of March. A slight drop brought the current price down a little and $23@24 per oz. was quoted until the middle of May. A reduction to $23@23.50 was reported early in June, and 50c more was dropped in July, the price being $22.50@23, which held for a month. In August the market was disturbed by some holders of small stocks, who found it necessary to realize, and refined platinum could be had at $21@22.50 per oz., the higher price being that asked by the large refiners. About the end of August demand began to improve; sales were larger and the small holders who had been offering at low prices were generally cleaned out. On Aug. 28 an advance to $23@24.50 was recorded. Thereafter there was a steady advance, $24@24.50 being quoted on Sept. 4; $25.50, Sept. 18; $26 on Oct. 2; $27 on Oct. 9; $27.75 on Oct. 23, and $28.50 on Oct. 30. An unusually large fall trade developed, especially with jewelers, who took considerable quantities in anticipation of the holiday season. About the middle of November there was an advance to $29.50 per oz., and this held until the end of the year.

Hard metal, which is an alloy of platinum and iridium, had special advances on account of a scarcity of iridium and its consequent high price. During the first half of the year the difference in price between refined platinum and hard metal was $2.50 per oz.; in July this was increased to $3.75, and in December to $5.50. The dealers' quotation for hard platinum was $35@35.50 per oz., at the close of the year.

Russian Markets.—The prices of crude platinum in Russia fluctuated widely during the year. In Ekaterinburg, which is a primary market in which the smaller miners offer their production, the price in January was 5 rubles per zolotnik for crude metal, 83 per cent. platinum. This held until the end of March when a gradual fall began, the lowest price—4.25 rubles per zolotnik—being reached in June. Recovery from this point was slow for two months, but in September 5.25 rubles was reached; in November 6 rubles and at the close of the year 6.25 rubles. The large producers and the middlemen who buy small lots usually sell their metal in St. Petersburg. The opening price there was 20,550 rubles per pood; the quotation declined until June, when the lowest point of the year was reached, at 18,000 rubles per pood. An advance began in August which carried the quotations to 22,500 rubles in October; 24,000 rubles in November, and 24,500 rubles at the end of the year.

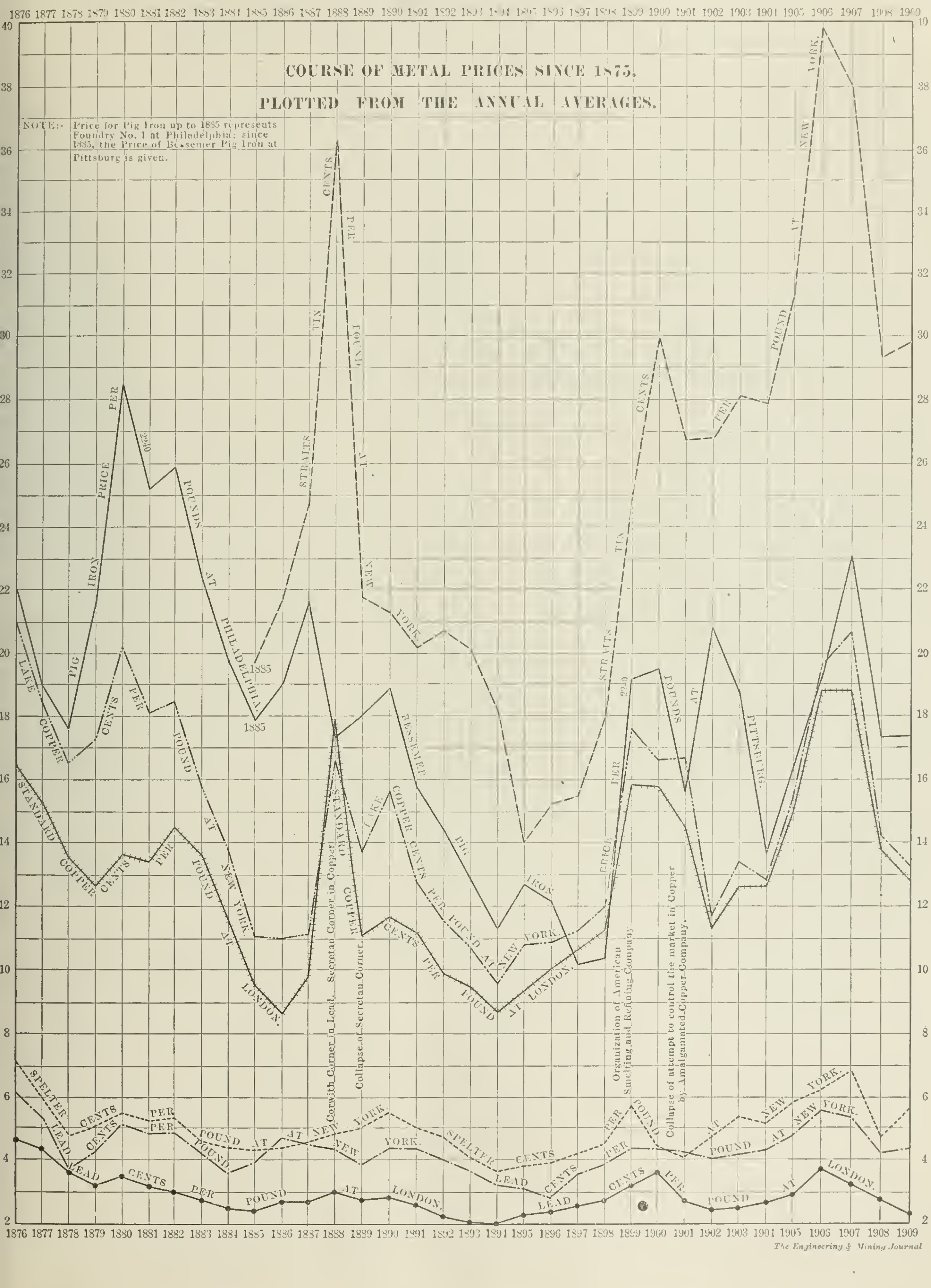
AVERAGE PRICES OF PLATINUM.

In Dollars per Ounce Troy.

	New York, Refined Platinum.	Russia. Crude Metal—83 Per Cent. Platinum.	
		St. Petersburg.	Ekaterinburg.
January	$24.10	$20.14	$18.80
February	24.00	19.80	18.89
March	23.75	19.09	18.85
April	23.50	18.13	17.48
May	23.25	18.13	17.86
June	22.75	17.64	16.58
July	22.43	17.64	16.73
August	22.65	19.83	19.27
September	25.31	20.64	19.74
October	27.75	21.85	21.53
November	29.50	23.52	22.56
December	29.50	23.77	23.03
Average for the year.	$24.87	$20.02	$19.26

The accompanying table gives average monthly prices of refined platinum in New York and of crude metal in the Russian markets. The Russian prices in the table are reduced to their equivalents in American money per ounce troy.

Average Yearly Prices of the Metals



The Copper Production of North America

The Production of the United States was 1,098,000,000 Pounds; of Mexico, 126,000,000 Pounds; of Canada, 48,000,000 Pounds

REFINED PRODUCT 1,410,000,000 POUNDS

The production of refined copper in the United States in 1909 was in round numbers 1,410,000,000 lb. against 1,153,000,000 lb. in 1908. The increase was in reality a little larger than is shown by these figures, because in the total for 1908 is included all the copper resmelted from junk, which it is not yet possible to figure for 1909. For both years these figures represent the total production of American refineries, which draw supplies of raw material, not only from the United States, Canada and Mexico, but also from many foreign countries. This raw material is partly ore and matte and partly blister copper, the production of Cerro de Pasco being the chief supply of the latter obtained from countries outside of North America.

Estimating the domestic deliveries of refined copper in December at 70,000,000 lb., the total for the year was 704,070,892, against 488,500,000 in 1908, 538,000,000 in 1907 and 668,600,000 in 1906. The productions and deliveries by months are given in an accompanying table. Regarding the domestic deliveries in 1909 by quarters, it appears that in the first three months the average was about 48,000,000 lb.; in the second, about 56,400,000; in the third, about 62,400,000; and in the fourth, 67,700,000. Consumption in 1909 probably did not increase to the amount indicated by the deliveries, inasmuch as manufacturers are supposed to have added to the stocks in their yards toward the end of the year, but there is little doubt that the actual domestic consumption in 1909 was fully 660,000,000 lb.

The statistics show clearly to what extent the American consumption of copper revived in 1909 and dispel the idea expressed during the year that the copper business was lagging behind the industrial improvement in general. Toward the end of 1909 the brass, sheet and tube mills went on over-time in order to keep up with their orders, and business in the lighter sort of wire, such as are required for telephone extensions, was good. It was only for the heavy wire, required for trolley and power transmission purposes, that demand was sluggish, the reason being obviously because the times had not yet become wholly propitious for the financing of new enterprises. However, at the very end of the year the demand for this kind of wire also showed a noteworthy improvement. The demand for copper in Germany improved materially in 1909, and in France business became fair. It was only in Great Britain that the demand continued sluggish.

PRODUCTION OF COPPER BY STATES.

State.	1908.	1909.
Alaska	4,394,887	4,474,203
Arizona	290,167,795	291,075,846
California	36,890,353	53,048,094
Colorado	13,896,689	10,408,823
Idaho	8,749,559	8,168,267
Michigan	222,267,444	227,019,646
Montana	252,558,330	315,090,341
Nevada	12,174,269	50,820,000
New Mexico	8,523,652	7,001,136
Utah	70,978,952	105,349,740
Wyoming	2,384,356	100,000
South and East (*a*)	20 822,368	21,524,333
Other states (*b*)	4,387,836	4 206,999
Total	948,196,490	1,098,287,425

(*a*) Includes Vermont, New Hampshire, Pennsylvania Virginia, North Carolina, Alabama and Tennessee. (*b*) Includes Washington, Oregon, South Dakota, Texas, Missouri, and the production of the lead desilverizers and others which it is impossible to distribute according to place of origin.

CONSUMPTION OF COPPER.

	1908.	1909.
Stock Jan. 1	120.000,000	122,357,266
Imports of refined	nil	nil
Production	1,152,895,019	1,410,116,663
Total supply	1,272,747,890	1,532.473,929
Exports	661,876,127	680,285,945
Remaining in U.S.	610,871.763	852,187,984
Stock Dec. 31	122,357,266	148,117,092
Delivered for consumption	488,514,497	704,070,892

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	125,550,000	70,000,000	60,000,000
Totals	1,410,116,663	704,070,892	680,285,945

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I	148,553,527	244,204,800	392,758,327

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month as brought over from the preceding month. The statistics for December are estimated.

During 1909 there was a good deal of complaint respecting the "low price for copper," yet the average for the year is not much below that of the last 20 years, or much below the figure upon which conservative engineers and industrialists base their calculations for a long way ahead. The new copper mining enterprises that are brought out with the countenance of competent and conservative engineering advice are seldom based upon a price for copper higher than 13½c. It is well known that the bulk of the North American production of copper yields a handsome profit on the basis of 13c. Otherwise, why should production have increased so hugely in 1909?

The really marvelous thing is that during 1908 and 1909 the price for copper has held so steadily at 13c. This has resulted primarily from the cheapness of money, which has made it easy to finance the accumulation, carried in the hope that absorption would not be long delayed, and, of course, the present concentration of the copper selling business in comparatively few strong hands has aided. This has kept the market free from any pressure that might have reduced the price to 10c. or less, as happened in former times, and by naturally restricting the unprofitable output brought production and consumption into equilibrium. So far as productive conditions are concerned there is no reason, so far as we can see, why copper should not be offered at as low a figure as at any time in the past. The exhaustion of some of the rich and cheaply worked mines of former times and the drawbacks of having to work many deposits at increased depth are fully offset by improvements in mining and metallurgy and the discovery of new mines.

Along toward the end of 1909, the widely discussed plan for consolidation of important interests played a prominent part in the copper market. The purpose of this plan was declared to be to improve the price for copper by curtailment of output. Incidentally, it was inferred that its purpose was also to put in a more marketable form various securities that the public would be more interested in buying on a basis of 15c. for copper. This would be, of course, more or less a repetition of the organization of Amalgamated in 1899. Probably the new consolidation would not include any larger proportion of the output than Amalgamated did at that time. The umbrella became too heavy for Amalgamated to hold, and without doubt the situation would

ome unmanageable to the new com-
ation when such prospective producers
Miami, Ray Consolidated and others
enter the market a few years hence.
wever, this would be for the public to
out. The Standard Oil decision gave
scheme a rude check. Also the diffi-
ty of reconciling many discordant in-
ests was very great. Consequently, it
decided to effect consolidation in
ups, and afterward undertake to bring
groups together. We think, however,
t the psychologic time for bringing out
consolidation was missed, and that
it is likely to be defeated by the
ght of criticism. The public is now
ter informed as to the principles of
ing valuation than it used to be, and
is less easy to lead investors into
nbles in excessively inflated securities.
t is difficult to forecast the probabili-
of the copper market in 1910, al-
ugh at the moment the sentiment is
hly optimistic. Artificial measures,
h as the consolidation project above
erred to, or the curtailment of pro-
tion by common consent, may have an
portant bearing upon the market.
ingency in the money market may be
any time an important factor, compel-
lower prices for a while, stimulating
sumption. However, the time will in-
tably come when consumption will
in exceed production. The demands
the world grow, and the increase by
ades is apt to be steady, although in
, two, or three years there may be
increase at all. Such a failure must
sequently be made up. Undoubtedly
world will sooner or later take up the
ck of 1908 and 1909.

We do not seem to be threatened by
dearth of copper. The determination
t the low-grade porphyry deposits of
ah and Nevada can be exploited profit-
y marked the beginning of a new era
copper production and mines of this
ss are now being rapidly developed in
izona and New Mexico. It is unbeliev-
e that such deposits are confined to the
ited States. On the contrary, it is
hly probable that similar deposits will
discovered and exploited in Mexico,
ile and other foreign countries, per-
ps even in Europe. Indeed, we know
such prospecting, promising well, that
s already been inaugurated. It is pos-
le that in admiring the pre-eminence
it North America has held in copper
duction we have underestimated the
ssibilities of the rest of the world.
nong the new copper districts clearly
view, it is expected that Copper River
ll produce a little in 1910 and largely
1911 when the railway will be com-
ted. Not much is known respecting
resources of this district, except the
nanza mine but the occurrence of cop-
r is wide-spread, the surface ores are
h and smelting facilities already exist
Tacoma. Katanga is also expected to begin production by the end of 1910 and a great deal of copper is known to exist there. However, both Copper River and Katanga are being developed under adverse natural conditions and their copper will not be produced at anywhere near so low a cost as has been advertised.

REVIEW OF COPPER MINING IN THE UNITED STATES

Alaska.—Production in 1909 was about the same as in 1908. The entire product was finally smelted at Tacoma, a portion being first treated at the Tyee works and thence shipped to Tacoma as matte.

Arizona—Production in 1909 was about the same as in 1908. There were no new producers of blister, but two companies are planning to instal converters. Miami and Ray Consolidated are building large concentrating mills.

California.—The increased operations by Mammoth and the steady operation by Balaklala added largely to the production of California, which is doubtless destined to make further gains in the near future. Mountain made only a small output in 1909 but has ore reserves enabling it to increase largely when it gets ready.

Colorado.—Production appears to have been somewhat less than in 1908.

Idaho.—Production appears to have been about the same as in 1908. The Snowstorm mine, in the Coeur d'Alene, continued to be the chief producer. All of the copper ore of Idaho is shipped to other States for smelting, a little being exported to British Columbia.

Michigan—Production increased considerably over 1908. It could readily have been increased further, but Calumet & Hecla restricted its production of refined metal, adding to its accumulation of "mineral." There were several new producers but none of particular importance except Superior, although some others, especially Lake, promise to figure prominently in the near future.

Montana.—In this State there was a large increase in production and it regained its former place as the premier. The Washoe and Great Falls works were run at practically full capacity throughout the year, except in December when the switchmen's strike interfered.

Nevada.—As the Steptoe Valley works approached completion their production swelled and the result was a huge increase for the State. At the rate of the last quarter Nevada Consolidated alone would produce 70,000,000 lb. in 1910. Steptoe Valley now has four reverberatory furnaces, and a fifth to be completed in January.

New Mexico.—Production appears to have been a little less than in 1908. Development of the old Santa Rita mines, now called Chino, will doubtless add largely to the production of this Territory, but hardly before the end of 1911.

Utah.—The huge increase in the production of this State was due chiefly to Utah Copper Company. The prospect is for progressive increases for several years to come. The United States Smelting Company expects soon to resume copper production. The Tooele smeltery will go into operation in 1910, taking the Highland Boy ore that now goes to Garfield. In December the Ohio Copper Company started the first section of its mill and began shipping to Garfield. The mills of the Utah Copper Company and Boston Consolidated are to be nearly doubled.

Wyoming.—Production in 1909 was insignificant, the Penn-Wyoming having been idle. Plans are on foot to operate again in 1910.

South and East.—Production was about the same as in 1908, coming chiefly from Tennessee. The output of Virginia became insignificant, but some copper was produced in Pennsylvania, Vermont and New Hampshire.

The Copper Statistics for 1909

The statistics of production in North America in 1908 and 1909 herewith presented are based upon reports from all of the producers and represent the Michigan production, plus the fine-copper content of blister copper and the copper content of the very small quantity of matte exported.

The distribution of the production of the United States among the several States and Territories as made at the present time is only approximately correct. Indeed there is some uncertainty as to the distribution between the United States and Mexico, but error in this particular cannot be more than a fraction of 1 per cent., one way or the other.

The total production of refined copper in the United States in 1909 was about 1,410,000,000 lb. The production of Lake copper was 227,019,646 lb.; of blister copper, in North America, 1,065,615,990. The amount of pig copper imported from foreign countries other than Canada and Mexico was 126,000,000 lb. Consequently the supply of blister copper to the American refineries was 1,191,615,990 lb. Estimating that 1 per cent. of the blister copper was recovered as bluestone, the total available from this source was 1,181,000,000 lb. in round numbers, and adding to this the 227,000,000 lb. of Lake copper the grand total is 1,408,000,000, which is a close check of the refinery statistics.

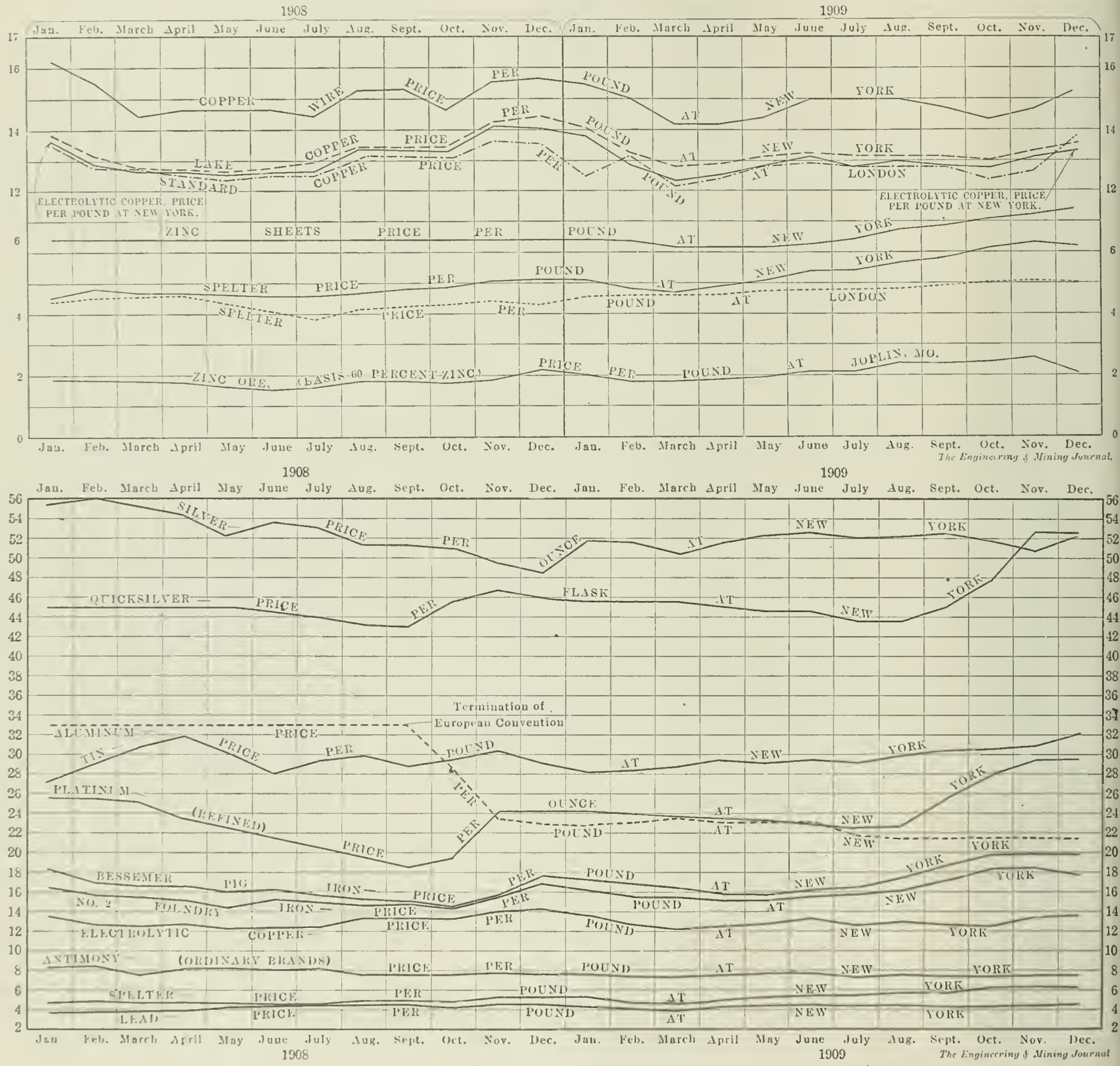
Texada island has shown more satisfactory recent development in copper mining than any other section of the British Columbia coast district. The Canadian geological survey has had a field party on the island two seasons.

Copper Production of North America

The copper production of North America is summarized as follows:

Country.	1908.	1909.
United States...	948,196,490	1,098,287,425
Mexico	89,576,464	125,982,688
Canada	53,725,213	48,067,710
Cuba	6,538,047	6,002,000
Totals	1,098,036,214	1,278,339,823

All of the Cuban ore was shipped to the United States for smelting.



Course of Metal Prices in 1908 and 1909, Plotted from the Monthly Averages

Copper Production of Mexico

The copper production of Mexico in 1909 was 125,982,688 lb., against 89,576,464 lb. in 1908. The producers of blister in Mexico were Cananea, Aguascalientes, Torreon and Boleo. All of these made increased outputs in 1909. A great deal of Mexican ore was also smelted at Douglas, Ariz., and at other works in the United States. The largest part of the increase in Mexican production in 1909 was due to Cananea. Teziutlan continued to keep its new smeltery out of operation.

Copper Production of Canada

The production of copper in Canada in 1909 was 48,067,710 lb., against 53,725,213 lb. in 1908. As heretofore the Boundary district of British Columbia and the Sudbury district of Ontario were the largest producers. The British Columbia and Granby companies were the only ones producing blister copper. The remainder of the Canadian production was exported as ore and matte, chiefly the latter, the bulk of this material being sent to the United States for smelting.

The Copper Market in 1909

The dawn of 1909 brought with it a very hopeful feeling for the future of the copper market, which, however, was doomed to an early disappointment. A retrospective analysis of the conditions would, however, tend to show that the developments as they took place were altogether logical. The opening up of the large low-grade orebodies of Ely, Nev. and Bingham, Utah, had been progressing during the previous two years and the mines had just about reached the producing stage, fulfilling in the course of the year all promises of the large production held out by the promoters. Consumption the world over did not increase fast enough to absorb the additional output, but with occasional irregularities and stimulated both by the general revival of business and the low price of the metal, the progress has been toward a steady enargement. In the meantime, however, tocks of copper have largely increased, articularly in Europe, where most of the isible supply is carried at the present ime. On Dec. 31, 1908, stocks there in ublic warehouses amounted to 55,677 ong tons, while on Nov. 30, 1909, hey had increased to 105,743 long tons.)ue to the figures compiled by the Cop-er Producers Association, which was ormed early in 1909, an exact record is gain being kept from month to month of he statistical position of the domestic iarket. According to the figures of the 'roducers Association, the stocks in this ountry, which had amounted on Jan. 1) 122,357,266 lb., showed an enlargement y the end of November to 153,509,626 lb. 'here is not likely to be a marked change n the figures, either here or in Europe, /hen the statistics for the whole year will ave become available.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
anuary...	13.726	13.893	13.901	14.280	62.386	57.688
ebruary..	12.905	12.949	13.098	13.295	58.786	61.198
larch.....	12.704	12.387	12.875	12.826	58.761	56.231
pril	12.743	12.56¼	12.928	12.93¾	58.331	57.363
lay.......	12.598	12.893	12.788	13.238	57.387	59.338
une.......	12.675	13.214	12.877	13.548	57.842	59.627
uly.......	12.702	12.880	12.933	13.363	57.989	58.556
ugust....	13.462	13.007	13.639	13.296	60.500	59.393
eptember	13.388	12.870	13.600	13.210	60.338	59.021
ctober ...	13.354	12.700	13.646	13.030	60.139	57.551
ovember.	14.130	13.125	14.386	13.354	63.417	58.917
ecember.	14.111	13.298	14.411	13.647	62.943	59.906
Year.....	13.208	12.982	13.424	13.335	59.902	58.732

New York, cents per pound. Electrolytic is or cakes, ingots or wirebars. London, pounds terling, per long ton, standard copper.

Throughout 1909, the market was in a ery sensitive condition being always un-er the influence of the speculative mar-et in London, which, in turn, takes its ue in a large measure from the share narkets. A great deal has been said to eprecate the influence which the London tandard market has been exercising on he business in the refined metal. It is, owever, but reasonable to conclude that hrough the standard market it has been nade possible to distribute among many he burden of carrying the large stock, vhich, had it been left in few hands, night have brought about market con-litions most unpleasant to contemplate. Even as matters are, the position in Lon-lon would not have been as sound as urned out to be the case—everything con-idered—had it not been for a lively peculative interest which made itself nanifest in this country, where formerly peculation in the copper metal had not een indulged in on a large scale. Specu-ators the world over show a singular confidence in their position, and though he figure of the visible supply of copper n hand in public warehouses in Europe s very formidable, the danger of the tock to the market is not very great as ong as the prospects for the future con-inue encouraging. So far as the stock in this country is concerned, it represents only a little more than a month's production.

Two episodes in the last quarter of the year gave a great deal of special interest to the copper situation. Firstly, the long contemplated copper merger had gradually arrived at a point where it began to assume tangible form. It is not necessary to refer here to the details of the plans which were entertained by the leading producers and which have since been deferred due to the Standard Oil decision. Secondly, as the year drew to a close, it became evident that the only chance of early improvement lies in a reduction in the output, and reports that many important mining companies throughout the country would curtail their production were widely circulated, although it is doubted whether they will really do so. On the other hand, consumption is making satisfactory progress. While during the high pressure of the early months of 1907 the actual consumption might have been in excess of the current requirements, the highest figures have certainly now been exceeded, compared with any extended period of time, and this in spite of the fact that the wire business is still far below both previous records and the capacity of the manufacturers.

AVERAGE MONTHLY PRICES OF COPPER MANUFACTURES.

(IN CENTS PER POUND).

	1908.		1909.	
	Copper Wire.	Sheet Copper.	Copper Wire.	Sheet Copper.
Jan......	16.375	20.000	15.650	20.000
Feb......	15.6875	19.75	15.0625	18.675
Mar.....	14.500	18.00	14.3125	17.30
Apr......	14.750	18.00	14.250	16.50
May.....	14.750	18.00	14.500	16.70
June.....	14.750	18.00	15.000	17.00
July.....	14.500	17.75	15.000	17.50
Aug.....	15.200	18.70	15.000	17.50
Sept.....	15.250	19.00	14.750	17.50
Oct......	14.8125	19.00	14.500	17.50
Nov.....	15.600	19.80	14.937	18.00
Dec......	15.750	20.00	15.250	18.50
Year...	15..160	18.833	14.851	17.72

In the early days of January, electrolytic copper was quoted at 14¼@14⅜, and this turned out to have been the highest price of the year. Later on in the month, the publication of exaggerated estimates of accumulated stock on this side led to the liquidation in the London market of large speculative accounts which had been carried for several months. This caused a break in the market for standard copper, and thereafter the decline was rapid both at London and New York. By the last of the month, the price of electrolytic copper had receded to 13⅜.

Throughout February, the copper market was dull and sagging. Sales were unusually small because manufacturers had overbought themselves in previous months. Prices continued to decline rapidly, until, during the last week of February, a basis of 12⅜c. was reached, which at last interested European buyers and in the last four days of the month some fairly large sales for export were consummated. The activity continued until March and an attempt was made to raise prices, which, however, failed, as manufacturers would not be led into buying largely upon a rising market. The improvement in general business, however, began to make itself felt, and at the low prices reached the market showed a great deal of resistance.

While prices did not improve very much in April, business was in good volume and the market held its own throughout the month at 12½@12⅝c.

During May, demand from consumers improved very much, being stimulated by a revival in business and a rampant bull movement in the London market emanating largely from this side. In the New York market there was a steady advance in the price during May, and at the close electrolytic was quoted at 13⅛@13⅜c.

The activity that characterized the end of May extended into the early part of June and an outburst in speculative buying in all the European markets carried prices further upward, a basis of 13½c. for electrolytic being reached. About the middle of the month, speculative selling led to a decline and later on the market became deluged with offerings from this source which precipitated a decline to 13 cents.

In July the market receded somewhat further, but when prices had declined to 12¾c. a large buying movement developed, and July closed with the market in a better condition at 12⅞ cents.

Not much business was done until Aug. 10, when the publication of the American statistics, showing a decrease of about 32,000,000 lb. in the visible supply on this side, was followed by excited buying from European sources and a considerable business from domestic manufacturers, which caused prices to advance to 13@13¼c. for electrolytic. Later on the conviction became general that the deliveries in July were swelled by speculative purchases on the part of some of the largest consumers, who had decided to carry heavier stocks, so that the statistics were not really so good as they looked. Consumers, having supplied themselves liberally, became disposed to await developments, while the selling agencies, who still had an abundant supply, became once more pressing in their competition and made concessions which carried the market again downward to 13 cents.

Early in September, the market was considerably disturbed by some large sales of metal from second hands, and a further depressing influence was the producers' statistics, which showed an increase of 12,600,000 lb. in stocks during August. However, the market showed a great deal of resistance, due to the realization that consumption had reached a very high level. At the close of the month, the market had not lost much ground, sales taking place at 12¾@13 cents.

The chief feature in October was the stiffening in the money market, which compelled some speculators to liquidate, while foreign bankers, in consequence, sought to discourage speculation in copper. The decline in the standard quotations compelled New York sellers to reduce their prices to nearly 12½c. When this level was reached, a better demand set in which carried prices up to 12⅝@12¾c. during the closing days of the month. The improvement was helped by the project of a copper consolidation, which inspired a speculative movement at the beginning of November. In the second week, this movement gained force and had the natural effect of drawing in manufacturers who were frightened into covering their requirements for a long time ahead. The volume of business up to Nov. 20 was on a larger scale than perhaps at any other time during the year, prices rising to 13⅝c. Then came the Standard Oil decision, which caused buyers to hold aloof waiting to see how far this would affect the plans for the consolidation. The speculative market took this decision more seriously, and under a heavy wave of liquidation prices in London gave way sharply. Electrolytic, as usual, followed, and the market at the end of the month was weak at 13@13¼ cents.

Developments during the last month of 1909 showed that the market is weathering the disturbing factors which have beset it. Consumption of copper both in Europe and in this country appears to have increased greatly. The outlook for still larger requirements the world over is good. The tone was steady throughout December, and the market closed with an upward tendency at 13⅝@13¾ cents.

Copper in Arizona in 1909

BY JAMES DOUGLAS *

The most notable feature of Arizona's copper mining during 1909 was in the direction of the development of deposits of low-grade ores in porphyry and schists. The greatest activity has been in the Globe district. The country between Pinal creek, which runs through the town of Globe, and the Pinal mountains, which are 20 miles south of Globe, is more or less impregnated with copper, and it is within that district that the most vigorous operations are now being conducted. Some of the properties which are to be worked by large public corporations have been small producers for a number of years, but nowhere have they been prospected in depth, and it is the deeper ores which under corporate management will unquestionably tell largely upon Arizona's future production.

Development of New Properties

The most prominent of the new properties is the Miami, which is being opened under the management of J. Parke Channing. The concentrating mill was designed and is being erected under the supervision of H. Kenyon Burch. It should, therefore, be an improvement upon the successful mills which have been built under his direction for the Detroit Copper Mining Company and the Montezuma Copper Company.

Adjacent to the Miami, the Inspiration and Black Copper are being opened up, and the Live Oak, Warrior and Eureka (renamed the Cordova since consolidation with the Globe Consolidated), all promise to become more prolific producers in the future than they have been in the past. The Cactus company is another new company which is appealing to the public for support. Its mines are about four miles west of the Miami. The Gibson Copper Company is still producing, and mines are being opened in the neighborhood of Bloody Tanks, a district historically interesting in that the first furnaces put up by the Old Dominion company in 1881 were erected there to treat the ores of the Chicago and New York.

To the north of Pinal creek, where are the properties of the Old Dominion and United Globe mines, the Arizona Commercial Company has passed from the passive stage of a mere ore producer into the active stage of a smelting enterprise, and is turning out at the start about 25 tons of 50 per cent. matte per day. Other companies working on the northern extension of the more or less developed Globe veins are the Superior & Boston and the Cordova, which has absorbed the Globe Consolidated.

Another district which is appealing to the public for support is what is known as Mineral creek, south of the Pinal mountains. The Ray mine has been more or less actively worked for the last 24 years, and has passed through various reorganizations. The last is the Ray Consolidated. Another company in the same neighborhood is the Ray Central. The Gila Consolidated is a third candidate appealing for public help. All these companies are capitalized at very high figures, and are developing enormous quantities of ore with churn and diamond drills. If their expectations are realized, the quantity of copper they will turn out will certainly supply all the world will require.

The only other new district in the Southwest in which the same quality of ores is being explored is in the Burro mountains in New Mexico, a short distance east of the Arizona line. The old Comanche mine, now consolidated with a neighboring concern as the Savannah, has been mining these low-grade ores for several years with indifferent success; but more extensive operations were conducted by the Burro Mountain and Chemung companies on an adjacent group of claims. Although the Burro Mountain company has treated the ores, necessarily extracted, in a small mill, neither of these companies has reached the point where it can confidently predict the cost of making copper.

On the testimony of churn drills and diamond drills we are measuring ore by the millions and millions of tons, and estimating its value to the tenth of a per cent, and counting the costs and the profits on prophetic anticipations of what mills will do and what prices will be. It is a wild game in which the public is generally the pawn and the players stand small danger of losing. In no case have active operations proceeded far enough to raise the value of these properties out of the speculative into the realized class.

Working the Low-grade Deposits

One inducement to capitalists to undertake the exploitation of these deposits has been the success of the Clifton companies in working profitably ores of 3 per cent. and under, though they do not carry precious metals in profitable quantities. In this respect they are at a disadvantage with the porphyry mines of Utah, Nevada and British Columbia. But the present position of the Clifton mines was earned by many years of financial trial and was gradually attained by experience as the grade of the ore dropped from 10 or 15 per cent. to its present level. The new undertakings start with even leaner ores than Clifton, but with the information derived from their neighbors' operations, and with the additional advantage of perfect knowledge of the great advance made within recent years in mining and metallurgy. The reduction in the cost of mining through the introduction of the caving and slicing systems, has, where conditions are favorable, cut in two the expense of underground mining; and the steam shovel, applied to opencast work,

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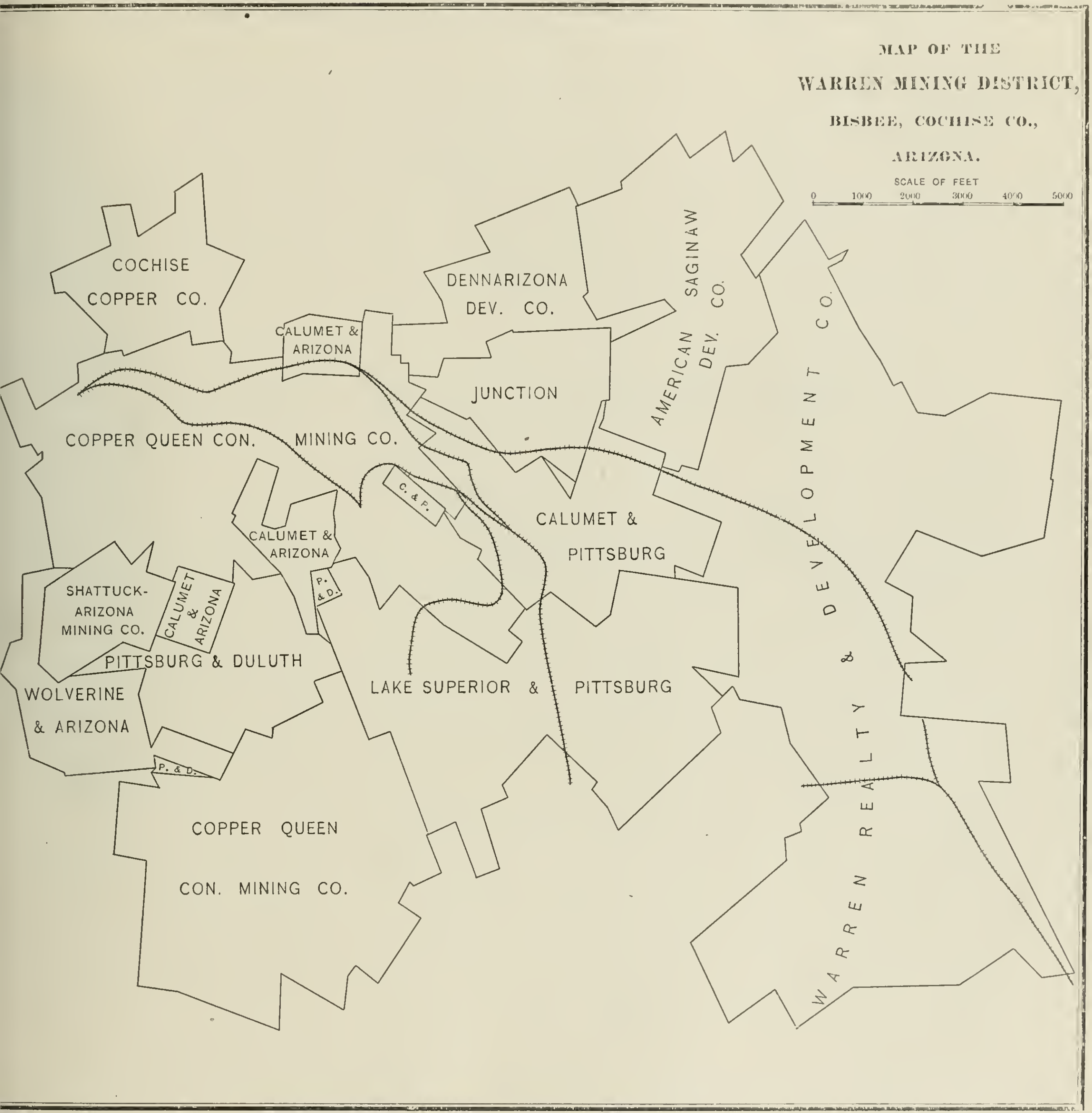
*President Phelps, Dodge & Co., 99 John street, New York.

s reduced such mining to the level of
ilroad grading. Mineral, therefore,
ich could not have been classed as ore
years ago is today worked to a profit.
id the ore when extracted can be
ndled with ever decreasing cost, both
echanically through the concentrating
ll, and metallurgically through the
elting works. It is therefore presump-



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ous to pretend to define what is the
nimum grade which under certain
vorable circumsances can be profitably
ated. Nevertheless another factor en-
s into the question of what is a profit-
le ore, besides the cost of turning it
o metal and marketing it and that is
price that is going to be realized for
metal. If there is any relation be-
een production and consumption in

controlling price, unlimited production must mean limited price. When, therefore, these new concerns talk lightly of building mills of 5000 and 6000 tons daily capacity instead of 1000 or 2000, they must have some assurance of a buoyant market, which will put the red metal to new uses.

These courageous projects cannot, however, be expected to notably increase Arizona's production during the coming year. The mills are not yet erected, nor the mines sufficiently opened to furnish with ore the mills of such large contemplated output.

THE 1909 PRODUCTION

The production of Arizona in 1909 was approximately the same as it was in 1908, say, 291,000,000 lb. As Butte has with but slight interruption been active throughout the year, Montana may be expected to again take the lead by a small excess. The copper statistics of Arizona are liable to be confused if the product of the Copper Queen smelting works at Douglas is credited wholly to the Territory. The copper smelted at the Copper Queen works during 1909 may be roughly distributed as follows:

	Lb.
Copper Queen ores..................	75,821,566
Custom (domestic)..................	7,704,997
Moctezuma Copper Company.....	23.936,000

The output of the Copper Queen mines during 1909 was 75,821,566 lb., as compared with 76,125,162 lb. in 1908, and 61,701,862 lb. in 1907. The Calumet & Arizona works at Douglas smelted approximately 52,142,664 lb., of which 27,793,322 lb. are credited to the Calumet & Arizona and 24,349,332 lb. to the Superior & Pittsburgh. Some ore, however, has recently reached these works from the property of the Calumet & Arizona at Courtland. The other producing company of that district, the Great Western, is shipping its ore to El Paso. Shipments from this source have only recently commenced, and have reached about 10,000 tons. The developments at Courtland do not yet warrant the anticipation that this new district will become a prolific producer.

Clifton's output was approximately 74,059,948 lb. as against 74,596,897 lb. in 1908, and that of the Old Dominion furnaces in Globe was approximately 35,027,576 lb. as against 37,840,587 lb. in 1908. The quantity of custom ore which was shipped to the smeltery at Globe fell off after the absorption of the properties which yielded it by the large corporation recently formed and which is reserving the resources for more economical treatment.

The only other smelting establishment which has been in blast is the Imperial, its furnaces turning out approximately 11,000,000 lb. of copper during 1909. The company states that it proposes to enlarge the plant during the coming year.

Developments in Sonora

It is not contemplated to increase any other of the smelting plants during 1910, but the success attained in Cananea in reverberatory smelting with the use of oil as fuel has suggested very radical alteration in those establishments which have to treat large quantities of concentrates and retreat large quantities of flue dust.

The two neighboring districts in northern Sonora which have been closely allied with Arizona enterprises, Cananea and Nacozari, have been active. At Cananea good management has brought the cost of copper within profitable bounds, and Nacozari has increased its output, and continues to ship its concentrates to the Copper Queen furnaces at Douglas. The Transvaal company has not resumed production.

The Indiana-Sonora property, which used to ship its crude ores to Douglas for reduction, was absorbed by the Greene-Cananea company.

Forecast for 1910

The forecast for the coming year is that all the companies will maintain their present production. Some can easily exceed it, but it would be injudicious in the present state of the market to do so. But there is no reason to suppose that any will cut down their production beyond the present limits. Changes if made in the furnace plants, will be in the direction of improved methods, not of increased capacity.

Lake Superior Copper District

BY C. L. C. FICHTEL [*]

The most important event of 1909 in the Lake Superior copper district was the passing of the Bigelow properties to the control of the Calumet & Hecla. After prolonged litigation between the two factions, regarding the voting of a block of Osceola stock acquired by the Calumet & Hecla company, a compromise was effected whereby the Calumet & Hecla took over the entire group, marking the retirement of A. S. Bigelow from the Lake Superior district. The locating of what was believed to be the extension of the Baltic lode on lands north of Portage lake will undoubtedly prove of material benefit to the district and the continuation of the remarkable richness of the Lake lode may mean the opening of mines in Ontonagon county. These have heretofore been disappointing. The producing mines maintained about a normal output and a large amount of drilling and other exploratory work was carried on by the newer companies.

Keweenaw County

The Keweenaw Copper Company suspended work on the Medora lode after an extensive mill run which showed the rock did not carry copper in commercial quantities. The West fissure vein that gave such promise when opened at the 11th level did not continue with depth and after drifting upon it for considerable distance at the 13th level it was deemed advisable to discontinue all work on this portion of the tract. Diamond drilling exposed the Calumet conglomerate and Osceola amygdaloid lodes but the cores showed them somewhat shattered. A shaft was sunk about 100 ft. on the Kearsarge lode with encouraging results.

Shortly after the passing of the Tamarack company to the control of the Calumet & Hecla, work was suspended at the Cliff property for financial reasons and at a special meeting of the stockholders it was decided to sell this tract to a new company formed for the purpose of proving these lands.

The Ojibway company sank both of its shafts to the 1250-ft. level where they were temporarily bottomed, until the ground down to that point shall be fully opened. Drifting to connect the two shafts was started from the 500-, 650- and 800-ft. levels, with an average grade of stamp rock at all points; with the exception of the drift south from No. 1 shaft at the 800-ft. level which, due to a fault, passed out of the copper-bearing formation. This property will be in position to start producing early in 1910. The Seneca sank its shaft to a depth of about 500 ft. and exposed the lode at two levels by means of crosscuts. The first level was established at a depth of 200 ft. and showed the lode badly shattered and carrying little copper. At the second level the lode was recently cut and, while not opened to any extent, is more uniform than at the upper level. This property is well located and should develop into a paying mine.

The Gratiot company sank its northern, or No. 1 shaft, down to the 12th level and extended the lateral opening from all the intervening levels, the lode opened by this shaft being well charged with copper. No. 2 shaft was sunk below the 11th level, with drifts extending from the 9th, 10th and 11th levels. This shaft did not open so good a grade of ground as No. 1 but a much better showing was noted below the 9th level. This property secured railway facilities and will become an early producer. A stock pile aggregating about 14,000 tons was accumulated during the opening of the two shafts.

The five producing shafts of the Mohawk company were sunk deeper with drifts extending both ways from the various levels. Regular production averaging about 2500 tons daily was maintained. A new shaft, No. 6, was started to open the southern portion of the tract; it was put down about 200 ft. in the footwall. Lateral openings were not started but the drifts south of No. 5 shaft, which were extended beyond the line of this shaft, showed a high state of mineralization.

The two new shafts of the Ahmeek were sunk to a depth of about 400 ft. They were provided with concrete collars and a power equipment installed capable of taking them below the depth at which the lode will be cut, estimated to be about 1250 ft. Production from the two producing shafts was increased to about 1700 tons daily which was stamped by the Franklin and Tamarack mills. The stamp mill which was under construction throughout the year was nearly

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[*] Electrical department, Calumet & Hecla Mining Company, Calumet, Mich.

ompleted and will have two heads ready
go into commission about Feb. 15
910. No. 2 shaft of the Allouez com-
any reached the lode, was turned to con-
orm to the pitch of the formation and
unk about 250 ft. on the lode, which was
ell mineralized. F. W. Ridley was ap-
ointed superintendent.

HOUGHTON COUNTY

Wolverine maintained about regular
roduction and opened up large tracts of
eserve ground. At the stamp mill, a
ackson sand-conveying system was in-
talled to take care of the tailings. The
vo Centennial shafts were sunk deeper,
lo. 2 shaft reaching a depth where the
orthern drifts began to come into the
ich Wolverine mineral zone. At the
amp mill, owned jointly by the Wolver-
ne and Allouez companies, the addi-
onal equipment was practically com-
leted and will go into commission early
1910. The Mayflower company re-
umed exploratory work in making a dia-
ond-drill cross-section of its tract. This
roperty has been idle since exploration
opped early in 1906.

Work on the conglomerate lode of the
alumet & Hecla Mining Company was
ormal with about the same results as
uring 1908. At the 74th level of No. 10
haft the drift south opened a streak of
xceptional ground which, however, did
ot continue for any distance. On the
sceola amygdaloid lode all the shafts
ere sunk deeper, openings extended and
e surface equipment improved, all to
ke care of the gradual increase in the
ck tonnage. (It is planned that the
ltimate capacity of the five producing
hafts on this lode will be about 10,000
ns of rock daily.) On the Kearsarge
de one shaft, No. 21, continued to
perate, showing average results. An
lectric-hoisting plant was installed un-
erground to handle the rock from the
lope shaft that is operating on the tract
f land north of the Tamarack Jr. prop-
rty. The large regrinding plant at the
tamp mill was completed. Henry Fisher
as appointed superintendent of the mills,
ucceeding H. W. Cake, deceased. This
ompany also continued its exploratory
ork on the None Such property in On-
nagon county.

A number of tests were made at the
alumet & Hecla's mills on rock taken
rom the various properties now under
s control. As an outcome, prepara-
ons were about completed for the trans-
r of rock. All conglomerate rock from
e Tamarack and Osceola properties will
e stamped at these mills and the rock
rom the Osceola lode on the Calumet
Hecla property will be treated at the
amarack and Osceola mills. No. 1 shaft
f the Tamarack was equipped with two
rge steam pumps and handled all the
ine water.

The Osceola company increased pro-
uction during 1909 and is in as fine condition as at any time in its history. No. 4 shaft on the North Kearsarge tract began to produce on a limited scale and in a short time will become a large factor in the mine's production. Details were completed for the equipping of the shaft houses, shops, etc., with electric power. The Laurium property came under the management of the Calumet & Hecla and operations were started during the summer. The shaft was put down to a depth of about 200 ft. and showed a well mineralized lode. The surface equipment was completed and is of such size as to take the property through the development stage.

Operations at the No. 2 shaft on the Caldwell tract were suspended by the La Salle, underground conditions not being sufficiently encouraging to warrant further work. No. 1 shaft was sunk to about 1000 ft. with the bottom openings coming into better ground. At the Tecumseh tract a new shaft (No. 2) was started and put down over 200 ft. with results about equal to those shown in the No. 1 shaft at the same depth. No. 1 shaft reached the 17th level. A mill test will be made during the coming year, the rock in all probability going to the Allouez-Centennial mills.

The Oneca company changed management, John D. Cuddihy of Calumet, Mich., being elected president. Exploratory work in the form of drilling was resumed. A copper-bearing lode, thought to be the same formation that is shown in the shaft sunk a few years age, was exposed in one of the drill cores at a depth of about 400 ft. A complete cross-section of the tract will be made by two drilling outfits with a view of opening what is believed to be the northern extension of the Baltic lode. A new company known as the New Arcadian Mining Company was organized to take over all the effects of the old company. Drilling operations were started and some encouraging cores taken.

The New Baltic Exploration Company was formed and exploratory work started to investigate what is believed to be the Baltic lode on lands north of Portage lake. The formation outcropped on these lands and in trenching encouraging copper rock was exposed. A drill core recently showed the lode to be about 70 ft. wide, and for 7 ft. very rich.

During 1909 the Franklin company took over the Rhode Island. It suspended all work on the conglomerate lode and directed its attention to opening the Pewabic. This lode was opened down to the 27th level by means of crosscuts; the drifts from the 23rd level down showed a fine grade of stamp rock. A number of drifts were extended into the Rhode Island tract with the same results. No. 9 or Pontiac shaft of the Quincy, was sunk for considerable distance with good results. Several air blasts occurred during the year but without material injury to the property. At the stamp mills, all the heads were equipped with the enlarged cylinders and their operation proved entirely satisfactory. The wash depth was enlarged to take care of the additional tonnage brought about by this change.

The Hancock No. 2 shaft reached the No. 3 lode at a depth of 2040 ft. and found it well charged with copper. A winze from the 13th level of No. 1 shaft was put down to the 17th level and a raise driven from the same point to the 11th. The drifts on this lode from the various levels were in good ground. No. 2 shaft continued sinking to cut the Pewabic lode which is estimated to be about 1500 ft. deeper. A mill site on the shores of Portage lake was purchased and a railroad spur put into No. 2 shaft. Nearly all the permanent surface equipment was installed and the property is on the verge of entering the producing list. Exploratory work was begun on Section 12, which adjoins the Isle Royale. Drill cores taken showed an amygdaloid formation carrying some copper.

The Isle Royale Company, under the management of the Calumet & Hecla, was operated on a conservative plan attention being given to the productive portion of the lode, sinking being suspended, with the result that a much smaller rock tonnage was handled with about the same copper yield and a corresponding decrease in cost of production. The shaft on section 11, sinking to open the Baltic lode, reached a depth of about 700 ft. and three levels were opened, but without encountering any copper worth considering.

The Superior company began production, the rock being stamped at the Atlantic mill. The lode showed an average of about 28 lb. refined copper to the ton of rock. No. 1 shaft was sunk below the 12th level and the lode opened further at all the levels. Sinking was resumed at No. 2 shaft. Atlantic continued its search for the Baltic lode at its Section 16 shaft without any permanent results. The shaft was put down to the 27th level and drifts and crosscuts driven at various points to expose the surrounding ground. St. Mary's Mineral Land Company abandoned all work on the Challenge tract after extensive exploratory work in the form of drilling and shaft sinking which gave unsatisfactory results.

The option on the Globe tract held by the Copper Range Consolidated was surrendered after a thorough investigation of the formation at a depth of 1000 ft. The option on the land in sections 7 and 8 was also released after a large amount of drill work had been done. The Champion and Baltic maintained about normal production while a much better showing was noted in the lower levels of the Trimountain, especially so below the 14th level of No. 4 shaft. The Copper Range railroad, which is owned by this company, paid its initial dividend of $4 per share. A large amount of reconstruction work was done on this road and it was well equipped in all departments.

ONTONAGON COUNTY

The Elm River company began crosscutting from the 200-ft. level of its exploratory shaft to make a complete cross-section of its land. One copper-bearing formation was cut but did not carry enough copper to warrant further exploitation. The Wyandot cut a number of lodes with the crosscut it is driving from the 700-ft. level of its shaft, but they only held out for a short distance. A very promising lode was recently encountered and drifting started.

Mining operations were centered at No. 4 shaft on the Winona property. This shaft was opened below the 14th level with a betterment in the formation showing in the lower workings. Operations at No. 3 shaft were temporarily suspended; on account of the large amount of ground opened in this shaft it was decided not to do any more work there until stamping began. Work on the new stamp mill which is owned jointly by this and the King Philip company progressed satisfactorily. It will be completed during the coming summer. The two shafts of the King Philip, opened on the Winona lode, revealed a good grade of rock in the lower levels and when the mill is ready to go into commission this property will be in position to maintain regular shipments.

The remarkable showing at the Lake property was maintained with depth. The shaft was put down to the 6th level and the lode opened at the levels above was of exceptionally high grade. Two mill tests, made at the Franklin mill with the rock taken from across the face of the formation at the 3rd and 5th levels, showed a mineral yield of 80 and 82 lb. to the ton. The construction of a temporary shaft house was commenced and when completed regular shipments will be maintained. Just above the 6th level the shaft encountered another copper-bearing lode on the foot-wall side about 90 ft. from the main lode. Diamond drilling was carried on for the location of a second shaft.

The results of the Lake property influenced the adjoining lands and North lake put down a number of drill holes and, while copper was shown in some of them, a definite location for a shaft was not decided upon. The Indiana company resumed exploratory work. The Aztec was taken over by the new South Lake company and drilling operations started to reveal the Lake lode. The Mass company discovered the existence of a new lo lying about 120 ft. south of the Eve green lode. This was accomplished driving a crosscut from the 17th level the A shaft. This lode was exposed four other points by crosscutting from th 13th and 15th levels. Drifting at the points was started and the lode opene for considerable distance and, while it d not continue as rich as at the point fir opened, it gave promise of proving a val able asset to the company.

Operations were suspended on the mai lode of the Michigan and a small amou of development work was done on th new lode that was opened on the Be tract. Diamond drilling was also pe formed to cut the new Mass lode, an the lodes exposed at the Adventure. Th Adventure started a new vertical shaft t open the three lodes that were exposed i drill work. The shaft was sunk to a dept of nearly 400 ft. and furnished with surface plant capable of handling operations to a depth of 2000 ft. It is calculated that the first of these lodes wil be reached at a depth of about 950 f The Victoria carried on developmen work during the early part of 1909 i hopes of opening more uniform coppe rock. At the 22nd level an encouragin streak was encountered and the compan was able to about meet current runnin expenses.

Changes in Acid Process at the Tennessee Copper Company

At the acid works of the Tennessee Copper Company at Copperhill, Tenn., the year 1909 witnessed developments in the sulphuric acid process as applied to waste blast-furnace gases, which have placed the industry finally on a firm financial and technical footing. Too much credit cannot be given to the men who had the courage of their convictions and embarked on this enterprise in the face of difficulties impossible to foresee.

As originally designed, the plant was intended to use 10 of the 12 tall chambers as front chambers in which the complete chemical reaction was supposed to occur[1]. A year was spent in efforts to work out this theory and it was found to be unsuited to the existing conditions. A change was therefore made early in 1909, connecting the chambers in series, as is customary at most acid plants. The one-chamber idea being abandoned, certain important changes in the details, such as flue areas, nitrating arrangements, etc., were also made, with the result that steady improvement was shown throughout the year, although the grade of gas was poorer than during 1908. This improvement is best indicated by the statement that the production of 60 deg. acid in 1909 was more than double that of 1908, and the make for December, 1909, was over three times the average monthly make for 1908. The plant, which more than doubles the chamber space of the old, will be described in a later issue of the JOURNAL.

Owing to the necessity for economy in ground space the new chambers will be as high or higher than the old, i.e., 70 ft. or more. Experience gained at this plant has not indicated any advantage in the tall type of chamber other than the saving of ground space, although no especial disadvantage can be attributed to it. Chambers of such proportions have been in successful operation for several years, as for instance at Baltimore where chambers 16x22x34 ft. high are seen, at Pittsburg where sets of chambers 20x20x21 ft. high have been running for many years, and near North Norfolk where chambers 17½x19x30 ft. high are used. It is expected that the new plant at Copperhill will be completed and in full operation early in the summer of 1910.

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[1] Eng. & Min. Journ., Sept. 4, 1909.

Molybdenum

Practically no molybdenum ore was produced in the United States in 1909. About 25 tons of molybdenite was imported. The demand for molybdenum products is increasing again, but very slowly.

Chromite

The only deposits of chromic iron or now being utilized in the United State are in California. Some hundreds of deposits are known in the State in the Coast range both north and south of Sa Francisco, a number of which have bee worked in the past but are now idle The production is only from 200 to 40 tons yearly, mainly from Shasta county though small lots are mined in Alameda county from some of the old deposit there. The ore is sold at from $17 to $2 per ton. Most of the California ore is o too low grade to meet the requirement of the market.

A good deal of mining for chrome ha been carried on in Alameda county from time to time but most of the known deposits are now idle. In Del Norte county are quite extensive deposits, formerly worked, but distance from suitable means of transportation keeps these mines closed. Test lots of copper ore are being shipped from that section, and if results are satisfactory the copper mines will be worked on a large scale. At that time the chrome deposits will undoubtedly be reopened. None of the Fresno county deposits are being worked, nor are those in Placer, San Luis Obispo, Sacramento, Sonoma or Tehama counties.

The importations of chrome iron int this country vary from 30,000 to 40,00 tons yearly.

he Production of Lead and Spelter in 1909

Statistics of Production and Price—Imports and Exports—A Review of Mining Conditions in Missouri, Oklahoma, Wisconsin—The Markets

LEAD, 374,579; SPELTER, 267,069 TONS

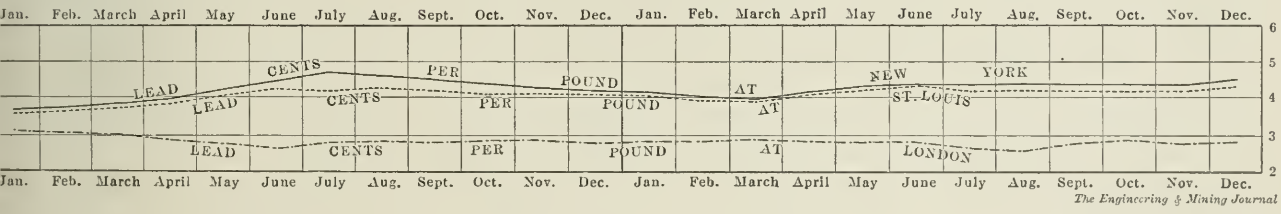
he production of lead in the United es in 1909 increased largely, the total he refined product exceeding the high- figure previously on record. The aration of the total product according rigin, domestic and foreign, cannot made precisely at this time, but the ned lead of domestic origin in 1909 ears to have been about 374,000 tons, inst about 319,000 tons in 1908. In of these figures the production of monial lead is included. There was a e increase in the lead production of souri, and also in that of Utah and the ur d'Alenes.

PRODUCTION OF REFINED LEAD.

(In Tons of 2000 Lb.)

Class.	1908.	1909.
esilverized	174,650	214,516
ntimonial	13,109	12,715
outheast Missouri	113,103	126,916
outhwest Missouri	18,014	20,432
Total domestic	318,876	374,579
Total foreign	94,992	86,524
Grand total	413,868	461,103

) Does not include the lead chiefly of Mis- i origin, which is desilverized by one smelter linois and is here entered under Class 3. (2) production of antimonial lead which used e divided according to domestic and foreign, 908 and 1909, has been wholly entered under estic. (3) Includes two smelters in Illinois, h use chiefly ore from southeastern Missouri. Includes one smelter in Kansas, which uses chiefly from southwestern Missouri.



The Engineering & Mining Journal

COURSE OF LEAD PRICES IN 1908 AND 1909, PLOTTED FROM THE MONTHLY AVERAGES

IMPORTS AND EXPORTS OF LEAD.

(For First 11 Months of the Year.)

(In Tons of 2000 Lb.)

orts:	1908.	1909.
n ore and base bullion	97,120	100,967
igs, bars and old	2,753	3,238
orts:		
ore and bullion	68,124	82,852

he consumption of lead increased gely, business in white lead and oxides, ich amounts to about 40 per cent. of total, having been especially good. s caused the stocks in the hands of the ners, rather large at the beginning of 9, gradually to disappear, and at the of the year there was probably rcely more than an ordinary working plus on hand.

he Payne law made no change in the ff on lead in ore and base bullion, but alteration in the section as to smelting in bond deprived the refiners of the "exempt lead" which formerly was a valuable perquisite. For the cancellation of bonds, the refiner is now obliged to deliver the lead actually produced, whereas, formerly he had to deliver only 90 per cent. of the base bullion imported, although he normally recovered 96 per cent. Consequently, he obtained the difference free of duty.

The Lead Market

The general business revival which followed after the so called "Taft boom" extended only a few days into the year 1909, and lead, like all other metals, was affected by the reaction which followed during the latter part of January and lasted until well into spring. After selling early in January at 4.20c. New York, prices receded and the decline was not checked until the market had dropped below 4c. During the month of March, the demand for the Spring requirements of the lead-consuming trades began to make itself felt and prices began to harden. A buying movement set in, in which all interests participated, and in consequence the price was carried up to 4.35c. New York late in May. From that time on the market displayed a strong undertone, the consumption for all purposes being on a very satisfactory scale. The requirements for lead-covered cables, which had been at a low ebb since the panic of 1907, at last began to make an impression upon the stocks carried over from that period. It was due to their existence and slow distribution that the improvement in prices did not make headway more quickly. As the year drew to a close, this burden was reduced to a normal point. On the other hand, the demand from all sources improved at a rapid rate, and under the impetus of a large business, prices during December advanced quickly to 4.70c. New York, at which figure the market closed firm and active.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	4.560	4.459	13.166	13.125
Year	4.200	4.273	4.153	13.439	13.049

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

White Lead in 1909

The consumption of paints during 1909 showed an increase over 1908 fully commensurate with the growth of the country, and enough to indicate a revival of building operations in many sections where little new work was completed during 1908. The lead pigments enjoyed a full share of the increased demand, the beneficial effects of the agitation for paint legislation still being apparent in the growing use of pure white lead and linseed oil to the exclusion of their substitutes. Although but few new State laws were adopted the agitation over this subject increased. The substitution of full net weights for gross weights or partial tare, was made complete in 1909 on pure lead in oil, and with its attendant advance in the price of small packages was accepted by the trade and consumers without creating any such serious protest as was predicted by the opponents of the "full weights and measures legislation" which led up to this change. The use of steel for packages of 100 lb. and under, was considerably extended during 1909, and promises to displace wood entirely, although the latter will continue to be used for the larger packages.

LEAD CARBONATE

There was no change in the card price for lead in oil from Dec. 10, 1908, until Dec. 6, 1909, the nominal quotation being 6½@6¾c. per lb. for packages of 100 lb. or over. Active competition among corroders caused more or less irregularity in the actual price, however, so that a considerable portion of the year's business was probably done at a concession of about $5 per ton from these prices in spite of the fact that at no time was there any excessive supply in the hands of corroders. Owing to the high cost of linseed oil, lead in oil was advanced on Dec. 6 to 6¾@7c. per lb. for 100-lb. packages and over, and with a subsequent advance on pig lead there is some prospect at the close of a further rise in prices of all products before the spring trade opens.

Dry white lead was nominally 5⅜c. to large consumers, but with the bulk of the sales to carload buyers at 5¼c., a price that was really established by the large contracts entered into in the latter part of 1908, and which covered a good share of the consuming demand for 1909. The same course was followed this year, and a large tonnage placed for 1910 delivery at 5¼c., with an advance in the nominal quotation to 5½@5⅝c. per lb. on Dec. 6. There was but little addition to the corroding capacity of the country during 1909, but 1910 will probably show a 10-per cent. increase.

The fact that in revising the tariff Congress reduced the duty on white lead to 2½c., without changing the rate on pig lead, leaves the margin of protection against foreign lead in oil so narrow that, unless metallic lead were to advance abroad with a consequent rise in the products, corroders here would be unable to advance their prices much beyond the present limit, without opening the door to possible competition from abroad. At the present time English lead in oil could probably be laid down here, duty paid, at 6½c. per pound.

LEAD OXIDES

While the consumption of lead oxi was in excess of that of 1908 by reas of an increased demand for red lead structural iron and steel work, and litharge from the glass, rubber and otl large consuming industries, prices w irregular and unprofitable to produce Red lead sold as low as 6c. to carlo buyers and litharge at 5½c., and ev these figures were shaded early in fall to work off stock which accumula during the summer. At the close, ho ever, there was a disposition to get ba to a more reasonable basis, and nominal advance on white lead extend also to the oxides, with special conc sions to the largest buyers much n rower than they were some mon earlier. In a large way red lead w quoted at the end of 1909 at 6¼@6½ and litharge at 5¾ and 6c. per pound.

Southeast Missouri Lead District

BY H. A. WHEELER [*]

The Southeast Missouri lead district enjoyed a highly prosperous year in 1909, as there were no labor troubles, wages were reasonable, the price of lead was fair, and the output was by far the largest in its history. The production has been steadily growing for the last 40 years and each year has usually shown a marked advance over its predecessor, but in 1909 the increase was unusually large as it exceeded the banner record of 1908 by about 23 per cent. The estimated output of the district in 1909 was 128,000 tons of pig lead with an approximate value of $11,000,000, which not only breaks the local records, but probably gives southeastern Missouri the world's record, as a district. The only other output that exceeds it is that of Spain, but that is derived from several different provinces or states. When the production of the Joplin district in southwestern Missouri (where about 30,000 tons of lead per year are recovered as a by-product in working the zinc ores) is added, the Missouri production slightly exceeds the Spanish, and gives Missouri the world's lead record.

Missouri has been the largest lead producer in the United States since 1905, when it passed Idaho. The development of the Cœur d' Alene district enabled Idaho in 1897 to take the lead from Colorado, which had been the leading producer for many years, especially during the palmy days of the Leadville mines. The lead produced by the mines west of Kansas is a by-product in working the silver ores, whereas the Missouri mines are solely lead producers. It is also noteworthy that the large lead-producing camps that have been opened up in the far West during the last 40 years have seldom maintained their importance for more than 15 to 20 years, including Leadville and Aspen in Colorado, Frisco in Utah, Eureka in Nevada, and Wood River and the Cœur d' Alene in Idaho. The Southeast Missouri district, on the contrary, has been a continuous lead producer for two centuries. Up to 1825 the production was very small, yet it was by no means unimportant in a country that was scarcely settled and where the principal use of the lead was for bullets. The output from 1825 to 1869 increased materially but not uniformly, usually ranging from 2000 to 5000 tons annually, and was about 3500 tons in 1869, when the total output of the United States was 17,000 tons. Up to this time the lead was produced from innumerable shallow diggings by a host of small leasers who worked on a royalty basis.

DISSEMINATED DEPOSITS

The year 1869 was the most eventful in the history of this district, as it marks the introduction of the diamond drill by which the deeper disseminated deposits were discovered. As the first mills erected to treat the disseminated ore had a daily capacity of only about 100 tons, the growth was not rapid and there was none too much confidence in this new class of deposits, especially as they required so much capital. A marked impetus to output was given in 1883, when the stru gling St. Joe company lost its mill fire. This proved to be the dating po of the success of this company, for burned mill was replaced by a 500-t mill, which at that time was not only largest in the district, but, outside of Lake Superior copper mills, was probal the largest in the United States. T large mill brought out the very importa facts that the disseminated, low-gra orebodies were not only large and liable, but that they were also high profitable.

As the merits of the disseminated o slowly became known, other operato were attracted and the district enjoyed quiet but substantial growth, in which boomer was conspicuous by his absen It was opened up and developed by Ea ern capital, and St. Louis has never h more than a minor interest in the distri which recent sales have further reduc Although only 60 miles distant, it is better known and appreciated in W street, and probably 90 per cent. of St. Louis business men are not ev aware of its existence. Yet last year was the most important lead-produci district in the world.

The productive portion of the Sout east Missouri district is a belt about miles long that includes the counties Franklin, Jefferson, Washington, Francois and Madison. The heavy pr duction of 1909 was derived from deep, low-grade, disseminated depos that occur in a basin in St. Franc ounty, 15 miles long by 7 miles wide, in hich the principal towns are Bonne erre, Flat River and Leadwood. Another asin of much less importance occurs in adison county, about six by five miles area, of which Fredericktown is the enter. St. Francois county is preëmi- ently the giant, as last year it produced ver 95 per cent. of the output, while adison county produced about 4 and e remainder of the district, from the hallow diggings, produced less than 1 er cent.

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[*] Mining engineer, 510 Pine street, St. Louis, Mo.

That disseminated ore will be found to greater or less extent underlying the hallow lead beyond the present produc- ve zones, there is scarcely any doubt, nd it is well to remember that the dis- eminated belt produced lead from its hallow deposits for 100 to 150 years be- ore the deep underlying ores were dis- overed. It is also interesting to note that e early work in the disseminated mines as confined to shallow depths, 50 to 00 ft.; later, deposits were worked at 00 to 400 ft.; still later at 500; and one f the most recent shafts is over 700 ft. eep. In Washington county a still reater range in depth is likely to be ound, as one body has been worked at a epth of 200 ft., and deposits in the west- rn part of the county are likely to be 00 to 1200 ft. deep.

Diamond Drill Prospecting

Prospecting for new orebodies with the iamond drill was carried on to only a oderate extent in 1909, and was en- rely confined to the operating companies. ost of the drilling was done to develop e extensions of the working orebodies; ttle virgin land was drilled and few ptions were taken. While the large out- uts resulted in lower working costs and rger profits, they also necessitated much ore vigorous drilling than was required the past. To secure the economy of big ills having a capacity of from 2000 to 000 tons daily, they must be worked up their capacity and that means an in- atiable demand for ore that is going to xhaust the present orebodies at a rate itherto unknown. The recent rapid rate f growth of the huge piles of tailings at e large mills is an ocular warning of e importance of more rapidly opening p new ground.

The Penicaut, Elizabeth, Manhattan nd Bogy companies still remained in the rilling stage of development and did othing in 1909. It is more likely that hey will be absorbed by some of the resent operators than developed into ew producers.

An interesting problem in forestry was aken up by the St. Joseph company in rying to utilize some of its extensive oldings, which now exceed 20,000 acres. he company tried farming and cattle- aising, but these did not prove a finan- ial success as the soil is very poor. hile the mines do not require timbering, the company's 60-mile railroad is a large consumer of ties and lumber, and it also builds from 25 to 75 houses annually to provide for the increasing corps of employees. A professional forester was retained, and under his advice an effort is being made to stimulate the growth of the valuable trees and to remove the black jack and other low-grade or valueless trees and shrubbery. Natural reforestation takes place promptly throughout the lead belt when the original oak timber is cut off, but the black jack and scrub oaks that have replaced the white, post and other oaks are of little value except for fire-wood. Should this experiment prove a success it will be helpful to all the large companies in the district.

St. Joseph Lead Company

For the first time in its long, successful career the St. Joseph Lead Company took second place, as its output in 1909 was exceeded by that of the Federal Lead Company. While the Federal company attained in 10 years what required over 40 years' effort by the pioneer company, the latter never enjoyed the benefits of its younger rival in receiving large blocks of new capital and absorbing several producing mines. The growth of the St. Joseph company to its present great size, with its numerous valuable mines, large surface plants and 60 miles of well-built railroad, was paid for out of the profits, and no new capital has been put into the company since its formation in 1864.

The St. Joseph company maintained its usual large production in 1909, and its vitality is illustrated by the fact that the greater portion of the ore for the No. 1 mill was obtained from the original mine at Bonne Terre that underlies the mill and which was opened in 1865. The No. 1 mill was built as a 500-ton mill, but has since been enlarged and improved until it now has a capacity of 1500 tons. The ore from the old mine is all raised through the No. 1 shaft at the mill, to which it is brought by a compressed-air haulage system. This permitted the closing down of shafts Nos. 2, 3, 4, 5 and 6, which are now used only for ventilation.

Ore is also shipped over the company's railroad, in 50-ton, steel, drop-bottom cars to the No. 1 mill from the No. 7 or Hill shaft, two miles distant; from the No. 8 or Crawley shaft at Flat River, eight miles distant; and from the No. 10 or Gumbo shaft, 11 miles distant.

The No. 2 mill at Leadwood, built in 1904 with a daily capacity of 1500 tons, is supplied by shafts in the Upper Big River district, viz., the No. 11 or Hunt shaft, the No. 12 or Hoffman shaft and the No. 14, which are all in the town of Leadwood. Both mills were kept in full operation throughout 1909 and the concentrates shipped to the smeltery at Herculaneum, 30 miles north of Bonne Terre on the Mississippi river. The smeltery is equipped with five, large, mechanically fed shaft furnaces and a battery of five Savelsberg pots or roasting furnaces, besides the refinery and matte roasters. It is the intention to greatly enlarge the pot plant for roasting the concentrates, after which the 20 Freiberg or hand-roasting furnaces at Leadwood will be closed down.

The gas-power plant at Bonne Terre was increased by adding a 30-drill, Snow type, gas-driven air compressor which will supersede the Norwalk compound, condensing, steam-driven compressors.

A new shaft, No. 15, was sunk on the southern part of the Crawley tract at Flat River and equipped with an electric hoist. As soon as the enlarged power plant of the Doe Run company at Flat River can furnish power, this shaft will begin shipping ore to the Bonne Terre mill and thus make the ninth producer out of a total of 15 shafts.

Doe Run and Desloge Companies

The Doe Run Lead Company, closely affiliated with the St. Joe Lead Company, had a prosperous year and materially increased its output. The new 2000-ton concentrator (No. 3) at Flat River started in March, and was successfully operated on ore from the Mitchell shaft and part of the output of the Flat River shafts. It is a thoroughly modern plant that is divided into four units housed in a steel building with concrete floors. It was designed by O. M. Bilharz, the manager of the company. The old or No. 1 mill at Doe Run, of 1500 tons capacity, and the No. 2, or old remodeled Columbia mill, of 600 tons capacity, were also operated, and the three mills were run on the output of six shafts.

The No. 6 shaft at Elvins, on the right of way of the Missouri Southern railroad, after lying idle for several years, was completed and equipped with an electric hoisting plant. A new shaft (No. 9) is being sunk on the property purchased from the Union Lead Company, two miles east of Flat River, where the diamond drill disclosed an attractive orebody. It is near the shaft of the old Donnelly company, where seams of quite pure siegenite, the double sulphide of nickel and cobalt, were found an inch or two in thickness. Nickel and cobalt may become a valuable by-product of this new shaft.

The power plant at Central was increased by a new unit, so that it now consists of four Snow gas engines that directly drive 600-kw. Westinghouse alternating-current generators that produce a 6600-volt current. The gas is furnished by four Loomis-Pettibone down-draft gas producers that are run on southern Illinois bituminous coal.

The Desloge Lead Company completed its new or No. 6 shaft near Leadwood and made regular ore shipments about four miles to the mill over a spur of the Desloge railroad. It is equipped with a crushing department having four rock breakers. This is the deepest producing shaft in the district, 550 ft. to the sump, and within three miles of the Washington county line, or beyond the "deadline" of what was formerly considered the western boundary of the disseminated-lead belt. The Hoffman shaft of the St. Joe company is nearer the Washington county line by about half a mile, yet this is recognized, after having been operated for six years, as being one of the strongest and richest orebodies ever opened in southeast Missouri.

The 1000-ton mill at the town of Desloge is also receiving ore from the No. 3 shaft near the mill and from the No. 4 shaft on Big river, about one mile west of the mill. The No. 2 shaft, at the southern end of the property, was not operated. In the smelting department, the blast furnace and hand roasters were not operated, but three Flintshire or air furnaces were run steadily. As they could smelt only a small portion of the concentrates, the surplus was shipped to the Federal smeltery at Alton, Ill.

The National Lead Company maintained its usual output. It was not burdened with any important new construction work although a small brick hospital is now being erected for its employees. Its 1500-ton mill was supplied from four shafts and the concentrates were shipped to its large smeltery at Collinsville, Illinois.

FEDERAL LEAD COMPANY

Although the Federal Lead Company, at Flat River, is the youngest of the St. Francois county producers, it has grown so rapidly and been developed so energetically that it was by far the largest producer in the district in 1909. It started in 1900 with a small acreage and one shaft—the No. 1 or Blue Jay—where an 800-ton mill was erected the following year on highly original lines. No jigs were employed in this mill, the ore being crushed to 3 mm. and treated on Bartlett tables. Another shaft, the No. 2, or Graveyard, was sunk in 1902 on Flat river, and the mill remodeled for coarse crushing (9 mm.) and the Bartlett tables being replaced by Harz jigs.

In 1903 the Derby property and the Irondale Lead Company were acquired. In 1905 the adjoining property of the Central Lead Company was purchased. In 1906 the erection of a modern 3000-ton mill (No. 3) and power house was started on the Central property, and a new shaft, No. 8, was commenced on the 40-acre Central tract at Elvins. In 1907 two shafts, Nos. 8 and 9, were started in the recently acquired land of the Missouri Leadfields Company, which had a large acreage south of Flat River. In 1908 a new shaft, No. 11, was sunk on the extension of the Rogers orebody, and the new mill was remodeled by substituting Hancock for Harz jigs.

The year 1909 found the Federal Lead Company with its construction and readjustment work at last finished, including repeated changes in the local manager, and more attention was given to production and reduction in costs. The year was more than satisfactory, and the output showed an unprecedented growth. In fact, the lead production is today not only the largest in the district, but is probably the largest in the United States, if not in the world.

OTHER MINES

The Madison county mines, at the southern end of the disseminated-lead belt, all suffered from the great disadvantage of having much smaller orebodies than occur in St. Francois county. They therefore have smaller plants, and none of them reached an output as large as 3000 tons of lead in 1909. As a compensation, however, they have little or no water to contend with and the orebodies are shallow or occur at 40 to 300 ft. in depth, as against 300 to 700 ft. in St. Francois county. None of the companies operate smelting plants and the concentrates were sold in the St. Louis market. They all cluster around Fredericktown, on the Iron Mountain Railroad, and are close or adjacent to the granite and porphyry hills that characterize this portion of the Ozark uplift.

The oldest lead mine in the United States, the Mine la Motte, has been producing since 1720, and had a quiet, uneventful year in 1909. The construction work of the present owners ceased with the completion of a 500-ton mill in 1908, and 1909 was devoted to production and the development of new orebodies. Part of the company's large acreage was leased on a royalty basis to two operating companies, each of which operated its own mill. The individual leaser has always been an important factor here, as the shallowness of the deposits, 20 to 120 ft., and the freedom from water have enabled the small leasers to produce considerable lead which is milled in the company's mill on a tonnage basis.

The North American Lead Company has for some time been a copper, nickel and cobalt producer, and the lead that is recovered as a by-product is a minor factor. A large body of mixed sulphides, in which pyrite greatly predominated, was worked during the year from which the main output was ingot copper, metallic nickel and cobalt oxide. The electrolytic process was employed in the separation of these metals. The galena or lead by-product is recovered in the mill on the jigs, before the "sulphides" are sent to the large smelting plant that adjoins the mill. The output is derived from one shaft, and is milled in a concentrator of about 500 tons daily capacity.

The Madison Lead and Land Company, formerly known as the Catherine, went into the hands of a receiver last summer, after successfully weathering the panic of 1907. This is one of the few instances of failure in this district and seems to be due to a complex of troubles, among which it is said that the company stoped over its line into the adjoining property. The present company made extensive improvements since it purchased the property from the Catherine Lead Company, and added a second mill of 500 tons capacity, which is situated at No. 2 shaft. This, with the No. 1 mill on the Little St. Francois river, gave a total daily milling capacity of 750 tons, but as no new shafts were added there were only two shafts to furnish such a heavy tonnage—a severe strain on the orebodies of Madison county. As the company possesses a considerable acreage and as the mines, which are dry and shallow, have been operated less than 10 years, the property will probably be acquired by stronger interests and worked on a larger scale.

Spelter

The production of spelter in 1909 exceeded the highest figure previously on record. The deliveries for consumption increased even more than the production, inasmuch as there were larger imports of foreign spelter than is usually the case, and there was a diminution of stocks in the hands of the smelters. The demand for consumption, especially in the brass and galvanizing trades, was excellent. The business in sheet zinc improved materially, but not perhaps to as large an extent as in the other branches.

PRODUCTION OF SPELTER.

(IN TONS OF 2000 LB.)

State.	1908.	1909.
Colorado	3,079	6,115
Illinois	50,244	75,271
Kansas	99,136	104,012
Missouri	10,196	8,478
Oklahoma	14,867	28,821
South and East	32,989	44,372
Total	210,511	267,069

DELIVERIES INTO CONSUMPTION.

(IN TONS OF 2000 LB.)

	1908.	1909.
Stock January 1	32,883	25,000
Production	210,511	267,069
Imports	811	11,000
Total supply	244,275	303,069
Exports	2,640	2,440
Stock, December 31	25,000	12,000
Deliveries	216,635	288,629

During the first half of 1909 the zinc industry was greatly disturbed by the fight over the tariff question, which was finally won by the producers of ore. Under the new tariff zinc ore (formerly free of duty) is subject to a graduated schedule, rising to 1c. per lb. on the zinc content of ore assaying 30 per cent. zinc. The zinc smelters are not interested in ore of any lower grade than that, and consequently in their case the maximum rate of duty is of general application.

The imposition of this duty coming contemporaneously with a buoyant feeling

n nearly all lines of business and an
mproved demand for spelter led to an
dvance in price to a high level, which
ndeed made it possible to resume the
mportation of Mexican ore in spite of
he duty.

Previous to the enactment of the new
ariff many of the smelters imported large
uantities of ore and also stocked up
rom domestic sources, so that while the
uotational margin for 1909 does not
how well the rise in the price for the
etal was highly profitable to some of
e smelters. The zinc smelting industry,
owever, has been by no means a bed of
oses for all hands. The immediate
ffect of the rise in spelter was to stimu-
te developments to the west of the
ocky mountains and there is every
rospect of a greatly increased supply
f ore from that region. In particular it
eems as if the zinc mines of Butte,
lont., would become of great importance.
hipments from Butte in 1909 were con-
derable and the construction of two
rge mills, now in progress, will greatly
crease the supply in the near future.
he Butte ore assays about 24 per cent.
nc and can readily be concentrated to
) per cent., with but little iron, and
ccurring in large bodies which can be
ined and milled at $4 @ 4.50 per ton,
ith a $7 freight rate on the concentrate,
e mines can produce profitably on a
sis of 5c. spelter, or less. The very
w freight rates quoted by the railways,
nsidering the long haul, promote the
evelopment of zinc mines in the far
'est. During 1909 a considerable ton-
ge of calamine was shipped from the
w mines in southwestern Nevada,
ich was hauled to Kansas smelteries at
; per ton. This ore assayed about 45
r cent. zinc. There was also an in-
eased production of zinc ore in Arizona.
olorado and Utah produced about as
ual. The Magdalena district of New
exico is still checked by milling diffi-
lties.

In the East there was an increased
oduction in Wisconsin and Oklahoma.
e ore deposits of the latter State ap-
ar to be of importance, but develop-
nt is retarded by the absurdly extor-
nate demands of the owners of the
d and the lack of expert knowledge
d efficient means to mill the peculiarly
mplex ore. One drawback hangs upon
: other. So long as greedy land or
se-owners exact an outrageous scale
royalty, the big companies that are
le to solve the mining and milling diffi-
lties will not go into the district. Thus
t only does the whole industry suffer,
t also the present policy is contrary
the best interests of this district.

Anyway, the result of 1909 has made
clear that the shortage of zinc ore in
s country is not so pronounced as we
ught during the pessimistic days of
pression following the panic. The de-
nd for a tariff on foreign ore was pressed at a period when spelter was low along with other metals, with which it would certainly have appreciated upon the revival in business. The tariff doubtless contributed to a jacking up of the price to an inordinate level, but as new supplies of ore are developed we are likely to see a recession to what would have been the normal level without any tariff. The latter will, however, excite local irritations, as for example to those smelters who are short of gas and miss the Mexican calamine that does not require roasting.

The gas question is in fact becoming very serious in Kansas, and the smelters at Iola will consider themselves lucky if they get through this winter. There is still an abundant supply of gas in Oklahoma, and we shall look for a gradual transference of a part of the smelting industry from Kansas to that State, which is already indicated by the statistics. The occurrence of zinc ore and natural gas in such proximity as in Oklahoma emphasizes the shortsightedness that prevents both resources from being utilized to the best advantage.

The Spelter Market

At the opening of 1909 the market ruled above 5c. St. Louis. Under the influence of the unfavorable conditions developing at that time in the iron and steel industry, prices began to weaken and declined continuously until 4.60c. St. Louis was reached late in February. This low figure attracted buying by both consumers and speculators, and in consequence a steadier tone prevailed during March. Moreover, the smelters were reluctant to enter orders, due to the fact that ore prices had not yielded in proportion to the decline in the refined metal. The strength of the ore market was in a measure due to the sentimental influence created by the efforts of the Joplin miners to shut out Mexican and British Columbia ore, by causing a prohibitive duty to be placed on zinc ore in the Payne tariff bill. This factor made itself felt more strongly as time passed, and combined with the revival in business in general, and in the iron and steel industry in particular, caused prices to harden, and under large transactions the market moved upward by leaps and bounds in April, May and June until 5.30c. St. Louis was realized toward the end of the last named month. At about this time it became known that the leading buyers had purchased large lots of foreign spelter, ostensibly for drawback purposes, the quantities being estimated at from 8000 to 10,000 tons. This news created at first considerable consternation, bringing about recessions early in July, but the influence wore off as the month advanced, being overshadowed by the developments in Washington, where it became clearer from day to day that the mining interests would win their fight for a duty on zinc ore, which had been fixed at 1c. per lb. of zinc contained on such grades as are available for the manufacture of spelter. This expectation was realized at the final passage of the bill early in August.

While the return of prosperity began to be reflected in an expanding consumption of spelter for all purposes, the output of the metal continued restricted, as necessarily considerable time must elapse until the quantities formerly supplied from Mexico could be replaced by an increased output in this country.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February....	4.788	4.889	4.638	4.739	20.875	21.563
March..	4.665	4.757	4.527	4.607	21.075	21.438
April....	4.645	4.965	4.495	4.815	21.344	21.531
May..	4.608	5.124	4.458	4.974	19.906	21.975
June..	4.543	5.402	4.393	5.252	19.000	22.000
July..	4.485	5.402	4.338	5.252	19.031	21.969
August......	4.702	5.729	4.556	5.579	19.350	22.125
September ..	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November .	5.059	6.381	4.909	6.231	20.875	23.188
December...	5.137	6.249	4.987	6.099	20.625	23.094
Year..	4.726	5.503	4.578	5.352	20.163	22.185

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

MONTHLY AVERAGE PRICES OF SPELTER AND SHEET ZINC.

(IN CENTS PER POUND.)

Month.	1908.		1909.	
	(*a*) Spelter.	(*b*) Sheet Zinc.	(*a*) Spelter.	(*b*) Sheet Zinc.
January	4.518	6.44	5.141	6.44
February	4.788	6.44	4.889	6.44
March	4.665	6.44	4.757	6.21
April	4.645	6.44	4.965	6.21
May	4.608	6.44	5.124	6.21
June	4.543	6.44	5.402	6.325
July	4.485	6.44	5.402	6.44
August	4.702	6.44	5.729	6.808
September	4.769	6.44	5.796	6.90
October	4.801	6.44	6.199	7.187
November	5.059	6.44	6.381	7.36
December	5.137	6.44	6.249	7.36
Year	4.726	6.44	5.503	6.657

(*a*) At New York. (*b*) At Lasalle-Peru, Illinois.

Everything had, therefore, shaped itself toward laying the foundation for a strong advance in the market, and the forward movement was resumed with great vigor during August. The influx of orders became so heavy that, in addition to the current consumption, the bulk of the stock which had been carried over from the previous year was gradually absorbed during September, October and November. In October, the price—for the first time since the panic of 1907—crossed 6c. St. Louis, and the advance did not stop until 6¼c. St. Louis was reached toward the end of that month. The market remained active and firm around this level throughout November.

Necessarily, such high prices attracted a great deal of attention to deposits of zinc ore throughout the country. Mines which had been shut down for several years, owing to the low price of spelter, are now again in a position to operate profitably, and work is progressing rapidly toward putting them into shape to produce. An entirely new source of supply is promised from Montana. Even now shipments from there amount to approximately 1500 tons a month, and a large increase will take place as soon as the Butte & Superior Copper Company begins shipments from its mill now in the course of construction. At the relative parity of the foreign and domestic markets, imports of ore from Mexico have become feasible, in spite of the duty. It is, therefore, evident that no scarcity of raw material need be feared so long as the price of spelter rules at reasonable level. A realization of thi situation brought about freer offering of the metal during the last month o 1909 at slight recessions in the price.

The prospects for the zinc industr continue bright, in view of the unprecedentedly large consumption on the on hand, while on the other, a material increase in the output cannot be expecte since the present idle smelting capacit is in those gasfields where the suppl of gas is becoming exhausted, as is ev denced by the necessity of the installation of pumping plants at some of th important smelting works at Iola an Gas in Kansas. The year closes wit spelter at 6@6.05c. St. Louis, and 6.15@ 6.20c. New York.

Zinc and Lead in the Joplin District

BY JESSE A ZOOK

During 1909 the shipment was increased 37,825 tons of zinc and 5342 tons of lead concentrate, the increment of values aggregating $3,577,100, compared with 1908.

THE COURSE OF PRICES

With prices at the beginning of the year fair, a weakening spelter market sent zinc ore down $5.50 per ton within six weeks. The lowest point of the year was in February, when for three weeks the highest price was $40 and the average as low as $33 per ton the second week of the month. With the upward turn of spelter in May zinc ore and metal advanced steadily to the end of the year. The average increase in zinc prices for the year was $6.72 per ton, the extreme variation in the market ranging from $40 in February to $55 at the year end.

TABLE II. SIXTEEN YEARS' PRODUCTION OF JOPLIN DISTRICT.

	Zinc Tons.	Lead, Tons.	Total Value.
1909	296,453	43,875	$14,573,077
1908	258,628	38,533	10,995,977
1907	286,538	42,065	15,419,827
1906	278,930	39,189	15,128,175
1905	252,435	31,679	13,302,800
1904	267,210	34,362	11,487,350
1903	231,773	28,656	9,471,395
1902	262,545	31,625	9,130,890
1901	258,306	35,177	7,971,651
1900	218,416	29,132	7,992,105
1899	255,088	23,888	10,715,307
1898	234,155	26,687	7,119,867
1897	177,976	30,105	4,726,302
1896	155,333	27,721	3,857,355
1895	141,487	31,294	3,775,929
1894	117,310	32,190	3,535,736
Totals	3,758,913	526,178	$119,503,743

Table I gives the comparative sales of zinc and lead ore for 11 months of 1909 and the same period of 1908 from each camp, each county and State and the Joplin district totals. Table II gives the district totals for each of 16 years. Table III gives the highest and average price paid each month of 1900 for zinc and lead per ton of 2000 lb. Table IV gives the high and average price for each of 11 years.

TABLE I. PRODUCTION OF ZINC AND LEAD IN THE JOPLIN DISTRICT.

	ZINC ORE (Short Tons).				LEAD ORE (Short Tons).			
	1909.	1908.	Inc.	Dec.	1909.	1908.	Inc.	Dec.
Webb City–Carterville	90,888	70,460	20,428	....	19,350	16,890	2,460	....
Joplin	45,833	51,727	.....	5,894	6,221	6,278	....	57
Duenweg	15,405	11,939	3,466	....	2,394	1,840	554	....
Alba-Neck	10,480	11,968	.....	1,488	155	86	69	....
Prosperity	10,394	7,691	2,703	....	2,887	2,182	705	....
Oronogo	7,407	8,506	.....	1,099	842	410	432	....
Carthage	6,486	3,893	2,593	....	8	3	5	....
Sarcoxie	4,142	2,123	2,019	....	.....	.....	....	....
Zincite	3,561	2,064	1,497	....	73	83	....	10
Cave Springs	1,677	945	732	....	10	6	4	....
Carl Junction	1,501	1,386	115	....	28	65	....	37
Reeds	......	82	.....	82	.....	.....	....	....
Jasper County	197,774	172,784	24,990	....	31,968	27,843	4,125	....
Granby	13,060	10,599	2,461	....	321	831	....	510
Spurgeon	8,005	6,863	1,142	....	1,891	1,479	412	....
Jackson	1,421	......	1,421	....	181	.....	181	....
Saginaw	1,227	......	1,227	....	130	.....	130	....
Wentworth	288	597	.....	309	.....	.....	....	....
Seneca	23	18	5	....	50	76	....	26
Newton County	24,024	18,077	5,947	....	2,573	2,386	187	....
Aurora	11,120	8,406	3,014	....	333	201	129	....
Stott City	573	159	114	....	.....	.....	....	....
Lawrence County	11,993	8,565	3,428	....	333	204	129	....
Dade County	61	......	61	....	.....	.....	....	....
Barry County	18	......	18	....	.....	.....	....	....
Green County	......	19	.....	19	41	59	....	18
KANSAS.								
Galena	16,260	16,576	.....	316	1,772	2,807	....	1,035
Badger	7,669	9,633	.....	1,964	115	509	....	364
Playter	......	220	.....	220	....	36	....	36
Cherokee County	23,929	26,429	.....	2,500	1,917	3,352	....	1,435
OKLAHOMA.								
Miami	10,312	5,870	4,442	....	3,561	1,254	2,307	....
Quapaw	1,599	3,149	1,450	....	277	44	233	..
Peoria	212	288	.....	46	.....	.....	..	..
Ottawa County	15,153	9,307	5,846	....	3,838	1,298	2,540	...
Murray County	16	......	16	....	.....	.....	....	....
Missouri	233,870	199,115	31,402	...	31,915	30,192	4,423	....
Kansas	23,929	26,429	.....	2,500	1,917	3,352	....	1,135
Oklahoma	15,169	9,307	5,862	....	3,838	1,298	2,540	...
Joplin District	272,968	235,181	37,787	...	40,670	35,112	5,528	....

PROSPECT AND DEVELOPMENT WORK

The steadily advancing level of price inspired a campaign of prospecting an development work that grew in interes to the end of the year. The greater results from development work came to th eet-ore area, yet there were other nts that marked a greater percentage increase. The renewal of operations Saginaw and Jackson, together with large increase in the output of Spur-n, all of which are in the Joplin area, l represent a portion of the Joplin elopment, do not show in favor of in, however, as they are in Newton nty. Development of the work con-ous to Joplin in Jasper county, near Junction, where eight additional s are planned, and in Galena, Kan., culminate in results another year.

TABLE III. ZINC-LEAD PRICES PER TON, 1909.

	ZINC.		LEAD.	
	High.	Aver-age.	High.	Aver-age.
iary	$46.00	$38.48	$54.50	$51.74
ruary	40.50	34.46	53.00	50.54
ch	41.50	34.77	53.50	50.46
l	43.00	35.99	58.00	54.71
	46.00	37.82	59.00	56.61
	47.50	40.00	60.00	57.92
	48.00	41.28	57.00	54.19
ust	54.50	44.56	60.50	57.61
ember	52.50	44.78	58.00	56.32
ber	54.00	46.04	58.00	55.26
ember	55.00	48.29	58.00	53.98
ember	55.00	48.43	54.00	53.23
is year	55.00	41.08	60.50	54.56
st year	47.00	34.36	66.00	54.66
Increase	8.00	6.72	.....	.....
Decrease	....	....	5.50	0.10

A NEW FIELD

e shipment from Murray county, homa, comes from the vicinity of Davis. Murray is the southern county of the old Chickasaw nation, separated from Texas by Red river, and almost centrally situated from east to west of the State. This ore is a zinc silicate of fair grade. But one shipment has been reported made.

DEVELOPING LOWER LEVELS

In 1899 the possibilities of lower ore levels was first made public by the publication of the Crossman drill chart, which stated that 34 per cent. of holes drilled 250 ft. deep found ore; that 75 per cent. of holes drilled 500 ft. found 40 to 60 ft. of ore; that 50 per cent. of holes drilled to 600 ft. found 40 to 60 ft. of ore; that 50 per cent. of holes drilled to 1100 ft. found 25 ft. of ore on that level; that one hole drilled to 2500 ft. found chert and limestone.

TABLE IV. PRICES FOR ELEVEN YEARS.

	ZINC ORE.		LEAD ORE.	
	High.	Aver-age	High.	Aver-age.
1909	$55.00	$41.08	$60.50	$54.56
1908	47.00	34.36	66.00	54.66
1907	53.50	43.68	88.50	68.90
1906	54.00	43.30	87.00	77.78
1905	60.00	44.88	80.00	62.12
1904	53.00	35.92	62.00	54.80
1903	42.00	33.72	60.50	54.12
1902	42.00	30.33	50.00	46.10
1901	34.00	24.21	47.50	45.99
1900	38.50	26.50	56.50	48.32
1899	55.00	36.61	55.00	51.34

An effort to develop ore on the 300- and 400-ft. levels was made at Aurora a few years ago, but falling ore prices stopped production. It was demonstrated that these levels could then be mined only at a cost of $45 per ton of concentrate.

This year a company at Cave Springs, Mo., near the State line of Kansas, by an incline shaft driven at an angle of 45 deg. a length of 444 ft., developed a sheet formation in Grand Falls chert from 180 ft. to the 220-ft. level, and from 222 ft. to the 290-ft. level found ore disseminated in shaly limestone. Two miles west in Galena, Kan., a similar ore occurrence was found by drill, and two miles north of this it is just now being developed by shaft. The three form a triangular area two miles each way, and are geologically predicative of a continuation of one ore occurrence.

In addition to the above, recent drillings near Quapaw, Oklahoma, also near Joplin, Webb City, Carterville, Hornet, Granby, Aurora and Springfield in Missouri, corroborate the Crossman drill chart in the existence of an extensive ore area in the Kinderhook rock, underlying the Grand Falls chert, which has a very perceptible dip northward.

The ore occurrence in shaly limestone, below the Grand Falls chert, carries with it a problem in concentration at variance to the ore occurrence in chert, requiring a solution before the ore of this level can be marketed at a profit.

Miami District, Oklahoma

e mines of the Miami district of homa are at Hattonville, 2½ miles of Miami. The ground that has prospected and partially developed s an area ½ mile wide and about miles long. The development work r accomplished shows that the ore sit extends along a line approxi-ly north 20 deg. west. According to ocal operators, the ore occurs in a s of parallel "runs" 50 to 80 ft. wide pitch slightly toward the north. resent workings range from 100 to ft. in depth, while farther north a er of drill holes are reported to have ntered ore at a greater depth. The ce of the country is a flat open e with no rock outcrop near the s. The ore was accidentally dis-ed while drilling a well for domestic ses.

eological section from the surface consists of approximately 25 ft. of nd clay, 50 to 60 ft. of shale and tone, 8 to 10 ft. of oil-bearing lime-which is usually the cap rock. Be-this is a stratum 6 to 20 ft. thick ning both lead and zinc in a cherty oil-bearing limestone. The bedrock beneath this consists of a thin stratum of chert. At present all the mining is carried on in the ore-bearing formation above the chert bedrock, and in many instances the ore is found to extend up to and slightly into the soapstone roof. With this roof it is necessary to drive narrow drifts and use more or less timber, leaving large pillars, thus adding to the expense of mining. In a few instances ore has been found below the chert bed. Only the richest deposits are being taken out, and these are mined in anything but a systematic manner, as is the case in most mining districts in their early history.

The district is well equipped with mills, there being 18 or 20 complete and ready for operation. The operating mills are the Emma-Gordon, Queen City-Joplin, Old Chief, Okmulgee, Chatham Oil and Gas, Turkey Fat, King Jack and New State. In addition to this there are two tailings plants in operation and a third one now under construction. The above mills have a capacity of 50 to 200 tons each, while the Emma-Gordon is a 400-ton mill. These are all rated on Joplin ore. However, the character of the ore here is such that most of the mills are operated on about half the rated capacity, and even then the losses are high. Among some of the dozen idle mills are a number of new ones that have only recently been completed, while others have been run a short time, and for one reason or another have not been found profitable. In many cases the mills are built before the ground is thoroughly proven and developed and by the time the mill is ready for operation, operating funds are depleted and work must cease or wait until the mill and land can be leased to someone else.

ROYALTIES

The high royalty in this district works a severe hardship on the operators, and if it were not for the fact that the ore is exceedingly rich it would be almost impossible for any mill to pay dividends. The owner of the land receives 5 per cent. royalty. This is paid by a Royalty company, which sub-leases the property to the prospector for 15 to 20 per cent. The Prospector does a little work on the land and in turn leases it to a milling company for 25 to 30 per cent. In one or two cases the company putting up the mill has sub-leased the entire plant for 35 per cent., with the understanding that the operator keeps up the mill and leaves it in good condition at the expiration of the lease. In some cases a bonus of $2000 or $3000 with a royalty of 27½ per cent. is paid by the operator who has to make an additional outlay of $5000 to $15,000 for a mill, depending upon the scale he proposes to work.

A number of the tailings dumps have been leased at 30 to 50 per cent. of the gross output. At this price the lessee builds his own mill. The high royalty on the tailings is largely the fault of the man who proposes to work them. The dirt being rich, it looks as if money would be easily made in working it over, and in his enthusiasm the operator in some cases has actually offered to pay this high rate, asking no questions.

An attempt is being made to reduce the royalties. Some prospectors refuse to lease from the Royalty company, and are endeavoring to obtain their leases direct from the fee owner. By doing this, at least one royalty of 10 to 15 per cent. can be cut out entirely. Some of the old leases that have been forfeited from one cause or another are now being sub-let on a closer margin.

State Taxes

The State taxes imposed on mining companies in Oklahoma are also quite high. One half of one per cent is charged on the gross output of the mine; this has to be paid even though the mine be running at a loss. In addition to this there is a tax on the net profits, as well as the regular tax on the assessed valuation of the property.

Milling Practice

The same type of mill that is used in the Joplin district has been installed at Miami. In fact a large number of the mills that have been built are ones that have been moved direct from the Joplin field. While this type of mill may be the best one available at the present time for treating these ores, there is a good field for some other type of mill. The character of the ore is such that these mills do not recover to exceed 50 per cent. of the metallic content. The tailings losses are exceedingly high. This is due largely to the fact that the ore carries a notable percentage of petroleum and bitumen. The hydrocarbons make the ore more or less sticky and there is a tendency to clog the jig beds. A portion of the oil floats off and carries fine blende with it. A large percentage of the ore is finely disseminated and to recover it will require fine crushing.

The present practice is to crush the ore to ¼ inch size, run it over a roughing jig; the spigot product goes to a finishing jig. The tailings from the roughing jig are disposed of as waste, while those from the finishing jig are recrushed and passed over a sand jig. The majority of the mills have one or two Wilfley, or other make of tables, upon which the slimes are treated. In some cases no tables are used.

The ore as it comes from the mine contains three parts blende to one of galena, with a high percentage of marcasite. It is hard to obtain a finished product that contains over 50 to 52 per cent. zinc. The iron content of the concentrate is high, and as a result the highest prices are not obtained.

Zinc Mining in Wisconsin in 1909

BY J. E. KENNEDY

The output of zinc ore of the Wisconsin district closely approximated 75,000 tons in 1909. This exceeded the highest previous production, that of 1908, by about 30 per cent., but on account of the better metal prices and the higher grade of concentrate delivered, the production of 1909 is easily 40 per cent. greater in value. During the first four months of the year the weekly production of crude concentrate was 1000 to 1200 tons; it steadily increased during the summer months and exceeded 2000 tons at the close of the year.

The year opened with the base price of 60 per cent. zinc ore at $40 per ton. During January it advanced to $43. A reaction came in February, when the base price declined to $37@38 and remained at these figures until the middle of April. From that time it worked back and forth until the $50 mark was reached the last week in August. Competition among ore buyers in the Joplin district, rather than a healthy advance in the spelter market, caused the high base at this time and it immediately eased off again to $48. Following the rise in spelter the base price went to $50 again in October. The highest premium price reported during the year was $53 per ton. The best base price was $51 per ton, recorded during November and December.

Eleven roasters were in almost continuous operation during 1909, including three of the Mineral Point Zinc Company and two of the Joplin Separator Works. By the process of roasting, green concentrates assaying from 17 to 40 per cent. zinc were converted into a product containing from 55 to 63 per cent. zinc. A loss exceeding 10 per cent. of the zinc content was sustained, however, together with a shrinkage of 30 to 50 per cent. in the gross weight of raw concentrate, the sulphur content going off in fumes and the residual iron going to the dump pile. The electrostatic separator, at Platteville, saved the iron pyrite as a byproduct. Since Nov. 6 the shipment of zinc ore from this district was based on ore sent to smelteries, either from the mines direct, or from the three separating plants at Platteville, Galena and Mineral Point, the grade varying from 40 per cent. for the raw sulphide to 63 per cent. roasted. Formerly all zinc ore shipped to the Mineral Point Zinc Company's separating plant at Mineral Point was classified as "ore to smelteries." About 5000 tons of carbonate-zinc ore were included in the year's output.

Production by Camps

In respect to production, Platteville, Benton, Hazel Green, Mifflin, Highland, Cuba City, Linden, Rewey, Galena, Livingston, Shullsburg, Mineral Point, Montfort, Dodgeville and Potosi stood in the order of importance named. One hundred mining companies contributed to the year's shipment. Of this number 75 were equipped with modern milling plants.

Eight new concentrators were constructed and 11 second-hand mills were moved to new properties. Rich deposits of zinc were opened up at New Diggings, an old lead camp lying between Benton and Shullsburg, which is new territory for zinc mining. A central power plant, at Galena, which will furnish electric motive power to mines between Platteville and Galena, is nearing completion.

The Mineral Point Zinc Company bought additional mineral land at Highland, Benton and Hazel Green. The Kennedy mine was purchased early in October for $250,000. The Wisconsin Zinc Company acquired control of the property of the Benton Development Company, including the Pittsburg-Benton and Drumm mines; also the land of the LaFayette Land and Mining Company, comprising 1900 acres of mineral land lying between Benton and Shullsburg. The Frontier Mining Company bought the Dark Horse mine, at Linden, for $25,000, and developed and equipped the Hoosier mine on the Graham land, south of Hazel Green. A substantial gain in dividend payments by producing properties invited new capital into the field, and a number of abandoned mines were again placed in the producing list.

ron and Steel Industry in 1909

A Year Beginning with Halting Recovery from Depression and Ending with Production at an Unprecedented Rate and a Very Large Demand

PIG IRON PRODUCTION, 25,712,000 TONS

As the record of 1908 was one of eep depression at the beginning, with nly slow and halting steps toward reovery in the later part of the year, hat of 1909 began rather unfavorably. he determined adherence of the leading nterests to the policy of maintaining rices seemed to have discouraged those who believed that the financial condition of the country had so far improved that money was ready for investment in construction of all kinds, if only proper encouragement could be given by the cheapening of material. Their view, which experience once more showed to be the only correct one, finally prevailed. The halting and confusion of the early months of the year fast gave way to activity on every side. Production increased by leaps and bounds, and the year closes with blast furnaces and steel mills operating at a rate unprecedented in the history of the trade, and with preparations for increasing their capacity.

Iron and Steel Production

BY FREDERICK HOBART

As the production of iron and steel n 1908 was sharply contracted from that f the previous two years, so the output f 1909 showed an equally rapid reound, and the year took its place among hose of greatest activity. That the larger art of this work was crowded into a omparatively short time—less than twohirds of the year—illustrates the great apacity of the plants which have been uilt up in this country, and the intensified activity in operating them which vas shown in the latter part part of the ear. The same story extends through ll branches of the trade.

Iron Ore Production

The production of iron ore at the pening of 1909 was at a low level, and he estimates of the requirements for the year were not encouraging. It was not until work was well started for the season that it became apparent that these estimates were mistaken. It became necessary to call in all the reserves of labor and machinery and to extend operations in every direction in order to meet the demand. The Lake Superior region in particular was urged to the limit, and responded well, especially from the Mesabi range in Minnesota. The value of the exploration and development work done in 1907 and 1908 became apparent, and the monthly shipments in the latter part of the season were greater than any before known.

	1908.	1909.	Changes.
Lake Superior....	26,014,987	42,533,873	I. 16,518,886
Southern States...	5,900,000	7,350,000	I. 1,450,000
Other States......	1,875,000	3,150,000	I. 1,275,000
Total prod......	33,789,987	53,033,873	I. 19,243,886
Add imports......	776,896	1,650,000	I. 873,104
Total supply	34,566,883	54,683,873	I. 20,116,990
Deduct exports.:..	309,099	465,000	I. 155,901
App. consumpt'n	34,257,784	54,218,873	I. 19,961,089

The estimated production of iron ore for 1909 is given herewith, in long tons, in comparison with that for 1908.

In the imports and exports the month of December is estimated. For the 11 months ended Nov. 30 the completed statement of imports gives a total of 1,473,812 tons; of which 809,935 tons came from Cuba; 209,376 tons from Canada and Newfoundland; and 411,522 tons from Europe, chiefly Spain and Norway. A large increase is expected to come from Cuba in 1910, and contracts have been for supplies for Eastern furnaces from Norway, Russia and Spain.

The Southern iron-ore mines were. like those of the Lake Superior region, in a condition to respond to a call for increased production. In the East there was a good deal of work done in extending old mines and in reopening deposits formerly worked. The Lake Champlain and Adirondack regions in New York had much work of this kind done. The Wharton group and other mines in New Jersey were actively worked.

In the general statement above, no account is made of stocks on hand, for the reason that accurate figures are not attainable for what may be called the invisible stocks; that is, those in furnace yards. It is probable that there was no great difference. At the opening of the year furnaces were not disposed to carry large stocks; at its close they were hardly able to get the ore as fast as they needed it.

The consumption of iron ore per ton of pig iron made appears to be increasing, owing to the use of lower-grade ores. Last year it was about 2.11 tons.

Lake Superior Iron Ores—The statistics of Lake Superior shipments are very closely kept, through the enterprise of the Cleveland *Iron Trade Review*. It is possible to give definite figures, especially as water shipments close early in December. The only estimate required this year is of the rail shipments, part of which are made during the winter. The shipments of Lake ore, by ports, were as follows, for three years past, in long tons; with the rail shipments added for 1907 and 1908, and an estimate of them for 1909:

Port.	1907.	1908.	1909.
Escanaba...........	5,761,988	3,351,502	5,748,042
Marquette..........	3,013,826	1,487,487	2,909,578
Ashland............	3,437,672	2,513,670	3,834,286
Superior...........	7,440,386	3,564,030	9,181,132
Duluth.............	13,445,977	8,808,168	6,540,505
Two Harbors.......	8,188,906	5,702,237	13,470,503
Total water.......	41,288,755	25,427,094	41,684,005
Rail.................	956,315	587,893	850,000
Total...............	42,245,070	26,014,987	42,534,005

The distribution by ranges in 1908 is not yet complete. Escanaba and Marquette are the shipping ports for the Marquette and the Menominee ranges; Ashland for the Gogebic. Two Harbors takes the ore from the Vermillion range and a part of the Mesabi; while the docks at Superior and Duluth are supplied entirely from the Mesabi range. The rail shipments come from all ranges; they go to Zenith furnace at Duluth, to the furnaces at Marquette, Gladstone, St. Ignace and other points in Michigan and Wisconsin.

The season shipments to furnaces from Lake Erie ports, to which about 80 per cent. of the Lake ore goes, and from which it is distributed, were as follows:

	1908.	1909.
Ore on docks, May 1	5,480.300	8,441,533
Receipts for the season	20,414.491	33,672.825
Total	25,894.791	42,114.358
Shipments to furnaces	17,453.258	33,148.569
Stocks on docks, Dec. 1..........	8,441,533	8,965.789

Shipments to furnaces in the season of 1909 increased by 15,695,311 tons over

1908. The stocks on docks Dec. 1 increased 524,256 tons. These stocks would have been less, if the railroads had been able to transport the ore faster.

The distribution of the season's receipts and of the stocks on the docks Dec. 1 among the several ports is shown in the accompanying table.

About 80 per cent. of the Lake ore goes to the Lake Erie pots for distribution to the consuming furnaces. The remaining 20 per cent. goes chiefly to Chicago and vicinity for the furnaces of the Illinois Steel Company and others, and lately for the great new furnaces of the Indiana Steel Company at Gary.

The prices of Lake Superior ore to buyers for the season of 1909 were, f.o.b. Lake Erie ports: Old Range bessemers, $4.50; Mesabi bessemers, $4.25; Old Range nonbessemers, $3.70; Mesabi bessemers, $3.50. The base guarantee was 55 per cent. iron for bessemer ore, and 51.5 per cent. for nonbessemer ore. All the larger steel companies own their mines, and to them, of course, the price of their ore is practically the cost of mining and transporting it.

PORTS.	RECEIPTS.			STOCKS		
	1907.	1908.	1909.	1907.	1908.	1909.
Toledo	1,314,140	680,553	1,374,224	518,645	590,925	332,456
Sandusky	83,043	....	11,088	44,546	36,079	39,557
Huron	971,430	213,377	243,082	415,730	458,158	477,333
Lorain	2,621,025	2,286,388	2,796,856	366,271	426,274	407,129
Cleveland	6,495,998	4,240,816	6 051,342	1,281,335	1,458,592	1,547,142
Fairport	2,437,649	1,518,961	1,734,277	523,981	835,821	867,640
Ashtabula	7,521,859	3,012,064	8,056,941	2,056,820	2,293,531	2,594,359
Conneaut	5,875,937	4,798,631	7,007,834	1,090,774	1,296,675	1,411,002
Erie	2,294,239	828,602	1,235,057	652,219	730,530	788,046
Buffalo	5,580,438	2,835,099	5,002,235	435,407	315,148	501,125
Detroit	....	....	159,889	....	....	....
Total	35,195,758	20,414,491	33,672,825	7,385,728	8,441,533	8,965,789

Lake ores in recent years have supplied the raw material for from 75 to 80 per cent. of the pig iron made; and in 1909 there was no material change in this proportion.

Manganese Ore—Imports of manganese ore into the United States for the 11 months ended Nov. 30 were 170,662 tons in 1908, and 199,222 tons in 1909; an increase of 28,560 tons. The quantity of manganese ore mined in the United States is comparatively small.

Limestone Flux—The quantity of limestone and dolomite used in 1909 as flux in making pig iron is estimated at 14,070,000 long tons.

PIG-IRON PRODUCTION

The second half of 1908 showed a substantial gain over the first, but it was only sufficient to bring the total for the year up to 15.936,018 tons, the smallest recorded since 1901. For the first half of 1909 there was a further gain of about 2,000,000 tons, or about on the level of 1905. The second half, however, brought an advance of 3,700,000 tons over the first half and the total for the half year was unprecedented in the history of the trade. In 1907 the blast furnaces turned out close to 26,000,000 tons; the production of the second half of 1909 was at the rate of close upon 30,000,000 tons a year. This was made possible by the fact that during the time of depression preparations for greater output had not been suspended, and when the demand came everything was ready to meet it.

The following table shows the production by half years for three years past. For the first half of 1909 the figures are those collected and published by the American Iron and Steel Association—as are the totals for 1907 and 1908; for the second half they are estimated on the basis of the monthly reports of the capacity of the active furnaces. The figures are, in long tons:

	1907.	1908.	1909.
First half	13,478,044	6,918,004	11,022,346
Second half	12,303,317	9,018,014	14,689,500
Total	25,781,361	15,936,018	25,711,846

The total increase of 1909 over 1908 was 61.3 per cent. The production for 1909 was very close to that of 1907 by the estimate; so close that it is quite possible that the final official figures may make it quite equal, if not a little greater. The difference, however, cannot be more than a few thousand tons.

Assuming that the division of the iron according to the uses for which it was intended was substantially the same as in the first half, for which we have official figures, we find that this analysis of the production will compare with that of 1908 as follows:

	1908.	1909.	Changes.
Foundry and forge	4,307,734	6,866,274	I. 2,558,540
Bessemer	7,216,976	10,357,290	I. 3,140,314
Basic	4,010,144	7,892,318	I. 3,882,174
Charcoal	249,146	391,732	I. 142,586
Spiegel and ferro.	152,018	204,232	I. 52,214
Total	15,936,018	25,711,846	I. 9,775,828

It is probable that the final figures may show some changes in this table, especially in foundry and basic iron. When the revival in iron production began it was manifest chiefly in the stacks owned by the large steel companies making iron for their use. Later the merchant furnaces began to gain, and in November and December the increase was almost wholly from those furnaces. The demand for basic pig was especially active and pressing.

The production of pig iron in the United States for the past 10 years has been as follows, in long tons:

1900	13,789,242	1905	22,992,380
1901	15,878,354	1906	25,307,391
1902	17,821,307	1907	25,781,381
1903	18,009,259	1908	15,936,018
1904	16,497,003	1909	25,711,846

No two years in the past 10—or for 20 years before that—show such wide differences as 1908 and 1909. A change of nearly 10,000,000 tons in a year is so great as to be almost startling. In past years the recovery from depression has been much more gradual.

The approximate consumption of pig iron in the United States in 1909 was, in long tons:

Production	25,711,846
Imports, Dec., estimated	181,000
Total	25,892,846
Exports, Dec., estimated	66,000
Consumption	25,826,846

This shows the approximate consumption of pig iron during the year to have been 643 lb. per capita.

PRODUCTION OF STEEL

No figures are available for the production of steel for any part of the year. The only approximation that can be made is an estimate based on the output of pig iron. It is probable that the total steel made was: Bessemer, 10,750,000 tons; open-hearth, 12,500,000; other, 150,000; a total of 23,400,000 tons; an increase of 9,393,000 tons over 1908, and a gain of about 100,000 tons over 1907. The revival in production and demand was manifested earlier and more strongly in steel products than in foundry products and wrought iron. The demand for steel, in fact, was greater throughout the year. There is no doubt that there was an increase in the proportion of open-hearth steel, owing to the opening of the Gary works and the substitution of open-hearth furnaces for bessemer converters in some important plants.

For finished material no accurate figures are available. The business of the year in structural steel was very large; but there was a strong demand also for bars and plates. The railroads placed large orders for new cars, but the rail business was not large. Heavy orders for rails were for 1910 delivery. The business in wire, nails and the minor materials of construction was large. The full figures for finished material in 1909 will be well up to those for 1907; possibly exceeding them in some lines.

THE UNITED STATES STEEL CORPORATION

The Steel Corporation continued to be the most important factor, producing about 60 per cent. of the total output of finished material. Its managers were forced to give way in their chosen policy of limited output and high prices, but they did so in a way which preserved their influence in the trade. The earnings of the Corporation showed an increase of between 40 and 50 per cent. over those of 1908. For the nine months ended with September, for which reports ave been made, the total net earnings ere $90,508,666, and the surplus after iecting all fixed charges was $51,427,05. The net earnings increased from 22,921,268 in the first quarter to $38,46,907 in the third quarter, and the surlus from $11,873,106 to $23,543,067. 1 the June quarter the dividends on the ommon stock were increased from 0.5 to .75 per cent. quarterly, and for the Sepember quarter there was a further inrease to 1 per cent.

The earnings for the fourth quarter of ie year, not yet reported, will probably ring the total net earnings for the year 909 up to about $135,000,000 and the urplus to $80,000,000. In the Septemer quarter the appropriation of money or new construction was resumed, after suspension of nearly two years; the um of $10,000,000 being set aside for iat purpose. The unfilled orders on the ooks on Sept. 30 reached a total of ,796,833 tons, an increase of more than ,000,000 tons over the first of the year.

Changes and Consolidations

Changes among iron and steel comanies were comparatively few; and no onsolidations of great importance were iade. There was at one time talk of a onsolidation of several of the larger inependent companies, but this was umor only, and nothing resulted. The ethlehem Steel Corporation extended s operations in this country and its minig interests in Cuba, and absorbed some f its subsidiary companies. Near the lose of the year the Rogers-Brown Iron ompany was organized, taking in the uffalo & Susquehanna Iron Company nd some allied interests.

New Works and Extensions

Probably the most important event of ie year was the progress made on the xtensive works of the United States teel Corporation at Gary, Ind. Several f the blast furnaces and some units of ie steel plant are now in operation, and apid progress is being made with the est. Important improvements have been 1 progress at the steel works of the ennessee Coal, Iron and Railroad Comany at Ensley, Ala. These will enlarge ie capacity of the works, and it is inended to handle there all the Steel Cororation business in the South. The ones & Laughlin Steel Company reumed work on its new plant at Alleuippa, Penn., and has the blast furaces there now in operation. The new iills of the Bethlehem Steel Company, ear Bethlehem, Penn., are nearing comletion.

Technical Progress

The progress of the open-hearth steel roduction is marked, though no very reat changes occurred in 1909. Both he Gary and Ensley plants are openearth steel works, and no new bessemer converters are being installed. Further investigations of the quality and properties of steel were in progress, but with no announced results.

The electric furnace continues to make progress, especially in the manufacture of steel. The Steel Corporation has installed two electric furnaces of large capacity, one at the Joliet works of the Illinois Steel Company and the other at the wire works at Worcester, Mass.

The Gary dry-air blast has made progress both in the United States and abroad. Mr. Gary has supplemented it by devices intended to secure uniformity of temperature in the blast, and consequently of the weight of air delivered to a furnace.

Labor Conditions

With two exceptions the year 1909 was measurably free from labor troubles in the iron and steel trades. A strike at the works of the Pressed Steel Car Company at McKees Rocks, Penn., was the cause of much trouble and a great deal of violence; but it was local in its causes and effects and did not extend further.

In June, according to custom, the Amalgamated Association of Iron, Steel and Tin Workers presented a new scale to the manufacturers. This association is one of the oldest labor unions in the country and its members are in the bar, sheet and tinplate mills. After some discussion and amendment the scales were adopted by the Republic Iron and Steel Company and by the independent manufacturers. The American Sheet and Tin Plate Company, however, refused to sign any agreement, announcing its intention of operating all its plants on the open-shop plan. This resulted in the closing of several of the mills which had been union works. The company was able to go on with its nonunion works, and to reopen some of the former union mills, so that its operations were not seriously affected. The cause of the Amalgamated Association was taken up at the annual convention of the American Federation of Labor, and a formal declaration of hostility to the United States Steel Corporation was the result. No actual steps have been taken, but the Federation has begun the collection of a large reserve fund, to be used when opportunity for a strike is presented.

Imports and Exports

The values of the imports of iron and steel and of machinery in the United States for the 11 months ended Nov. 30 are reported as follows:

	1908.	1909.	Changes.
Imports....	$ 18,247,908	$ 27,628,188	I. $9,380,280
Exports....	138,881,373	142,605,148	I. 3,723,775

The increase in imports was 51.4 per cent.; it was largely in pig iron, in steel scrap and in billets, ingots and blooms. The increase in exports was 2 per cent.; in quantities it was greater than in value, owing to a generally lower level of declared values. The increase was pretty well distributed, taking in rails, bars, plates, wire and billets. The increase in billets was chiefly due to a large contract for tinplate bars for Welsh works, taken early in the year.

A marked feature of the imports was a large increase in structural steel, most of which was brought in on the Pacific Coast. Deliveries of foreign steel are made there by water, at a low freight rate, while the high rail rates from the East offset the duty charged. San Francisco especially has been using large quantities of structural steel in the rebuilding of the city, and constructors have found it to their advantage to take English, German and Belgian steel, rather than that from the East. There is also a strong local feeling involved on account of the refusal of the railroads to reduce rates on this class of material.

The tariff bill passed in August cut down the duties on pig iron, steel rails and a few other articles. Outside of these it did not make material changes. The reductions were not sufficient to induce any imports on a considerable scale. The imports of structural steel above referred to were the result of special and local causes, and the effect of tariff changes so far has been moderate. The exports did not increase to any great extent, although efforts were made to push them in the earlier part of the year. As business began to improve abroad, it increased still more rapidly here, and there was comparatively little surplus for export. The result serves to emphasize the remarks on foreign trade which were made in the review for the year 1908. The exports for 1909 included a large quantity of material for the Panama canal.

Iron Production in Belgium and Sweden

In 1909 Belgium showed the greatest relative increase in production of any European country. For the 10 months ended Oct. 31 the total pig iron made was 1,322,490 metric tons, an increase of 334,920 tons over 1908. The foreign trade showed an increase of about 10 per cent. for the period.

Sweden—The production of iron and steel in Sweden for the six months ended June 30 was: Pig iron, 285,900 metric tons; wrought iron, 61,200 tons; bessemer-steel ingots, 40,900; open-hearth ingots, 458,100; total steel, 499,000 tons. The production was decreased by the general strike and by light demand. Exports were 176,200 tons, chief items being 54,800 tons pig iron, 20,000 tons blooms and billets, 14,400 tons wire-rods, 65,100 tons bars.

The Iron and Steel Markets in 1909

A Strongly Marked Recovery in Demand and Later in Prices, Following the Adoption of an Open Market Policy by Producers

REPORTS FROM VARIOUS CENTERS

The general course of the markets during 1909 was a new vindication of the old law of supply and demand. The halting and hesitation manifest at the opening of the year disappeared as soon as the large producers abandoned their untenable position, gave up their policy of maintaining prices and permitted the market to take its course. From that time on business increased with almost unprecedented rapidity; and as a natural consequence of increasing demand prices crept up gradually until they reached almost the level from which they had dropped. These gradual advances came naturally as the result of improved demand and did not check or limit the volume of trade.

The tariff discussion in the summer did not seriously affect the market. As soon as it became apparent that final settlement rested with the Senate, the situation was generally discounted. The final outcome—a spectacular reduction in the duties on pig iron, steel rails and few other items, and a practical maintenance of other rates—was generally anticipated, and had little effect on the market when the Payne-Aldrich bill finally became a law in August.

The rail question, which caused s much discussion in 1908, ended by a com promise which was generally accepte with little publicity. The rail mills quietl agreed to conform to the stricter specifications of the railroads, and maintaine the price of $28 per ton. There was a increased demand for open-hearth rails

The course of the markets is well tol in the letters which follow from ou special correspondents. These includ Pittsburg and Birmingham, the chief primary markets; Chicago, which is typica of the Western territory; and the loca markets on the seaboard.

The Pittsburg Iron and Steel Markets

BY B. E. V. LUTY

Seldom has a year in the iron trade exhibited such fluctutations in prices as occurred in 1909. The complete cycle was run, prices declining and then advancing. So much pomp and circumstance surrounded the maintenance of finished steel prices in 1908 after the panic of October, 1907, so violent was the break upon the abandonment of the price maintenance policy, and so quietly and gradualy did prices steal upwards in the second half of the year, that it requires a careful scrutiny of the opening and closing prices of the year to divest the mind of the impression that the net result of the year was a general and material lowering in the level of values.

As a matter of fact the absolute minimum price of merchant steel bars at the close of the year was $1 a ton higher than the nominal or official price at the opening, while plates and shapes showed an apparent reduction of $1 a ton. The nominal or official prices on bars, plates and shapes at the opening of the year were not generally observed, there having been shading on practically all important business, so that the net result of the year was an average advance in these three important products. Wire products suffered reductions of $8 per ton of 2000 lb. in plain wire, $7 in nails and $10 in barb wire, the subsequent advances amounting to $5 on each line, leaving an average net decline of about $3. Tinplates declined 25c. per box and recovered 20c.; black sheets made up all but $1 a ton of their loss, while galvanized sheets made up their entire loss. Standard steel rails suffered no fluctuation in the year.

Steel pipe alone of all finished steel products suffered a material net reduction. The reduction was five points or about $9.50 per ton of 2000 lbs., while the only advance was one point.

Unlike finished steel products, pig iron had found low points in 1908, the desultory attempts early in the year to maintain prices having been abandoned. An ill-advised marking up of prices in November and December, 1908, made the opening prices of 1909 higher than they should have been, considering the general situation, but even with such artificiality in the opening prices the closing prices of the year showed gains all along the line. Comparing the average quotations in December with those in January gains were shown in pig iron, f.o.b. Valley furnaces, of $2.72 in bessemer, $1.50 in basic, $1.62 in foundry and $2 in gray forge.

The February Price Break.—At a conference of officials of the United States Steel Corporation with representatives of a few important independent producers on the afternoon of Feb. 18, it was decided to abandon all concerted effort to maintain prices on finished steel products, with the single exception of standard rails. An exception was not made of rails without due deliberation; the abandonment of price maintenance was considered from the two standpoints of the ability or inability to hold prices, and the prospects of increased business at reductions. In the case of rails the number of producers was so small that the question of ability to maintain prices was relatively unimportant, and the decision rested upon the prospects of business. A hasty canvass of the railroads showed that no large business could be expected to follow a reduction; hence rails were excluded from the open market declaration.

The public utterances of officials of the United States Steel Corporation at the time of the break sought to convey the impression that it was brought about almost wholly by the cutting of some of the independents, but there is good reason to believe that this was the excuse rather than the reason. The Steel Corporation, however, was not wholly responsible for the taking of this oblique view. Several prominent independent interests had grown tired of the price maintenance game for a variety of reasons, but that they selected to urge upon the Steel Corporation was that certain smaller independents were cutting into their trade.

The outcome of the price break was a general resumption of activity following more closely than even the most sanguine anticipated. The immediate effect of the open market declaration was to suspend shipments on the great bulk of contracts on books, pending a readjustment of prices. In only a few particular instances did the mills attempt to hold customers to their contracts. Bar, plate and shape contracts were soon adjusted to a new level, although ultimately sales

made at a still lower level. The
c of pig iron production, which
ded continually upward from June,
), through February, 1909, dropped
ply in March and again in April,
fly on account of the suspension of
ments on contracts.

fter April the trend of production was
ply upward, and in the latter part of
ember, just six months after the
k, the production of pig iron in the
ed States reached the rate of
00,000 tons annually which had been
hed in October, 1907, the panic
th. The entire dip in the curve of
uction extended over a period just
t of two years. In quantity, it ex-
ed from a rate of 28,000,000 tons in
ber, 1907, the record to that time, to
te less than 13,000,000 tons in Jan-
, 1908, the lowest since January,
. In December, 1909, a rate of ap-
imately 32,000,000 tons was reached.
the resumption of activity was due
he break in prices the move was thor-
hly efficacious; if it was not due to
cause, if the resumption was marked
come in any event, it constituted a
ous arraignment of the judgment of
se who held prices for 15 months, only
desert the cause when the fruit was
. The former assumption sems to
the true one.

he Course of Steel Prices.—Standard
s, as noted, commanded unchanged
ces during the year. The $28 rail price
first made in the spring of 1901, as
United States Steel Corporation was
ng formed, and has not been changed
e.

lates and shapes had been 1.70c. in
7; June 9, 1908, the official price was
uced to 1.60c. At times in 1908 there
extensive shading, down to 1.40c. or
er, and the 1.60c. official price was
bably being better held at the open-
of 1909 than were the respective
ces of 1.70c. and 1.60c. during much
the preceding year. Following the
n market declaration, plates and
pes dropped, Feb. 19 and 20, to 1.30c.,

AVERAGE PRICES AT PITTSBURG, 1909.

	Pig Iron.				Steel.					Nails.	
	Bes-semer.	No. 2 Found-ry.	Gray Forge.	Ferro-Mang.	Bes-semer Billets.	Rails.	Black Sheets No. 28.	Tank Plate.	Steel Bars.	Wire per Keg.	Cut per Keg.
	$	$	$	$	$	$	c.	c.	c.	$	$
ary......	17.18	16.28	15.15	45.95	25.00	28.00	2.45	1.60	1.40	1.95	1.90
uary.....	16.73	15.90	15.15	45.45	25.00	28.00	2.39	1.50	1.33	1.95	1.90
ch.......	16.40	15.62	14.82	43.85	23.00	28.00	2.20	1.30	1.20	1.90	1.80
l........	15.79	15.06	14.56	43.45	23.00	28.00	2.20	1.28	1.13	1.95	1.70
....	15.77	15.08	14.40	42.45	23.00	28.00	2.15	1.25	1.19	1.65	1.70
....	16.13	15.63	14.82	42.85	23.00	28.00	2.10	1.25	1.20	1.70	1.70
....	16.40	15.96	15.05	43.35	23.50	28.00	2.15	1.33	1.25	1.72	1.71
ust.......	17.16	16.20	15.45	42.95	24.16	28.00	2.15	1.40	1.33	1.80	1.75
ember....	18.44	17.03	16.34	44.45	25.00	28.00	2.22	1.45	1.37	1.80	1.75
ber......	19.75	18.02	17.02	45.00	26.00	28.00	2.30	1.50	1.40	1.80	1.77
ember....	19.90	18.09	17.22	46.35	27.15	28.00	2.36	1.54	1.45	1.80	1.80
ember....	19.90	17.90	17.15	46.95	27.20	28.00	2.40	1.55	1.45	1.83	1.80
ear.......	17.46	16.40	15.59	44.42	24.58	28.00	2.26	1.41	1.31	1.82	1.77
ear 1908..	17.23	16.28	15.28	46.38	26.25	28.00	2.50	1.64	1.48	1.99	1.83

and existing contracts were largely adjusted to that basis. During parts of March and April they sold openly at 1.20c., but 1.10c. was done in special cases.

Steel bars had been 1.60c. in 1907, and were reduced to 1.40c. June 1, 1908, opening 1909 with that price fairly well held. The first break was to 1.20c., but in parts of March and April sales were freely made at 1.10c., and 1.05c. was done in special cases.

In the latter part of April plates, shapes and bars firmed up, closing the month at 1.15c. for bars and 1.30c. for plates and shapes. Bars soon gained $1 a ton upon plates and shapes, and thereafter there was a steadily advancing market on the three products, closing the year with bars at 1.45c. and plates and shapes at 1.55c., with $1 a ton more asked in some cases, particularly on deliveries more than three months ahead.

Merchant steel pipe opened the year at a nominal price of 80 per cent. off list, which with the customary concession to large jobbers made the actual inside price 81 and 5. There had been a two-point reduction from the 1907 price on June 9, 1908. March 1 the National Tube Company promulgated new prices, carrying a reduction of five points, or about $9.50 per net ton. Oct. 1 a one-point advance was made.

Sheets opened the year at 2.45c. for black and 3.50c. for galvanized, 28 gage. The first reduction was Feb. 24, making black sheets 2.20c. and galvanized 3.25c. In the next four months these prices were cut, at times, to about 2.10c. and 3.15c. In July and August the market firmed up, closing August with 2.20c. on black and 3.25c. on galvanized sheets. Sept. 28 and advance of $2 a ton was made, making black sheets 2.30c. and galvanized 3.35c. Nov. 12 prices were advanced to 2.40 for black and 3.50c. for galvanized, the spread between black and galvanized sheets being increased 5c. per 100 lb., which only partly made up for the advance in spelter.

Tinplates were reduced from $3.65 to $3.40 per box for 100-lb. cokes on March 15, and were advanced Sept. 28 and Nov. 12, 10c. each time, making the closing price $3.60 per box.

A peculiar condition confronted the wire trade when the open market declaration was made, as the jobbers had laid in large stocks for the spring trade. At first a general reduction appeared inevitable, but the threat of a large reduction served to hold the wavering producers fairly well in line. There was some cutting, particularly in April, but a general reduction was postponed until May 1, when jobbers had fairly well worked off their stocks and were ready to place additional orders. On that date prices were reduced from $1.95 per keg to $1.60 on wire nails, from 1.80c. to 1.40c. on plain wire, from 2.40c. to 1.90c. on galvanized barb wire and from 2.10c. to 1.60c. on painted barb wire, $7, $8 and $10 per net ton respectively. New business came with a rush, and May 15 prices were marked up $2 a ton. July 24 another $2 advance occurred, and Dec. 12 $1 was added, leaving prices $2, $3 and $5 respectively below the opening.

Pig Iron.—The course of pig iron prices is shown in the accompanying table, which is made up from daily prices, averaged each month. Prices at the opening of the year were inflated, as there had been a sharp advance in November and December of the preceding year, based upon insufficient grounds. Had it not been for this inflation the pig iron market might have passed through the period of readjustment in finished steel prices with but little decline. As it was, pig iron prices declined sharply, reaching a minimum early in May of about $14.50, Valley, for bessemer and $13.85@13.90, Valley, for No. 2 foundry and basic, Pittsburg prices being 90c. higher. Thereafter the market advanced steadily.

The most striking feature of the local market was the heavy buying of bessemer iron by independent steel works, the Republic Iron and Steel Company, Youngstown Sheet and Tube Company, Jones & Laughlin Steel Company, Cambria Steel Company and Lackawanna Steel Company. In ordinary conditions these companies are practically self-sustaining in pig iron, but when under pressure they take outside iron. The five companies bought a total of more than 400,000 tons of bessemer iron, chiefly from Valley furnaces, the purchases beginning with 10,000 tons by the Republic May 20, at $14.50, Valley. The heaviest buying was in September and October.

New Construction.—The Carnegie Steel Company completed Nos. 5 and 6 of the Duquesne blast furnaces, ground having been broken Dec. 1, 1906. The Jones & Laughlin Steel Company blew in No. 1 of the three Aliquippa furnaces upon which construction work started in 1907. When the other two Aliquippa furnaces are completed the immediate Pittsburg district, covering Allegheny county, the Monongahela river up to Donora and the Ohio valley down to Aliquippa and Midland, will have a pig iron capacity of fully 8,000,000 tons per annum. Summing up the new furnaces blown in since Jan. 1, 1905, and including Duquesne and Aliquippa, the increase in the immediate Pittsburg district covers 12 furnaces, with a total annual rating of between 1,900,000 and 2,000,000 tons per annum. In the order of their completion these are: Two Donora of the Carnegie Steel Company; McKeesport of the National Tube Company; Midland of the Midland Steel Company; two Carrie of the Carnegie Steel Company; McKeesport of the National Tube Company; two Duquesnes of the Carnegie Steel Company, and three Aliquippa of the Jones & Laughlin Steel Company.

In November ground was broken for four additional open-hearth furnaces at the Homestead steel works of the Carnegie Steel Company.

The Forged Steel Wheel Company, subsidiary of the Standard Steel Ca Company, began the erection at Butle Penn., 40 miles north of Pittsburg, of a open-hearth plant to comprise six 50-to furnaces, to be completed by April 1 1910. The primary function of the plan will be to furnish blanks for forged stee wheels. Later the plant may be enlarge to make plates.

The Seaboard Iron Market

SPECIAL CORRESPONDENCE

The course of the seaboard iron markets is determined chiefly by New York and Philadelphia. New York is the distributing point for a large territory in New York State and New England; Philadelphia not only has its own special territory, but is near to a large producing district in Eastern Pennsylvania, of which it is the chief outlet.

There are two distinct demands in the seaboard territory; the one being found in the direct consumers, who buy for immediate use, and the other in the manufacturers who buy raw iron and steel to make up into machinery and other finished forms. The seaboard territory is more a foundry than a steel making region, and the market there is for foundry rather than steel-making pig, and for steel in finished forms. The exception to this is that the Philadelphia market takes a large quantity of steel billets and basic pig.

The seaboard markets followed the course of the general market rather closely. In almost all lines the year opened with dull trade and rather light buying. This continued until after the 1908 policy of maintaining prices was abandoned and an open market declared. From that time on business improved rapidly; there was sharp buying in all lines, while foundry and machine shop work increased in all quarters. Buying continued active, almost without intermission, until the latter part of November, when matters began to quiet down, and December was rather a slow month. This was taken, however, as rather an indication of the usual end-of-the-year lull, than as any threat of a coming depression.

Pig iron had been the only open market in 1908 and at the beginning of 1909 had reached rather low levels. These were emphasized in the early months of the year and about the lowest points were reached in February and March. From that time on the quotations began to work up, until in December No. 2X foundry was quoted in Philadelphia at $19 @ 19.50; forge at $18, and basic at $18.50 @ 19. Southern iron sold well during the year, No. 2 Alabama foundry being for the most part about on a parity with Northern of the same grade. In November and December the market for Southern was disturbed by offerings of considerable quantities of speculative iron, which had been bought from furnaces earlier in the year, and held for an advance. Storage charges and interest forced out most of this iron, and it was sold at 50c. or 75c. below the price of $15, Birmingham, for No. 2 foundry which the furnaces were trying to maintain. For this reason chiefly Souther foundry closed the year at about 50 per ton below the parity of Northern.

The only active market in finishe material in 1908 had been structura steel. The open market did not so muc affect this branch when it was declare in 1909, for the reason that much business had been done for months at quietl shaded prices. Structural business continued active throughout the year, and is estimated that contracts calling fo nearly 2,000,000 tons were placed in seaboard cities during the year. Othe branches of the trade were active als after the break; bars, sheets, plates an wire all selling freely for consumptio and manufacture. The sales of nails bars and other material for building o the smaller class started up and rapidl developed into a very active trade. I was evident that large amounts of mone were being put into small as well a large construction.

Railroad and terminal improvement and municipal work in and around Ne York, Philadelphia and Boston absorbe great quantities of material. Contract for this work are generally made wit the large mills directly, and do not appear on the local markets.

The Alabama Pig Iron Market

BY L. W. FRIEDMAN

With the production almost at the top notch, the quotations firm around a high figure, a general reverse of conditions that existed at the beginning of the twelve-months, the year 1909 is looked back upon as a good one for the Alabama pig iron manufacturers, in the face of what was expected and dreaded. The authoritative figures give the State credit for 1,708,068 tons of pig iron during 1909 while the year went out with but little of this iron in the furnace yards belonging to the producers. The quotations were anything but high for the first part of the year, and the make was kept down. When change for the better came on and the demand improved better quotations followed. Pig iron that in 1907 (to September) brought above $24 and $25 per ton spot, was to be purchased during 1909 as low as $11 and even $10.65 per ton, No. 2 foundry, in Alabama; some brokers and speculators took advantag of this condition and purchased. The demand became very slack and the furnac companies curtailed the production and i June the low water mark was reached i output, the Alabama total being unde 100,000 tons for the month.

Before the summer was over in Alabama the manufacturers saw prosperit ahead and attention was given to preparation for iron making. The quotation gan taking on advances 50c. and then per ton.

The improving demand in the fall ad- nced quotations to $15, and even $15.25 r ton, No. 2 foundry, was seen before e close of the year. While some of the rnaces sold in large quantities when e quotations were down at $11 per ton, e opinion evidently being that it would better to sell and keep the furnaces blast than to carry the iron or shut wn, still, there was some profit at these ices.

The figures of the output tell the story the year's pig iron transactions in Ala- ma: January, 148,404 tons; February, 34,909; March, 144,873; April, 139,493; ay, 113,524; June, 99,355; July, 104,- 75; August, 137,363; September, 151,- 03; October, 176,266; November, 182,- 03; December (estimated), 175,000; tal. 1,708,068 tons.

Several of the Alabama furnace companies had foresight, and as a consequence there was much work done in the way of rehabilitating, improving, enlarging and practically rebuilding furnaces in the State. During the year the reorganization of the Southern Steel Company, the large independent corporation, took place and the Southern Steel and Iron Company was formed. The new company undertook and accomplished the rehabilitation of furnaces and other properties including the steel plant near Gadsden, and also constructed a large steel rod and wire mill which will be placed in commission early in 1910. The Tennessee Coal, Iron and Railroad Company began a series of improvements and betterments of the present properties and outlined further extensive developments. Additions to the extensive property holdings of the company have been made and preparations are underway to enlarge them further. To provide an outlet for the various products, other subsidiary corporations are to establish themselves in the Birmingham district. The Sloss-Sheffield Steel and Iron Company, the Woodward Iron Company, the Republic Iron and Steel Company, the Birmingham Coal and Iron Company, the Central Coal and Iron Company, the Woodstock Iron Company, the Williamson Iron Company and others in the South, Alabama in particular, had furnaces repaired.

Additions and improvements have been made to the cast-iron pipe plants, the soil pipe plants, the foundries, machine shops and other works.

The steel production during the year was satisfactory. The plant of the Tennessee company at Ensley was in operation through the year, with the exception of a few weeks. Besides a large production of steel rails, some of the steel was worked up into other shapes, especially structural steel.

The Chicago Iron Market

BY E. MORRISON

In its first half the year 1909 was isappointing in nearly all lines of the on and steel trade, but the second half owed boom conditions for finished roducts and a much better sale of pig on. Opening in depression, January w hardly any buying of pig iron, a car- ad to 100 tons being the average melt- r's purchase for the immediate needs of is light business. Finished materials ad hardly any sale, except railroad sup- lies. Foundries continued to need very ttle iron throughout February and by larch prices of both Northern and South- rn had weakened to their lowest records or the year—$16.50 for Northern No. 2 nd $15.35 for Southern No. 2 ($11 Bir- ingham).

The cut in prices of iron and steel roducts, in February had the effect of timulating sales of these products almost mmediately, but the wave of increased uying did not reach the pig iron market ntil several months later. Tariff revi- ion influenced many if not most users f both pig iron and iron and steel mate- ials toward delay in making purchases, ven after it became apparent that the ountry had thoroughly recovered from ts financial troubles and had regained its onsumptive power. The greatest buy- rs of the year, the railroads, did not egin placing their very heavy orders un- il the latter part of April; early in that nonth the agricultural implement manu- acturers, feeling sure of a prosperous ear, placed heavy orders for bars and ther materials, while the total tonnage f pig iron sales shot suddenly upward, vith the feeling that the "bottom of the narket" had been reached. It had been, and the spurt raised prices slightly on Southern, with the result that another period of inactivity for pig iron began. The average melter was not yet ready to buy liberally.

The railroads, once started, came into the market rapidly for long-delayed purchases. By the middle of July rails, bars, plates and structural shapes were selling more heavily than at any period since 1907. Building projects of all kinds went forward in confidence; shops generally put on full forces of workmen and prices of iron and steel materials rose again. The purchase of about 55,000 tons of pig iron by the agricultural implement makers, in July, strengthened greatly both Northern and Southern pig iron and the strong condition for the rest of the year.

In the spring of 1909 the average sale of pig iron was of a small amount, with early delivery. The summer saw active buying for the last half and by August some melters were asking contracts to cover the first half of 1910. Furnace agents were reluctant to sell so far ahead at current prices, being confident of a rising market, and prices of both Northern and Southern iron naturally rose, with Northern furnaces well sold up for the rest of the year. Northern, by September, reached $18.50 and a month later it went to $19 minimum for No. 2, at which figure it stayed for the rest of the year. Southern's low quotations on No. 2 were $16.85 in July, $17.85 in August, $18.35 in September and $19.35 in October, remaining firm at the last named quotation until November, when some Southern iron was sold at 50c. less.

Highest and lowest prices in the 1909 market, compared with similar prices in the previous year are given in the table.

	1908.		1909.	
	Highest.	Lowest.	Highest.	Lowest.
Lake Superior charcoal	$24.00	$19.50	$20.00	$19.50
Northern No. 2 foundry	18.50	16.50	19.50	16.50
Southern No. 2 foundry	17.85	15.35	19.85	15.35
Bar Iron	1.65c.	1.50c.	1.60c.	1.30c.
*Structural Material	1.78c.	1.88c.	1.78c.	1.40c.

*Beams and channels, 3 in. to 15 in., and angles, 3 in. to 6 x ¼ in. or heavier.

The months of November and December saw a quiet market for pig iron, but with every indication that a heavy purchasing power would be manifested as soon as foundries could be brought into full operating capacity, molders being scarce. Local furnaces were all in blast and Northern iron remained very firm. Little quick delivery iron was sold. Inquiries indicated that large contracts would be placed, with the imaginary dividing line of the New Year once passed. Considerable business was done in December in resale Southern iron.

Lake Superior charcoal iron sold well throughout the year at uniform quotations of $19.50@20 per ton.

Quicksilver in the United States in 1909

BY H. W. TURNER *

The world's price for quicksilver is practically fixed in London by the Rothschilds, who control the product of the most important mine, the Almaden of Spain. The higher domestic prices in 1909 were due to a protective tariff of $5.25 per flask. The New York price is usually a little higher than the San Francisco price, and the export price about $2 less than that for domestic consumption.

The total production of the United States in 1909 was about 20,000 flasks as against 18,000 in 1908. Two of the old producing mines of California closed down within the last two years, and two others, the Great Western of Lake county and the Napa Consolidated of Napa county, are making their final cleanups; while still another, formerly a very important property, is working very low-grade ore. No new deposits of much importance were developed in California, although some promising prospects may prove to be valuable. Quicksilver mines are therefore likely to be profitable as a result of diminishing production and consequently better prices.

CALIFORNIA

In Lake county, California, the furnace of the Helen mine produced a large amount of soot, which is now being retorted and may amount to 800 flasks. The Chicago, just east of the Helen, found considerable ore, but no pay shoots as yet. The Wall Street, adjoining the Chicago, ran one D-retort during part of the year on ore from that mine. In Sonoma county the Culver-Baer, formerly known as the Oakland, has a good body of ore. In Napa county, a retort is said to be in operation at the Etna mine in Pope valley and considerable ore is blocked out. In Santa Clara county, according to Arthur Feust, the New Almaden furnace is treating 0.2 to 0.3 per cent. ore. In San Benito county the New Idria held its own and was the largest producer in the State. In Modoc county a discovery of cinnabar was reported in the Willow Creek district, near Goose lake.

NEVADA

The Davis & Workman property is situated about three miles northeast of Berlin, Nye county. The ore is found chiefly in rhyolite near limestone, and to some extent in the limestone. It is sorted up to a 6 per cent. grade and roasted in nine D-retorts, 8 ft. long and 2 ft. wide. These retorts treat about 5½ tons daily. The retorts are kept at a cherry-red heat and the excess sulphur gives little trouble, being absorbed by the lime in the ore. The total production for 1909 was about 2000 flasks. The mercury is present as cinnabar, metacinnabarite and calomel. Much of the ore was obtained from an open cut.

Some new discoveries of cinnabar were made east of Goldfield and between Berlin and Austin. Their extent has not yet been determined.

TEXAS.

The condition of the quicksilver industry in Texas was recently reviewed by William B. Phillips.[1] There are seven furnaces in the Terlingua district, of which one of the Marfa & Mariposa and that of the Chisos Mining Company were in operation. The two furnaces of the Marfa & Mariposa Company are called 10-ton furnaces although they treat 12 tons per day each. The Chisos company operated for several years with D-retorts, but in 1908 built a 20-ton Scott furnace which was in commission in 1909, and in consequence the company treated a lower grade of ore, as was also done in 1908 in the Tignor furnace.

AVERAGE MONTHLY PRICE OF QUICKSILVER.
(PER FLASK OF 75 LB.)

	1908.			1909.		
		San Francisco.			San Francisco.	
	New York.	Domestic.	Export.	New York.	Domestic.	Export.
January	$45.00	$45.00	$43.50	$45.50	$45.30	$43.30
February	45.00	45.00	43.50	45.50	45.50	43.50
March	45.00	45.00	43.50	45.50	44.75	42.75
April	45.00	45.00	43.50	45.00	44.25	42.25
May	45.00	44.50	43.00	44.50	44.00	42.00
June	44.25	44.00	42.50	44.50	44.00	42.00
July	44.00	43.50	42.00	43.75	43.44	41.44
August	43.30	42.70	41.30	43.75	42.95	40.95
September	42.87	42.25	40.50	45.00	43.50	41.50
October	46.25	43.50	41.62	47.00	45.90	43.90
November	46.60	41.50	42.50	52.50	50.75	48.75
December	45.75	45.12	43.12	52.50	51.00	49.00
Year	$44.84	$44.17	$42.54	$46.30	45.45	43.45

There are two main geological horizons in the district that contain mercury deposits: The Lower Cretaceous (Edwards limestone) and the Upper Cretaceous (Eagle Ford shale). The ores of these two formations differ to some extent. The ores in the Edwards limestone contain considerable yellow ore and native mercury, the yellow ore being oxychloride of mercury. Nevertheless the ordinary ore is cinnabar with calcite, gypsum, and sometimes pyrite, and traces of bitumen.

The ores of the Eagle Ford shales, which are bituminous, contain much hydrocarbon, and when formerly treated in retorts yielded considerable oil and illuminating gas. Phillips records the discovery of oxychlorides of mercury in the Eagle Ford shales, six miles east of California hill. Previously all the ore found in these bituminous shales was cinnabar.

Thus far much the larger part of the production has come from deposits in the Edwards limestone, but the Chisos mine is now finding ore in depth and its future looks promising. The main shaft of the Chisos is now down 500 ft., and preparations are being made to sink a larger shaft to the 1000-ft. level.

The growing scarcity of wood fuel would be alarming (the district is 90 miles from the railroad and hence the use of oil fuel is not practicable) were it not that there are beds of lignite in Brewster county, not far from the quicksilver mines. This coal is suitable for making producer gas, and Phillips is of the opinion that producer gas can be used in quicksilver furnaces. As a matter of fact, it has already been used in quicksilver reduction by W. B. Dennis at Blackbutte, Oregon. The use of gas should moreover greatly reduce the quantity of soot in the condensors, which is much to be desired. Phillips estimated the total cost of producing mercury in the Terlingua district at $25 per flask of 75 lb. The total production of the Terlingua district to date is given as 40,000 flasks.

In 1905, the legislature of Texas passed a law which practically stopped prospecting on the State lands. The prospector was required to make application for the land wanted, after which the land commissioner fixed the price. Thus if a lucky prospector stumbled on a rich find the commissioner could put on such a price as would prevent a profitable operation. The law of 1909, however, fixes the upper limit at $25 per acre.

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*Geologist and Mining Engineer, San Francisco, Cal.

[1] Eng. & Min. Journ., Nov. 20, 1909.

Mining in the United States During 1909

Development of Porphyry Copper Properties Continued; Zinc Mining Stimulated by Higher Prices ; Homestake Mine Closed by Labor Troubles

REVIEW OF 1909 BY STATES

Throughout the United States, the in- istry cf mining may be said to have en- yed a prosperous year in 1909, hav- g gradually followed the revival of l branches of business since the late riod of financial depression. While ining will, no doubt, always offer an en- ing field for the flotations of unscrupulous promoters, yet 1909 saw distinct steps taken toward diminishing this evil. Large companies and small are beginning to adopt a policy of frankness to their stockholders which cannot fail to place the industry on a higher plane as a field for investment.

In Nevada there was an increase in actual metal output, three companies, the Nevada Consolidated, the Goldfield Consolidated, and the Tonopah Mining Company, standing out preëminently in the production of copper, gold and silver, respectively. The great Homestake property in South Dakota closed on account of threatened labor troubles.

Alaska

BY WILLIAM M. BREWER *

The following estimates of the value of e mineral output of Alaska in 1909 have en announced in the press bulletin of e U. S. Geological Survey: "The total ineral production is estimated at $20,-)0,000 practically the same as that of 08, which was $20,139,272. The esti- ated value of the gold output of 1909 as $19,460,000; that of 1908 was $19,- 2,818. The copper production of 1909 as approximately 4,000,000 lb., valued about $520,000; that of 1908 was 585,362 lb., valued at $602,267. Prob- ly the output of none of the other min- al products, including silver, coal, mar- e and gypsum, differed greatly from at of 1908, when the total value was 44,189.

"From 1880, when mining first began Alaska, to the close of 1909, the total lue of the mineral production was, in und numbers, $168,000,000. Of this nount the gold mines contributed about 61,000,000; the commercial value of e silver output was about $1,200,000, d the copper production about $4,700,-)0. The remainder is represented by e value of the output of coal, gypsum, 1, and marble."

With regard to the production of cop- r, I am convinced that 4,000,000 lb. is o low an estimate because the "Big onanza" mine on Latouche island alone oduced approximately 1,250,000 lb., d late in the autumn the Ellamar or ladhaugh mine resumed shipments. is, with other smaller consignments om Prince William sound, would bring e total from that section up to approxi- ately 1,600,000 lb., leaving only 2,400,-)0 lb. to be credited to the mines on ince of Wales island, where the Mount ndrew, Jumbo and It mines were regu- r shippers and where in addition there ere some irregular shippers.

Because of the great extent of the territory and the long distance intervening between the various districts, as well as for the convenience of those sufficiently interested to refer to a map while considering the following review of the mining industry for 1909, I have divided the territory into seven geographical subdivisions as follows: Prince of Wales island; Juneau; Prince William sound; Kenai peninsula; Copper river; Yukon basin, and Seward peninsula.

PRINCE OF WALES ISLAND DISTRICT

The distributing center for the Prince of Wales Island district is Ketchikan, the most southeasterly port of call in Alaskan territory. While some discoveries of gold-bearing quartz and copper-sulphide ore have been made on Revillagigedo island, on the westerly side of which Ketchikan is situated, all of the most important are situated on Prince of Wales island and are confined so far to four separate districts: On and in the vicinity of Kasaan peninsula, around Moira sound, and McLean's arm on the east side of the island, and near the head of Hetta inlet on the west side of the island.

During 1909 there were three mines that were regular shippers of copper-gold ore, viz., the Mount Andrew and It mines, situated on Kasaan peninsula, and the Jumbo on Hetta inlet. It is interesting to note that the ore from the Mount Andrew mine, on account of its heavy excess of iron needed to flux the silicious ores offered, is smelted at a much lower rate for treatment than probably any other copper ore in the United States. The iron content of this ore is rarely below 35 per cent., and sometimes as high as 53 per cent., with copper ranging around 4 per cent. wet assay.

It is also encouraging to other owners of magnetite orebodies carrying small amounts of copper to know that in recent work at a depth of 150 ft. below any former work the ore contains more copper but much less iron indicating that the magnetite is only a surface deposit.

The Goodro property on Kasaan peninsula, was developed and equipped during last spring and summer and commenced shipping copper-gold ore in October. The It mine has the distinction of having shipped regularly the highest grade copper-gold ore ever produced from Prince of Wales island. The Rush & Brown property, on Karta bay at the head of the Kasaan peninsula, made some shipments of ore carrying a considerable excess of iron but low in copper, and it is expected that during 1910 this mine which was a regular shipper in 1906-07 will resume operations. The Niblack mine on Moira sound has been idle since the ligitation over it was settled and the lease canceled.

Development work was done during 1909 on several other copper properties, and especially on some locations in the vicinity of McLean's, near the southeast end of Prince of Wales island, where several promising discoveries were made in 1908.

On the southeast portion of Gravina island, which is situated between Prince of Wales and Revillagigedo islands, the Victor Mining Company worked continuously during the year driving a crosscut tunnel near the beach. This tunnel will prospect the ground at a depth of about 2000 ft. by driving about 1100 ft. into the mountain.

On the west coast of Prince of Wales island the Tyee Copper Company, of Victoria, B. C., used diamond drills to prospect a group of claims carrying copper ore. On the properties that carry gold-bearing quartz and on the Moonshine, the only galena prospect so far discovered on Prince of Wales island, more work was done in 1909 than during 1908, with a

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*Mining engineer, Victoria, B. C.

view to bringing these into the ranks of producers during 1910. The low price of copper was chiefly responsible for the lack of activity around such properties as the Niblack on Moira sound and the Mamie and Stevenstown on Kasaan peninsula, all of which have been shippers in the past.

The great need in this district, as well as all over Alaska, is capital judiciously and systematically handled to develop promising prospects; and in addition to capital there is need of judgment on the part of owners of prospects in placing on them a reasonable purchase price.

Juneau District

The Alaska-Treadwell group, Alaska-Perseverance, Eagle River and Chicagoff Island mines worked steadily and produced nearly $3,400,000, the entire estimated poduction of gold from lode mining during the year credited to Alaska by the U. S. Geological Survey. This, the oldest gold-producing district in Alaska, has produced upward of $40,000,000 since 1880, and nearly all from lode mines.

The sale of the Ebner property to a new company that proposes to work it on a big scale instead of with merely a 15-stamp mill as in the past, together with the proposed reopening of the Jualin mine by Ex-Governor Hoggat and the expected settlement of the protracted litigation over the Kensington mines at Berner's bay, promise a materially increased production for the Juneau district in 1910. In addition to the producing lode-gold mines there are a large number of promising prospects in the Juneau district on which more or less development work was done during the year.

This district is also the only producer of gypsum in Alaska, and that industry during the last two or three years has grown into such importance that the monthly shipments to Tacoma, where it is used in the manufacture of plaster, increased from about 1000 tons in 1908 to about 3000 in 1909.

Prince William Sound District

The Prince William Sound district promises to become the most important as well as probably the most populous in Alaska within a comparatively short time for two reasons: (1) Because Cordova in this district is the ocean terminus of the Copper River & Northwestern railway; (2) because the Controller Bay or Bering Lake coalfields and numerous copper prospects are also situated within its boundaries.

The copper production from this district during 1909 exceeded 1,600,000 lb., and all except possibly 250,000 lb. was produced from Beatson's Big Bonanza mine on Latouche island, and from less than 5000 tons of ore. Although this mine was the only regular shipper, there was considerable activity shown by owners of other properties in pushing development work. The Big Bonanza since it commenced shipping in 1902, has produced a very high grade of copper ore. The orebody is shown by development to a depth of 130 ft. below the floor of the quarry from which the ore was shipped. Up to the present time only 300 ft. along the strike has been prospected underground, but on the surface several outcroppings occur within the length of the property along the strike of the orebody (4500 ft.) The country rock on the hanging-wall side is a slate, while on the footwall it has been variously designated, usually as a quartzite. There are about 3000 ft. of underground workings.

At the Ellamar or Gladhaugh mine on Virgin bay, which, until 1907, was a regular shipper of a good grade of copper ore, exploration work with diamond drill and also the construction of a cofferdam to make it possible to mine out a body of ore that outcrops on the beach below tidewater, and was left above the first level, progressed steadily.

Development work was also done at properties at Landlock bay, Fidalgo bay, Wells bay, Knight's island, Galena bay, Cordova bay, and near Shoup glacier in Valdez bay. Except at the last mentioned locality where high-grade, free-milling gold quartz is being mined, all these are copper properties in varying stages of development; some, like the Standard Copper and Three Men companies on Landlock bay and Girdwood and Barrack's on Latouche island, made shipments, and are equipped to ship regularly when the price of copper goes up; others, like the Millard property on Galena bay, the Schlosser and the Blakeney on Fidalgo bay, are nearing a point of development which the owners consider justifies them in installing equipment for shipping.

While copper mining will undoubtedly be an important industry in the district, there is no doubt but that coal mining will be even more so when Congress passes legislation under which the owners of claims in the coalfields near Katalla, commonly known as the Controller Bay fields, are enabled to open collieries, and when the Copper River & Northwestern railroad builds lines so that the coal can be hauled to the coast. Especially will this be so if smelteries are built in the district and the Seattle, Tacoma and other markets in the State of Washington are supplied. Lack of such legislation is retarding the development of these coalfields as well as the building of lines of railroad into them, so that during 1909 there was nothing done in the coal-mining industry, and only very little boring or prospecting for oil.

Seepages of oil occur in the same section as the coal, and as early as 1902 systematic prospecting was carried on. Several diamond-drill holes were put down by an English syndicate which is also heavily interested in the coalfields, but this work was suspended when the coal lands were withdrawn from entry. While some oil was produced, yet it is not known yet whether wells that would produce on a commercial scale can be developed.

The work of construction on the Copper River & Northwestern railroad, that has been carried on by M. J. Heney steadily since 1907, made Cordova the most important point in the Prince William Sound district and encouraged many prospectors to explore the country along the line of the railroad as well as around Cordova bay. Their work resulted in the locating of several promising prospects, not only near the salt water on Cordova bay, but also on the lower Copper river, near Alganik, and as far up as Taral, near the mouth of the Chitina river, southwesterly from what is known as the Copper River belt.

The building of this railroad is a stupendous undertaking, more especially when it is considered that the present development of the country is so limited that only one mining property, the Bonanza, situated over 200 miles northeasterly from the ocean terminus, is sufficiently developed to warrant an estimate with regard to freight traffic. The cos for construction, especially for bridges across the Copper river, has been enormous. The first 100 miles is completed and when a trail is made from Copper Center, over the military trail from Valdez to Fairbanks, to the mouth of the Chitina river, undoubtedly the travel from and to Fairbanks and the Tanana valley will be diverted from Valdez. The Copper river from Taral up to Copper Cente is navigable a portion of the summer fo very light-draft boats, one of which made that trip during 1907. Just above the mouth of the Chitina river the railroad crosses the Copper river from the wes to the east side, and from there will follow up the Chitina river and make connection with a tram line from the Bonanza mine.

Location surveys have been made fo a branch of this line of railroad from the lower Copper river to the Bering Lake coalfields, a distance of about 80 mile in a southeasterly direction. During th summer of 1909 it was reported that construction was to be commenced on thi branch at once, but this was abandoned until such time as the question of title t the coal lands is definitely settled. A few miles of track was laid by this compan in 1907 from Katalla, on the coast, eas from the mouth of the Copper river toward the coalfields. It was then proposed to make Katalla the ocean terminus, but work on this line was stoppe in the autumn of the same year and ha never been resumed. This section o track will, I presume, be used when th branch to the Copper river is built.

The other railroad enterprises propos

to build into this coalfield and the pper River country, have apparently died natural deaths, thus removing all npetition from the path of the Copper er & Northwestern Railroad Company. ring the summer of 1909 bonds to the ount of $50,000,000 were issued by company and the property mortgaged secure this amount.

Kenai Peninsula District

The Kenai Peninsula district owes its portance chiefly to the fact that Seward, the head of Resurrection bay, is the an terminus of the Alaska Central road, thus making it the gateway to Cook's Inlet placer and hydraulic gings and also to the Matanooska lfields, the objective point of this raild. A limited quantity of gold was duced by the hydraulic mines and n some new discoveries of gold-bear- quartz on Willow creek, a branch of Susitna river, but there was no other eral production during 1909.

Gold-bearing quartz was discovered on se creek, about 20 miles out from vard, in 1905; but more serious work done on the locations during the nmer of 1909, when an arrastra was alled, and, it is said, sufficient gold ed to pay the cost of the development k.

There was quite a stampede in August Moose pass, about 45 miles from vard, owing to the locating of gold- ring quartz veins and the bonding of Gilpatrick group to Watson & Snow $80,000. Although about 50 claims all were located during the summer re was comparatively little work done any except the Gilpatrick group, and sufficient there to demonstrate the ie of the camp. During 1910 this uld be ascertained, and there is a d chance there for the development an important lode-mining camp.

The Willow Creek camp, from all re- ts, also promises to become a pros- ous lode-mining camp, especially if railroad construction is continued in 0. This road will afford easy access the Susitna, Yentna and Mantanooska er sheds, considered by good pros- tors as offering the best chances for coveries of gold-bearing, free-milling rtz of any section of southwestern ska.

The railroad was completed to the head Cook's inlet, 72 miles from Seward, 1909. It has been in course of con- iction since 1904. During the year as in the hands of a receiver, and the 20 miles, the construction of which been left unfinished, was completed. ently the railroad was sold at re- ver's sale and a new company, called Alaska Northern Railroad Company, anized. It is the expressed intention this company to continue construction 910 and complete the road to the Mat- oska coalfields, about 150 miles beyond the present northern terminus, at the earliest possible date. It is reported that the site for a naval coaling station on Resurrection bay has been approved by the Navy Department, the site being within easy reach of the Alaska Central railroad.

Copper River District

The Copper River district may, for the purpose of this review, be considered to include all of the territory between the Chitina river on the south, the Tanana and Yukon on the north, the International boundary on the east and the Copper river basin on the west. These boundaries will include the placer diggings on Slate and Valdez creeks and the hydraulic mines on the Nizina river, as well as the copper deposits in the belt a short distance north of the Chitina river. The Assay Office at Seattle reports the receipt of $106,655 in placer gold from this section during the first ten months of 1909.

The portion of this district in which placer gold is liable to occur is quite extensive, but owing to the ice fields and precipitous mountain ranges, small sections only have been explored. Although a considerable quantity of placer gold has been produced every year since 1898, yet the most attention has been given by prospectors to prospecting for copper in the belt north from the Chitina river. High-grade copper ore is here found at and near the contact of limestone and igneous rock.

During last summer it was reported that the Morgan-Guggenheim syndicate, which is building the railroad, had purchased all of the remaining outside interests in the Bonanza mine, and also the interests of the Great Northern Development Company and the Alaska-Kotsina Copper Company, and also those of Henry Bratnober and associates in the Nabesua-White River copper belt. If these reports are correct, this syndicate operating as the Alaskan Copper and Coal Company acquired a very large acreage of the Copper River district.

During 1910 there should be such systematic development work done in this inland copper belt as will forever set at rest all speculation as to its future prospects. There is no doubt as to the grade of the ore so far exposed, which is much higher than is usually found; the questions of tonnage, cost of mining and transportation remain to be determined.

Considering the limited development work that has been done in this district and the great amount of cash expended, without including the enormous cost for railroad construction, there is not a particle of doubt but that the cost up to the present time has been greater than the cost of opening up any other copper camp in the United States. Owing to this fact it is necessary that the tonnage developed, as well as the grade, should be exceptional in order to insure dividends from future operations sufficiently high to make these properties attractive investments.

Yukon Basin District

For the first ten months of 1909 the Assay Office at Seattle reports the receipts from the various camps in this district as follows: Tanana, $5,631,836; Circle, $59,275; Koyukuk, $388,922; Eagle, $28,923. The discovery of gold-bearing quartz veins near Fairbanks, in the Koyukuk and Chandlar valleys, and in the Bonnifield district will have a tendency to attract hard-rock prospectors into the territory heretofore the home of the placer miner. Doctor Brooks, of the U. S. Geological Survey, speaks in encouraging terms of the lode prospects so far discovered, and in the press bulletin issued by the Survey these discoveries are discussed at considerable length. This discussion may be summarized thus: So far the development has been so limited that, while the prospects have promising possibilities, yet it is too early to warrant the expression of any opinion as to their ultimate value. Development work has been confined to surface prospecting, sinking on veins to depths of less than 100 ft. and tunneling along them to distances not much exceeding 100 ft. The material has been milled in small lots by means of a small stamp mill established at the town of Fairbanks during the winter of 1909.

About the only new features chronicled during 1909 with regard to placer mining in this district were the discoveries of pay streaks on Otter creek, a tributary of the Haiditarod, itself a tributary of the Innoko river. The Innoko district is credited with a probable yield of $300,000 during 1909, indicating that systematic mining followed the prospecting done in 1908. Other reports are of the discovery of placer gold on the Tolusak, a tributary of the Kuskokwin, in what seems to be an extension of the same belt as that of the Innoko and Haiditarod. Stampedes of considerable magnitude were reported during the summer and autumn from Fairbanks and other older placer camps into the newer and more attractive fields, and it is quite possible that during 1910 a considerable increase in the production of placer gold from the Yukon Basin territory will be recorded.

The Alaska Road Commission was active in building new trails and improving the trunk roads in the district, and this will have an important bearing on the future exploration of this almost unexplored portion of Alaska.

In placer mining the dredge and hydraulic plant are rapidly taking the place of the individual miner in portions of this district, and especially in the Fortymile basin where three dredges were in operation during 1909, one of these working on the south fork of Fortymile and the other two on Walker's fork.

It is reported that, because of the isolated positions of these dredges, the initial cost for installation was probably twice as much as it would have been in some other portions of Alaska, and besides, for two of these dredges the ground has to be thawed. The operations so far have been successful, and therefore a precedent has been established.

Seward Peninsula District

The output of placer gold received at the Seattle Assay Office from the Seward Peninsula district, during the first ten months of 1909 is reported at $4,035,983; this was all placer gold. Around and at Nome the installation of larger plants proceeded rapidly enough to insure the keeping up of production, especially during such a dry season as that of 1909. It is generally conceded by those who have thoroughly studied the conditions that there is quite an extensive area containing reserves of gold-bearing gravel; but the question of water supply will have to be seriously studied and met before much advancement can be made in mining on a large scale. Large plants are needed to handle such quantities of the lower-grade gravel as will insure satisfactory results to the operators.

So far as the tin deposits in this district are concerned, there was apparently little activity in the section where the occur. A big lot of specimens of bot lode and stream tin was shipped to the Alaska Yukon Pacific Exposition a Seattle. The isolated location, the close sea during a long period each year an consequent lack of regular transportation and the question of cost will alway enter largely into the problem of minin the tin ore in this section. Before an serious development is undertaken, thos who propose to invest the required capital should have all the conditions thoroughly examined by experts who hav made tin mining a specialty.

Arizona

BY WILLIAM P. BLAKE *

The continued low price of copper turned the attention of prospectors and miners more and more to the other metals, notably to gold, silver-lead and zinc.

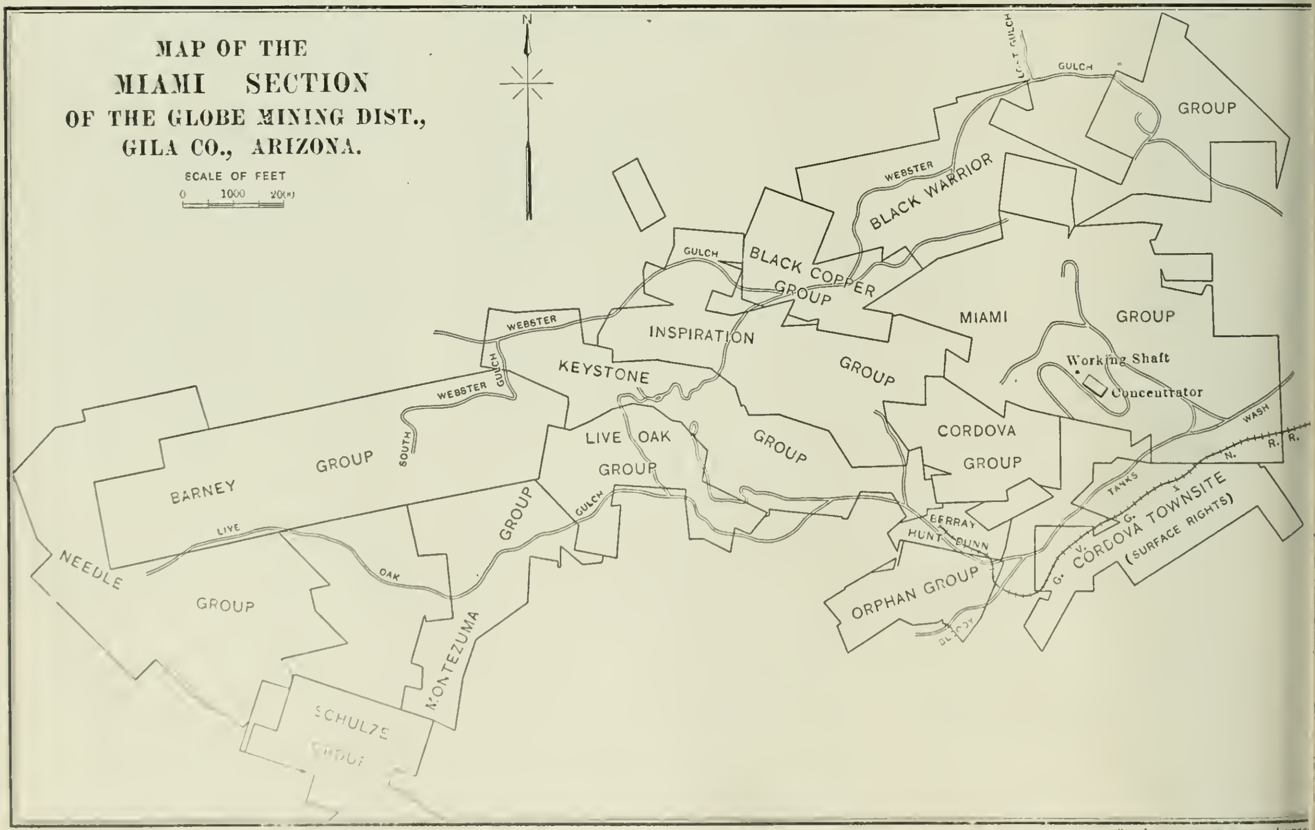
Gold

The active development of the gold region of western Arizona continued during 1909 with most encouraging results, especially in Yuma and Mohave counties, where new properties have been opened. The existence of a gold-bearing region along the western border of the Territory is now recognized. This region is coincident with the uplift of the hydro-mica schists of the Arizonian, noted throughout the Territory as the country rock of valuable mineral deposits. It is of extreme antiquity, antedating in deposition the ancient sediments of the Silurian and Cambrian seas. These schists have a wide development west of the Harquahalla mountains, especially near Vicksburg, where they are traversed by many quartz veins.

The King of Arizona, in southern Yuma county, was worked without interruption, and added about $20,000 monthly t the gold output of the Territory. Th North Star, now known as the Golde Star, maintained its prestige as a larg producer and recovered from the destruction by fire of the ore chutes at the mil

Prospecting and locating were activel prosecuted from Castle Dome on th south to and including Mohave county the north. Mack's Ruby gold mine, abo five miles above Parker, was bonded Eastern men and is under exploration.

The gold mines of Mohave county we actively worked and were so well repr sented at the Territorial fair as to secu



The Engineering & Mining Journal

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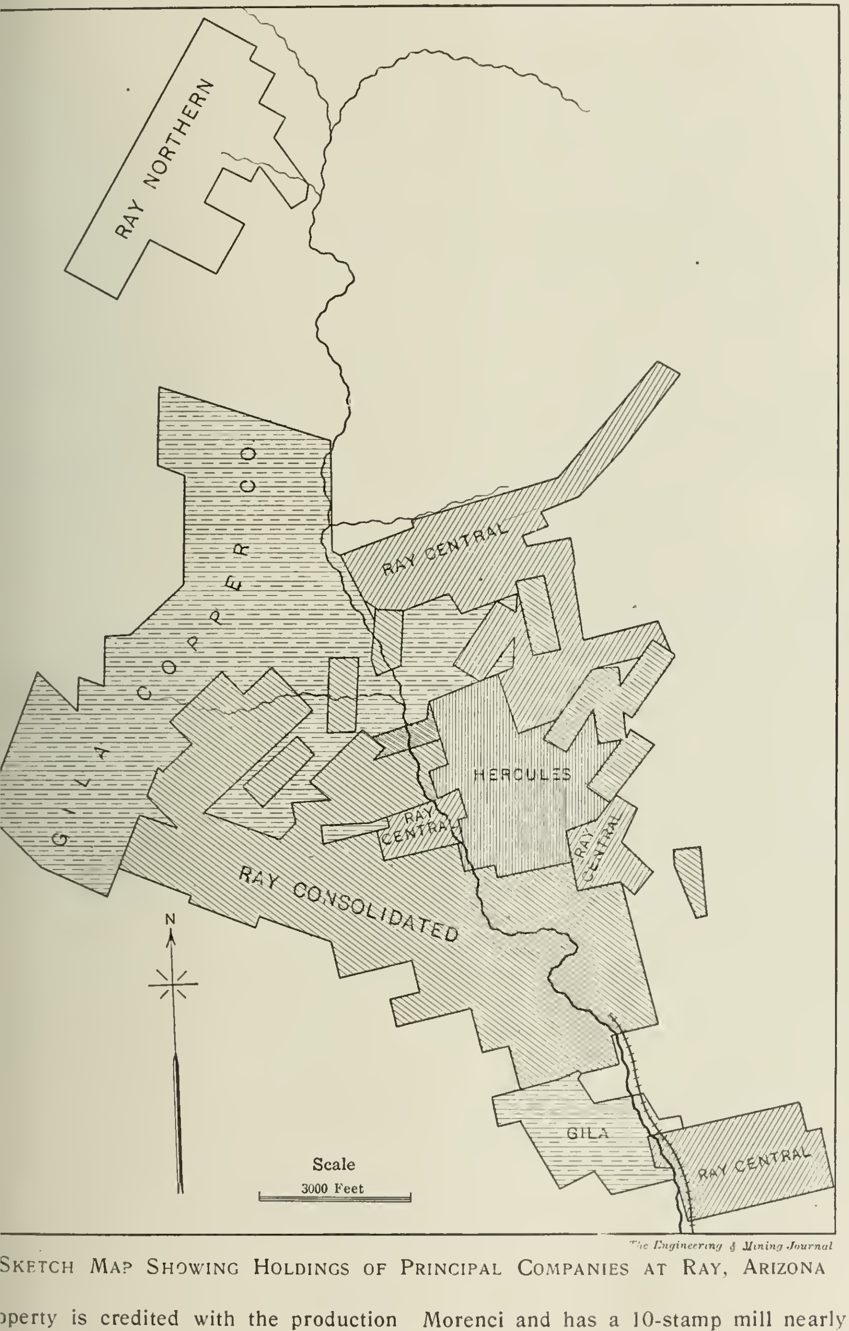
*Territorial geologist of Arizona, Tucson, Arizona.

e medal for the best mining exhibit. e ores of the Gold Road mine were ominent. A gilded representation of a ld bar valued at $45,000 indicated the sult of 15 days' run of the mill. The m Reed mine, about 1½ miles south the Gold Road, is in the same forma- n and has similar ore. A 250-ft. shaft d about 1800 ft. of drifts and crosscuts ve proved the existence of a large body free-milling ore in this mine. The perty is credited with the production $300,000, and has acquired added ominence by the reported transfer of controlling interest to John Hays mmond and associates.

In Maricopa county, the old Vul- e mine, near Wickenburg, operated ccessfully and shipped bullion after ril. A new mill of 100 stamps is nned. Five bulletins of progress were ued during 1909, showing active sinking and driving and the development of reserves. In Pinal county work upon the Mohawk, near the Mammoth, at Shultz, continued as in 1908 under the direction of Mr. Roberts.



The Engineering & Mining Journal

SKETCH MAP SHOWING HOLDINGS OF PRINCIPAL COMPANIES AT RAY, ARIZONA

In Graham county the Crawford mines, north of Clifton and Morenci, were under active development and a small cyanide plant was operated with a reported extraction of 85 per cent. A new property, called the Gold Belt, was opened near Morenci and has a 10-stamp mill nearly ready to start. The Stafford mine, Vicksburg, was opened by an 80-ft. incline and a drift of about 90 ft. in ore.

An accident in June caused the stoppage of the pumps on the 1000-ft. level of the pump shaft of the Tombstone Consolidated Mines Company, and the mines were speedily flooded. The water rose rapidly to the 800-ft. level. A new set of pumps equal in capacity to those drowned were installed on the 800, and when the 1000-ft. level is unwatered, and the pumps are recovered, the maximum total pump capacity will be about 12,000,000 gal. daily, or 8500 per min. The day before the accident the quantity of water pumped was 6,706,080 gallons.

Shipments of ore and concentrates were continued from the 700- and 800-ft. levels. The exploration of the ground below the old water level fully confirmed the expectations formed of the geologic conditions and mineralization of the lode below the permanent water level. Neither the grade nor character of the ore was affected by the water.

COPPER AND RAILWAYS

The Centurion mine at Johnson, Cochise county, yielded rich ores of copper, resembling those of the Copper Queen, from cave-like ground on the 225-ft. level. A 125-ton smeltery was blown in, and connection established with the Southern Pacific railway. Several companies were organized and the region actively prospected. The branch railway is known as the Johnson, Dragoon & Northern Railway, and was completed in November.

The transfer of the Saddle Mountain properties to the Development Company of America included the Deer Creek coalfield and the gold-bearing lodes in the andesitic hills south of the creek.

The opening of new copper districts stimulated the construction of new branch railways from the mines to the smelteries. It is said that the Development Company of America will build from Winkelman to Sasco, where the ores of the Imperial mine are smelted, and that it may extend a line to the Ajo and Gunsight districts in the southwest.

At Courtland, Cochise county, large bodies of low-grade copper ore were opened. The requirements of the smelters at Douglas resulted in the extension of two lines of railway from Douglas to the mines, and in the stimulation of prospecting for the precious metals. The discovery of gold-bearing quartz lodes was reported in November.

In the Tyndall district, Santa Cruz county, large shipments of low-grade, pyritic copper ore were made from the Horey mine to the smelteries at Globe. Advantage was taken of a low freight rate on ores averaging less than 10 per cent. copper. Some of the shipments assayed less than 6 per cent. copper.

At the Salero, the main shaft on the Darwin was sunk to the 400-ft. level and a 72-ft. crosscut was extended to the lode, which was found to maintain its average width of 15 to 20 ft. Drifting on this lode for 400 ft. or more, east and west, failed to show more than occasional green stains of copper. Two raises on the vein were in progress at the end of the year.

The World's Fair, the Mowry and other properties in the region south of Patagonia remained idle during the year. The sale of the Flux and other properties projected in 1908 was not realized.

An interesting exhibit was made at the Territorial fair by the Kay Copper Company of a newly opened deposit of sulphide copper ore in schist, closely resembling the occurrence at the United Verde, Jerome. The deposit is on the Agua Fria river, Yavapai county, about 60 miles from the Verde mine, and is under development. The sulphides are intercalated with the schist in broad lenses, often of high-grade chalcopyrite.

The Copper Mines Company of Arizona installed two Keystone churn drills near the Metcalf and was nearly ready to begin the prospecting work at the end of the year. The Shannon railway from the mines at Metcalf to the smeltery at Clifton was nearly complete at the end of October and was promised to be in running order by the end of the year.

Several of the older and neglected claims in western Pima county were reopened with satisfactory results. The silver-lead mines of the Vekol were reported as producing high-grade ore. The deposits of disseminated copper ores at the Ray and at the Miami (Globe) were prospected by churn drills at the angles of 200-ft. squares. The assays showed a wide distribution of low-grade ore. This was blocked out by crosscuts and raises at regular intervals with the result that the estimated quantity of ore is expressed in millions of tons.

Zinc, Cobalt and Tungsten

An important addition to the mineral products of Arizona was found in the deposit of zinc ore in the form of the sulphide (black jack) from the Golconda mine, in the Union Basin district, Mohave county. Shipments of 1000 tons per month of 46 per cent. ore, containing also $10 per ton in gold, were reported to have been made from the Union Basin company to smelteries in Oklahoma.

The discovery of cobalt ore in quantity added to the variety of the mineral products of Arizona. It occurs in the Black Hills mining district about 8 miles south of the United Verde mine at Jerome. An assay yielding 8 per cent. cobalt and 1½ per cent. nickel was reported. A carload was shipped to New Jersey as a test.

The several properties of tungsten ore in the form of hübnerite at Dragoon and at Gigas, south of Tucson, remained unworked during the year, though there seemed an increased demand for eithe wolframite, hübnerite or scheelite. A change of ownership in the Bradford property at Gigas suggested a probable early resumption of work and production of hübnerite concentrates. Samples o tungsten ores from two or three sections in Mohave county were shown at the Territorial fair, notably from Cedar district and the Williams mines, Greenwood

Electric Power

The utilization of the waters of Fossi creek for the production of electri energy by the Arizona Power Company was an event of great importance to the mining interests of central Arizona Wires were strung through mining districts as far as Prescott. In other part of the Territory power plants have also been erected.

Utah

BY PERCY E. BARBOUR *

During 1909, most of the mining districts of Utah made strides which mark that year as one of the greatest in Utah's mining history. None of the various mining camps declined, but one or two are still in the doldrums left over from the panic of two years ago.

Bingham

Bingham easily held the most conspicuous position in mining operations in Utah by reason of the enormous output from the porphyry mines. From 13,000 to 15,000 cars of ore were shipped from Bingham per month. At the maximum output, a train of ore left Bingham cañon for the Garfield plants every two hours during the day. Most of this tonnage came from the Utah Copper and the Boston Consolidated. The Yampa mined 800 tons per day but treated it all in its own smeltery in the cañon. The Utah Consolidated mines shipped about 800 tons per day to the Garfield smeltery and the leasers in the Commercial and Lark properties approximately 300 tons.

The railroad increased its equipment by the addition of eight new Mallet compound locomotives and a large number of steel cars. This will ease the transportation problem and allow a heavily increased production. With this aid and the number of new mills and mines that will enter or reënter the shipping list, 1910 will see a far greater production of ore than 1909.

The Utah Copper alone mined and treated more than 2,750,000 tons of ore during the year. The largest day's shipment was 13,700 tons which would have been still larger if the railroad could have furnished sufficient number of cars. When it is considered that the total switching yard for the purpose of handling this tonnage and the necessary empties and the making up of the ore trains consists of but four tracks about a quarter of a mile long, limited by the steep and narrow cañon, the immensity of the tonnage handled is emphasized. During the first three quarters of the year the total production of fine copper was 12,107,549, 13,774,412 and 15,299,674 lb. respectively at a total cost, including also selling and eastern expenses, of 9.68, 9.192 and 8.077c. per lb., according to the company report. During the last quarter the total mining expense was 25.22c. per ton; the total milling expense was 56.85c.; making a total mining and milling expense of 82.07c. per ton of ore. This included all possible charges and the proper proportion of stripping expense. The ore averaged less than 2 per cent. copper, 0.015 oz. gold and 0.15 oz. silver per ton. Except the ore which comes from development work all underground mining has ceased and all the output is coming from the steam-shovel operations. The company has 21 locomotives and 19 miles o standard-gage track for the handling and disposing of the capping; and has more than 20 miles of underground workings.

The mill at Copperton and the mill a Garfield were both run all the year, except for a short shutdown of the forme for some changes and repairs. The Garfield mill has a nominal capacity of 6000 tons per day but easily handled a tonnage almost 33 per cent. larger than this with satisfactory results.

A sample of the blasting practice i connection with Bingham steam-shove mining was a round of nine holes loaded with eleven tons of powder, which broke 87,000 tons of ore.

The Boston Consolidated company stopped mining by steam shovels and i doing all its mining underground, using the square-set system in its so-called sulphide mine and the caving system in it porphyry mine. By the former method the cost per ton is $1.688 and by the latte method 66.7c. per ton. The mine i equipped with 12 locomotives, 6 miles o narrow-gage track, and 80 rock drills and employed between 500 and 600 men The mill at Garfield placed the thirteenth and final unit in commission in July and after that between 2500 and 3000 tons o ore per day were milled. The produc for the year amounted to about 20,000,000 pounds of fine copper. The tota

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*Mining engineer, Salt Lake City, Utah.

milling expense was 50.11c. per ton. The company's latest reports stated that copper was being produced at a fraction under 10c. per lb. About 250 men were employed at and around the mill. In all probability another unit will be added to he mill.

In November, the Ohio Copper Company started up the first 750-ton unit of ts 2250-ton mill. The second unit was held back by the non-arrival of some of he electrical equipment. The mill is situated at Lark over the ridge from Bingham cañon and only 3000 ft. from the Mascotte tunnel which connects with the Ohio shaft at a distance of 14,000 ft. from the portal. The ores will be taken hrough this tunnel to the mill, thus givng the Ohio the simplest transportation problem of any of the big Bingham producers. The Ohio ores carry about 1.75 per cent. copper with some gold and ilver, though occasionally high-grade ore s encountered.

The Utah Consolidated, operating the Highland Boy mine, sent about 800 tons per day regularly to the Garfield smelery. This output was limited by the capacity of the aërial tramway. An unusual amount of development work has been done underground to get the mine n shape for a continuous production of 200 tons per day which it will be called upon to furnish to the International smelery at Tooele. The tramway being built from the mine to this smeltery is nearly ompleted. The cost of copper was given as 9.58c. The new smelting contract is aid to be much more favorable than the old one and the transportation cost, by he elimination of the railroad haul, will be reduced 35c. per ton so that the property is expected to make a new low-cost ecord during 1910. The Highland Boy ores carry over 2 per cent. copper, 1½ o 2 oz. silver and $1 to $2 in gold per on.

The Utah Metals company was the result of the recent consolidation of the Bingham Metals and the Bingham Cenral-Standard companies. The company owns about 2500 acres in Bingham disrict. A tunnel is to be driven from the westerly side of the range from Middle Fork cañon, through the claims and into Bingham cañon. This tunnel is already n a distance of 3000 ft. It is 7x7 ft. in he clear, is to be relaid with 35-lb. rails and will have to be driven 10,000 ft. farther to reach Bingham. The portal of the tunnel is within four miles of the new Tooele smeltery which will reduce he transportation of the ore to a minimum.

The Bingham Mines Company, the successor to the erstwhile tangled affairs of he Bingham Consolidated, renewed operation, through leasers, of several of ts properties both in Bingham and Tinic. The company did not operate exensively but made money on its operaions, which are increasing in magnitude, and it seems likely will yet retrieve the fortunes of the old Bingham Consolidated.

The Mascotte tunnel which is driven from the easterly side of the range, starting at Lark, toward Bingham cañon, is in a distance of 14,000 ft. It would require only a few thousand feet to extend the tunnel under Bingham cañon and but 16,000 ft. of tunneling to reach Pine cañon on the Tooele side where the International smeltery is being built. This tunnel is bound to be the main artery of the Bingham district in the not distant future and Heinze showed remarkable prescience in acquiring it at the beginning of his operations in Utah.

The Bingham-New Haven mill of 100 tons capacity was started and the Butler-Liberal mill, capacity 250 tons, was remodeled and put into commission during 1909. The Utah-Apex mill is being entirely reconstructed and will have a capacity of 250 tons when completed.

Park City

Park City, one of the most important lead camps of the country and which has produced $120,000,000 since its discovery, was the scene of several consolidations and of continuous expansion. The Silver King Coalition, including the original Silver King mine, which has already produced $20,000,000, is said to have blocked out in the mine $25,000,000 which is a better showing than at any previous time in its history. Over $12,000,000 have been paid out in dividends. About 400 men were employed. The Ontario, which is credited with a still larger production, resumed shipments which are expected to soon return it to the dividend class. The Silver King Consolidated encountered good ore on both the 1550- and the 2050-ft. levels.

The Daly-Judge found a new orebody just below the 1400-ft. level, carload shipments from which averaged 23 per cent. lead, 29.3 oz. silver and 24 per cent. zinc. On the 1200-ft. level another orebody was discovered. These discoveries were in the territory which will be drained by the new tunnel from the Snake Creek side of the range. This tunnel is to be driven by the Snake Creek Mining and Tunneling Company which is fathered by the Daly-Judge company. It will be of great benefit to all the other properties in the neighborhood, nearly all of which are in the enterprise. The tunnel will be about three miles long.

The American Flag took over the Constellation group and increased its equipment. It is considering the erection of a mill to recover the gold lost in concentrating the silver-lead ore. The Daly-West, which was forced to draw heavily on the ore reserves in the upper portions of the mine during the time the lower portions were drowned out owing to the cave in the Ontario drain tunnel, paid dividends, which it was not earning, until the treasury surplus was reduced lower than previous policy had dictated. This course was more or less forced upon the company by one faction which had always been opposed to maintaining a large surplus. The mine is looking well and the working force has been increased. The West Quincy and the Thompson companies arranged for a consolidation, the new company to be known as the Quincy-Thompson Consolidated.

Alta

There was an increased amount of activity in Alta and adjacent districts. The Emma Copper Company after much litigation actual and threatened owing to debts and mortgages emerged from the trouble freed from obligations and entered upon active development work. The Columbus Consolidated made an entirely new discovery in a shoot parallel to its old orebody and began shipments from it, thus increasing the output of the mine. The Rainbow Mining Company, situated in a section long considered unfavorable, struck a body of lead-silver ore in its tunnel. The Big Cottonwood Copper and Gold Mining Company encountered in its tunnel the contact for which the neighboring Mountain Lake Company was also driving. Copper ore carrying considerable amounts of gold and silver was found on the contact. The Wasatch-Utah near the mouth of Little Cottonwood developed a vein of gold quartz which was sold to the smelters for converter lining. The Yellow Jacket tunnel at a distance of 1000 ft. struck 6 ft. of copper-gold ore. The old Prince of Wales mine, which shipped largely in the old days, is being developed by a tunnel driven from the opposite side of the mountain which will give a depth on the vein of about 2000 feet.

Mercur

Mercur is still Utah's greatest gold camp and in the last seven years has produced 56 per cent. of the gold produced by the State. The Consolidated Mercur at whose Golden Gate mill the cyanide process was first tried on an extensive scale in this country, has produced over $14,000,000 and has paid in dividends over $4,000,000. In 1909 it mined and milled approximately 750 tons of ore per day. The Mercur ores are complex, classified as oxidized and base; the base ores require roasting before cyaniding. This cost $1.05 per ton of ore roasted. The total average cost of mining for 1909 was $1.53 and for milling $1.09, making a total cost of $2.62. The mill heads averaged $3.58 and the tailings 88c. per ton. The cyanide consumption amounted to 0.78 lb. and the zinc consumption to 0.36 lb. per ton of ore. Nearly 300,000 tons were mined and milled during the year. The Boston-Sunshine company remodeled the Sunshine mill and for several months treated 125 tons of ore per day. The payment of dividends was begun. The mill heads averaged $3.50 and the tails 35c. per ton. The milling costs were 88c. per ton. The consumption of cyanide and zinc was 0.76 and 0.45 lb. respectively. The Daisy mines were purchased by a close corporation and the old mill which was used for the Sacramento dump ore was acquired and remodeled. The West Dip installed equipment, remodeled its mill and repaired its six-mile pipe line from Ophir. When these two mills are in full operation Mercur will be mining and milling 1200 tons of ore per day.

TINTIC

Though there was a serious slump in the stock of several of its prominent mines, Tintic during 1909 maintained its position as the camp with the largest number of individual shippers and dividend payers. The deeper workings of the camp are showing up well and promise as bright a future as the past has been. The Eagle & Blue Bell shaft was sunk below the 1000-ft. level, the Grand Central was working on the 2200, the Centennial-Eureka on the 2260, the Lower Mammoth on the 2200, the Mammoth on the 2100, and in each case the lower workings were as good or more promising than on the upper levels. Some new shippers entered the list and several old-time shippers resumed. The introduction of churn and diamond drills for prospecting was an innovation in Tintic. The Ajax passed to the control of the Loose interests and was then turned over to the Golden Chain which will develop its property through the 1100-ft. shaft of the Ajax.

BEAVER COUNTY

Of most import to Beaver county was the final successful adjustment and reorganization of the Newhouse Mines and Smelters under the new name of the South Utah Mines and Smelters. The Newhouse properties were bought at foreclosure sale by the Trust Company of America, by whom they were turned over to the new company. Before the closing of these properties the output amounted to more than 500,000 lb. of copper per month. The new Cactus mill has a capacity of 1200 tons per day. The mine is opened to a depth of about 1000 ft. Samuel Newhouse declined the presidency of the new company.

The reorganized Majestic Mines Company reopened the Harrington mine. New machinery was added, the mine provided with ample pumping equipment and a 6-in. water column put in the 500-ft. shaft. This new shaft encountered an entirely new body of silver-lead ore which varied from 8 to 15 ft. in width and on the 500 level was 120 ft. long. No work was done at the O. K. or the Hickory, all work having been centered on the Harrington. In the Hickory are several thousand tons of 2½ per cent. copper ore and undeveloped possibilities of considerable promise. The O. K. also has a good showing.

The Red Warrior did several thousand feet of development and discovered and developed a body of sand carbonates of large proportions. Sixty-five carloads of ore netted the company $55,000. The mine is five miles from a railroad. The Cedar-Talisman after the consolidation confined its work to the lead-silver ores of the Cedar which were opened on the 500 level. On the 225-ft. level a drift was run to cut the zinc ores of the Talisman for which the mine was offered $25 per ton, f.o.b., Milford. The Blackbird prospected its territory with drills. The Beaver Carbonate developed sufficient ores to justify a mill which is now under consideration. The Utah Gold and Copper was optioned to persons who contemplate a mill and 30 miles of railroad.

TOOELE COUNTY

Shipments from the Deep Creek section incur a freight charge of $25 per ton, yet an occasional shipment was made with profit. The Western Pacific railroad, which was placed in operation in 1909, passes within 30 miles of the district and promised to build a spur to the camps in the spring of 1910. The Tonopah & Tidewater road which is coming through from Goldfield to Ely is expected to reach Salt Lake by making connection with the Saltair road and will pass near enough to Deep Creek to be an outlet for it. Either road will cause extensive development in this camp. The Western Utah Copper Company developed large bodies of copper ore and discovered an entirely new body of lead ore of shipping grade for a width of 75 ft. The district is at present of indeterminate area and is spoken of indefinitely as the Deep Creek, the Dugway, or the Clifton district. The present shipping point is Wendover.

The nearest thing to a new bonanza which Utah had during 1909 was the Silver Island Coalition property. Four tunnels were driven in ore from the surface, from which sensational assays were obtained. Carload shipments to the Salt Lake smelteries netted the company $65 to $100 per ton, which considering the long wagon haul and the high freight rates is approaching bonanza ore. Wendover is also the shipping point for these mines.

SEIVER AND PIUTE COUNTIES

The Sevier Consolidated, which had been in the hands of its creditors for a long time, resumed work at Kimberley under the direction of the Salt Lake Hardware Company interests. The mine has been a good producer and has good underground showings and seems to require only good conservative management. Both mine and mill are equipped with complete and modern electrical machinery. Electricity is supplied by the company's power house in Clear Creek cañon. The Gold Development Company at Marysvale began work preliminary to the reopening of the mines and the building of a 300-ton mill and an aërial tram. Several other properties were working in this district in which, although primarily a gold camp, some copper and lead prospects of considerable importance were developed.

IRON COUNTY

At Modena, the Gold Springs Mining and Power Company installed two 190-h.p. Westinghouse gas producers, two 16x18-in. three-cylinder gas engines, 160 h.p. each, and two 110-kw. generators. This plant is to furnish power to other mines in the Gold Springs district which is 10 miles from Modena. Lack of power prevented them heretofore from carrying on extensive operations now planned. Fay, Uvada, Stateline, 25 miles away, and other towns are relying on this plant for power and there is no doubt that the plant will be enlarged as soon as the first installation is running smoothly. The Ninety-nine Copper company at Good Springs, Nev., and the Iowa Copper company, 25 miles east of Modena, increased their working forces. The Hoosier mine which has extensive zinc orebodies will resume shipments in 1910, preparations for which are now under way.

WASHINGTON COUNTY

The Old Silver Reef property, which was once famous for its silver production but which was forced to close on account of the increasing amount of copper, was acquired by a Salt Lake company. The old stopes are said to contain a large tonnage of ore which will average 4 per cent. copper and which is amenable to leaching. A 125-ton mill has been arranged for.

GRAND AND SAN JUAN COUNTIES

In the La Sal mountains in Grand and San Juan counties, although isolated from railroad facilities, considerable work was done in gold mining. Besides quartz mining there was one hydraulic installation working and numerous long-toms and sluices working on a small scale but with results which hold out much hope for this district which is at present so little known.

BOX ELDER COUNTY

The Park Valley gold district in the northwestern part of the State about 20 miles from the Southern Pacific railroad, though comparatively new and unknown, did an increasing amount of work during the latter months of 1909. The Century mine, which has produced $250,000 but which was never profitable as an enterprise, started to remodel its mill. It has considerable ore blocked out. The Susana developed sufficient ore to justify a 40-ton mill which was installed. The Doctor Mining and Milling Company was a new incorporation which started work on a oup of claims near the Century and sana.

The Smelting Plants

The Garfield smeltery increased its isting capacity by the addition of more :Dougal furnaces. It built and sucssfully ran a new basic-lined copper nverter. This converter is of the horintal cylindrical type, 22 ft. long and 10 in diameter. It has a capacity of 40 50 tons of copper per day. The silica cessary to slag the iron of the matte is pplied by dumping raw silicious ore o the converter.

The Highland Boy smeltery near Bingm Junction, now officially known as dvale, was dismantled and delivered to new Tooele smeltery where the greater rt of it was utilized in the new conuction.

The Bingham Consolidated smeltery s not been operated since it was closed the time of the smoke suits two years). It is rapidly falling to pieces. The ıgham Mines Company, the successor the Bingham Consolidated, made a faable smelting contract with the Yampa elting Company for the treatment of Bingham ores.

The Yampa smeltery closed its conting department and contracted to sell matte to the Garfield smeltery. The mpa had a peculiar accident during the ny season. A cloudburst sent an unul flood of water down the steep side the mountain on which the smeltery is ıated, breaking in the side of the build, and carrying away the wall of a reberatory furnace which was full of tte. The resulting explosion shook ıgham cañon and buried in mud a iple of workmen who were later resed uninjured.

The Knight smeltery at Tintic which was wn in during July, 1908, was forced suspend operations due to a lack of ficient and suitable smelting ores. The eltery has four lead stacks and one pper furnace. A considerable shifting the balance of power in a mining way the Tintic district materially changed ore-supply situation from what it was en the smeltery was projected. The uring of long-time ore contracts from mines by the smelters of the Salt ke valley made it impossible for the tic smeltery to secure the proper fluxmixture and the shutdown was made perative.

Work on the smeltery of the Internaıal Smelting and Refining Company at ɔele progressed during 1909 with great idity. If it were not for the delay v experienced due to the non-arrival of structural steel the completion of the nt would probably have anticipated the ed date. The shops, power plant, crush, and sampling plant, and the roasting nts were practically finished, as was o the 350-ft. brick chimney. The foundation for this stack contained 1200 cu.yd. of concrete. The main furnace building will contain five reverberatory furnaces, each 102x19 ft., and one blast furnace, 51 ft. long. The converter plant will also be under the same roof. The plant is laid out for symmetrical additions and extensions as this is not expected to be the final limit of size or capacity.

At the United States smeltery the copper furnaces are still idle as they have been since the injunction secured by the "smoke farmers" in 1907. A baghouse system to treat the copper fumes and render them innocuous to vegetation is being designed. The court gave permission for the resumption of copper smelting when such a baghouse is installed. The lead plant ran steadily. The fumes from the lead smeltery are neutralized by the use of lime and zinc oxide, the latter produced from the roasting of the zinc-mill concentrates, and the gases are then passed through the baghouse where all the dust is filtered out. The gases escaping through the stack are invisible as they emerge from the top. The solid particles are removed and the sulphurous anhydride neutralized. In connection with the smeltery the company has a wet-concentrating mill where the lead ores of the Bingham mines are treated. A tube mill was added to regrind the sulphide concentrates which it does with exceptionally satisfactory results and without making much slime. The zinky concentrates are sent from this wet mill to the new zinc mill which was installed and started during the latter part of 1909. This mill has a complete equipment of the Huff electrostatic separators which are making a satisfactory separation of the zinc from the lead and iron, so that the zinc product can be shipped to the Eastern zinc smelters without entailing penalties for lead and iron and the lead and iron product can be treated at the lead smeltery without incurring a penalty for zinc.

Zinc

The increased price for zinc, due to the tariff, the success of the Daly-Judge mill in Park City, and the Huff electrostatic mill at the United States smeltery stimulated the zinc producers of Utah to an increased output and further increases will continue to be made. The American Fork district in Utah county, the Good Springs district in Iron county, the Horn Silver and the Cedar-Talisman mines in Beaver county, devoted special efforts to opening up their zinc deposits. Pioche, Nev., which is close to the Utah line in Iron county, has also large zinc deposits which are being similarly developed. The Monte Cristo at Good Springs shipped to Kansas smelteries and the Yellow Pine has more than $500,000 blocked out which will now be mined.

Graphite

The Homber Mining Company of Salt Lake City opened and made shipments during 1909 from graphite deposits in Box Elder county. The shipments averaged from 90 to 98 per cent. pure graphite. The clean, ground product found a ready local market at about $100 per ton. The deposit is in the form of a well defined vein about 20 ft. thick. It was crosscut by prospectors in 1864 but they were after coal and the deposit remained undeveloped until recently. The mine is four miles south of Brigham City, three miles north of Willard and is about two miles east of the Oregon Short Line railroad.

Oil

The Rangely oilfields in Uinta county, on the border between Utah and Colorado, contain about fifty wells. None of these wells flows but they will furnish by pumping from 5 to 100 barrels per day. Lands taken up here years ago and patented by the homesteaders were acquired by long lease or purchase by various oil companies and a considerable amount of drilling and prospecting is still going on. The Moffat railroad, the Denver Northwestern & Pacific, will pass within a mile of the Rangely wells and will give a great impetus to the promising operations there.

In San Juan county, in the extreme southeastern corner of the State, are other extensive oil lands. All the unlocated oil lands were recently withdrawn from entry. This district is at present greatly handicapped by its distance from the railroads but a pipe line and two railroads have been surveyed into the fields which are about 50 miles wide by 90 miles long. There were 16 producing wells, one of which has produced by pumping 600 bbl. of oil per day. The oil-bearing sedimentaries have a thickness of about 3000 ft. The oil has a paraffin base. The London & San Juan Company installed an outfit capable of drilling 3000 feet.

The Virgin oilfield in Washington county in the extreme southwestern corner of the State was the scene of considerable oil excitement about a year and a half ago but the oil encountered at a depth of 500 ft. was in small quantities. At a depth of 600 ft. a hard limestone was encountered which discouraged further work. Some companies prospected steadily, however, with the result that the 400 ft. of limestone was penetrated and the shale underneath yielded oil. Underneath this shale are brown oil sands for a thickness of about 200 ft. The Virgin oil has a density of 25 to 30.

Surface indications in several other counties gave promise of oil and attracted the attention of Eastern oil men who did quietly a large amount of reconnaissance work in the various prospective fields.

Coal and Hydrocarbons

The coal-mining industry maintained steady operations during 1909 without much change of conditions or output.

The Uinta reservation in Uinta county produced an increased amount of hydrocarbons and with the completion of the Moffat railroad through the county, this industry will assume important proportions. About 28,000 tons were shipped during 1909 via the Uinta railway. The principal mineral mined was uintaite, known locally as gilsonite. Gilsonite is used for street paving, roofing and similar purposes. Elaterite or mineral caoutchouc, an elastic bitumen, was also produced in some quantity. Elaterite is used for roofing, and by mixing it with other hydrocarbons, a mineral rubber is being manufactured from which a Salt Lake company is successfully making automobile tires.

Cement

The cement industry in Utah is gro ing. The principal outputs were at Devi Slide on the Southern Pacific east Ogden and from Parley's cañon near Sa Lake City. At Devil's Slide is a lar and modern plant. The largest Salt La plant was closed to undergo repairs a extensions. Construction was begun a new plant near Brigham City in B Elder county.

South Dakota

BY J. V. N. DORR *

The year 1909 was not a very prosperous one for the mining industry in South Dakota and its end is overshadowed by the shutdown of the Homestake mines and mills to avoid a strike. Those familiar with the Black Hills, however, do not feel discouraged, as the possibilities of the country have by no means been exhausted, and the mines now down will undoubtedly be started again.

The Homestake Trouble

The matter in everyone's mind at the time this is written is the shutdown of the Homestake, which has thrown 2500 men directly out of employment. While the time for resumption of work cannot be anticipated, the ultimate outcome will undoubtedly be the operation of the property on a non-union basis. The history of the trouble is of general interest. The Homestake company has always maintained the best relations with its employees and has had the unique record of operating 31 years without a strike. Good wages were always paid and the management maintained cordial personal relations with the men that were unusual with such a large company. During the whole time the property has been open shop and the only attempt to make it closed shop, made about the time of the organization of the Western Federation of Miners, was met by a notice from the management that no discrimination would be shown between union and non-union men.

The origin of the present movement may be traced back to the autumn of 1906, when the men asked for eight hours work with the same daily pay they were receiving for 10 to 12 hours. The company refused the request at first, but finally granted it without a strike, under conditions which enabled them to exact nearly the same amount of work as before in a shift, so that the operating costs were not materially increased. It was apparent, however, that the men considered that they had won an easy victory and there was more or less agitation for an increase of pay, which was stopped by the mine fire of 1907. An increase of the dividend to 75c. a share for one month only in November, 1908, renewed the discussion, and it was generally thought that it would be brought up actively when the million-dollar waterpower system, which the company then began, was completed.

The union started an active campaign last summer to increase its membership, importing organizers and speakers, and sending committees to persuade recalcitrant workmen to join. The first overt act in the present trouble was the adoption of a resolution by the unions concerned on Oct. 10, demanding that all eligible men join at once, and stating that any man who neglected to join would be dealt with as the union might determine. This was followed by a resolution, passed Oct. 24, that all men failing to join by Nov. 25 would be declared "unfair," and no members of the union would work with them after that date.

The company took no action until Nov. 10, when it filed suit in the United States court against the union for $10,000 damages alleged to have been sustained on account of the intimidation of the men, whose working value had been thereby diminished. Finally on Nov. 17 the district was greatly surprised when notices were posted and published that after Jan. 1, 1910, no union men would be employed on the property and that all employees desiring to work after that time must register before Dec. 15. The leaders of the union were astounded by this movement, for they had apparently taken the liberality and kindness of the management as a sign of weakness and had anticipated as easy a victory as in the eight-hour movement.

On Nov. 23, the company, finding that the union had decided to call out its men on Nov. 25, shut the property down with the exception of work on the waterpower plant. A number of the employees, as well as men from the outside, have been employed as watchmen and there has been no violence of any sort attempted. The company has not given out the number of men who have applied for work, but it is understood that applications a coming in rapidly and it is probable the will be enough men available to opera part of the property at any rate early the year. It is not expected that a violence will occur, as the company amply prepared for any emergency a the leaders of the union are strong against any disturbance.

Much discontent was caused amo the men when they found that instead getting strike benefits from the start, th were expected to use up all their o funds before applying for aid.

To an outsider it appears as if t management, while friendly to unions general, realized that, with unlimit power the federation would surely aim live up to the avowed principles of t order, and believing, as they assert, th "labor produces all wealth" (evident recognizing physical labor only), a "wealth belongs to the produce thereof," they would endeavor to gath it in. The remark of a member of t executive board to a committee of mi operators, during the strike over t eight-hour question two years ago, thro further light on their attitude. He sai "Boys, you might as well give the m eight hours and get as much of that you can, for we will be coming up he again asking for a six-hour day som time." While the legal right of all m to get all they can for as little work possible is recognized by everyone, seems that, from the employees' standpoint, poor judgment was used, and t federation will have only its managers blame if it loses a large membership the Black Hills.

Improvements at the Homestake

The Homestake company finished th addition to the slime plant during th year and commenced the construction o a hydraulic power plant in Spearfis cañon. The installation includes sever miles of tunnels and is expected to furnish from 3000 to 4000 engine horsepower at the mills at a cost of at lea $1,000,000 for the plant. The saving operation will more than pay interest o

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*Metallurgical engineer, Pluma, S. D.

e money expended, and it is expected at the plant will be running by the end 1910.

Silicious Ore Mines

There have been no new developments this district during the year. At its ɔse the only fine crushing mills operat- g at full capacity are the Mogul, hand- g about 350 tons, the Golden Reward, 0 tons, and Lundberg, Dorr & Wilson, 0 tons. The Imperial company, while ll prospecting for ore on the lower con- ct in the Portland district, is running e shift and treating about 40 tons. It perhaps, of metallurgical interest to te that the first three mills above men- ned are all grinding the ore with chile lls and are using the Moore process r treating the slimes, whereas several ars ago stamping and decantation were general use.

The recent purchase of adjoining prop- y by the Wasp No. 2 will give re- wed life to that remarkable property, iich is now handling about 200 tons of in two eight-hour shifts.

Galena District

The Golden Crest Company completed 200-ton mill during the summer, but s not started it as they are engaged in larging and deepening the shaft.

The Branch Mint company is shut wn. It has appeared in court proceed- gs that the promoter thereof, Mr. ırdin, who spent upward of $500,000 the mill and other surface equipment, s not selling treasury stock as was nerally supposed, but selling his own ock and loaning the proceeds to the mpany. When the showdown came, he ed a lien against the company for 75,000 and bid the property in.

The Gilt Edge Maid mine is shut down, but negotiations are under way to secure capital for operating it on the large scale required to make it yield a profit. The company apparently possesses a very large body of low-grade ore.

Black Hills Development and Financial Corporation

An interesting experiment in promotion, after what is said to be English methods, is being tried here. Robert Bunce, a London banker, has organized the Black Hills Development and Financial Corporation with $3,500,000 capitalization. Of this stock $1,000,000 will be used to purchase mining claims that are undeveloped; $2,000,000 will be sold at par for money to develop and equip the claims secured, and the $500,000 left will go for promotion expenses. After securing all the claims possible, the company will select five of the most promising, and spend $100,000 upon each for development. The mine showing the greatest amount of pay ore will then be equipped with a mill and put on a paying basis. A sub company will then take the property and the parent company will keep one-half its stock and sell the balance for enough to repay it for expenses incurred. This capital will now be available to develop and equip a second property, and eventually the parent company should own a half interest in a number of valuable mines and still have its money.

The company gives as its consulting engineer a distinguished South African engineer, now operating in Mexico, but has apparently selected its claims and determined the amount of stock to be paid for each without technical advice. Mr. Bunce will act as managing director for the next five years, which would be restricting the power of the stockholders for some time. Such a project requires the highest technical skill and most careful management to make it a success, and the outcome here will be watched with interest.

General Conditions

In the Black Hills there are a number of mines not operated now, which could undoubtedly be made to earn profits with a reasonable expenditure of capital and careful management. The region has been greatly handicapped in the past by the large number of claims managed by the men who promoted them, and who considered that the ability to extract money from the pockets of the tenderfoot "back East" proved conclusively that they could develop and operate a mine.

Labor conditions have also retarded development, for in the Terry district, where most of the prospecting is to be done, the union has insisted on 50c. more per day for surface work than is paid in Lead or Deadwood and absolutely refuses to allow any contract work. It is probable that the present condition of the mining industry, with so many mills shut down, and those operating making very little, will convince the union men that their own interests will be best served by assisting capital in every way in development.

The use of electric power through the Black Hills offers an opportunity for economy in all mining work and it appears to me that conditions are becoming more favorable for investors to come in and secure mining property at a reasonable price.

Montana

BY W. P. CARY *

The more important of the coal mines Montana were operated by the several ilway and large copper-mining com- nies. Carbon county had a number of tive producers during the year, among ıich were the Washoe Copper Com- ny's mines at Bear creek, the Northern cific Railway Company's mines at Red dge and the Bridger Coal Company's nes. In Yellowstone county, the Chi- go, Milwaukee & Puget Sound Rail- y operated mines at Roundup, and in ısade county the Great Northern rail- ıy's mines at Sand Coulee produced eir usual tonnage. In Deer Lodge unty, the Bielenberg and Higgins mines re the principal producers.

Copper

Copper, as has been the case for many years past, was the most important mineral product of the State in 1909. Production in the Butte district was steady and continuous throughout the year with the exception of an occasional shutdown due mainly to unfavorable weather conditions, such as extreme cold spells. The various operating companies of the Amalgamated Copper Company were easily the greatest producers and showed the most development work. The Boston & Montana company operated the Mountain View, Leonard, Pennsylvania, East and West Colusa and the Badger State. At the Badger State operations were confined to development work. The shaft was sunk from the 800-ft. level to the 1400-ft. level, and crosscuts were run north and south on the 1300-ft. level. A connection was also made with the Moose mine. At the Pennsylvania, an air shaft was constructed to the 1800-ft. level. The principal mining was done on the 1400-, 1600- and 1800-ft. levels. Production at this mine throughout the year averaged between 1000 and 1200 tons daily. A crosscut was run from the 1800-ft. level of the Mountain View to the same level of the West Colusa, a distance of about 1400 ft., and was used to convey the copper water from the Mountain View to the West Colusa and from there to the Leonard where it is pumped to the surface. At the East Colusa operations were hindered somewhat by a smoldering fire in the old stopes.

The Anaconda Copper Mining Company operated the High Ore, Never Sweat, Anaconda, Mountain Consolidated, St. Lawrence, Bell, Diamond, Buffalo, J. I. C., Modoc, Belmont and Right Bower mines. At the Anaconda, St. Lawrence

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*Mining engineer, Butte, Mont.

and Never Sweat mines operations were seriously hampered by smoldering fires. These three mines adjoin one another and the fire generated fumes which made it difficult to work them except on a limited scale. The shaft at the Diamond mine was sunk from the 2200- to the 2800-ft. level, while that of the Mountain Consolidated was sunk from the 2200- to the 2300-ft. level. At the Right Bower a shaft was sunk from the surface to the 600-ft. mark. The several mines of the company operated continuously throughout the year.

The Butte & Boston company operated the East and West Gray Rock, the Berkeley and Silver Bow mines without interruption. At the West Gray Rock the shaft was sunk from the 700- to the 1100-ft. mark. This mine gives promise of surpassing the East Gray Rock, which has always been the greater producer.

The Washoe company's smeltery in Anaconda was threatened with a shutdown as a result of the suit brought against the company by the farmers in the Deer Lodge valley, in which the plant is situated, but the Federal Circuit Court decided in favor of the company and refused to issue an injunction. The shutting down of the smeltery would have spelled disaster for a great number of the citizens of the State who are dependent upon the mines for their livelihood, and the court's decision was received with rejoicing.

The Parrot company operated the Parrot and Little Mina mines. At the Parrot the principal work was done on the 1200-, 1400-, 1600-, 1700- and 1800-ft. levels. At the Little Mina the shaft was sunk from the 1000- to the 1200-ft. level. Operations were carried on on the 600-, 800- and 1000-ft. levels.

The Trenton Mining Company operated the Gagnon mine throughout the year and opened up orebodies of greater value than any discovered in the mine for years. A new perpendicular shaft was begun to take the place of the incline shaft, and was sunk 400 ft. Production averaged between 700 and 800 tons daily.

The operating mines of the Butte Coalition company were the Rarus, Tramway and Minnie Healy, the latter being worked through the Tramway shaft. During the year the extensive development work at the Tramway and Minnie Healy, which has been carried on for the last two years, was completed and the orebodies of the latter mine were placed upon a producing basis. The company, starting with a total daily production of about 1300 tons, increased its output gradually until over 2000 tons were produced from the Tramway and Rarus shafts, exclusive of the ore of the Coalition which is hoisted through the shaft of the Boston & Montana company's Pennsylvania mine. At the Tramway the shaft was sunk from the 1700- to the 1965-ft. mark, while at the Rarus the shaft was sunk 95 ft., reaching a depth of 2395 ft. The air shaft was enlarged from three to four compartments, giving increased ventilation through the Speculator shaft. Ore was mined on the 1000-, 1200-, 1600-, 1800-, 2000- and 2200-ft. levels and production averaged about 1500 tons daily. The Granite Mountain claim, having a shaft 500 ft. deep, was purchased from the Lewisohns, and raises were started under this shaft from the 1200-, 1400- and 1600-ft. levels of the North Butte ground to make the Granite Mountain shaft into an air raise. Throughout the year the company observed a policy of reticence with reference to the work underground, and but little definite information was given out. It is generally understood that the ore disclosed on the 2000- and 2200-ft. levels was not up to the standard of that previously mined on the 1600- and 1800-ft. levels.

The Davis-Daly company operated its claims through the Colorado shaft, which was sunk from the 1500- to the 1800-ft. level. The upper 900 ft. of the shaft was enlarged from two to three compartments, thus making the shaft three-compartment throughout. Shipments averaged between 150 and 200 tons daily, most of which came from the 1400-ft. level. During the year a considerable body of good ore was discovered and the property placed upon a permanent producing basis. Troubles among the stockholders resulted in a victory for F. A. Heinze, who will dictate the policy of development work in the future as in the past.

The Original Mining Company, controlled by W. A. Clark, operated the Original and West Stewart mines steadily throughout the year, the ore being treated at the Butte Reduction Works, also owned by Senator Clark. The shaft at the West Stewart was sunk from the 2100- to the 2300-ft. level, while that of the Original was sunk from the 2200- to the 2400-ft. mark. With the increased depth the value of the orebodies materially increased. The Elm Orlu mine, also owned by Senator Clark, developed into a zinc producer, and its ores were treated at an experimental zinc concentrator built for that purpose at the Butte Reduction Works.

The East Butte Copper Company absorbed the properties of the Pittsmont company during the year, thereby gaining a smeltery for the treatment of its ores as well as the valuable orebodies of the Pittsmont mine. At the East Butte mine operations were confined for the most part to the 600-ft. level, from which shipments were made to the Pittsmont smeltery. The vein was cut on the 900-ft. level but a strong flow of water was encountered which necessitated the suspension of operations at that point. At the Pittsmont mine a new 250-ton blast furnace and a new hoist were installed and considerable custom ore was treated. Operations were chiefly on the 800-ft. level, although work was also done on the 1000- and 1200-ft. levels. The East Butte company also worked the dump at the old Parrot smeltery by means of a precipitating plant.

At the Tuolumne Copper Company's property the shaft was sunk from the 1250- to the 1450-ft. level. On the 1400-ft. level the continuation of the North Butte company's Edith May vein was cut in August and proved to contain high-grade copper. Beginning in October, shipments were made at the rate of 100 tons daily. During the course of the year this mine passed from the experimental stage to the ranks of the steady shippers. There were some rumors that the Tuolumne company's right to the orebody discovered would be contested by the North Butte company, but no legal steps were taken.

At the Butte & Balaklava property the shaft was sunk from the 1240-ft. mark to the 1400-ft. level. The work of enlarging the upper 500 ft. of the shaft from two to three compartments was also begun. Beginning in November, shipments were made averaging between 50 and 75 tons daily. The mine developed during the year from the prospecting to the producing stage.

The Corbin district in Jefferson county ranks next to Butte in importance from the copper standpoint. The Boston & Corbin mine is the most important in the district and work was prosecuted there steadily throughout the year. The shaft was sunk to the 700-ft. level and enlarged from two to three compartments. The principal work has been done on the 500-ft. level in exploring the orebodies of the Bertha and Fairview claims. The Boston & Alta company was organized to take over the old Alta mine. A new surface plant was installed and a new shaft sunk 300 ft., from where a crosscut was started to the vein. The Corbin Copper Company, with a large amount of mining ground, passed into the producing stage in November. At the Minneapolis-Corbin company's ground a shaft was sunk to a depth of 250 ft. The Montana-Corbin company, after a number of changes in management and control of the property, resumed operations in November.

ZINC

While the State has never been known as a producer of this metal, yet recent developments at the Butte & Superior company's Black Rock mine in the Butte district indicate that the day is not far distant when this metal may become of importance in the State's products. During the year the Black Rock shaft was sunk from the 1400- to the 1600-ft. level, and a body of high-grade zinc ore was blocked out. On the 1400- and 1600-ft. levels three veins were cut, and on the 1600-ft. level stoping was started. Plans were made for the erection of a 750-ton zinc concentrator on the property, and work upon the foundations begun.

Gold and Silver

The receipts of the United States Assay fice, at Helena, show that the pre- ous-metal output of the State increased aterially during 1909. In Silver Bow unty, the British-Butte company started operate its gold dredge in January and ntinued operations until November. e company is reticent in giving out in- rmation and therefore results of its erations are problematical. The title to e company's ground was in litigation during the year and has not yet been finally determined.

In Broadwater county the Keating Gold Mining Company and the Ohio-Keating company showed the best results. The Keating produced steadily at between 50 and 100 tons daily. The Ohio-Keating was not formed until May, but since that time sank its shaft an additional 100 ft., and shipped during October, November and December.

In Fergus county the Barnes-King, Cumberland and Kendall properties were operated. The Barnes-King and Cumberland made a number of shipments. In Madison county the Conrey Placer company had three gold dredges in operation throughout the year. The McKee group and the Pioneer company also carried on operations. In Granite county the Bimetallic mine continued to operate throughout the year and a new cyanide plant was installed. Deer Lodge and Lewis and Clark counties also produced considerable gold and silver.

New Mexico

BY R. V. SMITH *

The mines of New Mexico are among e oldest in the United States. The nta Rita mines were worked as early 1760 and furnished copper to the Mex- n government for its coinage for 50 ars before the discovery of copper in ichigan. Placer gold has been produced nce 1538, with more or less interruption account of Indian outbreaks and ought. Turquoise mines were opened the Indians and abandoned before the ys of the Spaniards. The Maxwell nd grant, in Lincoln county, is now en to individual locators by the pur- ase of mineral-land scrip which allows e holder to prospect the whole grant d locate claims on any untaken land. e scrip is sold by the trustees of the ant, at Raton. The reclamation work the Government will also have an im- ediate influence upon the development the country.

From all indications the great need for ansportation facilities in the different arts of the Territory is about to be partly upplied. Five railway enterprises are nder way and one of them, the railway to the copper districts in the Burro ountains, is under construction. This ne runs from Leopold and Tyron in the urro mountains to Whitewater station the Silver City branch of the Santa Fé. is being built by Phelps, Dodge & Co. rimarily to transport the ore from their ines in the Burros to the smeltery in rizona. Some construction was also one on the New Mexico Central, which a consolidation of two previous pro- ects and will serve the copper, zinc and old regions between Santa Fé and Tor- ance, on the El Paso & Southwestern, us reaching the vicinity of Los Cerril- s, San Pedro, and by branch, the Hagan oalfields and the Ortiz mountains.

In New Mexico, 1909 was a year of nportant developments and of increased roduction in all lines of the mineral in- ustry. Of the 252 corporations organ- ized and filed during the fiscal year ended June 30, 1909, 55 were mining incorporations with a total authorized capitalization of $68,450,000, being 60.3 per cent. of the total authorized capitalization for the year; 55,305 acres were taken for mining purposes and 93 lode claims were approved. Of these claims 68 were in Grant county, the most productive and the most extensively developed part of the Territory; 15 were in Socorro county, nine of them being in the zinc district; eight were in Santa Fé and one in Otero county.

Production in 1909 did not increase in proportion to the development. There was a decided increase, however, in practically all lines. The accompanying tabulation of the production for 1909 is based upon information gathered from private correspondence and previous records. The total mineral production of the Territory, coal and building materials included, is estimated at $8,250,000.

MINERAL PRODUCTION OF NEW MEXICO FOR 1909.

	Quantity.	Value.
Iron	124,000 tons	$ 436,000
Gold	19,400 oz.	401,000
Silver	648,000 oz.	332,000
Copper	9,400,000 lb.	1,222,000
Zinc	28,880,000 lb.	1,530,000
Lead	4,800,000 lb.	206,400
Bismuth*	....	....
Turquoise*	....	....
Natural cement*	....	12,000
Coal†	....	....

*Data not available.
†Statistics given in another article.

Minor Operations

Placer mining in the northern counties was in a dormant state. Several new mining companies were organized, but no discoveries of new districts, equal in importance to that of the previous year near Sylvanite, were reported. Bismuth was added to the list of minerals produced, shipments of several cars coming from the San Andres mountains, nearly west from Tularosa. Experimental shipments of fluorite were made from the mines in the vicinity of Deming. The highly silicious gold-silver and gold-copper ores of Lordsburg and the country to the south went in slightly increased quantity to the Arizona smelteries where it was used for converter linings.

Oil appeared as an article of commerce for the first time in the history of the Territory. The Madison well, near Artesia, was brought in late in November and the oil used as fuel in local plants. A shipment of a few barrels from another well went to El Paso during December. An important development in the oil business should be recorded in 1910.

Gold

The gold produced in 1909 came mainly from placers and the mixed ores of copper, lead, or silver and zinc, of the central and southern counties. By far the most productive areas were those reached from Silver City, in the southwestern part of the Territory. Placer mining in Colfax county, which was formerly the most active section, and where hand methods, hydraulicking and dredging have all been tried, was largely suspended during 1909. All summer, however, California operators were making a thorough sampling of the placer ground near Elizabethtown and its vicinity as far as Ute park, 18 miles from Elizabethtown. The Empire hand drill was used with success and proved the gravels to be of fairly regular grade with few boulders, and suited to modern dredging. Placer mining in other localities increased, particularly at Pinos Altos, nine miles from Silver City, where gold-bearing gravel carrying from $3 to $4 per yard was hand washed whenever water was available. The placers at Delores were worked by hydraulic methods, and small operations were carried on in the central counties at Nogal and other points.

Lode mining in the north-central counties increased and development was pushed at San Pedro, Cerrillos, Madrid and, in fact, all the gold camps. The Aztec mine with 40-stamp mill at Elizabethtown added to its $4,500,000 record. Some of the mines shipped to the Pueblo, Colo., smeltery, including the Ajax and the Pay Ore group, both new mines. Extensive cyanide tests are being conducted on the gold ores of this section, but no installations were made in 1909. Considerable activity exists in the vicinity of White Oaks. The mill of the Old Abe ran steadily handling the ores of leasers. A rich strike of tellurides in the White mountains caused a rush of prospectors to the section. At Parsons the 200-ton cyanide mill was idle pending a reorganization of the company. Large bodies of low-grade ores which may be quarried cheaply exist here. The ore averages higher than $3 per ton, and development was under way.

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*Professor of mining engineering, School of lines, Socorro, N. M.

The camps in the Black range and others in Sierra county were all active. Mining in the Black range was conducted at seven camps. The principal mines added to their equipment, increased shipments and continued to operate their mills. Silver and lead as well as gold were produced. The erection of one mill was commenced. Development in this region is rapidly bringing it to the front as a producer of high-grade ores, some shipments showing as high as 20 oz. gold per ton. The low-grade ores are in many cases being stocked, the object being to further develop the orebodies and apply cyanide treatment later on.

In Socorro county four cyanide mills were operated, one being the 20-stamp mill at Rosedale, where all-sliming in cyanide solution followed by treatment in a Burt filter is practised. The other three mills are in the Mogollon mountains, 90 miles north by stage from Silver City. The mineralized zones lie on both sides of the range, the mines of the Ernestine Mining Company and the Socorro Mines Company lying on the west side. The ores of the district run from about $10 at the surface to $22 per ton in depth (about equal value in gold and silver). Mining reached a depth of 1600 ft. Pan amalgamation was attempted in early days on these ores, but gave way to concentrating and sliming of the tailings in cyanide solution. The Last Chance mine of the Ernestine Mining Company, and the Top mine were recently consolidated.

A new and thoroughly modern cyanide mill of 150-tons capacity was built by the Socorro Mines Company. Crushing with stamps and tube mills in cyanide solution with pressure filtration in Burt filters and zinc shavings precipitation is practised. Dorr classifiers are used, also Brown-Pachuca tanks for agitation with compressed air. The mill was completed in the latter part of 1909 and run with steam power pending the completion of the hydroelectric plant. The mill at the Cooney mine, across the range, was run for a short time. In December the property was sold to a company of Nova Scotia capitalists, and extensive rearrangements and developments undertaken. The Cooney mill was the first to run in the district, was destroyed and in 1909 rebuilt. During the last few months telephonic communication was established between the Mogollons and Silver City, and a company organized with $1,000,000 capital to give transportation facilities to the section by the building of a railroad on which motor cars are to be operated.

In Grant county gold was obtained from the Pinos Altos and other placers in the vicinity of Silver City and Hachita, from the mixed gold-copper ores of Lordsburg, Steins Peak, Central, etc., and from the gold-silver-lead ores of Sylvanite, Steeplerock, and other districts. At Sylvanite the prospector's flurry is over and shipments were made to Douglas and El Paso from several of the developing properties. The ores ranged from $20 to $50 per ton, and this in one case after the choice ore had been picked and sent to Colorado. The Eureka-Sylvanite Mining Company owning the Ridgewood claim, which was one of the claims from which good ore was shipped, and the Hardscrabble Mining Company, owning the Gold Hill claim, were among the best properties. On Gold hill the proving of 6 ft. of shipping ore of increased value and of the continuation of the ores at a depth of 300 ft. was an important development. Hachita, 12 miles away, at the junction point of the El Paso & Southwestern and the Arizona & New Mexico railways, reaching both Douglas and Morenci, is the shipping point. Wagon haul is $2.50 on ore, and freight to Douglas $1 per ton (for ores of less than $50 value). In view of the conditions at the close of the year the camp may be relied upon to fulfil the expectations its discovery aroused.

The camps near Lordsburg, which is the junction point of the Southern Pacific and the Arizona & New Mexico railways, shipped about 40 cars per month throughout the year. The shippers received a premium for the ores in most cases on account of their desirable character for use as converter linings. The two principal districts were Pyramid and Virginia. The Eighty-Five was perhaps the chief mine and worked about 50 men. The Viola and the Nellie Bly mines, more or less inactive since the slump in silver, were reopened. A Partridge hot-blast smeltery of 10-ton capacity is being installed upon the property of the Bonnie company to treat the 10,000 tons of ore now on the stock piles, and the ores developed in its mines which carry gold, silver and copper. The discovery of what appears to be an ancient abandoned gold ledge a few miles from the Mogollon road was made by Leonard Smith.

SILVER

Silver forms about half the bullion value at Mogollon and Rosedale. Silver mining was prosecuted for the silver content of the ores in Grant, Socorro and Luna counties. The reopening of the silver mines on Chloride Flat, near Silve City, and Lordsburg, was significant Steeplerock, Granite Cap, Pyramid, Hermosa, and the camps in the central par of the Territory were all more actively developed than during 1908. The experimental mill at Lake Valley, on the Monarch mine, wherein it was intended to separate silver and lead from zinc, was not entirely successful, principally on account of lack of water for proper sizing of the ore. The mill was idle at the close of the year.

LEAD

The total output of the Territory for 1909 is estimated to exceed that for 1908 by about 60 per cent. The principal lead-mining districts are distributed for the most part in the central and southwestern parts of the Territory. Where the ores occur in limestone they carry silver, and where they occur as veins in the eruptives they usually also carry gold and copper. Mining was more active than for several years past, the additional supply coming mainly from the increased production of lead-zinc ores of the southern counties. A significant development was the opening of two bodies, from 14 to 50 ft. thick, and carrying 12 to 16 per cent. lead carbonate, and zinc in considerable proportion, on the properties of the Boston Cerrillos Mining Company at Los Cerrillos. Some of the most prominent districts working were: Cook's Peak, where the American Smelting and Refining Company operated its mines under leases (the old dumps were hand-jigged to produce 40 per cent. concentrates); the Sandias mountains; the San Andres; Tres Hermanas; Lake Valley, and the Organ mountains, where development was pushed on several properties. The old Stephenson Bennett mine was in the hands of a receiver and was not operated.

COPPER

The status of copper mining was most gratifying. Prospecting, development, or systematic mining of ores was conducted in 16 different counties during the year. The number of individual shippers a little more than doubled over those of 1908. The Grant county districts produced the greater part of Territorial output, and here the Santa Rita mines and the Burro mountain company were the principal producers, over half the total for the Territory coming from the Santa Rita.

The official transfer of the Santa Rita copper properties to the Chino Copper Company, of New York, financed by Hayden, Stone & Co., occurred during 1909. Developments are reported to show 6,000,000 tons of actual and probable ore of 2.49 per cent. average copper content; there are also 150,000 tons on the dumps. Eight churn drills are now further prospecting the orebodies. The ores can in large part be mined by steam

vels from the crescent-shaped basin
caving methods applied cheaply in
extraction of the balance. The ores
y native copper in the upper parts of
mines and occur as disseminated sul-
les in the porphyry beneath. For
r 100 years this orebody has been
ked, usually under the leasing system
reby the native copper has been ex-
ted, and occasionally the oxides hand
ed for sale. The mill originally built
leasers, but now used experimentally
he company, treated about 135 tons a
.

nother important transfer completed
r the close of the year was that of
Burro Mountain Copper Company to
lps, Dodge & Co. for $2,300,000.
mill on this property has run steadily
years, having produced about 15,000,-
lb. Over 15 miles of openings have
n made into the two mines of the
ro Mountain company. The Chemung
pper Company, operating at Tyron,
ms to have 8,000,000 tons of actual
probable ore, with an average of
e than 2.5 per cent. copper.

he completion of the Burro Mountain
lroad will make possible the reopen-
of the smeltery of the Savannah
pper Company, which owns exten-
ly developed mines both in the Bur-
and at Pinos Altos and a smeltery at
er City. No smelteries in the Terri-
were operating during 1909, but
se at Orogrande and at Deming were
rhauled. The Silver City plant is
dy to start at a few days notice.

ZINC

New Mexico has since 1902 enjoyed
siderable prominence as a zinc pro-
cer, and in 1909 made a greatly increased production. At Magdalena William F. Gordon, in a 50-ton mill, erected during the summer, demonstrated in a trial run the applicability, under skilled metallurgical control, of the Sutton Steele and Steele pneumatic tables to the separation of the carbonates, sulphides and oxides of lead and zinc from each other and from silicious gangue material. The Graphic, in which development has been conducted with a large force for three years and where a large body of zinc ore is blocked out, commenced the erection of a pneumatic mill along the lines of the Gordon mill. The Graphic has been a large producer. At Kelly, the lease of C. T. Brown and the Kelly mine were the only producers until the latter part of 1909. The water-concentration mill on the Kelly was operated and the concentrates were shipped to Colorado.

The United States Smelting, Refining and Mining Company, having purchased the mines of the Cleveland group, near Silver City, commenced developing the large bodies of blende by churn drills, and shipped several cars for experimental purposes. Hachita, Cooks Peak, Hanover and Los Cerrillos were all on the shipping list during 1909, the Los Cerrillos camps sending their ores to Colorado for the first time, though the presence of zinc was known for many years.

IRON

The Colorado Fuel and Iron Company have extracted over 1,000,000 tons of iron ore with open-cut and milling methods at Hanover and Fierro, in Grant county, since the mines were opened in 1900. During 1909 new surface arrangements were installed at Fierro, and the ores are now being blocked out to a lower level. The output from Fierro was nearly 500 tons per day for most of 1909, giving a total production of about 124,000 tons. The company worked a force of about 40 men at Elder, on the El Paso & Southwestern railroad, 35 miles above Carrizozo, taking out ore for shipment in 1910. The deposits of the Oscura mountains may be opened in 1910 by Duluth capitalists whose intentions are to build from White Oaks to the Oscuras and erect an iron-reduction plant at or near the White Oaks coalfields.

TURQUOISE

Turquoise occurs in America in several places outside of New Mexico, but practically the entire market for the gem in the United States is supplied by the mines of this Territory. While the actual value of the gems produced by the four working localities cannot be stated, it is known to have greatly exceeded that for 1908. The American Turquoise Company, controlled by Tiffany & Co., New York jewelers, has for many years operated the mines near Cerrillos in Santa Fé county, and continued to work them during 1909.

The mines in the Burro mountains in Grant county, about 15 miles from Silver City, are said to be the largest and most valuable in the world. Here, during 1909, a new deposit, about 1000 ft. east of the former pit, was opened and worked by four levels, with the result that the quantity of gems produced was more than trebled and that of matrix doubled over that of 1908. A compressor plant was installed and about 100 tons of rock handled per day. The gem-bearing rock undergoes a preliminary hand sorting at the mines and the high-grade gems are shipped to New York.

Colorado

BY GEORGE E. COLLINS *

The mining industry in Colorado was
rly prosperous in 1909, but there were
very important new developments.
the time of writing it is not possible
forecast the output with any approach
certainty: but I believe it will be found
it the gold production increased over
it of recent years, while that of sil-
r and other metals was somewhat
ver.

GOLD AND SILVER

Cripple Creek—The business interests
the camp complain of depressed con-
ions; but shipments were large, and
the whole the year was a satisfactory
e. The relative importance of the Portland lessened, and will doubtless continue to do so; but the Elkton, Vindicator, Golden Cycle, Strong, Granite, El Paso, Cresson and Mary McKinney kept up a large output. It is probable that the present production of the camp will be maintained for some years to come. No very sensational new discoveries have been reported. The new mill at Stratton's Independence began treating 250 tons of dump material daily by concentration and raw cyaniding, at a profit of probably 75c. per ton. The roasting mill designed by Philip Argall to treat the regular mine ores is not in operation.

The Roosevelt drainage tunnel was driven 11,705 ft. by the end of November, and was within a comparatively short distance from the contact of the granite and the fissure volcanic rocks in which most of the veins occur. During the year remarkably rapid progress was made in extending the tunnel.

Gilpin and Clear Creek Counties—The output was probably about the same as that of 1908, possibly a little larger. In Gilpin county the deep Nevadaville mines are still submerged awaiting drainage by the Argo (Newhouse) tunnel, which advanced at an average rate of 300 ft. monthly. The actual drainage of the district will, however, in all probability proceed more slowly than at Cripple Creek. None of the larger mines were especially prosperous. The greatest producer was probably the Fifty company, which maintained a large output from the Bobtail vein. The Saratoga is now in

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*Mining engineer, Boston building, Denver,
lo.

condition for active work through the Newhouse tunnel. The Topeka was unwatered and opened.

At Idaho Springs the Sun and Moon, which was operated in 1908 under lease, was at first unsuccessful, but work was later resumed by local operators who opened up a body of ore of good shipping grade. The Gem and Lamartine were worked on the tribute system, but the output was less than in recent years. The Stanley, also under lease, is being unwatered.

At Georgetown the Capital tunnel was probably the largest producer. Connection was made from the Burleigh tunnel to the Seven Thirty, which was drained and opened for work. In the Argentine district the Santiago and Waldorf properties opened up considerable bodies of ore; the grade, however, is rather low, and the expense of working higher than in the more accessible camps.

San Juan District—The production of the Camp Bird mine, near Ouray, was greater than ever and the proportion of net profit remarkably high. A considerable output was maintained by lessees from the Revenue group, but in other respects mining in Ouray county was inactive.

San Juan county had a poor year, owing partly to another fire at the Gold King which caused a suspension of work at that property for a great part of the year, and partly to a succession of washouts on the railway which prevented all shipments throughout the summer. The camp is again busy, the Old King, Sunnyside and Hercules being the principal producers. The Iowa-Tiger was worked by a local leasing syndicate with very profitable results. The ore of this mine is largely galena, containing gold and silver. The Silver Lake mines, carrying gold, silver, lead and copper, were operated entirely by tributors, some of whom have done well. The Gold Prince, formerly known as the Sunnyside Extension, was operated by a receiver appointed by the court.

At Telluride the three great mines are the Smuggler-Union, Liberty Bell and Tomboy, which jointly produced nearly all the output, with some assistance from the Alta and a few smaller properties. The Smuggler opened up good ore in the 10th level, between the Bullion and Pennsylvania tunnels, which will enable it to maintain its output for several years more. The Liberty Bell exposed a large tonnage above the Stilwell tunnel, which insures a long life. The grade of the ore in the Argentine vein of the Tomboy company decreased considerably in depth, but, thanks to a large tonnage and cheaper mining costs, it was still profitable.

Recent events indicate that too much weight can hardly be attached to the difficulties and dangers attending mining in this region due to the rugged topography and the isolated situation of the mines. Great care in future should be paid to selecting the situation of mill and mine buildings, and protecting them from snowslides. The danger of destructive fires must be guarded against by fireproof construction and better discipline among the employees.

Other Districts—At Leadville the gold-bearing district was a center of interest, and what is hoped may prove an important orebody was opened in the Highland Mary on Breece hill. The Ibex group maintained a large output, mined principally by leasers. The New Monarch mine is shipping about 1500 tons monthly to the Salida smeltery.

In Summit county the dredging industry was extended by the construction of two heavy dredges on the Blue river, and a second boat was placed in operation in French gulch. The latter is currently reported to have done especially well. It does not, however, seem probable that the industry will extend to the other districts in Colorado, or that it will become relatively important.

At Aspen an important discovery was made in the Free Silver shaft, operated jointly by the Della S. and the A.-J. and Smuggler interests. The output showed a notable increase during the last two or three months, and a further increase is probable.

Conditions in the other precious-metal producing centers of the State were unchanged. The only new discovery which seems likely to be of importance was one of gold-bearing sulphides, of shipping grade, in a vein of gneiss underlying the sedimentary formations on Elk creek, near Newcastle, a coal-mining camp on the Denver & Rio Grande railroad.

Lead, Zinc and Copper

As is well known, the ores of lead, zinc and copper in Colorado almost always contain notable amounts of gold or silver, while the precious-metal ores, excepting in the Cripple Creek district, often carry enough lead or copper, after hand sorting or mechanical concentration, to pay part of the smelting charges. It should, therefore, be understood that as a rule no hard and fast line can be drawn between the precious-metal and base-metal producers. Excepting in the Leadville district there are few mines the ores of which yield a greater return in base metals than in gold and silver. At Aspen the low-grade silver ores carried some lead and zinc, but would often be too poor for profitable working but for the high lime excess which enabled them to secure special smelting rates.

There were also no exclusively copper-producing mines in the State, the greater part of the output coming from gold-silver ores shipped from Gilpin, Clear Creek and Lake counties, and from the San Juan district. In Hinsdale county the Frank Hough, a copper-bearing vein on Engineer mountain just over the San Juan line, was the most promising and perhaps the most important producing mine. Shipments were made principally by the way of Silverton, and work was pushed on a 2500-ft. tunnel through the mountains to open up the orebody in depth from the west side. The San Antonio, in the Red Mountain district, also made notable shipments of high-grade copper ore.

The production of lead and zinc around Leadville fell off greatly after the suspension of work in the downtown mines which completely filled up with water. A large output, however, was maintained from the Yak tunnel, and the Iron-Silver company is again shipping on a large scale.

Other notable lead-zinc shipments were made from silver mines in the Creede Georgetown and Summit County districts, and also from the San Juan. The old Mary Murphy property at Romley, in the central part of the State, was acquired by an English company, and may at some future time become a notable producer of lead and zinc, with some silver and gold.

Rarer Metals

The output of tungsten concentrates from Boulder county remained comparatively small, owing to inactive demand from the manufacturers of high-speed steels and the existence of a considerable accumulated stock. A new mill is being completed near Nederland by the Primos company, one of the two largest producers, and it may be confidently expected that the tungsten industry will be active in 1910.

The Vanadium Alloys Company's mill at Newmire, San Miguel county, was in operation during the greater part of the year.

Some small shipments of pitchblende were made from Gilpin county, where it occurs as pockets and lenses in gold-silver-bearing veins in gneiss.

General

No review of conditions in Colorado would be complete without mention of the passing of the Argo smeltery, which for a generation was the main outlet for the ores and concentrates of the northern counties. A new smeltery of the semi-pyritic type was built close by, and is now being operated by the Modern Smelting and Refining Company, and there are reports of the reopening of the Carpenter plant at Golden. It remains to be seen whether the industry will gain as much from these as it must inevitably lose by the closing down of the Argo works. The American Smelting and Refining Company's plant at Durango was hard hit by the railroad washouts near Silverton and Telluride, from which its ore supplies were derived. The Globe smeltery at Denver was only partly supplied with re from this State. One may look in ain for signs of great prosperity, present r prospective, in the smelting industry ere, such as might encourage further ompetition or justify the press clamor gainst the "trust," which is rather uneasonably accused of bleeding the minig industry to death. As I have repeatdly pointed out, what we really need is ie discovery of new mines and new mining districts, and unfortunately there is little chance of finding either without far more energetic prospecting than has been done for some years past.

A project which, if successful, may be of great importance, is an experimental mill now being erected at Georgetown for the treatment of mixed lead-zinc-copper sulphide ores bearing precious metals. The treatment is to be by dry chlorination and electrolysis of the fused chlorides, somewhat on the lines of the Swinburne-Ashcroft process, tried several years ago on the Broken Hill ores. The occurrences of such ores in the State, especially in the central districts and in the San Juan, are numerous, and should some such method prove economically successful it may eventually be of great value to the mines of this State.

Nevada

SPECIAL CORRESPONDENCE

There are in operation in the State iore than 286 producing mines and more ian 400 others are operating, but not iipping. The financial crisis of 1907-08, ollowing a phenomenal activity in minig and prospecting consequent to the onopah and Goldfield discoveries, caused ie suspension of hundreds of operations. uring 1909, some of the most likely of iese operations resumed and some new xploration work was undertaken, parcularly in the northern counties. The inustry has now, however, largely passed ack to the hands of actual miners and is ot dominated by speculators and paper iiners, as in the boom days following 902.

Attention was given during 1909 to the pening up of the old camps in Eureka ounty, and the resurrection of the Comock operations, after more than 20 ears of sleep, is assured. The abandoned ly copper camp has come to the front a few years as one of the greatest opper-producing areas in the country. inc mining in the southern and central art of the State has been put on a good asis by proper development. In fact, eal mining is going on in nearly every amp, and the general results accomlished are most important for the future f the industry. Many new treatment lants have been completed or begun uring the year, and the railroad situaon has been improved by extensions and eduction of rates. Some of the new iining centers have lost much of their pectacular population, but the loss, if ich it be, is made up by the substitution f a stable, well-paid class of workmen nd technical men.

Storey County

The task of unwatering the Comstock iines, which has been under way since 398, the year of the formation of the omstock Pumping Association, was iaracterized by more definiteness and iergy in 1909 than heretofore, with esulting good success. This change is ue to the change in the control of sevral of the principal mines, now in the ands of the so-called Tunnel crowd, consting of Edward C. Sturges, Franklin Leonard, Jr. and their associates, who control the Belcher, Crown Point, Yellow Jacket, Consolidated Virginia, Ophir, Mexican, Potosi and Savage mines and also the Comstock or Sutro tunnel and the Yellow Jacket mill. Under the contract with the Comstock Pumping Association the tunnel company has expended nearly $335,000 for new timbering, railroad track, drain flume and complete repairs. The company is now using electric storage haulage, but for economic reasons will install a trolley haulage system.

The tunnel drains and ventilates all the mines at a depth below their respective collars of from 1650 to 2000 ft., and is essential in the operation of the properties. Owing to the fact that the tunnel belongs to an independent company and is depending upon a tonnage tax for operation, it is deprived of any income at the present stage. This necessitated the coöperation of the Pumping association and its interests with the tunnel interests, which coöperation was brought about in 1908 through the negotiations of Messrs. Sturges and Leonard. Since the Pumping association was formed, seven shafts have been fully equipped with modern electric hoists. These include the Union, Consolidated Virgina. Ward, Yellow Jacket, Belcher and Overman. The Mint, Combination, Ophir and Alta are also open to the Sutro tunnel level, and in good repair. The Mexican and Ophir are used as air shafts. The Combination and Alta are both fully equipped with hoisting works, air compressers and complete machinery. In the C. & C. shaft the Reidler electric pump and the Risdon hydraulic elevator lift the water to the Sutro tunnel level. In the Ward shaft the pumping equipment was built by the International Steam Pump Company and is known as the Blake-Knowles express pump.

The output from the deep levels of the Ophir, since the drainage began, amounts to $1,700,000; the output in November, 1909, was approximately $50,000, and this output was approximately maintained throughout the year. The Mexican mine opened a new orebody at the 2300 or deepest level, which is now being prospected. The Consolidated Virginia began sinking as soon as the drain flume in the tunnel was completed and has now reached the 2800 level. The Ward shaft has equipment to reach the 3100 level, and is now down 2575 ft. The Alta shaft will be used for deep drainage in the Gold Hill mine.

The Yellow Jacket, Crown Point and Belcher are all producing low-grade ore which was not available formerly for economical operation. This ore is being milled in the new Yellow Jacket concentrating mill, which has a capacity of 6000 tons per month and is reported to be making a saving of from 83 to 89 per cent., yielding a concentrate valued at $150 to $250 per ton. The Butters plant is handling low-grade ore from the surface workings of the Chollar and Potosi, and high-grade ore from the lower levels of the Ophir and Consolidated Virginia.

The Comstock company's mill at the mouth of the tunnel is now in operation treating ore from the Savage mine, which is delivered through the tunnel. Since the operations of the Pumping association the Consolidated Virginia has produced approximately $800,000. As an indication of the ores which are expected in the deep levels the following report for a December week from the Ophir mine is of interest: On the 2000 level, 37 cars assaying $65 per ton; on the 2200 level, 80 cars assaying $39.34 per ton; on the 2300 level stopes, 303 cars assaying $38.32 per ton; on the 2300 level drift, 65 cars assaying $58.33 per ton.

It has been demonstrated that the ores of the Comstock are easily concentrated and that the tailings can be successfully beneficiated by cyanidation. There are nine reduction plants at work on or near the Comstock lode at present. These include the Butters plant, the Yellow Jacket mill, the Comstock Tunnel Company's mill, the Dietrich mill, the Rocky Point mill, the Overland mill, the McTeague mill, the Davis mill and the Pfeffer mill. The plants are all small, except the Butters plant and the Yellow Jacket mill.

The district is now supplied with cheap electric power, costing from $4.50 to $6 per h.p. per month, according to the amount consumed. This price is in contrast with the reported cost of power in early days, when the pumping was done with the Cornish pumps at $34 per h.p. per month. Other commercial and economic conditions in the camp have greatly improved since the early days of its operation and make possible the mining and treatment of ore which formerly was of no value.

The funds for the pumping and development of the Comstock mines have been raised chiefly by assessment under the California law. Recently the earnings of the Ophir & Consolidated Virginia have been diverted to the work of the Pumping association and the Tunnel company.

Esmeralda County

Esmeralda county lies in the southwestern part of the State and has an area of more than 7000 sq. miles. It contains a score or more of developed, partly developed and developing mining camps. Most of these are producing the precious metals, but other mineral products are distributed throughout the county.

By comparison with the feverish activity of a few years ago, the Goldfield camp was very quiet during 1909. Yet during that period the camp produced more gold than ever before and satisfactory results were obtained from the explorations in several of the properties. In July, according to the report of the State mine inspector, there were 18 mines operating on company account, employing 677 men. In addition to this, a like number of leases employed 116 men. Of the men employed by mining companies, nearly 75 per cent. were on the payrolls of the Goldfield Consolidated.

The remarkable record of the Goldfield Consolidated, both as to gross output and as to cost of mining and milling, is the interesting feature of the operations in this camp. This property, which was in charge of John H. MacKenzie, now retiring, has made a record in respect to operations which is worthy of note in the annals of the mining industry. The consolidation of several properties into this company in 1908 had the results of decreasing the general activity in the camp, but it also permitted the effective and economical management of this vast mining property. The result has been eminently satisfactory in the matter of total profit and gross cost. The new 600-ton mill was placed in operation during the year. At the present time the only other large producer in the camp is the Florence mine, also equipped with a modern mill.

During the year there was comparatively little prospecting in the area about Goldfield. This abandonment is due partly to the aftermath of the financial crisis and also due somewhat to the publication of Mr. Ransome's report by the U. S. Geological Survey. This report indicated that the known orebodies were confined to the dacite, and that the ore-bearing formation was limited in area and largely confined to the territory controlled by the Goldfield Consolidated company. It is thought in the camp that Mr. Ransome's report was ultra-conservative, and there are those who believe that the last word as to the geology and ore deposits of this camp has not yet been said by any means. In this same official report it was pointed out that the veins, when they pass from the dacite into the latite, would possibly become impoverished. This official expression proved somewhat of a damper upon those who wanted to believe that good veins always get better with depth. However, the fact is that in this camp since this report was published the Goldfield Consolidated company has followed its orebodies into the latite and found them as rich as ever.

In the Silver Peak district, the Pittsburg-Silver Peak Gold Mining Company completed its new mill, which has an approximate capacity of 12,000 tons per month. It is interesting to note that the first cyanide mill in Nevada was installed in this district. At the time of the first introduction of this process, other operations had been carried on in the district for some time, but the results were mainly unsatisfactory until the new lease of life began with the general resumption in the industry in the State.

Other properties in this district are the Silver Peak-Valcalda, in which the Newhouse interests have acquired control, and the Goldfield-Silver Peak property on which a 10-stamp mill is being installed to treat the free-milling gold ore by plate amalgamation. The Scotch Lassie property has been satisfactorily developed, and the company is negotiating for the erection of a custom mill for its own use and for tributary properties.

Exploration and development work were carried on extensively in the Lida district, 32 miles from Goldfield. This is one of the oldest camps in the State, and its mineral area is extensive. On the Monarch a silver-lead strike was made. The Rea group installed a hoist and is sinking. The Nevada Exploration Company carried on exploration on the Wisconsin group. Nevada-Florida installed a 10-stamp mill. The Washington-Nevada sunk 500 ft. in development of a property in this district. The Indian Spring company installed equipment and is developing. The old Centennial is being explored, and the Death Valley mine, east of Lida, now known as the Red Wing, has developed high-grade silver-lead ore.

At Tule cañon a placer deposit was worked in a small way by owners and leasers. An attempt to take out the product by dry washing was not satisfactory. The Eagle property is developing a gold-quartz vein in this district.

In the Tokop district, about 50 miles southeast of Goldfield, Peter J. Somers and associates carried on development during the year. The district is considered as presenting favorable opportunities. In the Bonnie Claire district, 60 miles from Goldfield, a section in which there were extensive operations in the early '80s, the Bonnie Claire company has carried on successful development work and has erected a mill at Thorp's wells. The Oriental in this camp is being operated by leasers.

In the Hawthorne district the Lucky Boy attracted attention during the year, and it is reported that the property has been sold to the United States Smelting, Refining & Mining Company. A considerable amount of work is being done in this district by leasers. In the Horn Silver section the Great Western mine now equipped has been developed by the Russell brothers. The Hubbard lease on the Mountain King is reported to have produced over $1,000,000 during the year. J. C. McCormick of Goldfield has a lease on an adjoining property and is now sinking to the 300-ft. level. Another lease in this district, known as the Ingalls-Brodigan, is also sinking and drifting. On the Mitchell lease a complete plant was installed and work carried on to 300-ft. depth. The Collin shaft is deeper than 400 ft. The Oddie lease is adjoining the McCormick and Brodigan leases, and a new plant has been installed for the development of the property. The Spencer lease is operating on the Lucky Boy vein.

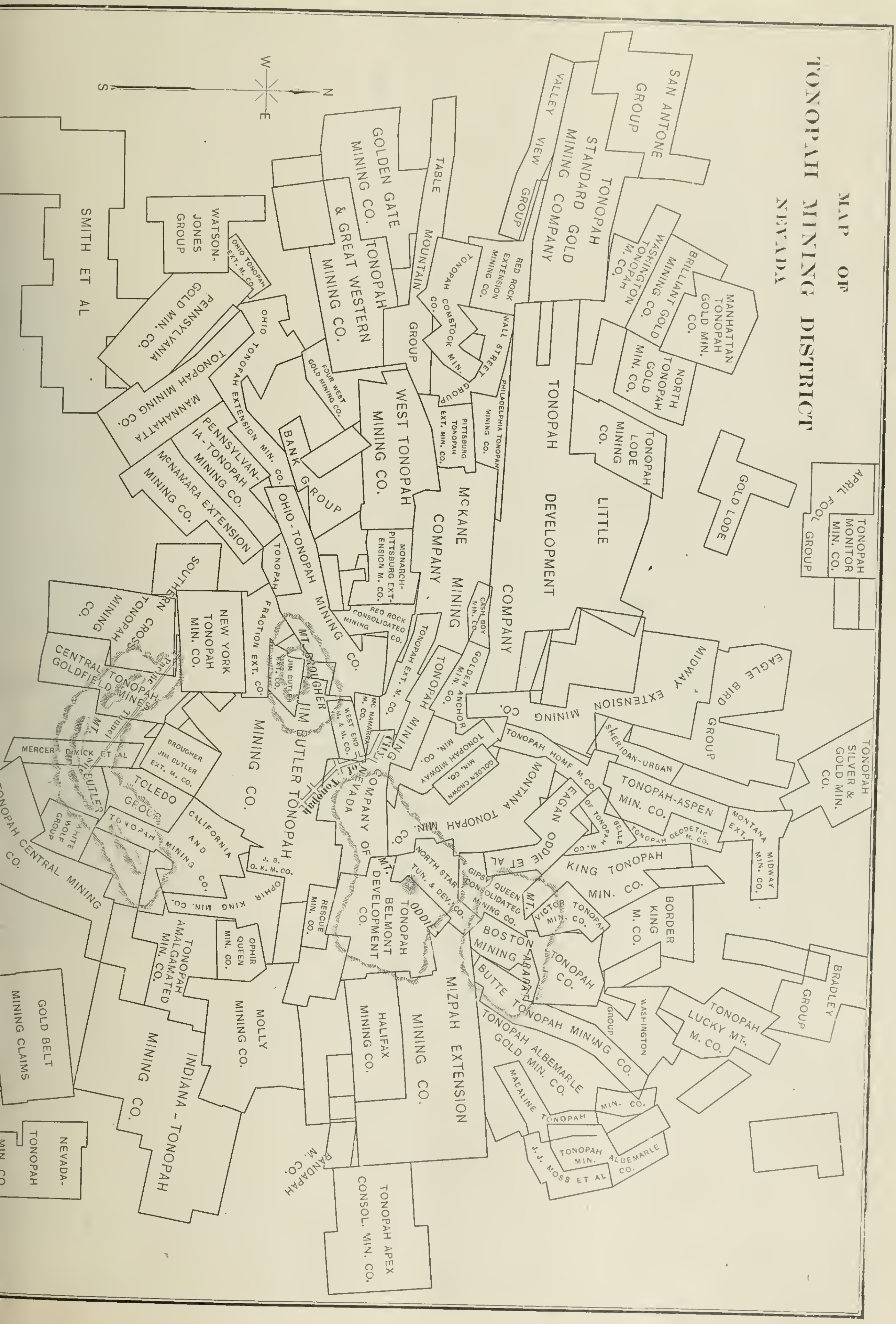
The Rawhide district came into existence on Christmas day, 1906. The first tumultuous years of the camp's existence have now yielded to a state of calm, waiting for the coming of a mill which will enable the various leasers and miners to treat their ores successfully in the district. Some rich ore has been shipped.

Near the Rawhide camp is the Regent district, in which the Black Eagle property is being developed, and also the Royal and Regent properties.

The Luning Gold Mine Syndicate, the Lotta mine and the Nevada-Silver lease (formerly the Hidden Treasury) are working at Luning, a few miles north of Mina. The Nevada Copper Hills property at Acme is also developing. At Wassuk, 12 miles northwest of Lucky Boy, some new developments were undertaken during the year, which promised well.

Nye County

The Tonopah mine claims to be the greatest silver-producing mine in the United States, and it is asserted that its dividends for the last three years have been greater than that of any other silver producer in the world. To a certain extent the underground work at Tonopah has conflicted with some of the conclusions of J. E. Spurr, United States geologist, whose report on the camp was at the time issued accepted as final. This conflict is particularly true as regards the formation. Some of the exposures of



MAP OF TONOPAH MINING DISTRICT NEVADA

igneous rock which were called dikes by this authority, have turned out, by development underground, to be intrusive masses, indicating a succession of flows. Definite information as to results of explorations in depth in the camp have not been made public.

Montana-Tonopah continued to operate its mine and mill successfully and efficiently, and the discovery of new orebodies in the property is reported. The West End Consolidated company developed a large tonnage of second-grade ore and continued shipments of high grade. The MacNamara carried on development work, blocking out milling ore. Numerous leases operated successfully in the district. Belmont, Midway and Tonopah-Extension all continued to be active producers.

Bullfrog was generally inactive. The principal mine, the Montgomery-Shoshone, made a successful showing during the first six months of the year, treating about 6000 tons per month from the 200 and 300 levels. During the last half of the year the net production of the mine decreased considerably. The Montgomery Mountain company is exploring the South-Rhyolite contact, adjoining the Montgomery-Shoshone properties. Other active properties in the district are the National Bank, the Original Bullfrog, Gold Bar, West Extension and Bullfrog-Mohawk. Owing to the lack of milling facilities much of the low-grade ore in the district is at present not available.

At Pioneer, the Bullfrog-Mayflower properties continued operations during the year. Many shipments of high-grade ore were made from this and other properties. At Golden Arrow the Kawich Consolidated continued sinking, and other properties were operated with fair success by leasers. The Round Mountain district has maintained a steady output since its discovery. Dry working and sluicing has been carried on successfully in the district. The Sunnyside mine has developed as a free-milling property and the mill has been operating steadily. Extensive bodies of milling ore have been opened up at the Daisy, the Sunnyside and the Sphinx.

White Pine County

The Robinson camp at Ely continued during the year to be the scene of the successful exploitation of enormous, low-grade, porphyry, copper orebodies, characteristic of that district. The Nevada Consolidated, the largest operating company, more than verified expectations during the year. The production was mainly from the Eureka or Copper Flat property A new orebody was discovered by drilling in this portion of the company's property at a point west of the Eureka shaft. This is known as the Liberty, and it is intended to open it up later as a steam shovel operation. The Ruth mine east of the Eureka is fully equipped and is held in reserve. On the Veteran mine of the Cumberland Ely work was suspended in the early part of the year on account of labor troubles, and it remained idle during the year. This property has now been merged with the Nevada Consolidated. The Steptoe plant worked almost entirely during the year on ores from the Copper Flat orebodies, treating about 6000 tons per day. No plans for the improving of the Veteran mine belonging to the company have yet been made public. It is indicated in the quarterly reports that the cost of producing ores from the Veteran mine is high.

The Giroux and other properties in the district were purchased during the year by the Cole-Ryan interests. The Alpha shaft of the Giroux property, in which a disastrous cave-in occurred some time ago, was found to be in such a condition that it was necessary to sink a new shaft. In doing this a body of high-grade ore was found in the lime out from the contact, but the extent of this discovery has not yet been determined.

There was a general revival of prospecting in the camp on several properties, particularly the Boston-Ely and the Ely Consolidated. Prospecting is being done on the Ely Central property, which was the subject of some interest in connection with operations on the New York curb market.

Several gold-quartz properties were developed during the year at Osceola and operations have been carried on in a small way on the tungsten deposits in that section. A number of properties are developing in the White Pine district, which in early days was an extensive producer. This district, which lies 36 miles west of Ely, is likely to become an important producer with the construction of the projected railroad from Ely to Goldfield, which passes close to it. At Granite, 25 miles north of Ely, important silver-lead properties were exploited during the year and attention was given to the lead deposits at Cherry creek.

Eureka County

Eureka county, in the central part of the State, has experienced the beginnings of a revival which promises to be important. The mines were first discovered in 1864 and the Eureka camp is credited with an output of not less than $125,000,000, principally during the decade succeeding the discovery. The mines have been practically abandoned until within the last few years, and during 1909 positive steps were taken to investigate and resume operations in this historic district. The Eureka-Windfall property has done extensive development and completed the installation of a mill costing $30,000. The Holly mine constructed a concentrating plant and blocked out much ore. The operating properties in the district are given as follows: Cyanide mine of Eureka, the Richmond-Eureka, West Eureka Windfall, and Diamond and Excelsior companies.

Some prospecting has been done at Secret cañon and at Prospect mountain. In the old Cortez district a number of locations have been made and some properties taken under option. The Cortez Metal Recovery Company constructed a 100-ton cyanide mill for the treatment of the ore from the dumps of the Garrison mine. Several properties at Mill cañon in this district have been under option during the year to outside interests and a shipment amounting to $75,000 has been made. The Keystone mine in the Roberts district is now developed by a tunnel 2000 ft. long and a shaft 150 ft. deep.

Churchill County

In Churchill, the west central county, is the camp of Fairview, in which moderate development is being carried on and small shipments made, principally by leasers. The Wonder camp is also in Churchill county and is today practically abandoned, a monument to the flitting hopes of many mining-stock investors of the boom years. At Shady run the Nevada Gold Mining Company is developing by tunnels and is planning to commence operations.

Douglas County

In Douglas county development and prospecting have been caried on in Pine Nut and Silver Lake districts, and at Buckskin. Work has been done on a placer property owned by the Success of Nevada company.

Elko County.

In Elko county little new development in mining took place in 1909. The attempt to revive the old Tuscarora district has been suspended for the time, although the results there were reported a satisfactory. Some work is being done at Cornucopia and at Spruce Mountain A new camp at Contact in the norther part of the country has recently been attracting attention. At Gold Circle a number of properties continued developmen in the vicinity of the town of Midas an development was carried on on the prop erties in that section. On the Lucky Gi mine a 20-stamp mill has been erected.

Humboldt County

There was little new development i Humboldt county during 1909. In th Seven Troughs district work was carrie on by several operating and leasing con panies, and the prospects for the distri are more encouraging. At Rosebud, Je sup and other districts some developme was done, and operations at the Go conda, on Ruby Hill, and other properti have been successful. Important disco eries were made at the National mi near Winnemucca and some rich shi ments made. The sulphur properties this county have continued to produ during the year.

Lyon County.

In Lyon county there was some

ival of activities at the old camp of ilver City. The Mason Valley district, ow being tapped by a railroad, has preented important developments in the Mason Valley mines and at the Ludwig ines belonging to the Nevada-Douglas Copper Company. The Western Nevada opper Company and other properties at erington carried on developments during e year. A gypsum deposit at Mound ouse shipped extensively during the ear. The Ramsey district has been deeloped and is considered as promising.

Lander County

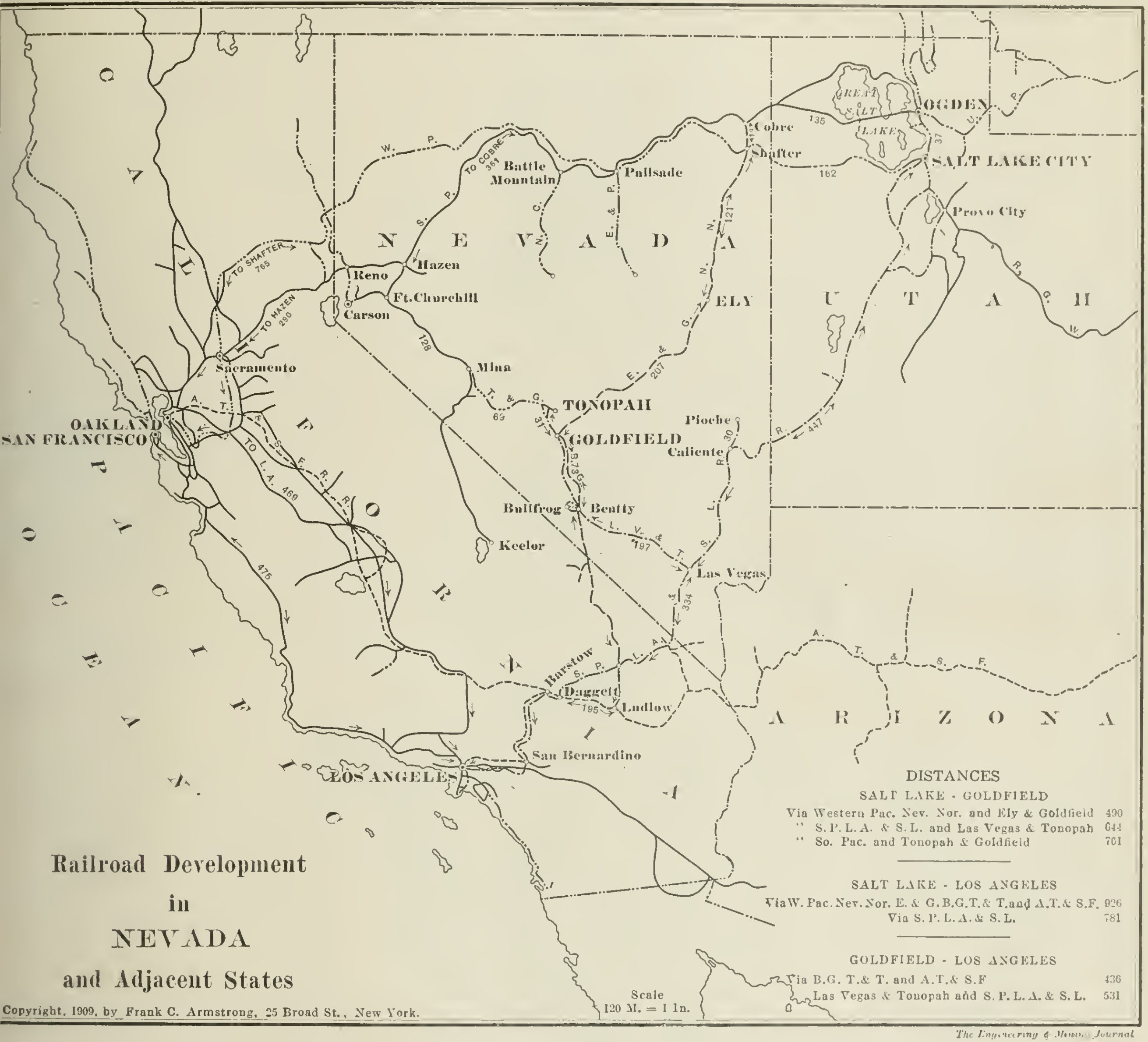
In Lander county, adjoining Eureka unty, the revival of the old districts has so extended. At Austin, Reese River, attle Mountain and the Lewis district d properties have been taken up and deeloped to a considerable extent. The ustin-Manhattan company has acquired properties in the Reese River district and recently completed a new mill. Several Battle Mountain properties have been shipping, one of them, the Glasgow-Western, has developed a large tonnage of copper-silver ores. Operations on the antimony properties near Battle Mountain were suspended during 1909 owing to the low price of the metal.

Other Counties.

Ormsby county has a variety of mineral resources which were exhibited extensively during the year. A graphite operation is carried on in Eagle valley; important clay deposits are being utilized near Carson. The Brunswick Consolidated company in the Delaware district carried on extensive developments during the year. The Bonanza property in Jack's valley was under development.

Washoe county contains the Jumbo camp, which now has several producing mines, and work was resumed during the year in the Peavine district.

The two southeastern counties, Lincoln and Clarke, include the important Searchlight and Eldorado districts and the Pioche district. In the Searchlight district the Quartette company continued developments with success. At Eldorado canon development was done. The attempt to work the alluvial deposits of the Colorado river by dredging was not successful. A number of properties in the Pioche camp were consolidated during 1909 and some operations carried on, but the shipments were suspended in the early autumn owing to difficulties in securing railroad and treatment rates. Near Las Vegas, Robert T. Hill has been in charge of scientific explorations for gold ores during the year. At Good Springs important copper, zinc and lead deposits have been successfully developed.



Sketch Map Showing Railroad Developments in Nevada and Adjoininc States

RAILROAD DEVELOPMENT IN NEVADA

Plans have been consummated during 1909 for the construction of the railroad link between Ely and Goldfield, thus making a new through route from the important Salt Lake railroad center to the Los Angeles transportation connections. The new road shortens the distance between Salt Lake City and southern California, and by its connections with the Western Pacific, a Gould road, and with the Santa Fe at the Tonopah & Tidewater junction it forms an outlet for the southwestern traffic of this important system. The new system includes the new road to Ely, the Nevada Northern and the Tonepah & Tidewater road now extended to Goldfield from California. The relative proportion and directness of the new through route is indicated on a map published herewith. Aside from the importance as enlarging the general transportation facilities of the West this new road has a direct bearing upon developments in Nevada. The road leaves the Tonapah & Tidewater roads at Cuprite, nine miles south of Goldfield in the Cactus valley. At this point are deposits of native sulphur, carrying gold. From Cuprite the road runs up Cactus valley in a northeastern direction. The first camp of importance on the line is at Gold Center, 20 miles from Cuprite. This is a low-grade camp, which will be likely to develop as a large producer with the advent of transportation. Tributary to Gold Center are the camps of Trappman, Jimtown, Antelope and Cactus Springs, all promising gold-silver districts and within 30 miles of this station. From Cactus valley the route leads into Kawich valley and 50 miles from Cuprite the Golden Arrow district is reached. This camp has already developed successfully and gives promise of rich production. Ten miles north of Golden Arrow and on the line of the road is Bellhellen, a gold and silver camp, and near this is the new camp of Clifford. Five miles from Clifford the road passes through Warm Springs pass and enters the Hot Creek valley and thence passes midway between the old time camps of Tybo and Reveille, with a branch surveyed to each. These camps were extensive producers of rich silver ores in the early '60's and it is likely that they will be revived with the coming of the railroad. Considerable development has been done at the Tybo mines in the last few years and it is claimed that smelting ore has been developed which can be successfully shipped at the present time.

The ores of the last two camps contain much lead. From Tybo the road passes into Railroad valley to the east of Pancake range and west of the White Pine range, and then through the White Pine range to the farming settlements of Blue Eagle, Currant Creek, Duckwater and White River. The one time important camp of Hamilton will be reached in this section and it is predicted that this camp, which was famous in the '60's for its silver output, will again become important with the building of the railroad. After crossing the White Pine range the railroad proceeds direct to the Robinson camp, connecting with the Nevada Northern railroad and thus forming the through connection to both the Harriman and the Gould systems to the north.

At the close of 1909 the Western Pacific completed its trans-continental line from Salt Lake to California, opening up an important new area in Nevada and providing a new line across the State.

Better transportation facilities are to be provided for Pioche by extensions of the branch from the Salt Lake-Los Angeles road at Caliente.

The Nevada Copper Belt Railroad practically completed its road from Wabuska on the Southern Pacific to Yerington in the Mason Valley copper district. This road, which will be in operation early in 1910, is controlled by the Nevada-Douglas Copper Company and will not only put this company in a position to smelt and market its products, but will be a great stimulus to the development of other important properties in the district.

Idaho

SPECIAL CORRESPONDENCE

Notwithstanding the failure of the lead and silver market to respond proportionately to the general improvement of business in the country the output of the silver-lead mines of the Cœur d'Alene district was more than in 1908. There was little interest taken in the unproductive properties and there has not been very much outside development work. The mines tributary to the new North Idaho railroad to Murray are taking advantage of the transportation facilities furnished and have started shipment.

IMPROVEMENTS IN MILLING.

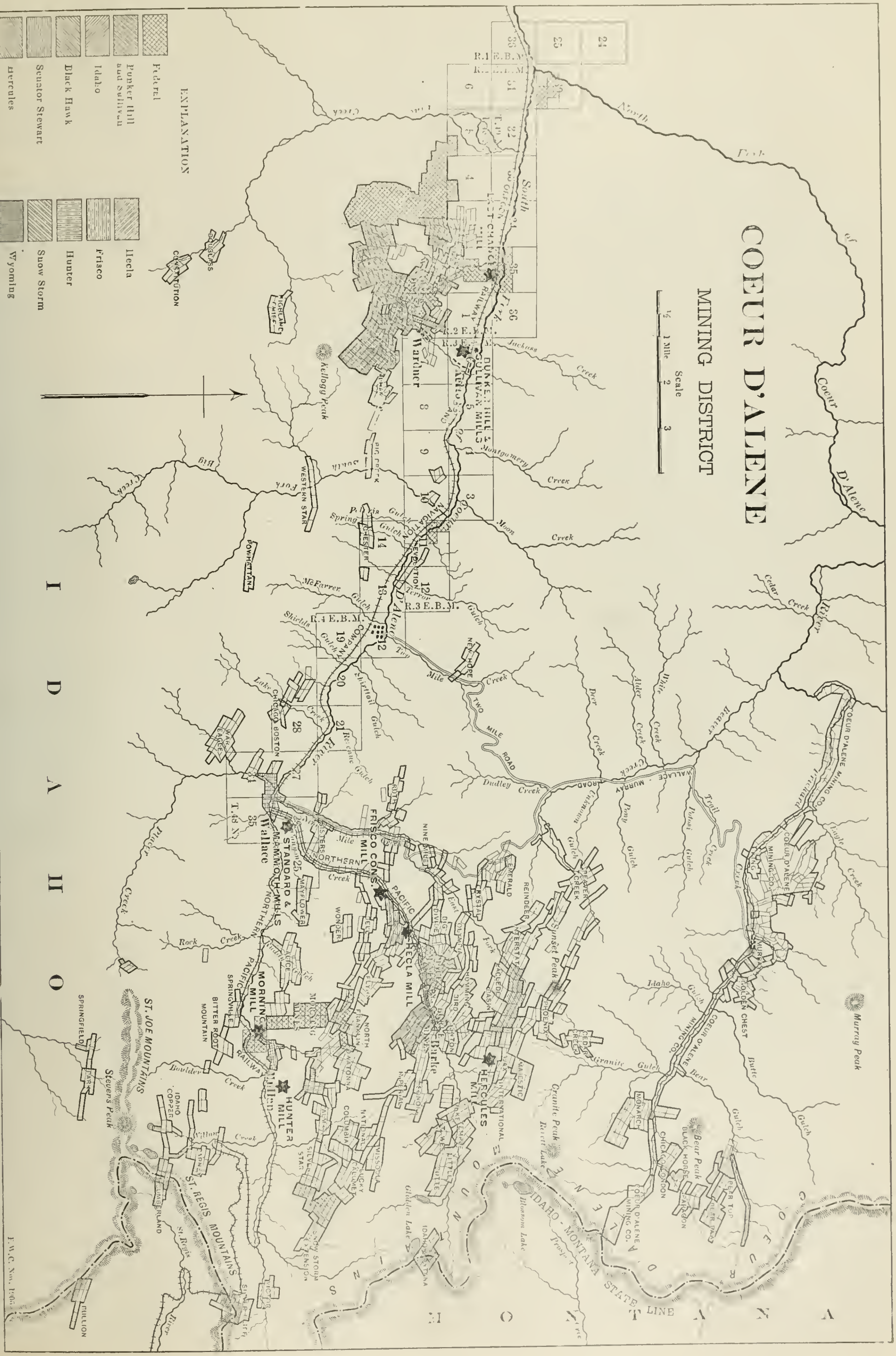
The older producers in the district gave more study to the improvement of ore treatment methods. The Federal company is obtaining satisfactory results from the Hancock jig on fine ore. The experience of the Cœur d' Alene mills has shown that the Harz jig, as originally constructed and operated was susceptible of much improvement. Improvement has been largely achieved in classifying and jigging the finer sizes, using the Caetani jig which appears to do as good work as the Hancock on the finer sizes. It also has the advantage of successfully separating all the slimes and sending them to the slime department directly from the first compartment, without traveling the length of the jig, and making further treatment necessary as the Hancock arrangement demands. Briefly it may be said that the old style of Harz jig will in a few years be entirely superseded by improved jigs of the type sucessfully used in some of the Cœur d'Alene mills, and by the Hancock pig for finer sizes.

The new mill of the Bunker Hill & Sullivan has been completed and is now in regular operation. Work is being done remodelling the old concentrators for reworking of the many thousands of tons of tailings. At the present market prices it will require very careful work, both metallurgicaly and mechanically to make this retreatment operation profitable.

The improved zinc market has resulted in the resumption of operations at the Success mine. The tariff law as enacted proved satisfactory to the lead interests and also gave new life to the zinc mining possibilities of the State. Attention was given to the possibility of increasing zinc production in view of the advancing market in the latter half of 1909. The lead production of this district, on the whole has increased.

RECENT COEUR D'ALENE DEVELOPMENT.

In the Cœur d'Alene district the Hercules mill burned Sept. 6 and the company leased the Tiger mill at Burke and made extensive improvements. The Last Chance mine completed the tailing plant during the year. The Enaville smeltery was blown in in November, using the Blanchard process. Work was commenced in a slimes plant on the south fork of the Cœur d'Alene river to treat the products from the Morning mills. The Snowstorm Extension Company transferred its holdings to a Los Angeles company. The Jack Waite property was sold to Patrick Burke of Murray. The Snowstorm made a contract for shipment of ore to California for treatment and increased its shipments to about 6000 tons per month. The Monarch mill treated about 2000 tons daily. The Hecla has been shipping since June. The National, east of Mullan, advanced the tunnel to strike the orebody at 1600 ft. Lucky Calumet, west of the Snowstorm is installing a 4000-ft. aërial tramway. The



Map of the Cœur d'Alene Mining District Showing Situation of Mills and Principal Mines

Mark Sullivan property was transferred to E. L. Cowell of Missoula and equipment is being installed. The Cœur d'Alene North Fork Company started its concentrator in November. The Marsh silver-lead claims near Burke were sold in December for $150,000. The Black Horse built a 150-ton mill at Murray.

Deep Workings.

The Cœur d'Alene mines have been successful in development in depth. The Bunker Hill & Sullivan mine is now 3000 ft. below the apex of its orebody. The Standard Mammoth is working at 2750 ft. in excellent ore. The Hercules at Burke is working at 2000 ft. in depth with ore of high grade. The Morning mine at Sullivan is down more than 2000 ft. The Hecla mine at Burke is 1200 ft. below the surface. It is reported that at 2200 ft. in depth in the Tiger-Poorman mine the oreshoots had contracted in width, but that there was a portion of the oreshoot which gave indications which would justify explorations to several hundred feet more in depth, which was the experience in other parts of the districts. There is at present no immediate prospect of the conclusion of the litigation involving the Bunker Hill & Sullivan and the Federal properties. The Cœur d'Alene district employs about 3500 men who are paid half a million dollars monthly.

During 1909 the Chicago, Milwaukee and St. Paul road completed its line to the Pacific coast. In Idaho the line extends through the southern border of the Cœur d'Alene district and affords an outlet for numerous copper, gold and lead-silver prospects in that section.

The Government reserved during 1909 large areas for a future phosphate rock supply for the country. Operations were continued to a small extent on the phosphate deposits at Montpelier, in Bear Lake county.

California

SPECIAL CORRESPONDENCE

The gold output of California can be counted on as $18,000,000 to $20,000,000 annually with great regularity, the only variation depending on the character of the season, that is, the rainfall, which furnishes the supply of water in larger or smaller quantity. With a small precipitation the gravel mines have short seasons for washing and some of the mills of the quartz mines have to stop work for lack of power. Large numbers of the quartz mines of the State are now run by electric power, generated by water originally, so that when water supply is short the electric current can not be supplied in sufficient quantity. Some of the larger properties are now equipped with auxiliary steam power plants, ready for use in case the water or electric power plants fail. This is not the case with all mines. Again heavy flood seasons have an effect, especially on the dredging industry, as was the case in 1907 when a number of dredges at Oreville were wrecked or damaged. There are about 4000 known mines of gold, silver, copper and lead in California of which 1100 are producing to a greater or less extent, the others being in course of development or held by annual assessment work. The quartz mines are yielding more gold than the placers, as has been the case for many years, but the quartz mines are not increasing their yield as the placer mines are, and before long it is expected that the placer yield will exceed that from quartz mining operations.

The total gold yield for California for the year 1908 was placed by the United States Mint and United States Geological Survey at $19,329,559 and the silver at 1,703,700 fine ounces, the latter of an average commercial value of 53 cents. It is probable that the yield of 1909 will vary little from this, though there may be shown an increase of a few hundred thousand dollars in gold with a slight falling off in silver output. No special activities were shown in quartz mining in 1909, except in the county of Sierra where discoveries of very rich ore were made in reopened mines. The finding of "candlebox" ore in one mine led to the development of several others, long idle.

In other districts there were few changes of conditions to be noted. The Grass Valley district of Nevada county, continues to be the leading quartz-mining section of the State. None of the other counties, even those of the Mother lode, approach it in production of gold. The deep mines of the State are yielding annually about 2,500,000 tons of ore of which 2,000,000 tons are milling ore, averaging from $5 to 5.75 per ton. The rest is copper ore, which is treated at smelteries. This carries gold and silver. In fact, by far the largest proportion of the silver is derived from the treatment of copper ore. The silicious ores needed for flux with the copper ores in late years has had a marked effect on gold mining. Thus many mines can be profitably worked without reduction works, there being ready sale for the quartz. This is especially the case in Shasta county where the largest smelting plants for copper ore are in operation.

Dredge Mining Increasing.

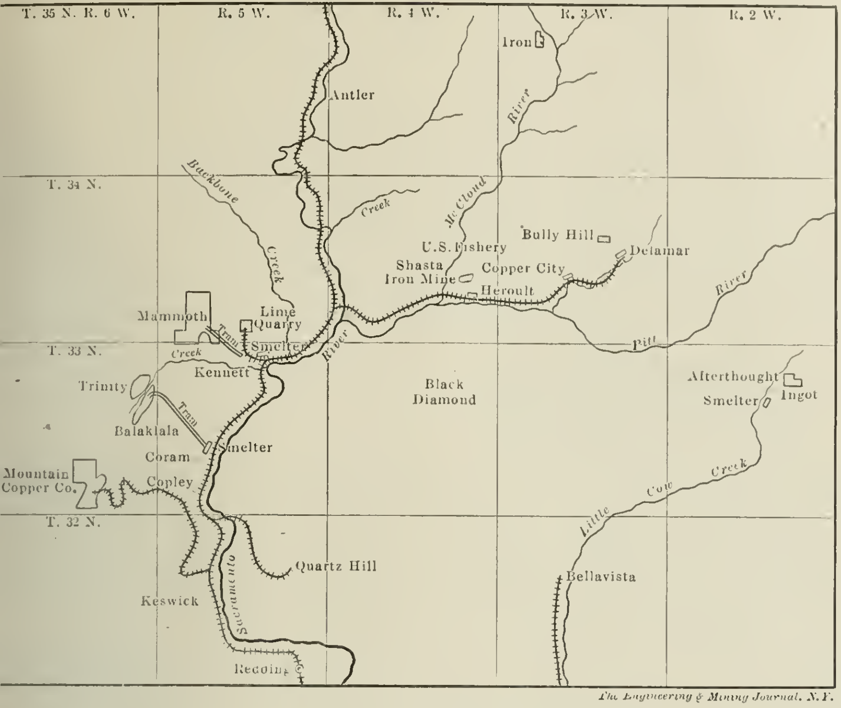
The quartz mines of California are now producing annually a few million dollars more than the combined forms of placer mining, which include dredge, hydraulic, drift, river-bar, ocean beach and surface placers. The dredges are now yielding about 80 per cent. of the placer gold output. Dredge mining is now the most progressive and growing of the different forms of gold mining carried on in California. With about 75 dredges at work the annual gold yield from that source is between $7,000,000 and $7,500,000. When this form of mining was commenced at Oroville in 1898 the yield for the year was only about $19,000. Since then over $31,000,000 have been produced by dredging operations, and the business is increasing yearly. The latest machines built are very costly and heavy, and are capable of handling over 250,000 cubic yards of material monthly. Some of the machines are doing the work at an operating cost of less than two cents per cu.yd. Dredge mining is now being carried on in 10 counties of California, the largest operations being in Butte, Yuba and Sacramento counties. A few dredges are working in Calaveras, Siskiyou, Trinity, Shasta, Merced and Stanislaus counties, and new grounds for dredging purposes are being prospected in many places. Larger machines are taking place of lighter and smaller ones in the older dredging fields of the State.

Decline of Hydraulicking

Hydraulic mining is in a decadent stage, the total yield from this source being less than a million dollars annually. The most prosperous counties for this form of gold mining are Siskiyou and Trinity. Drift mining also is showing a lessened yield from year to year, though there are signs of revival in drift work, especially in the upper mountain counties of Sierra and Plumas, where a number of old drift properties have lately been reopened and some new ones started. The partial cessation of hydraulic mining in the mountain and foothill central counties has cleared the streams of debris, so that placer mining on the surface and in rivers has been more prosperous than for a long time. Indeed this form of gold mining seems to be taking on a new lease of life as the yield has been growing annually. The mountain streams have been mined lately on old bars. Mining the sands of the ocean beaches has not been carried on to any great extent for the last few years, but as the heavy storms of this winter have been unusually severe, the beach sands ll be concentrated so that this form of ning should be profitable at many ıces in the spring of 1910.

There are now seven counties in Cali-rnia which are yielding over a million llars in gold each year, the heaviest oducer being Butte county, where the rgest number of dredges are situated. is county is yielding between three d four million dollars gold annually. evada county, the center of the quartz ning industry, is yielding about two d a half million. Yuba county, with its ıny dredges, yields over two million. her million dollar gold counties are Amador, Calaveras, Sacramento and Shasta. The latter named county is the most productive in the State with regard to minerals of all kinds, mainly on account of its copper industry, its record being now nearly $7,000,000 annually.

Altogether the total mineral output of California in 1908 was $66,363,198. For 1909, doubtless an increse of several millions will be shown when the final figures are available. The mineral industry of the State is in a favorable condition. In the matter of gold mining the counties showing the largest increase of output lately are those where the dredging enterprises are carried on to the greatest extent. In silver mining there was an increase of output, but the lower price of the metal keeps values down.



Sketch Map of Portion of Shasta County, Cal.

Mother Lode Operations

The mines in the Mother Lode counties of Amador, Calaveras, El Dorado, Mariposa and Tuolumne still continue to furnish three-fourths of the milling ores of the state, though the average recovery per ton is much less than in the other counties where the veins are smaller and richer. The average recovery is less than $4 per ton when all the counties in the Mother Lode are considered. In Nevada county, where the most productive quartz mines of the state are being worked, the average value recovered per ton is considerably over $10 in gold and silver. Some of the gold mines in Amador county, on the Mother Lode, are now being worked to a vertical depth of 3400 ft. and at that depth are taking out as good ore as they ever had near the surface. This has encouraged men working other deep mines, and explorations are now being made deeper than ever before. Shafts 1000, 1500, and even 2000 ft. deep are being sunk without stopping to drift, so as to open properties in a suitable manner.

Altogether, California is doing well with its mining industry. In certain branches great progress has been made in late years. The structural materials, clays and petroleum, have advanced materially in importance. Gold mining has about held its own in the last decade, but shows signs of augmented annual yield owing to the increase of gold dredging and the custom generally of deeper mining.

Texas

BY W. E. KOCH AND J. K. PRATHER *

Mining operations in Texas during 1909 ıre greatly curtailed on account of the ed of a fair mining law, the present one ındicapping the prospector beyond all ason and retarding the development of e mineral wealth of the State. Sev-al copper properties in the Sierra anca and Quitman mountains about 75 iles east of El Paso were worked in 09. In the Devil's ridge F. W. Tommee ened up some good ore and Oct. 1, H. Gilcrease shipped to the El Paso ıeltery from the Thunder Bird mining strict in the Quitman mountains the th car of chalcopyrite ore carrying 18 r cent. copper.

The mill of the Presidio Company, at ıafter, ran continuously during 1909. Young Brothers also operated a mine in this district. About 300,000 oz. of silver are produced annually in Presidio county, near Shafter. Ten miles west of Shafter, J. T. Fredley opened a property in the Cienega mountains. The Republic Mining and Milling Company, operating in the same region, voted to restart their Bonanza zinc mine and dry mill. In Brewster county the quicksilver mines of the Marfa & Mariposa and Chisos companies produced about 90 flasks a week and the latter company did much development work.

The El Paso Tin Mining and Smelting Company has been developing its property since October by means of three shafts and two tunnels. The new workings are in ore, which occurs as cassiterite in quartz veins, or disseminated through the country granite. These mines are situated about 16 miles, by road, north of El Paso, on the eastern slope of Mount Franklin. Roads were laid out, and a mill and smeltery site graded. Near Van Horn, 120 miles east of El Paso, the Texas Turquoise Company obtained some fine stones. Little was done to develop the sulphur beds in El Paso and Reeves counties.

Practically no exploitation of the iron, gypsum or asphaltum deposits was done during 1909. Lignites of Eocene age extend over a belt 200 miles long and were mined in nine counties. In 1908 847,970 tons, valued at $838,490, were extracted. The coal is of Cretaceous and Carboniferous age, and was mined in seven counties, 1,047,407 tons valued at $2,580,990 being extracted in 1908.

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*Mining engineers, El Paso, Texas.

Review of Mining in Foreign Countries

The Year's Developments in South Africa, Australasia, Mexico, Canada, Central America, Peru, Chile and Other South American Countries

STATISTICS OF PRODUCTION

The Witwatersrand showed further improvement during 1909 in the milling of gold ores. The immense consolidations installed large milling units and worked a lower grade of ore at lessened cost and for a higher recovery.

In Australasia, a feature of the operations was the recovery of zinc from tailings in the Broken Hill district. Ontario showed an increased production of silver, nickel and iron, but the petroleum output fell off slightly. Mexico had to contend with low prices for her chief products, silver and copper. The feature in Mexico was the steps taken toward treatment of low-grade ores and tailings. Mining in Central America was generally at a standstill, as regards new developments, on account of political conditions.

South American countries, particularly Bolivia and Ecuador, are seeking the development of their mineral resources by the building of railroads and, in some instances, by more favorable laws.

Australasia

BY F. S. MANCE *

In reviewing the mining industry in Australasia during 1909, it is found that the aggregate value of the production fell considerably short of that of the two preceding years. The yield from the gold mines was again lower than in the previous term and, by judging by existing conditions, there seems little, if any prospect of better results being achieved during the year 1910. The production of silver and lead suffered by the closing down of several of the mines at Broken Hill, and was less than for many years past. The copper-mining industry made a better showing than anticipated, and the output of the large producing mines was on an increased scale. The records of the yields from the tin mines, however, are not nearly so satisfactory as for the year 1908. The prominent feature of the year's work was the important advance made in the solution of the problem of turning to profitable account the large heaps of zinkiferous tailings on the Broken Hill field, by means of which the value of the mineral wealth was largely enhanced.

The returns show that the gold-mining industry in Australasia, as a whole, made no headway during the year. The output was mainly contributed by the established mines, and the yields diminished in value as depth was attained. It is estimated that the yield for 1909 is about 123,000 oz. less than that of 1908.

The comparative statement shows the output during the last two years, the figures for 1909 being based on the yield for the first 10 months of that year. It will be seen that the state of Western Australia is still the largest contributer, having furnished 47 per cent. of the total estimated yield for 1909. The gold-mining industry now seems to have reached a normal level in this state, and the present rate of output should be maintained for some years to come. The efforts directed toward reducing mining and milling costs, and to securing a higher extraction were attended with satisfactory results, and ores at one time regarded as valueless are now made to yield profitable returns. In addition the developments at depth in the mines on the Boulder belt are such as to afford good grounds for satisfaction. In the Great Boulder Proprietary the workings have attained a depth of 2500 ft., and the lode where located by means of a bore at a depth of 2400 ft. was proved to be 14 ft. wide, and for a width of 3 ft. it assayed 22 dwt. per ton. Borings conducted at deeper levels gave even better returns. The main shaft in the Golden Horseshoe is over 1800 ft. deep, and the lode at the bottom level was proved for a width of 12 ft., and assayed 9 dwt. of gold per ton. The Ivanhoe main shaft is being carried down to 2270 ft., and at the 1820-ft. level the Ivanhoe-East lode was driven along for a length of 400 ft. or more, and proved to have a value of over $12 per ton. It will thus be seen that these mines possess extensive ore reserves. The sound position of these old established mines is enhanced by the fact that several discoveries of importance have been made, work recently undertaken having proved an extension of the payable auriferous area both to the north and south.

GOLD PRODUCTION OF AUSTRALASIA.
IN FINE OUNCES.

	1908.	1909.
Western Australia....	1,647,911	1,604,500
Victoria..............	670,910	639,000
Queensland..........	465,085	455,000
New South Wales....	224,792	208,000
Tasmania............	57,085	45,000
South Australia and Northern Territory.	9,162	7,500
Commonwealth.....	3,074,945	2,959,000
New Zealand......	471,967	475,000
Total, ounces....	3,546,912	3,434,000
Total value......	$73,314,671	....

The East Murchison field includes several promising sections which are rapidly coming to the front. Among these are the Wiluna and Black Range districts, and the former, though somewhat remote from railway communication, should with its extremely large soft lodes become in time a prominent producing center. The principal mines in this area are the Black Range gold mine, Oroya-Black Range, and the Sandstone Development Company's leases. The output of the old field of Yilgarn is on the increase.

The Southern Cross district, which was completely overshadowed and neglected by the sensational Coolgardie discoveries in the early nineties, is now receiving renewed attention. Another progressive district is Meekatharra, where the mines are opening up well. The production of the Mount Margaret field fell off for a time owing to the suspension of operations in the Lancefield mine, but with the remodeling of the plant, this mine again entered the list of producers. The decrease at Coolgardie is largely attributed to the lessened output from the Westralia East Extension mine at Bonnievale, and the Burbanks Birthday mine at Burbanks, but several new mines are developing well, and the industry generally can be said to be on the up grade. The mines at Day Dawn exhibit a decreased yield mainly due to the reduced output from the Great Fingall mine.

Of the important mines outside of the Kalgoorlie-Boulder field, the Sons of Gwalia occupies the premier position. The large and consistent orebodies of this mine are developing most satisfactorily. The completion of the railway to Norse-

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*Department of Mines, Sydney, N. S. W.

man has improved mining matters there, and besides cheapening costs has stimulated interest in the field.

In the northern goldfields—Kimberley, Pilbarra, West Pilbarra, Ashburton, and Gascoyne—mining matters are quiet, but the construction of the Port Hedland & Marble Bar railway now under way, and the consequent reduction in transport charges, should give an impetus to operations.

In the state of Victoria the retrogression noticed in the previous year was not arrested, and a further falling off in the yield has to be recorded. On the principal field, Bendigo, operations were, however, attended with greatly improved results and the yields recorded for the first 10 months of the year 1909 are the best since the year 1904. It is also pleasing to note that the dividends for the first nine months of 1909 reached a total of £123,488, as compared with £97,370 for the same period in 1908. The full benefit of the dead work performed during the preceding year was reaped, and, taken altogether, the results contributed by the mines on this field were satisfactory. It is particularly noticeable, however, that the gold was won from the shallower levels, operations at depth not having been attended with the results anticipated. Dredging and sluicing operations still continue to contribute good returns. The decreased production is mainly due to the lessened output from the quartz mines at Walhalla, and from the deep alluvial workings.

The output from the state of Queensland is expected to approach closely to that of the preceding year. During the early months of the year under review the yield was unfavorably affected by the falls of roof at the Mount Morgan mine, which necessitated the suspension of operations at a place from which large supplies of ore were being drawn. It was not possible to face the contingency immediately and to secure sufficient ore from other parts of the mine, so that several of the furnaces had to be closed down for a period. The difficulties have now been surmounted, and during the closing months of the year the deficiency was rapidly liquidated. While there is nothing to record in the way of exceptional discoveries, still there was a steady and consistent output from the principal fields, including Charters Towers and Gympie. This position is clearly reflected by the dividends paid during the nine months of the year which amounted to £324,894, or £70,399 in excess of those for the same term in 1908.

In the state of New South Wales the gold-mining industry was particularly lifeless. The bulk of the yield continues to be furnished by the mines on the Cobar field, and by the dredges. The output from the Adelong division exhibits a satisfactory increase, but against this there was a considerable falling off in the yields from the Wyalong and Hillgrove fields. The state has been favored with exceptionally good seasons, and the pastoral and agricultural industries have found employment for so many additional hands that gold mining, or more particularly the prospecting for gold, has been comparatively neglected.

In Tasmania the yield was contributed mainly by the Tasmania gold mine at Beaconsfield, and by the Mount Lyell mines.

In South Australia the small returns from the gold mines at Mount Torrens, Petersburg, Glenloth, and Tarcoola were supplemented by contributions from the mines at Arltunga and MacDonnell ranges in the northern territory, also by the gold recovered by the Wallaroo & Moonta Copper Company. Reports of recent discoveries at Tanami in the northern territory are such as to emphasize the future possibilities of the "dead heart" of Australia.

In the Dominion of New Zealand the Waihi mine contributed another magnificent output, and still further enhanced its record. During the period ending with the first week in August this mine contributed gold to the value of £569,855, which brought the total value of the yield up to that date to £7,790,090. The dividends paid to Dec. 1, 1909, totaled £3,615,188. The Talisman Consolidated mine on the Karangahake goldfield is the next important producer and the operations conducted during the year have been attended with the most gratifying results. The additions and improvements made in the plants at these mines enabled an increased tonnage to be dealt with, and the indications point to a still larger output being contributed during the coming year. Dredging operations, though not conducted to the same extent as in previous years, still continued to supply good yields in the aggregate. Alluvial mining did not make any noteworthy progress, and owing to the gradual exhaustion of the deposits, a decreased output from this source is naturally to be expected. Taken altogether however, the gold-mining industry in the Dominion is in a flourishing condition.

Silver-lead Mines

The year's results proved disappointing, as owing to labor troubles, mining operations on the Broken Hill field were suspended on several of the large mines from the beginning of January until early in May. The concentrates despatched from the field during the first nine months of the year consequently showed a decrease of 160,972 tons and £630,648 in value. The Broken Hill Proprietary Company did not resume mining operations, but entered into a contract with several of the other companies for the purchase of lead concentrates, while the retreatment plants are kept running on the tailings which have accumulated to the extent of some 3,000,000 tons. The developments at the lower levels of the mine were unsatisfactory, but it is estimated that there are still several million tons of ore remaining to be extracted. Work is not, however, likely to be resumed below ground until a substantial rise takes place in the prices of metals. The fire in Block 11 mine is kept well in check. The output of this company for the half-year ending with May was only 438,109 oz. silver and 7609 tons of lead, as compared with 2,926,148 oz. silver and 47,842 tons of lead for the previous half-year. At the South mine it is estimated that the reserves of ore in sight above the 970-ft. level are sufficient to enable the present rate of output to be maintained for at least 13 years. The new mill is kept running full time treating about 7000 tons of ore weekly and producing 1000 tons of concentrates, and an appreciable reduction in working costs is shown. At the Central mine the bottom levels are opening up better than expected, and a big lode has been located at the 1100-ft. level. A good deal of ground crushed by the creep has again been opened up for production work. At Block 10 mine a new level is being opened up at a depth of 1615 ft., as on account of the orebody being comparatively narrow, operations have to be vigorously prosecuted at the deeper levels to keep the mill supplied. Block 14 mine is producting carbonate ore, but no attempt is being made to work the sulphide ores. The developments in the North mine below ground have proved encouraging. The new mill is now in operation, and a large output of concentrates is being maintained. The British and Junction mines remain closed down.

In the state of Queensland operations at the Mungana mines were affected first by a subsidence in the upper levels of the Lady Jane mine, and afterward by a fire in the workings. However, at the Girofla mines work was pushed on to maintain supplies of ore for the smelteries. For the year ending March the output of the reduction works of the Chillagoe company was 786,692 oz. silver, 6753 tons lead, and 2966 tons of copper.

In Tasmania the Zeehan, Dundas, Rosebery and Mt. Farrell mines were persistently worked and the output of silver-lead ore for the first nine months of the year amounted to 66,106 tons, valued at £240,777.

The silver contained in the gold ores of New Zealand, mined during the first 10 months of this year, amounted to 1,504,400 oz., valued at £149,990.

Zinc

The year's operations on the Broken Hill field showed clearly that the difficulties hitherto experienced in recovering the zinc from the vast heaps of accumulated tailings were successfully surmounted. The Elmore plant installed by the Zinc Corporation proved an unqualified success. The figures for the month of September may be quoted as thoroughly representative of the results secured: Tailings treated, 19,900 tons; zinc concentrates produced, 7395 tons, assaying zinc 45.8 per cent., silver 14.6 oz. per ton, lead 7.5 per cent.; lead concentrates produced 700 tons, assaying lead 57.5 per cent., silver 37.5 oz. per ton, and zinc 17 per cent.; working costs, 9s. per ton. The British Broken Hill Company is remodeling the mill and intends adding an Elmore plant, while Block 10 Company also proposes to install a similar plant. At the Central mine, operated by the Sulphide Coporation, the flotation (Potter) processes are doing good work, and have entirely superseded the magnetic plants. The Amalgamated Zinc (De Bavay's, Ltd.) is erecting a new mill consisting of two units. It is expected to have one unit in operation by January, 1910, and the other some three months later. When in full swing it is computed that the output will reach 100,000 tons of concentrates per annum. Contracts have been entered into for the sale of 90,000 tons of concentrates per annum for the next three years, and 70,000 tons per annum for the succeeding seven years. The Broken Hill Proprietary Company reports that the tube mills installed in connection with the zinc-treatment plant showed a great improvement in the recovery of the zinc. The flotation plant of this company also produced a large quantity of zinc concentrates. The construction of the spelter plant at Port Pirie was pushed, and it should be completed and in operation at an early date. Even after making considerable allowance for the fact that expectations as to the results likely to be secured may not be fully realized it is apparent that the Broken Hill field has become an important factor in the world's supply of spelter.

PRODUCTION OF MOUNT LYELL COMPANY.

Year	Ore Treated, Tons.	Metal Produced.		
		Copper, Tons.	Gold, Oz.	Silver, Oz.
1905	412,273	8,203	24,290	739,691
1906	394,752	9,009	23,088	703,945
1907	406,397	7,886	19,449	700,087
1908	401,983	8,641	19,532	681,262
1909	393,749	8,815	13,344	728,707
	2,009,154	12,554	99,703	3,553,692

COPPER

The accompanying table gives the output of copper by the Mount Lyell Company, Tasmania, during the years ending 30th September. The production for 1909 is slightly in advance of that of the preceding term. The assay value of the Mount Lyell pyrites was a little higher, and this is responsible for the increased copper production. Prospecting work was vigorously carried out by the company with encouraging results. The most important development was the proving at the 1000-ft. level in the North Mount Lyell of the downward continuation of bornite ore of a payable grade. The area of the orebodies in the higher levels of this mine, and particularly at the 700-, 850- and 1000-ft. levels, was proved by actual work to exceed that originally estimated, so that the reserves were considerably added to. The cost of producing blister copper for the year ending September was $3.69 per ton of ore treated. Since August, 1903, this company has contributed an output of 51,667 tons of copper, 4,466,200 oz. silver, and 124,691 oz. of gold.

At the Wallaroo & Moonta Company's mines in South Australia operations were continued on similar lines to those of 1908, although the output of copper was slightly increased. With the low prices ruling only very small quantities of outside ores were available on purchase account. The production of copper for the year from all sources, including what is derived from cementation, is expected to be about 5900 tons. The cost of producing "Wallaroo" ingot copper f.o.b. ocean steamer in 1908 was £54 16s. 8d., and for 1909 it is estimated approximately as follows: Mining, £39 3s.; smelting, £14; shipping and other charges, £1 2s.; total, £54 5s. per ton. The material smelted during the year amounted approximately to 170,000 tons. General development work at the mines was fully maintained, and a considerable expenditure was incurred at the Wallaroo mines, and at the smelting works in effecting improvements, and in additions to the plant.

In Queensland the output of copper was on an increased scale, the official figures for the first nine months of the year 1909 fixing the value at £659,885, as against £621,408 for the corresponding period in 1908. The accompanying table showing the output for the year ending with May indicates that the Mount Morgan Company has made headway.

These figures are all the more satisfactory when it is considered that the serious falls of roof which occurred in the months of September and November, 1908, checked operations and interrupted the supplies of ores, with the result that several of the furnaces had to be put out of commission. Operations have since proceeded on an increased scale, and in July the monthly output of copper reached 702 tons, and the production of copper for the first nine months of the year 1909 totaled 4523 tons. The development work undertaken showed that even larger quantities of auriferous copper ore are available than previously estimated, so that the future prospects of this company are bright. The basic ore which is being obtained from the Many Peaks mine obviated the use of ironstone and limestone fluxes, so that not only was the cost of treatment reduced, but a considerable quantity of ore hitherto regarded as unprofitable can now be successfully utilized. The other mines in the northern part of the State are developing well, and as they are being connected up and brought into communication with the seaboard by rail, a large increase in the production may safely be forecasted.

In New South Wales the principal copper producing mines were the Great Cobar, the Grafton, and the Kyloe. The other mines, owing to their lack of connection with the railway system, found the cost of transport too great to permit of operations being successfully prosecuted. The Great Cobar Company at the outset experienced some difficulty in operating the new furnaces installed, and the output was affected on this account. The blister copper produced during the first nine months of the year by this company is estimated to contain 4774 tons copper, 12,893 oz. gold, and 76,518 oz. silver. The developments underground have been particularly satisfactory.

OPERATIONS OF MOUNT MORGAN MINE.

Year.	Gold, Oz.	Copper, Tons.
1906	117,197	483
1907	145,138	4,087
1908	153,091	5,561
1909	138,311	5,799

The Port Kembla works of the Electrolytic Refining and Smelting Company of Australia, Ltd., have been in operation for practically a year. This company deals with the whole of the output of blister copper from the Mount Morgan mine. The smelting department drew supplies of mattes and ores from all parts of Australasia, and although production was materially restricted by the low price of copper, the refinery was able to more than justify its existence. Already the "E. S. A." brand of electrolytic copper has earned favorable recognition in the European markets and with the return of healthful conditions in the mining industry, it would seem that the works will require enlarging.

TIN

In the state of Tasmania the output of tin ore was well maintained, the official returns for the first nine months of 1909 giving the yield as 3208 tons, valued at £336,824. The vigorous policy of prospecting adopted at the Mount Bischoff mine has resulted in the ore reserves being considerably augmented, and the existing plant was largely added to with the object of increasing the output and lessening working costs. The company was enabled to maintain the remarkable run of dividends, which have now reached a total of £2,187,000, or £182 5s. per share. The Briseis mines continued to furnish tin ore in good quantity, and the output during the month of October, including a portion from the New Brothers No. 1 property, amounted to 88 tons.

In the state of Queensland the industry shows a marked retrogression when compared with the preceding year. The value of the output for the first nine months of 1909 totaled only £165,988, or £111,181 below that of the preceding term. The decrease is largely due to labor troubles causing a cessation of operations at the principal mines during the earlier months of the year. At the Stannary Hills mine a new plant was erected, and enabled a greatly increased output to be handled at a reduced cost. Development work disclosed that there is sufficient ore at present in sight for three years' work. The Vulcan mine showed considerable improvement during the latter months of the year, and there was a marked increase in the output. The latest reports indicate that a continuation of good crushings may be looked for, as operations disclosed the existence of bodies of ore in portions of the mine previously regarded as worked out. The main shaft at this mine was put down to a depth of 1450 ft. The Smiths Creek mines continue to produce ore of good quality, and the work of development is progressing on satisfactory lines.

In New South Wales the dredges continued to furnish the bulk of the yield, but some of the richer areas have been worked out, and a constant diminution in the yield is therefore, to be expected. The value of the tin and tin ore exported from this state during the first nine months of the year was £231,671, or £19,935 less than on the preceding year.

In West Australia the output of tin ore has been on a restricted scale, but it is expected that the construction of the Port Hedland & Marble Bar railway will give a stimulus to production.

Other Minerals

Respecting the numerous other minerals mined there is little of interest to report, operations having been governed largely by market conditions. From Queensland good supplies of wolfram continue to be drawn, while at Hillgrove in New South Wales, mining for scheelite was fairly active.

West Africa, Gold Coast and Ashanti

BY W. FISCHER WILKINSON *

The gold production of the Gold Coast and Ashanti, West Africa, during 1909 is expected to amount to £950,000, a figure considerably below that won during 1908, the reason being that several of the mills were shut down. The principal producing mines and the total output for the last ten years are given in the accompanying tables.

The Ashanti Goldfields and Abosso improved their production as compared with 1908 but Taquah did not do so well.

GOLD PRODUCTION OF GOLD COAST COLONY AND ASHANTI.

Year.	£	Year.	£
1900	38,006	1905	657,330
1901	22,186	1906	877,568
1902	96,880	1907	1,154,885
1903	254,790	1908	1,182,680
1904	345,608	1909	950,000*

*Estimated.

Broomassie and Bibiani remained about the same. Prestea Block A, Abbontiakoon Block I, and Wassau, which gave a considerable production in 1908, milled only in the early months of 1909. The Akrokerri company, which appeared in the producing list in 1908, went into liquidation. The Ashanti Goldfields, Abosso, Prestea, and Abbontiakoon maintained their grade, but the others showed a decrease, which was especially marked as regards Taquah and Broomassie. Attention was called last year to the high grade of Taquah as compared with other mines of the banket group. The dredging companies contributed a small amount to the production.

Ashanti Goldfields

The Ashanti Goldfields Corporation improved its position decidedly during 1909 and is now perhaps the strongest mining company in the Colony.

Justice's Find, the new orebody of great width and value discovered in 1908, continued to open up well, and the development of the mines at Obuasi was of a favorâble character. The main oreshoot of the Obuasi mine, which was cut at the third level of the Ashanti mine last year, was further developed on that level as well as on the sixth level. On the third level the oreshoot was proved to have an average width of 8 ft. and an average value of 3 oz. gold for a length of 502 ft. On the sixth level the same oreshoot proved to be shorter—about 220 ft. long—and to assay 27 dwt. over a width of 15 ft. The ore reserves at all the mines at the end of October were valued at over half a million tons of a gross value of two million pounds sterling, with an estimated profit in sight of over a million sterling.

GOLD COAST AND ASHANTI PRODUCING MINES IN 1909.

	Date.	Tons.	Value of Yield.	Value per Ton.
				s.
Ashanti Goldfields ...	Jan.-Oct.	45,754	£174,641	50 6
Abosso. ...	Jan.-Oct.	55,142	132,622	48 0
Taquah ..	Jan.-Oct.	50,933	114,539	44.8
Broomassie ..	Jan.-Sept.	20,036	81,269	80.1
Bibiani. ...	Jan.-Oct.	15,754	79,703	34 1
Abbontiakoon *a* ...	Jan.-May	27,439	48,218	34 6
Wassau *b* ...	Jan.-April	22,250	29,050	27 8
Prestea (Block A)*c*.	Jan.-June	46,500	79,377	34 0

*a*Shut down June. *b*Shut down May. *c*Shut down July.

For the year ended June 30, 1909, 70,345 long tons were milled, yielding bullion to the amount of £174,368 or 49s. 5d. per ton (44s. per short ton of 2000 lb.). The cost of mining, milling and general mine expenditure was 24s. ($5.84) per long ton. Freight and insurance of bullion, London expenses and the royalty of 5 per cent. of the gross value of bullion payable to the Government came to 4s. 7d. per ton. Depreciation and development account for 6s. 7d. per ton, making altogether a working cost of 35s. 2d. ($8.56) per ton. The development expenditure charged to working cost, it may be noticed, was only 25 per cent. of the expenditure incurred during the year, and though it may be a fair figure, it would have been sounder policy to have charged it all away to working expenditure.

The process of amalgamation followed by cyaniding was discarded, as no better extraction than 60 per cent. could be obtained by that method. The ore coming from the mine was crushed dry in ball mills, roasted in Edwards' furnaces and leached with cyanide solution, an extraction of 93.5 per cent. being obtained; the cost of mining was 6s., and of reduction 14s. per ton. The oxidized ore from Justice's Find was crushed wet and filter-pressed, at a cost of 10s. per ton for treatment and 4s. for quarrying, an extraction of 87.2 per cent. being obtained. The Obuasi ore yielded 15.14 dwt. and Justice's Find ore yielded 14.76 dwt. per ton. Having regard to the large increase in the ore reserves it was decided to increase the capacity of the reduction plant from 7000 to 10,000 tons per month, when it is expected that the total costs will be 32s. per ton of 2240 lb., and the profits about £24,000 per month.

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*Consulting mining engineer, London.

ORE RESERVES IN GOLD COAST AND ASHANTI MINES.

	Date.	Long Tons.	Value per Ton, dwt.
Abbontiakoon....	April 30, 1909	117,000	13.3
Abosso...	July 31, 1909	265,000*a*	11.3
Ashanti Goldfields	Nov. 30, 1909	519,300*b*	18.2
Bibiani....	Dec. 31, 1908	61,000	14.47
Broomassie	Dec. 31, 1908	9,851	32.6
Broomassie	Dec. 31, 1908	70,000	7.0
Prestea (Block A)	July 31, 1909	327,000	11.0
Taquah....	June 30, 1908	176,971	21.8
Taquah....	July 31, 1909	66,000*c*	26.0
Wassau....	Jan. 31, 1909	137,475	7.2
Cinnamon Bippo...	June 30, 1909	213,000	7.97

a Estimate of Arthur Wilkinson, inspecting engineer.

b Excluding 8 to 9 dwt. ore.

c Estimate of Arthur Wilkinson of ore in rich section.

Recent Reports Optimistic

The goldfield was a disappointment on the whole to its supporters up to the present time. Money was poured into the country with little return. In spite of previous failures a large amount of fresh capital was found in 1909, under the lead of the Consolidated Goldfields of South Africa, for giving the field another trial. This renewal of confidence is the outcome of a favorable report made by Walter Broadbridge, who expressed confidence that the mines could be made to pay. "The industry," he said, "needed energetic measures; the problem was to be solved by organization, development and, in certain instances, reconstruction. Development far in excess of that existing was necessary in order to provide for 100-stamp equipments with a big margin of ore reserves." In concluding a lengthy report he said that he hoped he would not be considered unreasonably optimistic in stating that the Gold Coast, including the Tarkwa field, in spite of the bad climate, has the makings of an industry which, if cerefully fostered and placed on a more substantial footing, will become one of the most important gold producers in the world.

This report was indorsed by J. H. Curle, who visited the country toward the end of 1908, and whose conclusions were summed up as follows: (1) It is a great goldfield, and if properly handled it should become a valuable one; (2) facilities for cheap working—outside of the climatic factor—are good; (3) the climatic factor is not so serious as has been thought.

As regards the climatic factor, Mr. Curle laid great stress on the necessity of exterminating the malaria mosquito. His plan was to cut down all growth for a mile round the mine, sow there a thick creeper grass, drain all damp ground, organize a supply of good food and in a word do everything that the experts of the tropical school of medicine could suggest.

Another favorable report written in 1909, dealing principally with the Taquah, Abosso and Prestea mines, is one by Arthur Wilkinson, an engineer of Rand experience. Unlike Mr. Curle, Mr. Wilkinson thought that labor was the crux of the whole question of successful gold mining in West Africa.

These reports have been quoted somewhat extensively as they led to the investment of large sums for the further development of the goldfield, sums which call for large profits from the mines to provide for adequate interest and redemption. The market valuation of West African mining stock now runs into millions and the future is alarmingly discounted. The gold production is now about one million sterling and the profits probably scarcely one-tenth of that. Very large increases are therefore needed to justify the prices at which the mines are now valued. Most of the money recently subscribed will go into the mines which are crushing or have been crushing, but some of it will be employed in testing the ground between the known oreshoots. The evidence so far obtained of the banket being payable over wide areas, as on the Rand, has not been encouraging and until more favorable results are obtained the valuation of companies by claim area, which is sometimes done, is to be deprecated.

Rhodesia

BY W. FISCHER WILKINSON *

The gold production of southern Rhodesia, that is of Rhodesia south of the Zambesi river, for the first ten months of 1909 was £2,156,999 and, allowing £431,400 for November and December, the total for 1909 may be expected to be about £2,590,000, somewhat in excess of the production of the previous year. The statistics in the accompanying tables are those of the Rhodesia Chamber of Mines, which happily from a statistician's point of view, changed its financial year to commence Jan. 1 instead of April 1.

As in 1908, the production was largely made up by a large number of small producers. There were about 115 companies or individuals making returns, a large number of whom worked with a five-stamp battery, or with chilean mills, Huntington mills, Wheeler pans or dollies. The 14 largest companies mentioned in the table accounted for about 46 per cent. of the output. The 101 other producers had, therefore, an average output of about £14,000, and if a few more of the larger producers had been added to the list of fourteen, the figures would have been still more striking.

Besides gold the country produced silver (contained in the gold bullion), lead, copper, chrome iron, wolfram, coal, antimony, asbestos and diamonds, aggregating about £200,000. As regards diamonds, an action brought by the British South Africa Company against the De Beers Consolidated Mines, Ltd., is now being tried to determine the validity of the De Beers diamond concession.

GOLD PRODUCTION OF SOUTHERN RHODESIA.

	Tons Milled.	Value of Gold Won £	Value per Ton, s.
Prior to Sept. 1, 1898	....*	23,456	.....
Sept. 1, 1898, to June 30, 1899	81,841	177,072	43.26
July 1, 1899, to June 30, 1900	104,746	208,877	39.88
July 1, 1900, to March 31, 1901	140,716	320,457	45.54
Year ended March 31, 1902	249,667	640,661	51.32
Year ended March 31, 1903	338,156	709,461	41 96
Year ended March 31, 1904	516,747	845,359	32 71
Year ended March 31, 1905	787,936	1,113,068	28 25
Year ended March 31, 1906	1,100,609	1,556,741	28 28
April 1, 1906, to Dec. 31, 1906	1,051,908	1,531,481	29 10
Year 1907	1,610,875	2,178,886	27 05
Year 1908	1,819,230	2,526,006	27 77
Year 1909†	1,850,000	2,590,000	28 00

*No details available. †Partly estimated.

The Mines

The most important mines as far as output is concerned, were the Globe & Phœnix and the Eldorado. The former mine has been working a number of years, and is probably the deepest mine in the country, the main shaft being 2300 feet deep. The bottom of the mine developed well, and a large increase in the profits was obtained. The ore reserves, which on Dec. 31, 1908, had a gross value of £485,020, were estimated on Sept. 30, 1909, to have a value of £1,045,151. The Eldorado mine, which commenced crushing in 1907, also turned out well. The ore worked is popularly described as "banket," though it has little resemblance to the Rand banket, having e appearance of a hornblende schist or eiss containing pebbles and boulders. iring the year a fresh issue of capital is made for the purpose of adding to e plant and for sinking a new main aft and an extension shaft.

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*Consulting mining engineer, London.

ITPUT OF PRINCIPAL MINES OF RHODESIA FOR NINE MONTHS ENDED, SEPTEMBER 30, 1909.

ame of Mine.	District.	Gold Produced.	Reduction Plant.
cks	Buluwayo.	£36,227	4 stamps.
sh Tick	Buluwayo.	24,621	20 stamps, 1 chilean mill and 2 pans.
st Gwanda	Buluwayo.	75,331	60 stamps, 1 chilean mill.
nely	Buluwayo	40,940	10 stamps.
ika	Gwelo.	43,626	5 stamps, and 1 chilean mill.
be & Phoenix	Gwelo.	169,466	40 stamps, and 3 Wheeler pans.
ukwe	Gwelo.	50,562	40 stamps.
rprise	Gwelo.	34,020	20 stamps.
nderer	Gwelo.	55,305	Rolls, dry process.
tlefields	Hartley.	46,763	2 Huntington mills, 1 chilean mill and 2 pans.
nt	Hartley.	52,591	15 stamps, 1 tube.
lorado	Lomogundi	127,474	20 stamps, 2 chilean mills and 8 pans.
mbo	Mazoe.	65,048	30 stamps.
nhalonga	Umtali.	67,254	60 stamps, 4 Huntington mills.

The Selukwe mine, one of the oldest mines in the country, was a producer, the gold won in the last financial year having amounted to over £63,000, but the operations were carried on at a loss. The Wanderer mine has been working a low-grade, auriferous deposit in the Selukwe district for some years, but was not a financial success. During the year a reconstruction of the capital was made to purchase the Camperdown property, which will be brought into connection with the Wanderer mill by a ropeway two or three miles in length. The Wanderer mine was worked as a quarry and the ore milled by a dry-crushing plant.

The Giant mine, which had to curtail operations last year on account of the collapse of its main shaft, will shortly be milling on the old basis. The mill is being increased by 15 stamps, and an output of 12,000 tons monthly arranged for. The new shaft, which is "timbered" with steel sets, was down to the sixth level (708 ft.) in July. The orebody is a wide schistose lode. On June 30, 1909, the ore reserves were 204,846 tons valued at 10.4 dwt. The mine is expected to be one of the largest gold producers of Rhodesia.

The most interesting event of the year was the discovery in the Abercorn district, at a place situated about 60 miles northeast of Salisbury, of an auriferous conglomerate. This conglomerate is reported to be similar as regards origin, though not in appearance, to the "banket" of the Eldorado mine in the Lomogundi district. This formation had been recognized some time previously, for F. P. Mennel referred to it in a paper presented to the Geological Society of South Africa and classified it with the Eldorado "banket" formation; but its auriferous character does not appear to have attracted much, if any, attention. The Shamva property, on which the most work has been done, has a line of old workings approximately 1500 ft. in length. The Consolidated Goldfields of South Africa has acquired a large interest in this property, and H. A. Piper, the consulting engineer, reported favorably upon it.

The year was marked by a good deal of reconstruction work as regards finance, in which work Rhodesian financiers should now be experts as they have had much experience. A number of fresh enterprises were launched, in which the Transvaal mining community has taken a prominent part—a feature which has a favorable significance. On the whole it may be fairly said that the year was one of progress as regards mining, and that the prospects for the future are encouraging.

The Transvaal

BY W. FISCHER WILKINSON*

In round figures the total gold pro- ction of the Transvaal for the year 09 may be expected to amount to some- ing in excess of £31,000,000, an in- ease over the production of 1908. The companying table, which gives the lue of the gold won from the Wit- itersrand district and from mines in tside districts, shows—if the war period neglected—a constant increase year by ar.

In spite of the enormous produc- n there is good reason for predicting at the zenith has not yet been reached. ie limiting factor today is not so much e extent of ground suitable for mining the labor required for exploiting the nes, and as difficulty is now being ex- rienced in providing for present re- irements, rapid expansion in the gold tput is not to be expected.

To illustrate the progress that has been ide, it is interesting to compare the turns of the mines of the Witwaters- nd district for the month of September th the corresponding figures for the me month of the previous year. In ptember, 1909, there were 600 addi- nal stamps working and 39 additional tube mills, with the result that the tonnage milled increased 13.4 per cent. The average grade of ore treated, however, was lower by 2s. 6d., and the costs by 6d. per ton, or considerably less than the fall in grade. The total value of gold won was 3.6 per cent. in excess of that won during the same period in 1908. The net profit per ton fell by about 15 per cent.

TABLE I. YEARLY PRODUCTION OF TRANSVAAL MINES.

Year.	Witwatersrand District. Tons Milled.	Witwatersrand District. Value.	Witwatersrand District. Value per Ton Milled, Shillings.	Outside Mines Value.	Transvaal Total.
1884–9	1,000,000	£2,440,000	48.83	£238,231	£2,678,231
1890	730,000	1,735,491	47.4	134,154	1,869,645
1891	1,154,144	2,556,328	44.2	367,977	2,924,305
1892	1,979,354	4,297,610	43.4	243,461	4,541,071
1893	2,203,704	5,187,206	47.0	293,292	5,480,498
1894	2,830,885	6,963,100	49.2	704,052	7,667,152
1895	3,456,575	7,840,770	45.2	728,776	8,569,555
1896	4,011,697	7,864,341	39.2	739,480	8,603,821
1897	5,325,355	10,583,616	39.74	1,070,109	11,653,725
1898	7,331,446	15,141,376	41.3	1,099,254	16,240,630
1899	6,872,750	15.067,473	48.84	661,220	15,728,693
1900	459,018	1,510,131	65.82	....	1,510,131
1901	412,006	1,014,687	49.25	81,364	1,096,051
1902	3,416,813	7,179,074	42.00	74,591	7,253,665
1903	6,105,016	12,146,307	39.79	442,941	12,589,248
1904	8,058,295	15,539,219	38.46	515,590	16,054,809
1905	11,160,422	19,991,658	35.82	810,416	20,802,074
1906	13,571,554	23,615,400	34.8	964,587	24,579,987
1907	15,523,229	26,421,837	34.04	981,901	27,403,738
1908	18,196,589	28,810,393	31.6	1,147,217	29,957,610
1909*	20,800,000	30,073,000	28.8	1,024,000	31,097,000

*Estimated.

Lower Grade of Ore Worked

It will be noticed in the table of production and from Table II that the grade of ore milled, as measured by the yield, which was about 92 per cent. of the original value, was lower than that treated in 1908, and considerably less than 10 years ago; and, indeed, the figures rather understate the fall in grade because the extraction is now generally higher than in former years. This reduction of grade was due mainly to the deliberate policy of taking out of the mines ore of lower quality than was formerly mined.

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*Consulting mining engineer, London.

TABLE II. RETURNS FROM TRANSVAAL ORES

	Recovery per Ton.	Costs per Ton.	Dividend per Ton.
	s.	s.	s.
1897	39.7	29.6	10.2
1898	41.3	28.0	13.0
1899	43.8	34.8	8.9
1903†	39.8	28.8	11.0
1904	38.5	29.0	9.5
1905	35.8	27.2	8.5
1906	34.8	26.4	8.2
1907	34.0	25.0	9.0
1908	31.6	22.2	9.4
1909	28.8*	19.6*	9.2*

*Estimated. †1900-1902 War period.

Note—Table compiled from returns of gold mines of the Witwatersrand to show the value per ton received, the dividend paid per ton and the cost of working (here taken as the difference between the value recovered and the dividend).

TABLE III DISTRIBUTION OF GOLD WON IN THE TRANSVAAL.

	1906.		1907.		1908.		1909.	
	£	Per Cent.	£	Per Cent.	£	Per Cent.	£	Per Cent.
Working costs. ...	14,637,043	66.23	17,000,000	63.813	16,600,000	58.2	17,860,000	57.64
Dividends	5,234,750	23.69	6,750,000	25.337	8,000,000	28.1	9,300,000	30.01
Profits tax	475,000	2.15	600,000	2.252	740,000	2.6	928,275	3.00
Reserve fund, Debenture, Redemption, Machinery, Renewals, etc.	1,753,914	7.93	2,290,490	8.598	3,168,368	11.1	2,897,693	9.35
	22,100,707	100.00	26,640,490	100.00	28,508,368	100.00	30,985,966	100.00

Note—Year ended June 30. Compiled by Consolidated Goldfields of South Africa from Mines Department Statistics.

The effect of this policy is, of course, to lower costs, as the wider the stopes the less is the cost of mining. It has also the effect of adding considerably to the gross production of gold in any particular area. In all mines there are ores ranging in value from zero up to the highest grade, and one of the most difficult problems that a mine manager has to face is to decide what is the ideal grade. If he mines closely he gets a large profit, high costs and a reduced life. If he aims at getting every ton of ore out of the mine that will pay expenses he gets low costs, small profits or none at all, and a long life. He has, therefore, to strike the happy medium and extract a grade of ore that will give what he considers the best results.

Opinions differ as to whether the policy of including low-grade ore has not, in the majority of cases been carried too far. I think that it has, and that in many cases a raising of the grade at the expense of longevity and of the working costs would produce better financial results for the shareholders. The subject is too technical to be discussed at length here—the reader must go to the transactions of the technical societies for detailed examination of the subject—but attention may be called to the great influence that the law of compound interest has in deciding the question of ideal grade. Gold is not productive until it is extracted from the mine and turned into bullion. And it is this principle which so strongly favors the policy of mining a high- instead of a low-grade ore.

If a mine has a life of 20 years on a basis of producing 500,000 tons per annum at a profit of 20s. per ton, its present value, assuming the investment is required to pay 6 per cent. and to give back the capital at the end of the life by a sinking fund invested at 3 per cent., is about £5,150,000. If the grade is reduced so as to give a 15s. profit per ton, the life must be extended to about 50 years in order to obtain an equivalent present value, or, in other words, to make the change of policy justifiable.

The lowering of the grade has, therefore, to be treated with great caution. Many of the mines now working are no doubt low-grade by nature, but there are probably not a few in which the grade has been reduced below what is financially sound for the sake of low costs and extended life.

TABLE IV. ANALYSIS OF WORKING COSTS IN THE TRANSVAAL.

	1906.		1907.		1908.		1909.	
	£	Per Cent.	£	Per Cent	£	Per Cent.	£	Per Cent.
White wages	5,049,780	31.5	5,916,000	34.98	5,650,000	34.0	6,050,000	33.87
Colored and Chinese.	2,781,038	19.0	3,211,900	19.07	3,400,000	20.5	3,900,000	21.84
Stores	5,781,632	39.5	6,439,600	37.88	6,300,000	38.0	6,630,000	37.12
Sundries	1,024,593	7.0	1,371,900	8.07	1,250,000	7.5	1,280,000	7.17
	11,637,013	100.0	17,000,000	100.00	16,600,000	100.0	17,860,000	100.00

Note—Year ended June 30 Compiled by Consolidated Goldfields of South Africa from Mines Department statistics.

Working Costs

Owing largely to the policy of working lower-grade ores, costs showed a marked diminution over those of previous years. It must be obvious that when wider stopes are kept and ore which in former years was left in the mine is sent to the mill, the cost calculated on the diluted ton will be less. I noted this point in the 1908 review, saying that in comparing costs it was necessary to remember that the ton of today was not the ton of yesterday—meaning, of course, that it differed in quality. I make this explanation because I have been questioned as to my meaning.

The larger scale of working also had a beneficial effect in reducing costs, as it allowed the fixed charges to be spread over a larger tonnage. Besides the reductions resulting from the above causes, reductions were made by improved methods of mining and by increased efficiency of labor.

The system of breaking ore on day shift alone was adopted on several mines with great advantage to ventilation and, therefore, to the efficiency of the workers. The single-shaft system also allowed of better supervision. The increased use of electric power contributed considerably to the reduction in costs. In metallurgical work benefits were obtained through the use of heavier stamps and of improved appliances for handling sands.

There were thus several influences at work to bring about a reduction in costs, and it is not easy to apportion them. The popular explanation is that this reduction was due to large-scale working, an explanation which the advocates of amalgamations strongly support. But, although some appreciable reduction was no doubt due to this cause, owing, as noted above, to the reduced weight of fixed charges, I believe it is mainly the policy of working poorer ores that has created the fall in costs. Both breaking and development benefit largely by the adoption of this method of working.

The favorable influence of modern plants and shafts must also be noted. One of the most cheaply worked mines, as well as one of the deepest, is the Simmer Deep. During the month of September, 1909, the costs at this mine were only 12s. 7d. per ton, and that on a production by no means the largest on the field. These costs compare favorably with an old established mine like the Robinson Deep, which works a larger tonnage for 16s. 6d. per ton. As a general rule, it will be found that the mines with the lowest costs are those with wide reefs and large mills. Where the reefs are narrow and where, consequently, a arge production cannot be maintained, he costs are comparatively high, but it loes not follow that the mines are being ess efficiently worked. To illustrate the eneral effect of large-scale working, the ccompanying analysis (Table V) of 60 ompanies making returns for August, 909, has been prepared.

ABLE V. AVERAGE MILLING COSTS ON THE RAND.

Tons Milled per Month.	Number of Companies.	Average Cost per Ton Milled.
		s. d.
nder 10,000 tons...	12	22 8
0,000 to 20,000....	15	19 2
0,000 to 30,000....	12	17 4
0,000 to 40,000....	8	16 2
0,000 to 50,000....	7	15 0
ver 50,000........	6	15 4

The results obtained by the six largest roducers during August, 1909, are given Table VI. In the Randfontein South, e East Rand and the Crown mines the illing plant is not in one unit.

ABLE VI. COSTS AT THE LARGE MILLS.

	Yield per Ton Milled.	Costs per Ton Milled.	Profit per Ton Milled.
	s. d.	s. d.	s. d.
nights Deep..	21 5	12 6	8 8
andfontein South.......	28 9	19 2*	9 6*
obinson Deep.	26 9	16 9	9 8
mmer and Jack........	26 4	11 10	14 3
ast Rand Proprietary.....	29 3	15 2	13 9
own Mines...	33 11	16 4	17 2

*Estimated.

Perhaps one of the best ways of illusating the reduction in costs and in what partments the chief savings were made, ill be by giving the detailed costs over number of years of the Simmer & Jack ne, one of the outcrop companies, ich at present is the cheapest worked ne on the field. The reduction in un- rground costs is striking. Since 1908 mine was worked on day shift alone, system that proved very economical.

TABLE VII. WORKING COSTS AT THE SIMMER & JACK.

Year Ended June 30.	1905.	1906.	1907.	1908.	1909.
ons milled......................	475,181	624,507	717,524	785,310	831,040
	s. d.	s. d.	s. d.	s. d.	s. d.
ining, hauling and pumping.......	14 3	12 4	11 0	8 11	6 4
ransport of quartz; crushing and sorting; milling and cyaniding........	5 0	4 7	4 3	4 2	3 9
evelopment and redemption.......	2 6	2 6	2 6	1 9	1 9
eneral charges, renewals, maintenance, etc....................	1 6	1 0	1 7	1 5	1 3
Total costs....................	23 3	20 5	19 4	16 3	13 1
Total yield....................	32 0	31 10	33 5*	33 4	29 9
Total profit..................	8 9	11 5	14 1	17 1	16 8

*Includes ⅓ reserve gold declared.

LABOR

As mentioned above, the question which itated the mining community most dur- 1909 was that of the native-labor supply. Table VIII shows the latest statistics of white, colored and Chinese labor employed on the gold mines of the Transvaal, as well as the figures for previous years. The figures are encouraging, showing a steady increase in spite of the repatriation of the Chinese. During the later months in the year there was a falling off in Kafirs which caused considerable alarm, and the outlook for the future was not promising.

The recruiting agencies are making greater efforts, and the shortage is being met to some extent by increased efficiency in the native himself and by the practice of greater economy in labor on the part of the managers. The statistics also show an increase in the employment of white labor, the ratio in August being 1 white to 7.7 natives.

TABLE VIII. LABOR EMPLOYED IN TRANSVAAL GOLD MINES.

MINES DEPARTMENT STATISTICS.

		White.	Colored.	Chinese.	Total Colored and Chinese.
1902........	July........	8,162	32,616	......	32,616
	Dec.........	10,292	45,698	......	45,698
1903........	June........	11,825	66,221	......	66,221
	Dec.........	12,695	73,558	......	73,558
1904........	June........	13,413	74,632	1,004	75,636
	Dec.........	15,023	83,639	20,885	104,524
1905........	June........	16,939	104,902	41,340	146,242
	Dec.........	18,159	93,831	47,267	141,098
1906........	June........	17,959	90,882	52,352	143,234
	Dec.........	17,495	98,156	52,917	151,073
1907........	June........	17,166	111,862	51,517	163,379
	Dec.........	17,697	129,618	37,118	166,736
1908........	June........	18,181	147,557	21,460	169,017
	Dec.........	19,605	164,826	12,275	177,101
1909........	June........	21,620	175,895	7,317	183,212

As an example of what can be done by better organization attention may be called to the case of the Simmer & Jack where, during the last financial year, a larger tonnage was treated with a less number of natives. The tonnage increase was 5.8 per cent. and the labor decrease was 12 per cent. The repatriation of the Chinese laborers continued during the year and it is expected that by April, 1910, all will have gone.

DIVIDENDS

The dividends declared for the half year, January to June, amounted to £4,549,097 for the Witwatersrand companies, and £50,201 for the outside mines, a total of £4,599,298. The total for the year may, therefore, be expected to be between nine and ten million pounds sterling, showing a considerable increase over 1908. Table IX gives the dividends paid from 1887 to date.

AMALGAMATIONS

The policy of amalgamating companies into larger units, which was discussed at some length in the 1908 review, was continued during 1909. The most notable of the amalgamations is that of the Crown Mines, a company formed to acquire several of the most important companies of the central Rand. The advantages officially claimed for the amalgamation were as follows: (1) Considerable prolongation of profitable life, which materially reduces the annual amount investors should set aside for amortization. (2) Increased facilities for maintaining a regular grade of ore. (3) Increased facilities for reducing working costs without impairing efficiency, by centralization of administration and concentration of work. Such reduction spread over the life of the amalgamated company will amount to an important sum.

A large amount of deep-level ground was included in this amalgamation, and it was estimated that the life of the new company would exceed half a century.

Other amalgamations that took place during the year were: The Kleinfontein Deep and the Van Ryn Deep; the Ferguson, East Randfontein, Van Hulsteyn and Johnson, combined into the Randfontein Central; the Consolidated Main Reef, the Main Reef East and the Main Reef Deep absorbed by the Consolidated Main Reef; the Rand Klipfontein and the Klipfontein Estate amalgamated into a company called the Rand Klip; the Lancaster and Lancaster West; the Robinson, Porges, South, North and Stubbs Randfontein into the Randfontein South; the Langlaagte Estate, Langlaate Block B, and the Langlaagte Exploration absorbed by the Langlaagte Estate; the Geldenhuis Estate, Geldenhuis Deep and Jumpers Deep absorbed by the Geldenhuis Deep; the Rose Deep and Glen Deep, the combined companies being continued under the name of the Rose Deep.

Besides these amalgamations, several

of the companies were reconstructed for the purpose of obtaining fresh working capital or additional claims. Among these may be mentioned the Aurora West, the Brakpan, the Western Rand Estates Company, the Main Reef West, the Rand Collieries, the Apex Company, the Meyer and Charlton, the West Rand Consolidated and the Van Dyk. An important change in ownership took place when the Rand Mines Deep Company sold its property to the Rand Mines, Ltd.

From what has been said it will be seen that the year was one of great activity in consolidating mining areas and in reorganizing the finances of a large number of companies. The reconstruction work that has been going on has brought out a large amount of fresh capital, most of which has gone toward developing the eastern Rand.

In the western end of the Rand, activity was not so great, and the goldfield from a producing point of view may still be said to end at Randfontein. On the Western Rand Estates, where the Randfontein series is claimed to have been proved by boring some years back, active development work is proposed, so that perhaps in the near future this end of the Rand may attract more attention.

TABLE IX. DIVIDEND LIST OF TRANSVAAL GOLD MINING COMPANIES.

Year.	Dividends.	Year.	Dividends.	Year.	Dividends.
1887	£12,976	1895	£2,046,852	1903	£3,362,237
1888	112,802	1896	1,513,682	1904	3,928,487
1889	432,541	1897	2,707,181	1905	4,857,539
1890	254,551	1898	4,864,973	1906	5,735,161
1891	334,698	1899	3,109,041	1907	7,131,612
1892	901,470	1900	nil	1908	8,751,282
1893	955,358	1901	415,813	1909*	4,599,298
1894	1,532,284	1902	2,121,126		

*January to June.

Notable Events

Of the notable events of the year, the heavy floods, which took place in January and which for a time caused considerable trouble to the mines and in one case a serious disaster, deserve mention. Through the collapse of a dam on the May Consolidated, the Witwatersrand (Knights) mine was flooded, with the result that seven white miners and 121 natives lost their lives. Twenty-four natives were rescued after an imprisonment in the mine of eight days, during which time they do not appear to have suffered very much except from anxiety that the time put in underground would not be paid for. It is at all events recorded that on being brought to surface the first thing they attended to was to see that their time tickets were properly filled in.

The Witwatersrand mine was particularly unfortunate as regards accidents, as another accident took place shortly before the flooding accident just recorded, some lives being lost through gas. It is mentioned here because it produced deeds of heroism on the part of several of the white miners, one of whom, John Jones, happily survived, receiving subsequently the Edward medal which was created by His Majesty Edward VII, in 1907, as a reward for bravery in mines. This is the first time this distinction has been won on the Witwatersrand goldfields.

Another event of the year was the calling for tenders for leases of mining ground owned by the government. Two areas on the farm Modderfontein and one in the central Rand were offered, the conditions being that a certain sum of money, calculated to be sufficient to bring the mine to a producing stage, should be guaranteed and that a percentage of the profits based on a sliding scale should be paid to the government. A further condition is that a portion of the capital shall be offered for subscription to residents in the Transvaal.

During the year the Act of Union agreed upon by the four colonies, Cape of Good Hope, Natal, Orange River, and the Transvaal Colonies, received the royal assent and will come into force next year.

Miners' Rights under Surface Plants

A feature of the year's work was the negotiations between the mine owners and the government with regard to the mining rights of *bewaarplaatsen* and water rights, that is, areas reserved for surface plant or the storage of water. Under the gold law the mining rights under these areas are vested in the government; they are, as a rule, too small to be worked separately, and can be profitably exploited only by the adjoining mines. At a recent meeting of the Meyer & Charlton company, George Albu announced that a satisfactory settlement had been reached. It was agreed that the *bewaarplaatsen* and water rights are to be worked by the mine on the basis of equal division of the profits between the mine and the government.

In order to convert this arrangement into a practical form the present value of the estimated profits to be won from the government ground (less 50 per cent. accruing to the mining company) are to be reduced to a corresponding percentage of the present value of the total profits to be earned over the extended area. In the case of the Meyer & Charlton, the government will get between 10 and 15 per cent. of the profits in return for the *bewaarplaatsen*. This seemed a complicated arrangement and one which will lead to difficulties in the event of the area being still further increased in the future; but it is satisfactory that some agreement was at last reached.

Development in Depth

As regards the continuation of the gold content as greater depths are reached, the work done during the year was, on the whole, satisfactory. Whether the formation becomes impoverished in depth has always been a mooted subject, and even today it is impossible to give a decided answer one way or the other. The falling off in the average yield from year to year is largely due to the practice of working poorer ores than formerly, and is, of course, no proof of impoverishment. The evidence now available seems to indicate that the ores will vary in the deeper workings, just as they do near the surface. At all events, in some of the deepest workings, such as at the City Deep and at Brakpan, good ore was found, while in other places the grade shows a distinct falling off in depth.

One of the best examples of this is the Robinson Deep on the central Rand. The operations of this mine during the last few months did a great deal to shake the confidence of investors in deep-level mines, not so much on account of the lower grade encountered in depth, which may be only temporary, but on account of a sudden heavy fall in the profits which took place. This occurrence, taking into account the value and tonnage of the ore reserves, was not due for a year or so. The Robinson Deep has always been regarded as one of the safest securities on the Rand, and its failure to keep up its reputation is a blow to the credit of the industry generally.

The deepest workings on the central Rand are those of the Village Deep, where the reefs have been cut by the Turf shaft at a depth of about 4000 ft. Only a small amount of development was carried out, but that done was not especially encouraging. The latest report—that for September—gives the following results: South reef at 16th level, 38.5 in., 7.3 dwt.; main reef leader at 17th level, east drive, 58 ft. reef, 51.57 in., 4.89 dwt.; west drive, 64 ft. reef, 44.85 in., 4.03 dwt. A note is made that in the above exposures of south reef and main reef leader there are included upper bands of very low grade which, if persistently poor, might be excluded from stoping operations, thus improving the average grade. In the 18th level the main reef leader, when first cut, showed an average width of 45 in., and an average assay of 13.1 pennyweights.

The City Deep development afforded strong evidence of the occurrence of payable ores at great depths. The workings of this mine are at a depth of 3000 ft., and up to Sept. 30, 1909, the tonnage exposed amounted to nearly 1,500,000 tons averaging 8.9 dwt. (37s.), over a stoping width of 64 inches.

In the far-eastern Rand, good assays ere also secured at great depths at rakpan, where the samplings over a ngth of 6647 ft. of reef showed a width ' 37.2 in., averaging 7.8 dwt. The ore serves in this mine were estimated in und figures at 400,000 tons, from which 29s. per ton can be recovered. In this mine the main reef was intersected in No. 2 shaft at a depth of 3695 feet.

On the Van Dyk mine, on the other hand, the development work has given disappointing results. At the Simmer Deep and Jupiter mines, which were worked at a depth of from 3000 to 4000 ft., crushing returns of about 18s. and 23s. per ton, respectively, were obtained, recoveries that do not leave a large margin for profit. At the Cinderella Deep, another deep mine, a yield of 30s. per ton was obtained for several months.

Mexico

SPECIAL CORRESPONDENCE

During 1909 the operating mines in exico had to contend with the con- uation of low prices for silver and pper, the principal mining products, d the developing companies were ham- ered by the difficulty in securing suffi- ent capital on good terms, due to the settled political conditions in the untry which were at an acute stage ring most of 1909. The industry, too, d to face the prospect of an increase ore freight rates on the government- ntrolled railroads and to adjust itself the installation of a protective freight te on imported coal and coke.

The delay in the final passage of the w mining law, enacted in December, 09, after more than two years' discus- on, unsettled many new mining enter- ises in which foreign capital was in- sted, because of the uncertainty as to e final results in regard to the so-called nti-foreign" clauses of the law as sub- itted. The large mines met the low ices by introducing economies of opera- n and improvements in method and uipment.

The political situation improved in re- nt months and there is now a restored nfidence at home and abroad in the rmanency of the Government and in e continuation of its liberal policies ward the mining industry and foreign vestments. The mining law as enacted entirely satisfactory, and its main new ovisions are considered favorable to the dustry even as compared with the rmer very favorable law. There re- ains the fact that the combined taxa- n borne by the industry is heavy, and t little of the money raised by taxa- n from the mines is returned to their nefit by the way of much needed pub- and local improvements. This situa- n is more than offset, however, by the eap cost of operation, mostly in the bor item and the low prices, compara- ely, at which the mines have been and n be bought.

The foreign interests in Mexican min- g continue to increase as compared to e Mexican holdings. American capital ntrols probably in excess of 75 per cent the operating and developing proper- s of Mexico. The English interest is xt in importance, and in 1908 and 1909 this interest increased. The German and French operations are small, comparatively, although not unimportant. Probably 90 per cent. of the mining operations in Mexico today are controlled by foreigners and mostly owned, too, outside of the country. This is an anomalous condition fraught with an important bearing on the future of the industry and of the country.

The mining industry of Mexico is rapidly entering the industrial stage, in which large operations treating low-grade ores at a small profit are the feature and the basis of the business. This is notably true in the camps of Guanajuato, Pachuca, Santa Eulalia, Cananea, Mazapil and Teziutlan, in Oaxaca and in Jalisco, and in other of the old districts once famous for their production of bonanza ores and now to become noted for their output of great tonnages of low-grade ores, yielding an increased metal product and an increased profit. The success and improvement in the treatment of the abundant low-grade silver ores of the country by cyanidation is the chief factor in this new order, and it is evident to those who know the conditions of the many old mining districts of Mexico that this change is only just beginning. This period of industrial mining requires larger capital, all of which must be secured abroad, and technically skilled men, most of whom come from the United States and from the British mining colonies.

The importance of the mineral areas of Mexico has become more generally recognized in the last few years by reason of the intelligent exploration and competent investigation made by representatives of investing English and American companies, and also by the scientifically directed explorations which have been extensively carried on in the older camps. For example, it is said that there is now more ore developed in the Santa Eulalia camp in Chihuahua than has been taken out of it in 200 years. In Pachuca it is evident that in the next 50 years there is a likelihood that the output will be as great, in the aggregate, as it has been in the last 300 years. There are, too, hundreds of districts in remote mountain localities unsupplied with the economic conditions for mining, which offer certain promise of successful exploitation. These districts are all being investigated and they only await the coming of the right men, with sufficient faith and capital to realize their possibilities.

Gold and Silver

The greater part of the precious-metal production of Mexico has been and is silver. In the times past when silver commanded a higher price, the rich and easily mined bodies of silver ore yielded veritable bonanzas, comparable to the output of any of the gold-mining camps of the world in profit and in total value. With the decrease in the price of silver, however, the output has continued to increase so that silver today makes up the bulk of the precious-metal yield of the country,

The silver production for the fiscal year ended June 30, 1908, was 28,572 kg., and in 31 years, according to government figures, it has exceeded 225,000 kg. The official figures for the current fiscal and calendar year are not available but they will undoubtedly show an increase in the silver output. This increase came mainly from the older camps in which many mills using modern processes and treating large tonnages are now in operation. It is to be noticed that this large silver production comes largely from low-grade ore (running perhaps as high as one "kilo" (32.15 troy oz.) in silver). Much that is treated contains from 400 to 800 grams of silver per ton. Some of the mines of Mexico produce rich ore, 7 to 20 kg. per ton, but this is the exception.

The gold production of Mexico, according to official reports, for 31 years, has amounted to more than 334,228,518 pesos. The gold yield has grown during the period covered by the above statistics from 1,473,912 pesos per year to 38,096,661 pesos for the fiscal year 1908-09. The greater part of the gold production was in connection with the silver output. The gold ratio to silver is fairly constant in most of the camps and runs from four to ten grams of gold to the kilogram of silver. Formerly this was largely lost in the old patio process treatment, but with the introduction of cyanidation most of this gold is recovered. Also considerable gold was produced in connection with the copper output of the country, which after several months suspension is now greater than ever before. The El Oro camp in Mexico produced mainly gold. There are gold districts in Oaxaca, Puebla, Sonora and Colima, but the operations in most of these, at present, are on a small scale.

Practically no successful placer or gravel operations are under way in Mexico at the present time. The reported rich placers of Sinaloa have been examined and condemned by American dredging engineers. The elaborate attempt to operate placers in eastern Chihuahua has so far failed. Some placer gold is obtained in Sonora, in the Altar district and also from the Fuerte and Yaqui rivers. An American company has undertaken to exploit the old placer deposit in Colima, near the Pacific coast, which in former days produced extensively and which has continued to yield in a small way under primitive methods.

Several attempts have been made to develop the gold district in Oaxaca, with the prospect at present of the successful operation of several small properties. The most notable gold property in Mexico, the Lluvia del Oro in Chihuahua was hindered in operation during 1909 by the delay in the installation of necessary machinery. An English-owned gold property at Mezquital del Oro in Zacatecas was recently revived.

No notable new silver or gold districts were discovered during 1909, but development of the older districts, Guanajuato, Pachuca, El Oro, Parral, Santa Eulalia, etc., gave much encouragement as to the future production of the low-grade, silicious and iron-lead-carbonate silver-bearing ores. The resumption of operations at the Cananea copper mines added to the silver and gold output.

The most notable features during recent times in connection with silver mining in Mexico are the development of the application of cyanidation to the silver ores and the working out of the mechanical and chemical problems which enable the profitable treatment of ores containing as low as 400 grams (12.9 oz.) in silver per ton. In Jalisco important progress has been made.

COPPER

There was no particular change in the copper-mining industry in Mexico during 1909. The Cananea mine, the most noted in the country, resumed full production. The Boleo mine, in Baja California, owned by the French Rothschilds, continued to work at full capacity, and is now producing regularly, shipping its products by boat to France. The Cananea company made extensive new installations for ore treatment and improved and changed the methods of mining so that the production is now on a greatly reduced cost basis. The copper smeltery at Teziutlan, in the state of Puebla, was not in operation during the year, but an extensive hydroelectric plant was installed and the smeltery is ready to operate at full capacity, treating the ores from the company's mines at Teziutlan and from Los Ocotes mine, owned by the company in Oaxaca. The Continental mine at Panuco, in the state of Coahuila, was idle during the year, pending investigations as to a special process of the peculiar ores there found. The English-owned Mazapil Copper Company, operating in the northern part of Zacatecas, and with a copper smeltery at Mazapil, continued to produce to normal capacity throughout the year.

The custom smelteries at San Luis Potosi, Chihuahua, Aguascalientes, Monterey and Torreon treated ores from the smaller mines operating in tributary sections. Attempts to develop the mines in the Jalisco districts have been so far mainly unsuccessful owing to transportation difficulties. However, the Carrizo smeltery is now in operation and will shortly increase its output, and a projected railroad will relieve the condition as to transportation in that section.

The ill-fated La Dicha mine, in the state of Guerrero, is in the hands of the creditors, and attempts at development have been abandoned. Another important property is being opened up at La Union in this same state, tributary to a tidewater port. The copper deposits of the state of Michoacan were, in the main, idle during 1909. The property belonging to the Rothschilds at Inguarán has been extensively developed and is said to have blocked out several million dollars worth of ore running from 2 to 4 per cent. copper; but it is impracticable to operate without a railroad and no move has been made toward a railroad so far. Several smaller properties in this state have been developed in a small way, and there is promise of extensive copper production from Michoacan when transportation conditions are improved.

Numerous copper properties were operating during 1909 in Durango and Chihuahua and also in Sonora. An English company is exploring for copper on the isthmus of Tehuantepec at a port called Tonala. The famous mines at Las Minas, in the state of Veracruz, were examined during 1909, but no negotiations resulted.

The attempts to finance the smeltery and copper properties at Zimapan in the state of Hidalgo, have so far not been successful. The prospects are that this district will become an important producer.

No great copper deposits similar to the porphyry copper deposits of the United States have so far been developed in Mexico, but undoubtedly such deposits exist and were entirely overlooked in the effort to find rich ores which would justify working under the adverse conditions which in the main prevail as regards the Mexican copper properties. Several experienced engineers are giving this phase of the copper situation in Mexico attention at this time.

During 1909 the Mexican government granted to the Cananea Consolidated Copper Company the right to import oil free, as a concession to advance the interest of this company and to encourage it to resume production on a large scale. The concession has proved a large item of saving in the operations of this company.

LEAD

The main lead production of Mexico comes from the Central Plateau country, where the great camps of Sierra Mojada, Almaloya, Niaca and Santa Eualalia are situated. These lead ores occur mostly as carbonates and are necessary and useful in the smelting operations. The lead production from the numerous mines in the northeastern states of the republic continued large, and was from widely distributed camps. This ore was mostly shipped to the smelteries at Monterey. Most of the lead ores in Mexico carry silver and are available for this reason. The lead, as bullion, is mostly shipped to the United States for refining.

ZINC

The zinc operations in Mexico during 1909 received a decided setback with the enactment of the American tariff. During the early months of the year the ores were shipped to the United States under the disputed tariff ruling and the tariff was paid or guaranteed mainly by the buyers. After the decision which removed this duty was rendered, a considerable increase in zinc shipments resulted, but this was soon stopped by the enactment of the law by Congress which placed a duty of 1c. per lb. on the zinc contents of imported ores. In addition to this the zinc ores, under judicial decision, must pay the lead duty on all lead over 0.1 per cent. With these conditions it was impossible to ship zinc ore to the United States at the prices which prevailed in the early and middle parts of 1909, but with increased prices in the United States the business was resumed, and the shipments of zinc from Mexico are now nearly normal.

Some ore from Mexico is going abroad, particularly from the southern part of the country, but in the main the shipments are to the Missouri-Kansas zinc plants. The chief zinc production is in the northern states, mainly from the limestone deposits.

There are other zinc deposits in connection with the precious-metal veins, as in Parral and at Charcas, and experiments are under way to extract these zinc ores for the purpose of producing a zinc product and at the same time beneficiating the remaining ore. Numerous concessions for zinc smelteries for Mexico were granted in the last half of 1909, t so far nothing has been undertaken a definite way in regard to this matter. e whole subject has been thoroughly vestigated several times by competent erests and the decisions have been verse.

Tin

Mexico continued to produce a small iount of tin from the scattered deposits the Central Plateau country, but no dertakings of importance are under iy, and in the main the output was pro- ced by natives using primitive methods d operating on a very small scale. The belt extends from Durango to Guana- ato, and the tin deposits are very merous, but so far no one of them has en of importance.

Iron

The most important iron-mining opera- ns in Mexico were carried on in the rthern part of the country, and on the operties tributary to Monterey used as base of supply for the Monterey iron d steel plant. The Tula iron works in lisco were recently taken over by an nerican syndicate and are now being anced on a highly inflated basis. The oney iron furnace in Hidalgo operated a small way, producing a high quality charcoal iron, and it is expected that e plant will increase its output with the tension of the railroad now being built o that section.

Extensive explorations of the coal and n deposits in Oaxaca were carried on ring the year, with reported good re- lts; and the iron deposits in southern exico and on the Pacific Coast were vestigated with a view of determining e possibility of deposits suitably situ- ed and sufficiently important to justify velopment for shipping abroad.

Oil

The oilfields of Mexico continued to be veloped extensively, but the results as production were not altogether satis- ctory. The Dos Bocas well produced enormous outflow of oil, all of which is lost in the subsequent fire which fol- wed the coming-in of the well. A com- ercial war between the Waters-Pierce l company and the Pearson oil interests is waged during the year, and the pros- cts are that there will be a consolida- on of the oil interests at no very distant te. Some oil explorations were carried in the northern part of Chihuahua by e Hearst-Keene interests, but the re- lts were not made public.

Other Mineral Products

A regular shipment of sulphur was aintained during the year from the de- osits at Los Cerritos in the state of San uis Potosi. This material was sent to ermany. Some sulphur was produced Durango for the local market, but the nount was small.

Several small shipments of mica were made from the deposits in Oaxaca. The mica occurs in fracture crevices in the limestone and is in the main small, although of good quality.

The shipments of graphite from the mines in Sonora continued. Some attempts were made to develop deposits of this material in the state of Oaxaca.

A deposit of cadmium was reported from near Tehuacan, Puebla, and samples of the product were sent to Germany for investigation, but so far no commercial shipments have followed.

Several attempts have been made to secure vanadium ores from the San Luis Potosi and Zacatecas for shipment. A deposit of mimetite at Zacatecas was exploited during the year and a few tons of ore prepared for shipment, but owing to the complex character of the product, which carried about 2.2 per cent. vanadium, no shipments resulted.

Some nickel-cobalt ores were reported to be mined on the Pacific coast near the boundary between Tepic and Jalisco. Several shipments from this section were made some years ago, and it is likely that other shipments will follow soon, although the deposit is reported to be small.

No attempt was made to work the manganese properties in Mexico. This material is found in several localities and has been exploited in a small way, but owing to the cost of transportation and the comparatively low grade of the product no satisfactory market has been found for it.

The salt deposit at Salinas in the central part of Mexico was extensively operated by an English company, and the government has been negotiating for concessions to operate the extensive deposit on Carmen island, off the coast of Sonora.

Mexico continued to produce a small amount of mercury from several deposits, principally in the state of Guerrero, but the production was much less than the consumption. There are numerous deposits in the country which are now being investigated, and it is likely that some of them will come into the productive list soon. One of these is the Santa Rosa in the state of Morelos.

Coal

The bituminous coalfield in Coahuila, in which nearly all of the operating coal mines are, is 50x40 miles in extent. The coal series consist of shale and sandstone. There are usually two seams of coal, the upper thinner and from 1 to 4 ft. thick, while the lower is from 4 to 10 ft. thick. The present output of this coalfield is about 3500 tons daily; the yearly consumption of coal in Mexico is about 4,500,000 tons, and that of coke is about one-fourth of the coal consumption. The coke output is about one-eighth of the consumption, the deficiency in coal and coke coming from the United States and Europe.

The average cost of mining coal, including the royalty of 20 centavos per ton, timbering, depreciation of plant and surface expenses is from 2 to 2.50 pesos per metric ton. Mine timber is a large item in the cost as most of it is imported from Texas. The labor is cheap, and there are no strikes nor labor-union difficulties. The mining laws as to liability for accidents are favorable to the companies. Clean, washed coal brings, f.o.b. railroad cars at the mine, 6 to 6.50 pesos per metric ton; mixed with shale and bone, 5 pesos per ton.

The coal makes a commercial coke, as good for some purposes as the imported coke. There are now 400 beehive ovens at the Las Esperanzas and Agujita mines. It takes about 40 tons of coal to yield 6½ tons of coke, and the cost of washing and burning is about 1.50 pesos per ton. The coke brings from 15 to 17 pesos f.o.b. cars at the mine.

There is another coalfield in northern Mexico, near the boundary, producing lignite, the demand for which is limited at present. Other coal deposits are in Sonora, Puebla, Oaxaca, Veracruz and Jalisco, but none of them are being commercially exploited at this time.

New Negotiations

The most notable mining deal in Mexico during the year, and in fact for many years, was the sale of the Santa Gertrudis mine at Pachuca to the Camp Bird, Ltd., for 9,000,000 pesos. Negotiations for the La Blanca mines in the same district failed to materialize. The Exploration Company of London has recently taken an option on the Campo Morado mine in Guerrero for 20,000,000 pesos, and is at present examining the property. Several English syndicates have options on important properties in Oaxaca, among them being the English firm of John Taylor & Sons. The Denny Brothers, of South Africa and Australia, have options on Mexican properties for English syndicates. The Cole-Ryan interests have taken over the Concheño mine in Chihuahua formerly controlled by the Greene Gold-Silver Company. Numerous important deals have been made in the Hostotipaquillo district of Jalisco and several negotiations are now under way there.

New Reduction Works

During the year the San Rafael mine at Pachuca completed a new cyanide mill with latest improvements. Work was begun on the mill for the Santa Gertrudis mine, in the same camp, which will now be greatly enlarged by the new owners, the Camp Bird, Ltd. The San Francisco hacienda at Pachuca enlarged and improved its equipment and La Union hacienda was changed from barrel chlorination to cyanide, using chilean mills for grinding. The Seguranza cyanide mill at Zacualpan, state of Mexico, was completed during 1909, and the Cinco Estrellas mill at Pinos, Zacatecas, also the new Benito Juarez mill, near Pinos. The El Bote mill at Zacatecas was remodeled. In Jalisco, the Virginia & Mexico mill was completed and several other mills started. The Virginia y Tapada mill at Totolapam and the Guebesbe mill at Ocotlan in Oaxaca were built last year. El Oro mills installed auxiliary turbine engines for power to replace the electric power from Necaxa, which was interrupted several times during the year by accidents. Several mills at Guanajuato were enlarged or remodeled during the year, and the new Carmen mill begun; the electric power installation was enlarged to meet the increasing demands. The Veta Colorado mill at Parral was started, but not completed because of financial difficulties; and the Palmilla mill at Parral was begun. Several smaller mills were built in Chihuahua, notably at the Rio Plata and Lluvia del Oro, and the zinc mill at Lagos. Experiments with dry concentration of zinc ores were carried on at Calera, Ahumada, at the San Francisco del Oro mine in Chihuahua and at Charcas, San Luis Potosi. Magnetic separation was installed at Santa Barbara and Parral. New mills were built at Llanos and Alamos and elsewhere in Sonora.

The smelting situation was not materially changed during 1909. The Torreon independent plant installed copper converters. A Monterey plant continued to exclusively refine and part bullion. The Chihuahua plant of the American Smelting and Refining Company and the new Velardeña plant were run to full capacity. A smeltery was built at Zacatecas for the Magistral mine, and one at Balsas for the Maine & Nebraska company. The Carizzo smeltery in Jalisco was completed. The smeltery at Teziutlan, Puebla, was equipped with electrical power from a new hydroelectric installation. A small lead stack was built at Tehuacan, Puebla. The 300-ton smeltery at Fundicion, Sonora, was started but discontinued owing to the lack of suitable ore mixtures. It will be started again soon. The Cananea Consolidated plant was remodeled and greatly improved in efficiency.

Numerous aërial trams were installed in different parts of Mexico during the year and as well as much modern hoisting and mining equipment. Practically all of this new equipment came from the American manufacturers, although some of the tube mills and heavy steel was from Germany and England.

New Railroads

The railroad construction during 1909 was mainly confined to the important Harriman extensions on the West Coast and in Sonora. The Orient road, projected by the Stilwell interests, completed the bridge across the Coñchos river, east of Chihuahua, and made some extensions in that direction, The road has done very little toward connecting the short, but very costly, gap between the westward extension from Chihuahua and the line from the Pacific port. It is announced now that this work will be undertaken and that funds are available for it.

A new line has been projected west from Durango, backed by state and government subsidies, and another line is about realized, extending from Guadalajara to the port of Chamela on the Pacific. Numerous lines in the south of Mexico have been projected on paper during the year, and it is likely that some of them will be realized. Some extensions from the terminus of the Southern railroad at Oaxaca were advanced in construction, and other projects were held up pending the fate of the Southern railroad in reference to the "Merger."

An important railroad line from Toluca to the Pacific has been surveyed, and it is reported that favorable advance has been made toward financing it. Another line from Teziutlan in the state of Puebla to Nautla, a gulf port, is also about to be undertaken.

In the main the railroad advance in Mexico during the year was unimportant, outside of the Southern Pacific operation, and not in accordance with the urgent needs of the extensions from the main trunk-line systems to meet the necessities of the industries of the country for better transportation. The attempt to establish navigation on the Rio Balsas has not been realized as yet, but there is expectation that this important waterway will be utilized in the near future.

A Canadian syndicate has taken over the Sierra Madre & Pacific railroad, leading southwest into Chihuahua from El Paso, and presumably will extend it. This syndicate will also probably become interested in the proposed railroad across northern Mexico from Monclova to Chihuahua. At Guanajuato work has been commenced on a belt-line railroad to connect the mines, and the Central line has extended the branch from Marfil into the city.

Central America

Salvador

The Butters Salvador mines have operated successfully and regularly during 1909. About six miles from these mines some Californians are developing the Mina Gigante and constructing a cyanide plant. Some other operations have been started, but have not reached the point of production as yet.

Nicaragua

Owing to the entirely unsettled state of affairs in Nicaragua very little mining development was undertaken during 1909. The deposits at Rama and Piz Piz near Bluefields have been operating continuously and small mills were installed. The product is gold and the ore is reported of high grade. Important deposits north of Lake Nicaragua have been under negotiation during the year but owing to the insecure political condition the negotiations have not been consummated. There are a number of important gold camps in the country, which, under favorable conditions, would undoubtedly attract foreign capital. Most of the foreign capital invested in Nicaraguan mines is from America, although some English capital has also been invested there.

Costa Rica

Some American companies have been interested in the gold deposits in Costa Rica, but the results have been somewhat slow in developing and the outcome of these negotiations and operations is more or less uncertain, due to the difficulty of carrying on commercial operations in the country and the lack of transportation and economic and sanitary conditions in some of the camps.

British Honduras

An American company undertook some development work in British Honduras during 1909, but the results are not yet known. The operations are in a region of comparatively high altitude, about 8000 to 9000 ft. above sea level.

Guatemala

There was very little change in the mining situation in Guatemala during 1909, owing to the continuation of unsettled political conditions. Some railroad building was undertaken in the country in connection with the projects for the extension of the Pan-american railway from Mexico through this country, but in the main the progress of railway building and mining has been at a standstill.

Honduras

While silver and gold are the most important metals mined in this country, denouncements have also been made of lead, copper, iron, antimony, zinc and ickel, and of other mineral products such s opals, kaolin, marble, saltpeter, chalk, oal, asphalt and petroleum. During 1909 nly two or three mining companies were n successful operation in Honduras. The most important company is that of he New York & Honduras Rosario Mining Company operating in San Juancinto, in the department of Tegucigalpa. During 1909 it mined and milled 32,790 tons of ore, which yielded 975,500 oz. of silver and 13,130 oz. of gold. The company's production is shipped to New York in the form of cyanide precipitates.

A discovery of copper was reported in the department of Yoro, in which the veins are said to be 14 ft. in width. The copper mines of Guanacostre in the department of Olancho contain high-grade copper ore, but in 1909 were not worked to any extent.

South America

ARGENTINA

The English-owned property, known as he Famatina, has continued to 'operate xtensively and successfully during 1909. The company inaugurated the smelting plant during the year. The mine is in the Rioja province. An aërial tramway and briquetting machinery were installed during the year.

The richness of the Argentina in coal mines and petroleum deposits has long been known but up to the present time hese resources have practically lain dormant. Recently activity has been manifested in the exploitation of petroleum deposits in Comodoro Rivadivia. The republic imports annually about $8,000,000 worth of coal, $1,500,000 of petroleum, and $500,000 of naphtha. That these products exist in large and paying quantities in different parts of the country, at Mendoza, Neuquen, and Rivadivia, has been fully established. The San Julian coal, which has the peculiarity of burning without producing smoke, might become a fuel of value for maritime use in case of war, and the Mendoza, San Juan, Neuquen, Salta and Juyjuy coal would find favor as fuel for railroads and industrial companies.

BRAZIL

No important new mining operations are reported as being inaugurated in Brazil during 1909. Development work has been carried on near Itabira do Matto Dentro in the state of Minas, Geraes, at the micaceous iron-ore deposits, carrying free gold. The deposit is said to be extensive and the gold carries a small percentage of palladium.

The manganese deposits have been worked regularly, but no new deposits have been opened. The central railroad has installed additional rolling stock, to better the transportation conditions in connection with these operations.

American and British representatives have continued prospecting the deposits of hematite in central Minas and work is planned for the deposit of magnetite near the port of Antonina, in Parana. Copper mining has been carried on in the Ceara properties and in the deposits of Rio Grande do Sul. These deposits yield enough gold and silver to pay the working cost, according to reports. The investigations have been continued in the Diamantina district and the production of bort and black diamonds continues to be important.

A variety of pale topaz was obtained from Rio Grande do Sul and tourmalines, beryls and aquamarines are mined to a considerable extent in Minas Geraes. The monazite deposits in Bahia and Espirito Santo have been worked extensively under concessions and most of the product is shipped to Hamburg, where it is used for its thorium content. Further prospecting shows that the monazite has a fairly wide distribution east of Minas and in the state of Rio de Janeiro. The shipment in 1908 was 2000 tons and the shipment for 1909 is probably in excess of this. Some mica is produced in Brazil and sold in Germany. Asphalt is reported along the coast of Bahia.

In general the mineral resources of this vast country are largely unexploited and largely unknown. Some projected railroad building now under charge of American contractors will probably open up important new districts in the near future.

Concerning the alluvial deposits in the state of Matto Grosso in southern Brazil, and which have been attracting attention by reason of the flotations in Buenos Aires, the bulletin of the Bureau of American Republics publishes the following data:

"Of late years many companies have been floated in Buenos Aires to dredge rivers descending from the Matto Grosso central hills. They have almost all been failures. Although gold undoubtedly exists, the difficulty of importing and setting up effective machinery in a district where all experience has yet to be gained, combined with the scarcity of skilled labor, makes the whole business very risky. The safest process of alluvial mining here would be to make share arrangements with a large number of native prospectors and washers, running at the same time a general store in some central position where they could sell their earnings and refit. For, if a river changes its course during a flood (as often happens here) it is much easier to shift an Indian with his tin washpan than to do the same with a 1000-ton dredge, however uptodate. The hills of Matto Grosso are older in formation than the Andes and much more denuded. Such gold particles as they contained are, therefore, today widely distributed in alluvial plains or in the water courses leading to them. The territory is so large that a closer examination might well result in the discovery of feasible workings. Meanwhile the method of grubstaking prospectors and goldwashars on shares, as suggested, is the cheapest method of verifying whether paying deposits exist."

MINING COMPANIES IN BRAZIL

Aurifera de Minas Geraes.
Extraction Mineral Brasileira.
Geral de Minas de Manganez.
Industrial Norte e Oeste do Brasil.
Manganez Queluz de Minas.
Morro da Mina.
Mineracao do Brasil.
Manganez da Bahia.

BELGIAN COMPANIES.

Cuivre de Camaquam.
Société Belge Brésiliene.
Compagnie de l'Urucum.
Société Ind.—Agric au Brésil.
Minière Belge Brésiliene de Trez Cruzes.

BRITISH COMPANIES.

Agua Suja Gold Mining Company.
Brazilian Diamond and Exploration Company.
Brazil Diamond Fields Corporation.
Conquista Xicao Gold Mines.
Ouro Preto Gold Mines of Brazil.
St. John del Rey Mining Company.
Sao Bento Gold States.
S. José Diamond and Carbons Company.

UNITED STATES COMPANIES.

Brazilian Diamond Mining Company.
Datas Diamond and Gold Company.
Diamond King Mining Company.
Diana Mining Company.
Pittsburg Brazilian Dredging Company.

RIO PLATA DREDGING COMPANIES.

Brumado Gold Dredging Company.
Cabacal Gold Dredging Company.
Diamantino (Matto Grosso) Dredging Company.
Este Matto Grosso Company.
Matto Grosso Gold Dredging Company.
Rio Plate Dredging Companies.

A list of the operating Brazilian mining companies, incorporated under the federal laws, as furnished by the consul-general for Brazil at New York is given herewith.

BRITISH GUIANA

In British Guiana several American companies have been carrying on developments in quartz-gold properties. One, the Aremu Mining Company of New York, has a mill under construction, and the South American Gold Company, of the same interests, is operating a placer property in this country.

The exports of gold for nine months ending Sept. 30 were reported at 48,769 oz. in 1908, and 46,919 oz. in 1909. An export of $28,000 in value of diamonds is also reported, a slight increase over last year.

CHILE

Several English- and German-owned companies, as well as local companies, continued to operate gold and copper properties in this country during 1909. The most important operation in which American capital is interested is the Braden Copper Mines Company, which controls 204 acres of property, on which a reduction plant has been installed, which has been recently increased from 250 to 400 tons daily capacity. A new mill of 1600 tons daily capacity is being constructed and will be completed early in 1911. Construction was continued on the railroad which the company is building from Rancagua to the mines, and the entire line will probably be ready for operation during the spring of 1910. The company reports as developed 5,000,000 tons of ore averaging 2 7/10 per cent. copper. Water power is utilized for the production of electrical power.

Oilfields in the south of Chile have been investigated during 1909 with success, and several companies have been formed to exploit them.

A French company has been developing copper deposits at Naltagua. A smeltery and an aërial tramway have been installed.

The report of the government commission which investigated the coal lands near Concepcion and Telcahuana, states that there are more than 80,000,000 cu.m. of soft coal within an area of 80,000 sq.m. The vein in places is 3½ m. thick, and the coal is said to be of fair quality.

The nitrate interests at Iquique recently petitioned President Montt for the renewal of the Nitrate Association Propaganda. A commission, appointed by the government, recommended that the state receive a sum equal to 1d. for each 46 kg. of nitrate exported, to be expended in promoting the nitrate industry, either by reducing the cost of production, increasing the consumption, or in opening new markets; that the scientific and industrial propaganda remain under the direction of the Nitrate Association Propaganda; that the state deliver annually to the Nitrate association an amount sufficient for the payment of its services, and that the commercial propaganda and the development of the nitrate industry, in so far as the cost of production and the propaganda at home and abroad are concerned, be placed under the direction of an advisory nitrate council. The commission further recommended the establishment of a technical industrial nitrate laboratory the centralization of the sale of nitrate, the systematic examination of present nitrate deposits, the search for new deposits, and the placing of sacks used in the exportation of nitrate on the free list. There is an export tax of 56c. per Spanish quintal of 101.42 pounds.

On Jan. 31, 1909, there were 145 separate nitrate works in Chile, and it is a very difficult matter to get all the interests together. There are several strong companies that own several plants each, and it is among these that the most opposition to combining is found.

During May, 1909, the price of nitrate was quoted as low as $1.60 per quintal, delivered alongside steamer in Chilean ports.

COLOMBIA

During 1909 the investigation of the gold-placer deposits in Colombia was carried on by engineers representing several American companies which have concessions or own property in the river districts of north central Colombia. The result of these investigations has demonstrated that the deposits are comparatively rich and that they are extensive, but the cost of installing and operating modern machinery in the district has deferred the realization of the possibilities of these gold properties. The government has appointed a special agent to investigate the platinum resources of the country, and it is reported that negotiations were entered into with the Russian platinum producers to control the world's market on platinum. Nothing definite has been announced as regards this important move affecting the two principal sources of platinum.

The Gualpala Mining Company installed a cyanide plant during 1909, using sectionalized machinery, made especially for the company at San Francisco. Several English companies have taken up and continue operating gold-quartz properties in the southern districts of Colombia. The operations are on a small scale, but the ore is rich and makes profits on the basis of small operations and in the face of exceedingly large cost for transportation of products and equipment.

The record of the enormous production of gold in Colombia in the past is a testimony to the possibilities of the country, but the political, economic and social conditions, as well as matters of topography and climate, are all factors which determine the extent and speed of the realization of the mineral possibilities of the country. During the year the progressive President Reyes resigned, and there was some uncertainty as to the conditions that would follow. In the main the government has continued to be progressive and liberal, and indicates a fixed policy of encouraging foreign operations in mining in the country. Some American companies are investigating in copper deposits in Colombia, and an iron deposit near the Carribean sea has been examined during 1909. The government has unsuccessfully undertaken to finance several railroads which, when realized, will mean a great deal to the mining operators of this country.

In the main it may be said that the American exploiters are principally interested in the placer deposits for dredging and hydraulic operations and in possible copper mines, while the British capital in Colombia is mainly invested in the rich gold-quartz veins in the interior. Some French and German capital is also interested in mining in the country. The operations carried on by native capital are comparatively limited.

During the year the Colombian government entered into a contract with a British syndicate for the exploitation of the emerald mines at Muzo. By the contract the syndicate will pay the government £250,000 annually out of the gross output. The net income in excess of this amount is paid equally to the government and the company. The contract gives the syndicate the exclusive right of exploitation for 20 years.

Mines of gold, silver, platinum and precious stones (excepting emeralds) may be denounced and taken up in Colombia by the first discoverer, whosoever may be the owner of the land on which the mine is situated. Minerals found on national property may be taken possession of in the same way, with the exception of coal, guano, and other similar manures, brine springs and salt beds. By presidential decree of Sept. 21, 1909, the export of all metals is declared free of duty, abrogating the general provision in regard to this matter.

ECUADOR

The policy of the Ecuadorian government in utlizing the $12,000,000 indemnitl paid by Brazil in connection with the boundary dispute to establish a system of railroads in the country is having its results in a revival of the latent mining interests of this South American country. Statistical data are entirely absent in regard to the operations in 1909. One American company in that country places the output of gold and silver for 1909 at about $400,000. Among the American companies interested in Ecuador is the South American Development Company of New York, which has properties near Zaruma, in the province of El Oro. These mines have operated continuously during the year, but data as to results are not obtainable.

The United States Gold Dredging and Rubber Company of New York is interested in an extensive placer deposit in province of Esmeraldas. This com- ıy has property near the large hold- s, acquired during 1909 by Coats and ociates, of London, who also control the ıya de Oro estate, holding large prop- y interests in the same province. Ne- iations for a consolidation of the Eng- ı and American interests were dis- ssed during 1909, but the terms have n refused by the American interests.

The Ecuadorian government is anxious interest foreign capital in the develop- nt of its mining enterprises and has ablished liberal mining laws. Con- ning the new railroads the Consul neral for Ecuador in New York writes: 'e have three railways in Ecuador: The ayaquil & Quito, which runs from ayaquil, the principal port of Ecuador, Quito the capital. This railway was ilt with American capital. Another ıd is being built from the port of Ba- de Caráquez, in the Province of Man- , to Quito. This railroad is financed French capital. There is a very short ıd from Puerto Bolivar, Province of Oro, to Pasaje."

A bill has been introduced into the ıgress of Ecuador amending the min- code so as to permit private persons acquire mines of gold, silver, copper, ıtinum, mercury, lead, zinc, bismuth, phur, cobalt, tin, antimony, precious nes, etc., the state reserving the right own and exploit petroleum, coal and phalt deposits, iron mines and fossil ostances.

Peru

The extension of the government-aided lroad system in Peru has opened up e possibility of important developments the Andean districts of the country. e Cerro de Pasco property, controlled the Haggin interests, has been put on successful basis through the manage- ent of R. H. Channing. The property s extensively developed by the Amer- n company for a number of years, but ing to conditions it was necessary to ild railroads and install much equip- ent in order to make the operation ofitable. The smeltery is now running ccessfully, the company is utilizing al from the local fields as far as pos- ble, and has provided adequate rail- ad facilities. A hydroelectrical instal- tion is being made, which will also in- ence the operations. The company is w producing at an annual rate of ,000,000 lb. of copper, which is shipped the United States for refining. Sev- al American and English companies are erating gold placer and vein prop- ties on the western slope of the Andes the head waters of the Amazon. These erations are carried on remote from ilroad transportation and at a large ex- nse; roads have been built and con- derable equipment taken in to the operties.

The American Vanadium Company has made shipment from the notable deposits of vanadium ores, discovered near Cerro de Pasco. The ore runs as high as 24 per cent. vanadic acid and is exceptional in extent and richness. It is controlled by Pittsburg capital. The Vanadium company has, during 1909, developed its mines to the extent of determining that the value and richness of the deposits are exceedingly great. The company is now prepared to realize from the property.

An article on the coal deposits of Peru was published in the JOURNAL, Nov. 13, 1909, and also a map of these same deposits in the JOURNAL, Dec. 25, 1909. An English company organized as the Chimbote Coal and Harbor Syndicate took control of the Recuay coal-fields four miles from Chimbote on the Pacific and proposes to operate them extensively, producing a coal reported to be anthracite. A report of the Lobitos Oil Fields Company, a corporation organized in London in 1908, for exploiting petroleum deposits of northern Peru, shows that shipments of Peruvian petroleum were made to Japan and the River Plate, and that a fair price was obtained. At the beginning of 1909 there were 62 oil wells in operation in the district referred to, the annual production of which was over 7000 tons of crude petroleum. A number of wells in northern Peru are being prepared for exploitation, and the output in the future will probably be greatly increased owing to the development of these new properties.

The Peruvian government has continued a liberal and progressive policy in regard to the development of its natural resources and general confidence is expressed in its stability and the good faith of the government toward the foreign interests in the country. An American-English syndicate has taken over the state railroad systems in exchange for assuming the large bonded indebtedness of the country, and English, American and German capital is largely invested in the railway and mining interests in the country.

Venezuela

The end of the Castro reign in Venezuela has attracted attention again to the possibilities of the exploitation of the mineral resources of that country. The output of asphalt has in a measure been resumed, and the adjustment of the relations between the syndicate and the government has been worked out through diplomatic agencies. Another matter which is under consideration between the American and Venezuela governments relates to the important iron deposits on the Oronoco river. These deposits were the subject of an exploitation undertaken by Minnesota capitalists about 10 years ago. The deposits were then reported to be extensive and to be very favorably located for access to tidewater. The concession owning them became involved in a dispute with the government of Venezuela, and the whole matter has been dropped until recently. It is now reported that Charles M. Schwab has been interested in an investigation of these deposits and that there is a likelihood of the concession rights being restored on certain conditions.

There are practically no data concerning the mineral resources of this country, although it is known that it has in the past produced considerable of the precious metals and several copper properties have been operated there. One belonging to an English firm near Tucacas, a few miles from Puerto Cabello, recently made a shipment of 600 tons of copper to England. Other properties in this locality are offered for sale by Venezuela. A gold property in the interior has continued to produce extensively for some time, and most of the output has gone to the government under Mr. Castro. The new government is seeking to invite foreign interests to develop the mineral resources of the country and is offering attractive concessions. The government controls remunerative salt monopolies.

It is entirely likely that Venezuela will, in the near future, become an important producer of gold and silver if the reported conditions concerning the resources of the interior are at all trustworthy.

Dominican Republic

The important minerals found in the Dominican Republic in modern times are gold, silver, iron and copper ore, lignite, salt and petroleum. Gold is the only mineral that has been worked to any extent. In the time of Columbus the Indians paid tribute in gold, and in the year 1496 the records show the following mines or placer workings: La Vega, the Cibao, the San Cristobal, and the Buenaventura.

Some gold is at present washed from the sands of the Yaque, Verde, Bao, Jaina and Mao rivers and their tributaries by the natives with the most primitive apparatus. None of the mining men now in this country claim to have located quartz veins that would pay for the working. There are no doubt some gold deposits, not only in the river beds but also on the hills, that have never been worked, and there is probably gold remaining in the old workings that could be saved by modern machinery and dredges.

There is abundant water and sufficient fall for drainage in most parts of the gold country, but a great drawback is the difficulty encountered in getting machinery to the interior, on account of the entire lack of wagon roads.

Bolivia

BY J. AGUIRRE-ACHA[*]

The situation of Bolivia in the center of the continent of South America is in a certain way disadvantageous on account of the lack of seaports, and the fact that it can depend only on some river ports in the north and east of the national territory for transportation by water; but to this position is also due the fact that the country embraces a part of the three geographical divisions of South America, possesses mineral riches of the Andean range, the tropical products of the river Amazon and the plains of the river Plate, suitable for cattle raising.

The ease of exploitation of the coast regions of South America has caused the neglect of other points which are richer but less accessible. An example of this assertion was the famous Cerro de Potosi in Bolivia. The city of this name, situated at 4146 m. (14.925 ft.) above the level of the sea, today has only 25,000 inhabitants, while formerly it contained more than 250.000 and occupied the second place after Madrid in the Spanish dominions of Charles V. There are 64 silver-bearing veins in this range, and the tailings of the enormous extraction of 363 years still offer a possible source of tin when transportation is improved. The same is to be noted in the deposits of Porco, Colquechaca, Carangas, Ayopaya, Arce, etc., which only await the railroads to forward their accumulated products to the markets.

BOLIVIAN EXPORTS, JAN. 1 TO AUG. 31.

Metals	1909.	1908.
Tin	22,806,037 kg.	19,075,202 kg.
Copper	2,301,763 kg.	2,004,498 kg.
Bismuth	256,920 bs.	216,798 bs.
Silver	1,114,413 bs.	1,157,297 bs.
Gold	56,225 bs.	....

FUEL AND RAILROADS

Besides the distance at which these centers are situated from the Pacific ocean and the deficiency of means of transportation, there is the great difficulty of lack of fuel for smelting and the consequent necessity of exporting the ore. For this reason many projects have been presented for taking advantage of the water power in the eastern valleys, not far from these mining centers, and for exploiting the deposits of lignite that are found at a somewhat greater distance.

There are now two railroads leading to the high table land from the coast of Chile and Peru; another, coming from the Argentine, will soon cross the southeastern part of the republic; and a fourth will unite more intimately almost all the mining zone of Bolivia with the port of Arica. There is thus a total of nearly 700 miles of railroad constructed up to the present time and an equal amount in construction and projection, without including in these figures the Madeira-Mamore railroad, on the Brazilian-Bolivian frontier.

The extent of Bolivian territory is a little greater than the combined area of the States of New York, Pennsylvania, Maine, Louisiana, California and Colorado, and the mining region embraces nearly one-fifth of that comprised in the mining districts of the western part of the United States, exclusive of Alaska. In addition to silver, the resources of the country include copper, tin, wolfram, bismuth and gold. The methods of exploitation are still primitive in most of the mines. There are, however, installations like that of Huanchaca, well able to compete with the best in the world in the extraction of silver. From 1873 to 1904 this mine produced 4600 tons of metal ready to be exported, and employed during 1909, in the 598 hectares that it possesses, nearly 5000 laborers. The tin mines, near the railroad lines, can be worked with profit even if the price of tin in London should decline to £100 per ton.

PRODUCTION OF TIN IN BOLIVIA.

Years.	Cassiterite, Kilos.	Tin, Tons.
1900	16,231,200	9,740
1901	21,915,900	13,149
1902	17,608,300	10,564
1903	no figures	no figures
1904	21,545,703	12,927
1905	27,689,621	14,613
1906	29,373,538	17,624
1907	27,677,780	16,608
1908	29,938,828	17,962
1909 (8 months)	22,806,037	13,884

The manner of acquiring mining property is by purchase, by claiming the forfeiture of a concession for fault of payment of the tax, or by discovery of a new mine that belongs only to the state and is free of any other individual claim. The foreigner has the same right to these methods as a native of the country. The legal formalities and procedure to assure possession of the property have been much simplified in the last few years. The taxes on mining property, as well as those levied on the exportation of the mineral products, are small, since Bolivia endeavors to stimulate greater production rather than to restrict it.

MINERAL RESOURCES

The following data, from the official publication *Hacianda & Industria*, give an idea of the recent mineral production compared with that of previous years, it being necessary to bear in mind that the Bolivian peso (boliviano) is equivalent to a little more than $0.39. From Jan. 1 to Aug. 31, the exportation of minerals in 1909 reached 25,256,047 bs., as against 23,765,592 bs. in 1908, an increase of 1,490,455 bs. during the eight-months period referred to.

The data referring to silver are not complete because in the figures for 1909 is not included the production from Huanchaca, which would increase still more the difference in favor of the first eight months of 1909. The exact figures of the exportation of gold are difficult to obtain, as the declarations depend to a great extent on the good faith of the exporters.

PRINCIPAL MINING COMPANIES IN BOLIVIA.

Companies.	Metals.	Home Offices.
Compañia Huanchaca	Silver.	Huanchaca.
Compañia del Socavon	Silver.	Oruro.
Compañia de San José	Silver.	Oruro.
Compañia Colquechaca Aullagas	Silver.	Colquechaca.
Compañia Gallofa	Silver.	Colquechaca.
Compañia Consolidada	Silver.	Colquechaca.
Compañia Guadalupe	Silver.	Potosí.
Compañia de Porco	Silver.	Potosí.
Compañia de Portugalete	Silver.	Potosí.
Compañia del Real Socavon	Silver.	Potosí.
Compañia de Andacaba	Silver.	Potosí.
Nueva Compañia de Lípez	Silver.	Santa Isabel.
Compañia de Berenguela	Tin.	Arque.
Compañia de Colcha	Tin.	Arque.
Compañia de Milluni	Tin.	La Paz.
Andes Tin Company	Tin.	La Paz.
Benedicto Goytia	Tin.	La Paz.
Jorge Machicado	Tin.	La Paz.
Franco Hermanos	Tin.	La Paz.
Pascual Cesarino	Tin.	La Paz.
Harrison & Bötiger	Tin	La Paz.
Matias Mendieta	Tin.	Potosí.
Julio Martens	Tin.	Potosí.
Arturo Arana	Tin.	Potosí.
Lucio Leiton	Tin.	Potosí.
Juan Rubarht	Tin.	Potosí.
Víctor Fuentes	Tin.	Potosí.
Compañia de Monte Blanco	Tin.	Potosí
Compañia de Chocaya	Tin.	Potosí.
Compañia de Avicaya	Tin.	Potosí.
Compañia de Antequera	Tin.	Oruro.
Compañia de Guanuni	Tin.	Oruro.
Compañia de Negro Pavellón	Tin.	Oruro.
Compañia de Morococala	Tin.	Oruro.
Compañia de Colquiri	Tin.	Oruro.
Roberto Peláez	Tin.	Oruro.
Jerman Fricke & Co.	Tin.	Oruro.
Simon I. Patiño	Tin.	Oruro.
Juan B. Minchin	Tin.	Oruro.
Compañia Llallagua	Tin.	Llallagua.
Soux & Hernández	Tin, silver.	Potosí.
Alfredo Meting	Tin, silver.	Potosí.
Bebin Hermanos	Tin, silver.	Potosí.
M. Diaz & Co.	Tin, silver.	Potosí.
Urriolagoitia & Co.	Tin, silver.	Potosí.
Compañia de Huaina Potosí	Tin, silver.	La Paz.
Aramayo Francke & Co.	Tin, bismuth, silver.	Tupiza.
Penny & Duncan	Tin, silver, copper.	Oruro.
Compañia de Corocoro	Copper.	Corocoro.
Berthin Freres & Co.	Copper.	Corocoro.
Compañia de la Chacarilla	Copper.	Corocoro.
Compañia Los Angeles	Copper.	Corocoro.
Compañia de Chuquiaguillo	Gold.	La Paz.
Compañia de Yani	Gold.	La Paz.
Incahuara Dredging Co.	Gold.	La Paz.
Compañia del Rio de San Juan	Gold.	Tupiza.
Compañia de Amayapampa	Gold.	Potosí.

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[*] Consul General of Bolivia, New York.

Bolivia furnishes nearly 19 per cent. of he world's total production of tin, and . large increase is expected when the ailroads which are in actual construction re completed. The following statistics re from a careful study of the production of tin by Casto Rojas, subsecretary f the treasury. The fineness that is enerally calculated for the cassiterite or *arrilla* exported from Bolivia is 65 per ent.; but the production of tin in the last ine years is given in an accompanying table on a basis of only 60 per cent.

Much interest was shown in copper in Bolivia. The railroad from La Paz to Arica will traverse the region of Pacajes in which deposits of importance have been discovered. This road will be opened for public use in about two years. Wolfram was exported during 1909 from the provinces of Sicasica. There were some companies organized for the exploitation of gold in the tropical region of the department of La Paz. The problem that presents itself here is the opening of roads to permit the introduction of proper machinery. An English company which has interests on the Kaka river and an Italian company on the Tipuani river are working on this. The enterprise of the Chuquiaguillo river, a few miles from the city of La Paz, was the most prosperous gold operation. The exploitation of silver depends on the quotations of the great markets, but will now be aided by the building of the railroad to Potosi.

Ontario

BY THOMAS W. GIBSON *

The province of Ontario is now easily rst among the silver-producing comunities of America, its annual output eing little short of that of the three best ilver States in the Union combined—olorado, Montana and Utah—and nearly 0 per cent. of the entire production of he United States. In 1909 the output vas in the neighborhood of 25,000,000 z., having a value of approximately $12,-00.000. In 1903 there was practically o silver produced in Ontario. In 1904 he first ore was raised at Cobalt, and to he end of 1909 the total yield was about 3,000,000 oz., woth $33,000,000.

Though Cobalt is without doubt the ichest silver field that has been opened nywhere during the present generation, o one can tell how much longer the present rate of production can be maintained. he probability is, however, that the camp vill be a producer for years to come. he mines are worked wholly for their ilver contents. The ore contains other lements of value, namely, cobalt, nickel nd arsenic, but the latter two bring no eturns to the mine owner, and the enorced production of cobalt ore is far in xcess of the world's consumption. The reater number of the veins at Cobalt ccur in conglomerate of Lower Huronian ge; perhaps 90 or 95 per cent. of the roduction has been from this conglomerte. Veins are also found in the diabase nd in the Keewatin, some of them quite ich.

The chief producers during the year vere Nipissing, Crown Reserve, O'Brien, a Rose, Kerr Lake, Coniagas, Trethevey, Buffalo, Temiskaming & Hudson 3ay, clustering around Cobalt station on he Temiskaming & Northern Ontario ailway. In southeastern Coleman, the emiskaming worked rich but somewhat rregular deposits in the Keewatin, and re was also found on the adjoining proprty, the Beaver. In the neighboring amp of South Lorrain, to the east, sevral mines are likely to become of imortance, among them the Wetlaufer, Keeley and the Haileybury Silver Mining Company. Anvil Lake, Elk Lake and Gowganda are still under development, and some properties will make shipments of ore during the present winter. None of these camps, however, have so far proved equal to Cobalt.

Concentration plants for low-grade ore are becoming numerous in the Cobalt camp, and most of the high-grade ore is treated in Ontario. There are reduction works at Copper Cliff, Deloro and Thorold. Part of the high-grade ore and most of the low-grade goes to smelteries in the United States.

Nickel

The nickel mines of Sudbury district were vigorously worked in 1909, and the production of nickel will be in the neighborhood of 12,000 tons, a considerable advance over any previous year. The value of the nickel in the matte will be, say, $2,550,000. The production was wholly from the Canadian Copper Company, Copper Cliff, and the Mond Nickel Company, Victoria mines. The former company confined its operations to the Creighton and Crean Hill mines, both carrying nickel and copper. In Creighton the nickel predominated and in Crean Hill the copper. The Canadian Copper Company exported its bessemer matte to the United States for further treatment, and the Mond company to Wales. The Dominion Nickel-Copper Company is building a railroad from the Canadian Northern to Whistle mine.

During 1909 a new nickel area was exploited in the township of Dundonald, a short distance west of the Temiskaming & Northern Ontario railway, near Frederick House lake. A body of pyrrhotite, very like that of the Sudbury mines, was located by a prospector named Kelso. The nickel contents of the ore vary somewhat, but are well within the workable limit. An option was taken on the property by the Canadian Copper Company, but after exploitation by the diamond drill it was abandoned, owing, it is said, to the limited size of the orebody.

The copper production of Ontario depends upon the nickel production, since this metal is found associated with the nickel of Sudbury. The output in 1908 was 7561 tons, and for 1909 the yield will be about the same. The sulphide mines of the north shore of Lake Huron have not been producing largely during the last few years, but the deposit at Bruce mines has now passed into the control of R. W. Leonard, of St. Catharines, and will doubtless contribute to the output in the future.

Iron, Zinc and Gold

The iron-ore output for 1909 will be in excess of that of 1908, when it was 216,177 tons. Most of the ore came from the Helen mine, Michipicoten, but Moose mountain and Bessemer contributed a considerable amount of magnetite. At Loon lake, east of Port Arthur, two carloads of hematite were shipped toward the latter end of the season by the Dominion Bessemer Ore Company, being the production of a deposit in the Animikie rocks of that district. The ore was found in horizontal layers a few feet below the surface and was of good quality, though not high in metallic contents. At Woman river an iron formation of considerable extent was located, and bodies of workable ore are believed to exist. The pig-iron production in 1909 will considerably exceed that of the previous year, when it was 271,656 tons. Blast furnaces were in operation at Saulte Ste. Marie, Port Arthur, Midland and Hamilton.

A little zinc ore, about 785 tons, was raised at the Olden mine in the county of Frontenac.

The yield of gold in 1909 was not important, coming mainly from the Laurentian mine in the Manitou region. Considerable excitement was aroused by the discovery of gold in the Porcupine Lake region, which lies west of Night Hawk lake on the Hudson bay side of the hight of land. A large number of claims were staked, following upon the finding of free gold in quartz in a number of places, and some of the properties give promise of being valuable. A good deal of the territory is covered with drift, which makes prospecting difficult. A rush into this district was in progress as the year closed.

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*Deputy Minister of Mines, Toronto, Ont.

NONMETALLIC AND OTHER MINERALS

The nonmetallic minerals of Ontario are numerous and valuable. They include petroleum, natural gas, salt, feldspar, corundum, graphite, gypsum, iron pyrites, mica and other economic substances, as well as clays, limestones and building stone.

The production of petroleum diminished. In 1908 it was 18,479,547 Imp. gal. In 1909 it will not greatly exceed 17,000,000 gal. The decrease was partly caused by the slight diminution annually going on in the old fields of Lambton county, and partly by the more rapid falling off in the wells of the newer Kent county field. About one-half of the requirements of the refining trade are now supplied by importation of crude oil from the United States. On the other hand, the production of natural gas increased. In 1908 the yield was valued at a little less than $1,000,000; in 1909 it will probably exceed that figure. The gasfields are as follows: Essex and Kent counties, Haldimand field, including Norfolk county, and the Welland county field. Of these the Haldimand field is now the largest producer. The exportation of natural gas has ceased.

The iron-pyrites industry is steadily increasing in importance. The Northern Pyrites Company, near Minnietakie lake, on the Grand Trunk Pacific, shipped a considerable quantity during 1909. Other deposits were worked in eastern and northern Ontario.

The Portland cement industry also expanded. During the year a merger was formed, taking in several of the Ontario plants and some in Quebec and other provinces. The Ontario output in 1908 was 2,022,877 bbl., and this will no doubt be exceeded in 1909.

Mica, feldspar, talc, apatite and quartz were all produced in varying yet important quantities. Arsenic was refined from the ores of cobalt at Deloro, Copper Cliff and Thorold. Building materials such as brick, lime and stone were produced probably in excess of 1908, since the building trade during the year was active in the cities and towns of this province.

British Columbia

BY E. JACOBS

The total mineral production of British Columbia, providing the accompanying preliminary estimates for 1909 are substantiated by the official figures, approximates a value of $347,804,000. Of this amount gold represents $126,317,000, silver $30,081,000, lead $23,298,000, copper $55,242,000, miscellaneous metals $991,000, coal and coke $102,782,000, building materials, etc., $9,093,000. The proportions of value are metalliferous minerals $235,929,000 and non-metalliferous $111,875,000.

MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1908-'09.

	1908.		1909.		Increase or Decrease.	
Gold, placer	32,350 oz.	$647,000	30,000 oz.	$600,000	D 2,350 oz.	D $47,000
Gold, lode	255,582 oz.	5,282,880	250,000 oz.	5,167,500	D 5,582 oz.	D 115,380
Silver	2,631,389 oz.	1,321,483	3,000,000 oz.	1,470,000	I 368,611 oz.	I 148,517
Lead	43,195,733 lb.	1,632,799	46,000,000 lb.	1,748,000	I 2,804,267 lb.	I 115,201
Copper	47,274,614 lb.	6,240,249	41,000,000 lb.	5,289,000	D 6,274,614 lb.	D 951,249
Zinc	....	270,000	....	500,000	....	I 230,000
Total—metalliferous	...	$15,391,111	.....	$11,774,500	....	D $619,911
Coal	1,677,849 l.t.	$5,872,172	1,910,000 l.t.	$6,790,000	I 262,151 l.t.	I $917,528
Coke	247,399 l.t.	1,484,394	277,000 l.t.	1,662,000	I 29,601 l.t.	I 177,606
Building Materials, etc		1,100,000		1,200,000	....	I 100,000
Total—non-metalliferous		$8,456,866	..	$9,652,000	....	I $1,195,134
Total production		$23,851,277		$24,126,500	....	I $575,223

The production in 1909 is estimated at $24,426,500, as shown in some detail in the tables herewith. In calculating the tables, the following prices were taken, the figures in parentheses representing prices in 1908 where this price differed from the average for 1909: Gold, placer, $20 per oz.; gold, lode, $20.67 per oz.; silver, 49c. (50.2c.) per oz.; lead, 3.8 (3.78)c per lb.; copper, 12.9 (13.2)c. per lb.; zinc, 5c. per lb ; coal, $3.50 per long ton; coke, $6 per long ton. Silver is less 5 per cent. and lead 10 per cent. of the average New York market prices for ten months.

GOLD.

The shortage in the placer gold output is attributable to a restricted supply of water, with a resultant shorter period of gravel-washing operations. Provision is being made in Cariboo for extended operations during 1910, chiefly on the properties of John Hopp, near Barkerville, and the leases represented by Howard W. DuBois. These leasers are constructing a 20-mile ditch and flume from Swift river to the Quesnel Forks neighborhood, preparatory to hydraulicking on a large scale. There was no dredging for gold in the province in 1909, though a number of bars in the Fraser river were prospected. The Guggenheim hydraulic-gold properties in British Columbia, in the Quesnel Forks and Atlin camps, were not worked during the season on the large scale that was expected. Recently a move was made to work some placer leases situated in the Big Bend of the Columbia District, north of Revelstoke, where good results were obtained in earlier years.

The decrease in the production of lode gold was largely in Rossland, a result of the suspension of production at the Le Roi mine, pending the carrying out of systematic exploration with a view to finding new orebodies of a payable grade in the deeper levels of the mine. The Center Star group of the Consolidated Mining and Smelting Company of Canada, Ltd., made a slightly larger production of gold than in 1908, and the Le Roi No. 2 equalled its 1908 production from its Josie mine. There was no change of importance among the smaller mines in Rossland camp, although work was done in several of them.

The Boundary district, as in earlier years, made a fairly large production of gold, which in the mines of that district is in association with copper. The greater part of the lode gold produced in British Columbia was from smelting ores, there being only two mining divisions in which gold ores were milled to any considerable extent, viz.: Nelson and Osoyoos. The Nickel Plate mine at Hedley was sold during the year to the Hedley Gold Mining Company. Development work will be done on the Nickel Plate in 1910, following extensive diamond drilling done in 1909 and additions are being made to power plant at both the mine and the 40-stamp mill, the former including the installation of the second half of a Rand-Corliss, compound-condensing air compressor, which may be operated either by Pelton wheel or steam; at the mill regrinders and filter press are being added.

The advance made in Nelson district ame mostly from Sheep Creek camp, in which several mines were developed with romising results. At Ymir the only proucer was the Yankee Girl, operated by New York company organized during ne year. Texada island made an inreased output of lode gold from two or hree mines, the gold occurring in an ore lso containing silver and copper.

SILVER

Nearly half of the increase in silver utput was made in Ainsworth camp, in West Kootenay. The Blue Bell mine on Kootenay lake contributed about 38,000 z. more than in 1908; the Whitewater nd Whitewater Deep mines, situated beween that lake and the Slocan mining ivision, about 58,000 oz., and various ther mines in the division together made p about 75,000 oz. of the total increase.

In the Slocan division the Richmond-Eureka mine produced 197,000 oz., 37,000 z. more than in 1908, while the Van Roi, n English-owned property, yielded an inrease of about 38,000 oz.

The production of East Kootenay ines was nearly 100,000 oz. less than in 908. Several mines in the Nelson diviion, the Silver Cup in Ferguson camp, Lardeau, and the Marble Bay and Corell mines on Texada island increased heir silver output. The finding of nave silver in bornite ore at between 900 nd 1000 ft. depth in the Marble Bay ine was one of the most interesting eatures of the year's mining in the Coast istrict; the more so since the first-class re also contained about $10 per ton in old.

The average silver content of the ores f the big Boundary mines appeared to be lightly lower than in earlier years: the ifference per ton was not considerable, ut in the aggregate silver content of the otal tonnage—nearly 1,600,000 tons—ined and smelted, it was distinctly oticeable.

A further increase in the quantity of ilver produced in the province is exected in 1910, for substantial progress nade in 1909 in the Ainsworth and Slocan districts may be expected to be maintained, while better results are looked for n East Kootenay. Boundary mines will ncrease their tonnage also, and in the Coast district new mines, in the Portland Canal district, will begin producing.

LEAD.

The increase in production of lead over 909 was about 2,804,000 lb., about 6,000,000 lb. having been produced. In ast years production has ranged as high s 63,358,000 in 1900. The stimulating ffect of the bounty paid by the Canadian Government on lead produced in the Dominion is shown by the statistics. Production for 1903, the year immediately preceding the granting of the bounty, had fallen to 18,089,000 lb., but since 1904 it was not lower than 43,000,000 lb. in any year, while it rose to 56,580,000 lb. in 1905. The bounty is determined by the price of lead in London, it being on a sliding scale to insure to the Canadian producer a minimum price of £17 per ton. The maximum bounty is 75c. per ton paid when the London quotation is £14 10s. or lower.

East Kootenay produced more than half the lead mined in British Columbia. Its total for 1909 was less by between 3,000,000 and 4,000,000 lb. than that of 1908, partly owing to a suspension of production at the Sullivan Group mine (this mine later resumed work), and partly to a decreased output of this metal from the St. Eugene and North Star mines. The output of mines in the Ainsworth mining division was over 10,000,000 lb., double that of 1908. More than half of this increase was made by the Blue Bell mine, with a production of about 6,466,000 lb. in 1909 as against 2,600,000 lb. in 1908. The Whitewater and Whitewater Deep mines produced about 3,355,000 lb. as compared with 2,000,000 in the preceding year. The Cork mine, on the south fork of Kaslo creek also contributed to this increase, though in much smaller degree.

MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1909 BY DISTRICTS.

Name.	Divisions.		Districts.	
	1908.	1909.	1908.	1909.
Cariboo District	....	....	$ 405,000	$ 390,000
Cariboo Mining Division	$355,000	$350,000	....	....
Quesnel Mining Division	30,000	25,000	....	....
Omineca Mining Division	20,000	15,000	....	....
Cassiar District	....	....	298,234	267,319
East Kootenay District	....	....	4,802,680	4,991,446
West Kootenay District	....	....	5,448,224	5,851,670
Ainsworth Mining Division	122,181	932,134	....	....
Nelson Mining Division	462,836	678,601	....	....
Slocan Mining Division	676,580	1,073,080	....	....
Trail Creek (Rossland)	3,713,392	3,023,711	....	....
Other parts	173,235	144,141	....	....
Lillooet District	....	....	13,779	10,000
Yale District	......	....	7,619,963	6,710,413
Osoyoos, Grand Forks and Greenwood Mining Divisions	7,545,380	6,426,609	....	....
Similkameen and Nicola	101,583	280,804	....	....
Yale Mining Division	3,000	3,000	....	....
Coast District (Nanaimo, Alberni, Clayoquot, Quatsino, Victoria)	....	....	5,233,397	6,205,652
	....	....	$23,851,277	$24,426,500

The production of Slocan mines fell off approximately 750,000 lb., the chief losers being the Rambler-Cariboo and Standard mines. Richmond-Eureka and Van Roi both considerably increased their output, the former producing 1,357,000 lb., and the latter 1,788,000 lb. of lead.

In the Nelson division, the Yankee Girl, at Ymir, was a new producer, with between 300,000 and 400,000 lb. to its credit. The Iron Mountain Company's Emerald mine, near Salmo, advanced its production from about 400,000 lb. in 1908 to 764,000 lb. in 1909. The La Plata, on Kokanee creek, near Nelson, was idle all the year.

The Consolidated Mining and Smelting Company of Canada, Ltd., during 1909 increased the lead-smelting capacity of its works at Trail and also enlarged its electrolytic lead refinery. Two lead stacks have each an average smelting capacity of 150 to 170 tons of ore per day. Steel water jackets were substituted for iron in these two furnaces, the number of tuyeres increased to 22, a 50-ton bullion pot installed and provision made for molding the lead into anodes at the furnace. An improved mechanical feed was installed at the furnaces. The number of Huntington-Heberlein circular roasters for lead was increased to seven and converting pots to 15. The lead refinery was enlarged to a daily capacity of about 120 tons of refined lead. The number of electrolytic tanks is now 596, these being housed in a building 600 ft. in length.

COPPER.

The copper production was about 6,274,000 lb. less than that of 1908, though official returns may change this figure. About 1,500,000 lb. of the decrease was due to the suspension of production at the Le Roi mine, Rossland. There was a comparatively small decrease in the production of the Center Star, in the same camp, and a slight increase in that of the Le Roi No. 2 company's Josie mine. The small mines of Rossland camp did not contribute any quantity of copper worth noting.

In the Boundary district the Granby company's mines led with a production estimated at between 23,000,000 and 24,000,000 lb. Those of the British Columbia Copper Company, with only about 6,500,000 lb., showed the effect of three months' idleness consequent on a strike at the collieries from which this company obtains its supply of coke for smelting. The Consolidated company's Snowshoe mine, with 3,775,000 lb., made a gain of about 2,500,000 lb. over 1908. The Dominion Copper Company mines were not operated during 1909. Comparatively big tonnages and low mining and smelting costs were prominent features of the copper-producing industry of the Boundary district.

The Granby company lately completed the improvements to its smelting plant which were commenced in the previous year. The maximum treatment capacity of the smeltery is now about 4500 tons of ore per diem, as evidenced by a recent full week's run giving an average of 560 tons per day per furnace for seven furnaces then in blast. The eighth enlarged furnace was since blown in. Enlargement of two of the three 700-ton blast furnaces of the British Columbia Copper Company is to be made to provide for the ore from a mine the company opened in Wellington camp, Boundary district, and also for ore from the New Dominion Copper Company's mines, which it is stated will be treated here. There does not appear to be any probability of the Dominion Copper Company's smelting works at Boundary Falls being used again under existing conditions.

The Tyee Copper Company installed a second blast furnace at its works at Ladysmith, Vancouver island. There was no production of copper ore on Vancouver island in 1909 worth mentioning, but the Tyee company kept its works operating on ores from other parts. During twelve months ended Aug. 31, 1909, approximately 45,000 tons of ore were smelted and matte containing about 3,500,000 lb. of copper produced. The new furnace is 48x160 in. at the tuyeres. Its capacity is estimated at about 12,000 tons of ore per month.

Exploration work was continued at the Britannia mine, on Howe sound, and latterly about 100 men were employed at mine and mill. Some of the orebodies carry a considerable percentage of zinc, and a roaster, cooler and Wetherill magnetic separator were installed for the purpose of determining in a commercial way whether the iron and copper can be separated from the zinc. The mill was remodeled, and its capacity brought up to 500 tons per day. Experimental work in saving the chalcopyrite contained in the highly silicious gangue characteristic of Britannia ore was continued. There is little probability of active production in the near future, the present intention being to definitely determine both the approximate tonnage of ore available and the best means of preparing it for smelting.

The large shoot of bornite ore in the Marble Bay mine, Texada island, was opened on the 960-ft. level for a length of 210 ft. with ore in the face at each end of the drift. A shipment of about 11,000 tons of second-grade ore from this mine returned 4 per cent. copper. A neighboring mine, the Cornell, reported 6.2 per cent. from 11,000 tons of ore.

In the northern part of the British Columbia coastal district there is promise of a substantial production of copper ere long. Herbert Carmichael, assistant provincial mineralogist, officially reported on the Red Cliff, distant about 20 miles from the head of the Portland canal, and the Hidden Creek group, on Observatory inlet, a branch of the Portland canal. The establishment of a smeltery in the vicinity is proposed.

Iron and Zinc

Iron mining in British Columbia, at no time of great importance, was practically at a standstill during the last two or three years. A large deposit of iron on Texada island was bonded to some United States men, but no steps were taken by them in the direction of mining the ore. In past years about 30,000 tons of this ore were shipped to Puget sound, Wash., and smelted in a charcoal furnace erected at Irondale, near Port Townsend.

A company was organized to establish iron and steel works at or near Vancouver or New Westminster, the latter within 20 miles of the mouth of Fraser river, but the plans of those in charge of this enterprise are not yet fully matured. The deposits of iron on Vancouver island remain undeveloped, as, too, do those known to occur in the Kootenay district, in the southern interior of the province.

There was more activity during 1909 in connection with the mining of zinc than for several years previous. Zinc was produced commercially at four or five mines, while at others tailings from silver-lead-concentrating plants were stored for later treatment. The largest producer of zinc in British Columbia was the Lucky Jim mine, in the eastern part of the Slocan district; much of the crude ore from this mine contained 52 per cent. zinc and was shipped without concentration. The Whitewater and Van Roi mines, the former in the Ainsworth mining division and the latter in western Slocan, both made a zinc concentrate. The Whitewater shipped 4360 tons of zinc concentrate averaging approximately 15 oz. silver per ton and 42 per cent. zinc; the Van Roi made about 1400 tons of similar concentrate assaying about 44 per cent. zinc and 50 oz. silver per ton. The Ruth, at Sandon, also made a zinc concentrate from its silver-lead-zinc ore, and shipped 655 tons in 1909. The ore of the Blue Bell contains much zinc, but so far no production of the metal on a commercial basis has been made at this mine. A group of mineral claims on Pingston creek, opposite Halcyon hot springs, on which there is a large surface showing of zinc ore, was lately bonded to New York men who are commencing development of the property.

Borax Mining in the United States in 1909

There was little or no change to be noted in the condition of the borax mining industry in this country during 1909. As in previous years, the output continued to come from California. Few mines were operated even then, most of them having closed down two years ago at the time of the drop in price of the refined product. The annual output has varied little, mining being carried on to keep pace with consumption, which has not increased to any extent if at all. The quantity produced was from 23,000 to 25,000 tons crude, valued at from $900,000 to $1,000,000, the value being fixed in proportion to the quantity of anhydrous boric acid contained. Most of the mineral mined contained 35 to 45 per cent. anhydrous boric acid. The marsh muds formerly worked carried only from 2 to 3 or 4 per cent. anhydrous boric acid, and they had to be concentrated before shipment to the refineries. The mining of these low-grade borates has practically ceased in the desert regions of California, the larger companies having given up their mines and plants as not profitable at recently prevailing prices. However, a large English corporation proposes to work some tracts of surface deposits of this character on an extensive scale, but as yet no production has been made.

The only productive deposits of importance in California were those of the Pacific Coast Borax Company, in Inyo county, and the Sterling Borax Company, at Lang, in Los Angeles county. In both cases the companies worked veins of colemanite. The Borax Properties, Ltd., has a surface deposit at Otis, San Bernardino county, which is expected to shortly become productive. Several of the old companies formerly working deposits in Ventura and San Bernardino counties became a part of the Sterling Borax Company, and the old mines were given up.

There is some talk of one or two claims at Griffin or Frazier, Ventura county, beginning operations again in the summer of 1910, but this is somewhat doubtful if prices of refined borax do not advance. With such an advance in price a number of claims once worked may resume, but until this happens their rehabilitation is not probable.

Crude borax was shipped to refineries in the East just as mined, though some of the low-grade mineral was calcined to concentrate it before shipment.

he Petroleum Industry of the United States

Total Production Decreased about 2 Per Cent. California Field Largest Producer; Mid-continental close Second. Texas-Louisiana Declined

PRODUCTION 180,717,696 BARRELS

The accompanying table shows the re- sed figures for the production of crude troleum in the United States in 1908 d preliminary estimates for 1909. There s a decline in production in 1909 ounting to about 4,000,000 bbl. or over per cent. California, however, showed very satisfactory increase of output, e 1909 total being nearly 30 per cent. rger than that of 1908. The Coalinga lfield was the largest producer in alifornia. The oil production of the ate in 1909 was valued at almost $27,- 0,000 which figure is larger than that the gold output of the State and larger an the production of the Mid-continen- l oilfield. The output of this field in 1909 was 7 per cent. less than for 1908 when it led the producing districts of the country.

PRODUCTION OF CRUDE PETROLEUM IN THE UNITED STATES.
(IN BARRELS OF 12 GAL.)

Field.	1908.	1909.
California	45,000,000	58,250,300
Colorado	411,836	(a) 500,000
Gulf { Texas	11,206,464	9,593,000
Gulf { Louisiana	6,835,130	3,192,000
Illinois	38,844,899	29,500,000
Lima { Indiana	7,287,000	6,192,000
Lima { Ohio	......	....
Mid-continental (b)	50,741,678	46,826,196
Kentucky-Tennessee	1,250,000	(a) 1,250,000
Appalachian (c)	24,240,000	25,394,200
Wyoming	(a) 13,000	(a) 15,000
Others	(a) 3,000	(a) 5,000
Total	184,711,413	180,717,696

(a) Estimated.
(b) Kansas and Oklahoma.
(c) Pennsylvania, New York, West Virginia and eastern Ohio.

The oilfields of Texas and Louisiana showed a greatly decreased production in 1909, every large pool except Caddo recording a smaller output than that for 1908. Humble was the largest producer. Prices were somewhat better in this section. The dissolution of the Waters-Pierce company by the Federal Government was an important happening in 1909. Illinois produced in 1909 only about 75 per cent. as much petroleum as in 1908. The Appalachian field, however, obtained a slightly increased output.

Petroleum in Texas and Louisiana

SPECIAL CORRESPONDENCE

Development in Texas and Louisiana uring 1909 did not open up any new usher pools, consequently production de- ined materially. Anse Le Butte, Mark- um, and Goose Creek dwindled into nall and costly pools confirming the pinion of most operators. Drilling at iedras Pintas, the Mission and other elds, that at first gave promise of a easonable output, were only conclusive proving them to be of small area and mited capacity. Operations in the Caddo egion were unsatisfactory on the whole nd the production much less than an- cipated. The proven area of the old ools was extended little, the field work onsisting largely in cleaning out and eepening old wells. Salt water increased reatly in the majority of the pools, par- cularly at Spindle Top, Humble, and ennings. The latter pool was especially isappointing and the output was less an half that of 1908 when it produced much larger yield than any other oastal pool. While field conditions were niformly discouraging crude-oil prices ere fully up to expectations because ocal consumption exceeded the produc- on.

OUTPUT

The 1908 production in Texas was 11,- 06,464 bbl., of which 10,483,000 bbl. orig- nated in the coastal region. The ouisiana production in 1908 was 6,835,- 30 bbl. and the total coastal produc- ion 17,318,330 bbl. The 1909 production f Texas, as nearly as it is possible to estimate, was 9,596,000 bbl., of which 8,921,000 bbl. were credited to the coastal field. The Louisiana estimate was 3,192,000 bbl., making the total output of the coastal region 12,113,000 bbl. The figures given indicate a decline of 1,610,460 bbl. in Texas (practically all in the coastal field) and 3,643,130 in Louisiana, every large pool showing a decrease except Caddo. The total value of the crude product was, however, only about $1,500,000 less than in 1908 for the average price per bbl. was about 12c. higher. The Humble pool was the largest producer in 1909, with a production of over 1,000,000 bbl. greater than that of Jennings, which was the leader in 1907 and 1908.

The estimated yield of the larger pools was as follows: Humble, 3,151,000; Jennings, 2,047,000; Sour Lake, 1,763,000; Spindle top, 1,400,000; Saratoga, 1,247,000; Batson, 1,230,000; Caddo, 1,036,000. In northern Texas the Powell field was much the largest producer.

The daily runs of the coastal field in 1908 averaged 44,131 bbl., while in 1909 the daily average declined from 39,000 bbl. in January to less than 31,000 bbl. in November. It is difficult to estimate the stored coastal crude, which was 2,786,000 bbl. in February, but it was probably not in excess of 1,500,000 bbl. on Dec. 31; nearly all of which was held by refinery interests and not available for general consumption. According to the *Oil Investors' Journal* the total number of completed wells for 11 months was 677, of which 449 were oil producers, 30 gas wells and 198 dry holes, and the December completion hardly exceeded 40 wells. The completions in 1908 were 833, which shows a reduction of more than 200 wells in 1909.

In addition to the large decrease in number the average initial well capacity was much less than in 1908. Sour Lake and Caddo were the only pools that showed increased activity. Batson, Humble, Spindletop and Jennings had the largest proportion of dry holes, Saratoga and Sour Lake the smallest. The number of wells drilled at Jennings was only half as large as in 1908 and dry holes were nearly as numerous as producing wells. In north Texas the Corsicana field was inactive but the number of wells finished in the Powell and Henrietta pools was more than double that of 1908. Many of the gas wells in the Caddo and Henrietta fields were of large capacity. Those in the latter were utilized to supply gas to Henrietta, Petrolia, and Wichita Falls and half of the 125-mile line to Dallas and Fort Worth was constructed.

The Mississippi Valley Gas and Pipe Line Company obtained a franchise to supply New Orleans from the Caddo field and are actively developing wells of ample capacity in the Vivian pool. The proposed pipe line will be about 350 miles long and cost $7,000,000 while the franchise stipulates that gas must be supplied within 30 months for 45c. per thousand feet up to a consumption of 60,000,000 ft. and over that amount for 40 cents.

The record of completed wells does not include any outside the well known pools. Wildcat drilling was undertaken in about 25 counties in Texas and 11 parishes in Louisiana extending over a wide area; many of the wells were not completed, though not finally abandoned. A few wells made a small showing of oil but the only one of prominence was a well near Electra in Wilbarger county, northern Texas. It was finished late in the year and is said to be capable of producing 40 bbl. of 41 deg. B. oil from a sand found at 1200 feet.

PRICES

The market for crude was weak early in January, prices at most points averaging 56c., with Caddo light selling at 50c. and heavy at 40c., Corsicana light at 70c. and fuel oil at 48c. In February when it was realized that the production was declining much below consumption, posted credit-balance prices advanced 2c. and spot oil at Jennings brought as high as 70c. The advance continued during March and April when credit-balance prices ranged from 72@76c. and Caddo oil brought from 50c. for fuel oil to 60c. for light grades suitable for refining. The market remained stable but inactive until July when the credit-balance prices stiffened to 75c. and remained unchanged to the end of the year, some oil selling as high as 80c. on contract.

The stable prices indicate that the market in all portions of the territory adjacent to pipe lines or refineries is now dominated by the cost of Oklahoma crude. A considerable portion of the fuel-oil demand was satisfied by refinery residuum and consumption would be large if more tank cars were available. The stability of prices and the ability to obtain long-time contracts may increase the consumption which undoubtedly declined owing to the high price and disinclination of coastal producers to make contracts guaranteeing price and delivery. The average posted credit-balance price for 1909 was 70@71c. in the coastal fields except Caddo. where the average was 50@55 cents.

REFINERIES AND PIPE LINES

The Standard Oil Company was constructing a refinery near Baton Rouge which, when completed early in 1910 is to have a still capacity of 10,000 bbl. The capacity of the Texas Company plant at Dallas was increased by 4800 bbl. daily in June and the Texas City Refining Company put in operation a new 2000-bbl. plant on the bay shore opposite Galveston. The Security Oil Company refinery near Beaumont was idle part of 1909 and the plant of the United Oil and Refining Company at Spindletop was closed down in August owing to financial difficulties which necessitated the appointment of a receiver.

Competition in refined products was very keen in 1909 and consumers had no reason to complain of prices or quality. Water shipments from Port Arthur and Sabine increased about 50 per cent. over those of 1908. The 1908 shipments of all grades and classes totalled 8,128,573 bbl. while the shipments for 11 months of 1909 aggregated 10,995,496 bbl., of which 7,579,812 bbl. were refinery products. Most of the cargoes were manifested to Gulf or eastern Atlantic ports and the rest were consigned for European or Mexican consumption. Practically all the refinery products (except asphalt) were derived from Oklahoma crude and the bulk of the crude shipped was from coastal fields. New pipe line construction in Texas was generally for the purpose of increasing the facilities for tranferring Oklahoma crude. The Gulf Pipe Line Company completed a 6-in. line from Sour Lake to Houston in order to save freight rates in supplying fuel oil to south Texas points. In Louisiana various laterals were laid in the Caddo field and a portion of the Standard Oil line from Oklahoma to Baton Rouge was completed.

LEGAL PROCEEDINGS

The onerous injunction and seizure of tank cars in the action under the anti-trust laws against the Security Oil Company, Navarro Refining Company and the Union Tank Line Company made it difficult to obtain an adequate supply of crude and prevented shipment of refined products by these concerns. When the action was tried the Security Oil Company and Navarro Refining Company admitted that their products were sold, under agreement, exclusively to the Standard Oil Company. Judgment was pronounced fining them, ordering their charters canceled and perpetually enjoining them from doing business in Texas. The Union Tank Line Company was fined $75,000 and their cars in custody ordered sold.

In the case of Texas vs. Waters-Pierce Oil Company the Supreme Court of the United States confirmed the State court on all points, a receiver was appointed, judgment given for ouster and a fine of $1,623,900 with costs imposed. The large fine was duly paid to the State Treasurer, the property sold in December to interests friendly to the defendants and the company will be reorganized by H. Clay Pierce, who successfully defended the criminal action against him.

TEXAS DISTRICTS

Sour Lake, the only pool showing an increased output over that of 1908, was the center of interest in the early part of the year on account of the development of the deep sand on the south side of the field. The field was also extended slightly to the northeast and the monthly production increased to 175,000 bbl. These extensions failed to maintain their yield, however, and the production declined to 125,000 bbl. in November. While the Humble pool retained its position as the largest producer in Texas its output declined 600,000 bbl. and well completions were 50 less than in 1908. Salt water proved a serious problem to contend with in the deep sand of the northern extension and operators were satisfied with 100-bbl. wells in the 900-ft. sand. The situation is best shown by the fact that the average initial capacity per well declined from 215 bbl. in 1908 to about 60 bbl. in 1909. Spindletop and Batson were featureless with output diminishing slowly but surely. The Saratoga pool was extended a short distance south and southwest. It yielded 300,000 bbl. less than in 1908 but the monthly reports show that its production varied little during the year and that the proportion of dry holes was very small. At Markham the Producers Oil Company abandoned the field after expending $150,000 in obtaining an insignificant production. Goose Creek had only one producing well at the end of the year and the production in the Mission Field, Bexar county, and at Piedras Pintas, Duval county, remain nominal. Hoskins Mount in Brazoria county developed several good wells and, while the shipments to date have been comparatively small, the pool showed more promise of an increased output than any of the new districts.

LOUISIANA DISTRICTS

The Welch field continued to give a small yield from old wells. All efforts to extend the Anse Le Butte pool were failures and the November production was only about one-third of that of January. The most disappointing feature of the year was the enormous decline in production at Jennings where about 50 wells were completed and the initial capacity of the producers was absurdly small when compared with previous years. A reduced yield was anticipated but not a decline of over 3,000,000 bbl. Some idea of the rapid encroach of salt water and consequent failure to hold up production was shown by the monthly runs which declined from 255,000 bbl. in January to 131,000 bbl. in November.

While the proven area in the Caddo field was largely extended in spots, field operations were not nearly as extensive as expected, though double what they were in 1908. The monthly production increased from 54,000 bbl. in January to 115,000 bbl. in November while the total yield was 400,000 in excess of 1908. The territory is apparently spotted and the wells vary greatly in capacity and in quality of crude. The producing wells are in the vicinity of Lewis, Vivian, Mooringsport, Oil City, Pine Island, and Hart's Ferry. Vivian the most northerly pool (eight miles north of the regular deep sand) not only produced heavy oil but some extremely large gas wells. These oil and gas wells are in the shallow sand and cost much less to drill than in other

Caddo pools. Many of the outside tests resulted in dry holes but the largest well of the year was brought in during November, two miles from the Texas line. This well which is four miles from the nearest well in the deep sand, is said to be 2350 ft. deep and to have had an initial capacity of 2000 bbl. of 41 deg. B. oil.

Ten samples of Caddo crude were examined by the U. S. Geological Survey. They were all black in color, had a specific gravity ranging from 21.3 to 41 deg. B., and gave no indication of sulphur. Their asphalt content was usually less than half of one per cent. and in no case exceeded one per cent; only two samples contained gasolene and the kerosene varied from 12 to 55 per cent.

The State survey issued a preliminary bulletin relating to the oil and gas in northwestern Louisiana and it will be followed by a more detailed report now in preparation by the U. S. Geological Survey.

The Appalachian Oilfield

BY H. C. GEORGE *

The oilfields of New York, Pennsylvania, West Virginia, southeast Ohio and Kentucky produce a high-grade petroleum with a paraffin base. These oilfields are included under the general name the "Appalachian Oilfield." This oilfield, for a number of years, has shown a steady decrease in production, but owing to the discovery of some large wells in West Virginia during 1909, a slight increase is recorded. The total production of the Appalachian oilfield in 1909 was 25,394,200 bbl., as compared with 24,240,000 bbl. in 1908, 25,500,000 bbl. in 1907, and 27,345,000 bbl. in 1906.

At the beginning of 1909 crude petroleum of the Pennsylvania grade sold for $1.78 per bbl. A break in prices came in April, and finally in November the uniform price paid was $1.43 per bbl. The average price during the year was $1.62 per bbl., as compared with $1.78 in 1908 and $1.74 in 1907.

New York and Pennsylvania

Petroleum developments in Pennsylvania and New York during 1909 have been the repetition of the history of these fields during the previous five years. The production has been maintained only by the yearly drilling of about 4000 wells with a daily average production per well of about 2½ bbl. Most of the oil territory in these two States is of the long-lived kind, owing mainly to the density of the sand rock containing the oil.

In the Allegany County field in New York, more than half of the producing wells, which number about 6000, were drilled 25 years ago. Hundreds of others equally as good were "pulled out" at the time of the big excitements in other fields between the years 1882 and 1892 for the purpose of securing the "junk" for use elsewhere. During the last five years, many of these abandoned wells have been redrilled and placed on a paying basis. During 1909 a test well was drilled in this field to a depth of 3200 ft. The well was cased to 300 ft. From 975 ft. to 2650 ft. the drill encountered black and brown shale. At 2650 ft. the Niagara limestone was reached. From 3050 ft. to 3115 ft. a salt bed was passed through. From 3115 ft. to 3200 ft., the bottom of the hole, the drilling was in blue slate.

Drilling operations in Pennsylvania are naturally limited by the scarcity of available territory and the small wells secured. But territory which would have been considered of no value a few years ago is now secured and thoroughly drilled. The decrease in the market price of petroleum during 1909 had a tendency to limit operations and developments in the Pennsylvania and other fields, where only small wells could be hoped for; not so much on account of the decrease itself, but more on account of the feeling of uncertainty that it created. Nearly all of the wells drilled in Pennsylvania during the year were small. A good well was struck last April in the Bradford sand at Smithport, McKean county. Probably the best well drilled in the State during the year was the one completed last October near Bakerstown, Allegheny county. The production during the first 24 hours was 350 barrels.

PRODUCTION OF WELLS DRILLED IN THE APPALACHIAN OILFIELD IN 1907, 1908 AND 1909.

	Number of Wells Drilled.			Daily Production in Barrels.			Daily Production in Barrels per Well Drilled.			Per Cent. of Dry Holes.		
Field.	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Allegany County, N. Y.	575	493	468	1,111	880	838	1.9	1.8	1.8	16.0	13.4	7.5
Pennsylvania	3,611	3,748	3,958	12,176	9,532	10,361	3.3	2.5	2.6	21.0	19.0	15.6
West Virginia	1,320	1,329	1,810	21,300	27,301	35,872	16.1	20.6	19.1	38.0	32.5	36.9
Southeast Ohio	1,335	1,314	2,285	6,793	13,798	25,239	5.9	10.3	11.0	39.5	39.3	36.2
Kentucky	212	205	179	2,006	2,519	2,108	9.4	12.3	11.7	32.0	33.6	41.7
Total	7,053	7,119	8,700	43,389	54,033	81,918	6.1	7.6	9.4	27.0	25.0	25.6

Ohio

The Steubenville pool in Jefferson county has been furnishing the largest producers in Ohio. But the limited area of this field will not justify hopes of any great increase in production. Operations were active during 1909 in Fairfield and Perry counties. The wells drilled are not large, but they indicate the existence of considerable undeveloped oil territory. In the earlier part of the year one of the best wells credited to the eastern fields was drilled in Ludlow township, Washington county. It produced in the first 48 hours about 2500 bbl. In the Woodsfield district, Monroe county, some good producers were found as a result of extended field activity. Neither Jefferson nor Columbiana counties has been very successful in field operations or new production.

West Virginia

West Virginia, during the last few years, has stood first in new production in the Appalachian field. Lincoln county led in active work and increased production during the earlier part of 1909. This was chiefly due to a number of fair producers in the Berea grit formation. Much exploration work was done in Putnam, Kanawha, Boone, Logan and Mingo counties, but with indifferent success.

The best well drilled in August in the Appalachian field was found in the Shinnston pool in Harrison county. At its best it produced about 80 bbl. per hour, and it averaged about 1700 bbl. per day at the end of a week. This well furnished about half of the new production credited to West Virginia in August.

Previous to August in 1909, southeast Ohio stood first in new production in the Appalachian field for the year, but at this time West Virginia resumed first place. Last October a well was drilled in the Mannington district in Marion county, West Virginia. It produced 500 bbl. during the first 12 hours. Later it was given a shot and the production was increased to 100 bbl. per hour.

In November the production of the

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*Director, Wisconsin State Mining Trade School, Platteville, Wis.

Shinnston pool in Harrison county had reached 7000 bbl. per day by the drilling of a few very large wells. Early in December this pool furnished the largest gusher with one exception since the days of the big wells of the McDonald field. No accurate gage could be taken of the production at first, but it was variously estimated from 300 to 500 bbl. per hour. When finally controlled, with facilities to handle the oil, the production reached 4000 bbl. during the first 24 hours. The production of the Shinnston pool in December averaged about 10,000 bbl. per day.

During the latter part of 1909 the Big Injun district in Roane county was most active in development work. This county has more wells drilled and started than any other in the southwest part of the Appalachian oilfield. About the time that operations became more active in Roane county there was a marked decline in Lincoln county. There was considerable development work in Ritchie, Pleasant and Wirt counties during the year. In the "shallow sand" territory in Ritchie county the Grant and Murphy districts produced some good wells. The new wells in Wirt and Pleasant counties are mostly small producers.

An accompanying table shows a complete record of the new production in the Appalachian oilfield. Developments in Kentucky were not especially promising. Nearly half of the wells drilled during 1909 were dry holes, and there are no strong indications in the State of any great extent of oil territory.

Oil and Gas in the Mid-continental Field

BY ERASMUS HAWORTH *

Probably the most interesting development in the Mid-continental field during 1909 was the bringing-in of a new pool six miles north of Okmulgee, at a little siding previously known as Hamilton switch, but now usually called Hamilton. In August a well was drilled which flowed 800 bbl. and which is still making about 600 bbl. per day. Five other wells, each of which is a good producer, were drilled, the last one starting off with a natural flow of 1500 barrels.

The discovery at Hamilton created quite a furor among oil men. The wells are the deepest of any in the entire field, with the possible exception of a few outside ones in remote districts. The sand lies uniformly 2200 ft. deep and is what practical oil men call a "fine" sand. No large gas wells were obtained, but a steady flow for months with but slight cessation means that there is sufficient gas to produce strong-flowing wells. Further, no one shot any of the wells. Development is being rushed and probably within the next 10 weeks there will be from 40 to 60 wells drilled and the pool at least partially outlined. By the first of December there were more than 40 rigs on the grounds. In midsummer leases could be had almost for the asking, by paying the royalties required by the Interior Department. Now such leases in extreme cases are selling at a bonus of $500 an acre. The Hamilton pool lies almost immediately south of the famous Glenn pool which makes it in line with practically all the great producers from Dewey south by way of Bartlesville and Red Fork; one of the most remarkable oil trends in the world.

CRUDE OIL BOUGHT BY THE PRAIRIE OIL AND GAS COMPANY DURING 1909.

Month.	Total Runs, Barrels.	Daily Average, Barrels.	Deliveries, Barrels.	Stored, Barrels.
January	2,684,529	86,597	2,197,351	487,178
February	2,322,582	82,949	1,804,899	517,683
March	2,119,129	79,001	2,178,254	261,875
April	2,291,894	76,496	2,262,918	31,975
May	2,379,196	76,748	2,296,896	82,300
June	2,442,487	81,416	2,117,182	325,004
July	1,871,792	60,380	1,743,330	128,462
August	2,528,107	81,551	2,492,897	35,210
September	2,516,956	83,898	2,405,133	111,822
October	2,382,488	76,854	2,369,525	12,963
November	2,459,353	78,978	2,425,199	33,854
December	2,394,683	78,897	2,209,159	9,393
Total	28,726,196		26,503,643	2,037,719

Some drilling was done throughout the entire Mid-continental area, but the amount was in no wise comparable with that of other years. The production already obtained was more than the markets demanded which accounts for a lapse of drilling activities. In the vicinity of Muskogee a number of wells were obtained all of which produced the same high-grade oil as of earlier times. Two well defined oil sands are encountered here, one at about 1200 ft. and the other at about 1600. The oil in the upper has an average gravity of about 42 deg. B. and in the lower of about 38 deg. Baumé.

The shallow field in the vicinity of Alluwe and Coody's Bluff remained productive to such a degree that some optomistic operators figure that this field could produce 100,000 bbl. daily should the market call for it. As Nowata is the principal town in this vicinity, it is becoming customary to speak of the region as the Nowata area, although the oil is obtained to the east and northeast of this place.

PIPE LINES

No new oil pipe lines were built during 1909 to carry the oil outside the Mid-continental field. But those in existence were actively in use all the time. The Prairie Oil and Gas Company purchased from 70,000 to 90,000 bbl. daily throughout the year, nearly all of which was delivered to the pipe-line companies, leaving but a small portion to be put in storage as will be seen by an examination of the statistical tables hereto appended. The Texas Pipe Line Company, sometimes spoken of as the John W. Gates company, and the Gulf Pipe Line Company, or Mellons company, each shipped large quantities of oil throughout the year.

OIL PRODUCTION, MID-CONTINENTAL FIELD, DURING 1909.

	Barrels.
Prairie Oil and Gas Co	28,726,196
Texas Oil Co.	6,250,000
Gulf Oil and Pipe Line Co	7,375,000
Independent refineries	2,975,000
Fuel oil, crude	500,000
Independent shippers	1,000,000
Totals for year	46,826,196

The Standard Oil Company began work on a large pipe line from the Mid-continental field to the gulf. E. A. McPherson, the contractor, reached the field about Dec. 1 and at once began making active preparations for the construction of the line. One branch of this line will start from the vicinity of Nowata and one from the Glenn pool. The two will meet a little northwest of Muskogee, from which point presumably the line will be carried through Arkansas and Louisiana by way of Baton Rouge, where the Standard Oil Company is now constructing a $2,000,000 refinery. It is hoped by producers that, with the construction of this new line, a much greater demand for oil than has existed for the last two years will result.

REFINERIES

The great bulk of oil produced in the

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*State geologist, Lawrence, Kansas.

id-continental field has been refined by e Standard Oil Company. Most of the rge number of independent refineries ted for last year[1] operated in 1909 al- ough some of the lesser ones stood idle e greater part of the time. The one at otaze, working largely on borrowed pital, began extensive enlargements of plant, with the ultimate result that it is placed in the hands of a receiver un- r the Federal court.

Fuel Oil

A larger amount of fuel oil was con- med in 1909 than ever before in the story of the Mid-continental field. Much ore than one-half of the oil thus con- med came from the refineries, yet a mparatively large amount of crude oil is taken directly from the wells to the rnaces throughout portions of Texas, Oklahoma, Kansas and Nebraska. The large refinery at Sugar Creek near Kansas City supplied the greater portion of the oil consumed. This refinery gets its supply of crude oil entirely from the Mid-continental field.

Gas

No remarkable developments were made during 1909 either in the production of gas wells or in the extending of gas pipe lines. The Kansas Natural Gas Company remained by far the largest producer and vender of gas for fuel. In the very heart of the gas territory a number of cities and towns which formerly had an independent supply of gas are now connected with the pipe lines of this company. The extension of pipe lines was confined entirely to connecting up more generally, with residences, business houses, small factories, etc., in territory already covered.

Much complaint was made during the early part of 1909, in Kansas City, St. Joseph and Topeka, particularly, and in some other towns to a lesser extent, because the gas supply was insufficient to meet the demands of consumption for domestic purposes. This is also being felt now. The cold weather of early December found Topeka so short on gas that on a few mornings the supply seemed to be entirely exhausted by nine o'clock. Governor Stubbs of Kansas, it is reported, instructed the State's attorney general to look into the matter, and should he find sufficient legal encouragement, to enjoin the Kansas Natural Gas Company from piping gas out of Kansas until its Kansas consumers, with whom it has life contracts, are first served.

Petroleum in Illinois

BY RAYMOND S. BLATCHLEY *

The production of oil in Illinois in 1909 l far below that of 1908, thus check- g the phenomenal growth of the three eceding years. The production was a le more than 29,500,000 bbl. as against ,685,106 bbl. in 1908. The returns for 09 are not complete but if it is esti- ated that the December production was ual to that of November and the tank- r shipments were 1,500,000 bbl., the to- is 29,500,000 bbl. for 1909. The pipe e runs of the Ohio Oil Company for rious months are given in an accom- nying table. The miscellaneous re- pts include tank-car shipments for the liana Refining Company, the Sun Oil mpany, the Cornplanter Oil Company d the pipe line runs of the Tidewater mpany. The latter company was in- lled in the field during the earlier part the spring.

CEIPTS OF THE OHIO OIL COMPANY IN 1909.

	Barrels.
uary	2,494,492
oruary	2,358,198
rch	2,568,392
ril	2,388,309
y	2,536,413
ie	2,365,956
y	2,413,218
gust	2,411,483
otember	2,203,705
ober	2,228,268
vember	2,149,371

The general production for the first months of 1909 held up to the average 1908, but with the coming of summer decline was marked. The cause for check lies in the fact that the mar- was overstocked through continued lling. This was somewhat further aug- nted by a drop in the price of oil. rly in the summer the price fell from 68c. per bbl. for oil above 30 deg. B. and 60c. per bbl. below 30 deg. B., to 65 and 57c. respectively. Later it took another decline to 62 and 54c., and finally in October it fell to 60 and 52c. for the two grades. The productive capacity of the field is far in excess of facilities for relieving the supply; in fact the initial production has been higher in 1909 than for the previous year, as greater producers were developed.

WELLS DRILLED IN ILLINOIS DURING 1909.

	Wells Completed.	New Production.	Dry Holes.	Average Initial Production
		Barrels.		Barrels.
January	213	5,060	41	$29\frac{3}{8}$
February	224	4,833	47	$26\frac{1}{3}$
March	216	5,018	15	$29\frac{1}{3}$
April	263	5,237	38	$23\frac{1}{4}$
May	321	7,681	45	$27\frac{7}{8}$
June	342	9,050	53	$31\frac{1}{3}$
July	346	9,820	50	$33\frac{1}{5}$
August	303	8,661	57	$35\frac{1}{5}$
September	282	8,324	50	$35\frac{7}{8}$
October	242	8,901	48	$45\frac{7}{8}$
November	223	9,628	52	$56\frac{1}{3}$
Total	2,975	82,216	526	

Principal Development in Lawrence County

The major development of the year took place in Lawrence county where the deep sands below the coal measures were sought for, these being more prolific than the upper sands. A new pay sand was developed along the southwestern edge of the field in section 30 of Bridgeport township. Oil was found at a depth of 1975 ft. and the initial and present daily yield of the well is 50 bbl. The deeper sands have not been tapped to the full extent because of an inactive market and increased expense from cavy conditions of the lower formations.

Clark, Coles and Cumberland counties decreased from 1908 in the point of drilling and new production. The shallow sands of these counties have gradually lost their production until now they are almost inactive in the original wells. The production of Crawford county kept up through the discovery of new limits at Oblong, New Hebron and Flat Rock.

On Jan. 1, 1909, it was estimated that 13,346 wells had been drilled. Of these 1821 were dry holes. During 1908 there were 3574 wells put down, of which 561 were dry holes. The new production established for the year was 78,960 bbl. In the first 11 months of 1909, 2975 wells were drilled, with 526 dry holes and a new production of 82,216 bbl. Up to December 1 the total estimate would reach 16,321 wells drilled, of which 2347 were dry. Following the custom of previous years, a record of drilling by months from the *Oil City Derrick* is herewith given; also the drilling record for 1909 in the eastern Illinois fields by counties.

WELLS DRILLED DURING 1909 IN DIFFERENT COUNTIES, ILLINOIS.

County.	Wells Completed.	New Production, Barrels.	Dry Holes.
Crawford	1,979	41,514	334
Lawrence	677	36,496	52
Clark	174	3,174	44
Coles	11	95	2
Cumberland	29	188	10
Edgar	5	10	3
Miscellaneous	100	139	81
	2,975	82,216	526

Eng. & Min. Journ., Jan. 9, 1909, p. 97.

*Assistant geologist, State Geological Sur- , Springfield, Ill.

There was an increase in "wildcatting" during the year, especially along the western edge of the great structural basin of southern and central Illinois. The territory around St. Louis, in Greene, Jersey, Macoupin, Madison and St. Clair counties, has been widely drilled with but meager results. At Carlinville a fair gas pressure was tapped, and at Waverly, in Morgan county, a small show of oil was obtained. During the latter part of 1909 activity was noticeable in the central-southern part of the State, with especial attention given to the dome structure at DuQuoin, where conditions are favorable to the accumulation of oil.

The finding of oil at Sparta, in 1906, brought on considerable drilling in Randolph county. A small production came in in 1908 but decreased during 1909 and at the present time is all but abandoned. Oil was found in small quantity at Eldorado, in Saline county, and presumably comes from the Chester formation. The deep sands of the main fields come from the same formation, which outcrops near Sparta and in which the oil is found there.

During the year oil was found in three wells drilled near Sandoval, in Marion county. This has caused an unusual activity in that section of the State and as a result there has been a wholesale leasing of farms in all directions, with a considerable loss through payment of exorbitant bonuses. The pay seems to have been limited up to the present writing to a single area covering 300 or more acres of ground. The sands in which the oil occurs are in the Chester formation and apparently correspond to the Buchanan and Kirkwood sands of the main field. The wells averaged about 125 bbl. on initial output. The year as a whole has been prosperous from the standpoint of new production, and with adequate means of taking the oil the outlook for the coming year would be excellent. The use of oil as fuel is commanding attention in the Illinois fields and a new line of demand is being opened up. A decrease in the production of gas was noticeable, thus giving opportunity to the use of oil as a fuel.

The Lima Oilfield

BY H. C. GEORGE *

The output of the northwestern Ohio and the eastern Indiana oilfields, which are included under the general name "Lima Oilfield," has declined steadily. The total production in 1909 was 6,192,000 bbl., as compared with 7,287,000 bbl., in 1908, and 8,030,000 bbl., in 1907.

Twelve thousand wells have been abandoned during the past five years and the production has been maintained only by the constant drilling of new wells. These wells have not been abandoned on account of the scarcity of gas nor the large volume of salt water, but because they no longer produce oil. In other words, the oil-bearing formation has been drained. The percentage of dry holes drilled during 1909 increased, as is shown in the accompanying table, which gives only the new wells and their production.

PRODUCTION OF WELLS DRILLED IN THE LIMA FIELD IN 1907, 1908 AND 1909.

Field.	Number of Wells Drilled.			Daily Production in Barrels.			Daily Production in Barrels per Well Drilled.			Per Cent. of Dry Holes.		
	1907.	1908.	1909.	1907	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Northwest Ohio...	930	837	917	8,100	9,252	7,771	8.7	11.0	8.4	15	9	9.6
Northeast Indiana.	682	413	304	5,673	3,405	3,852	8.3	8.2	12.6	20	19	27.3
Total..........	1,612	1,250	1,221	13,773	12,657	11,623	8.5	10.1	9.5	17	13.5	14.0

The average price paid for North Lima oil in 1909 was 91½c. per bbl. as compared with $1.03 in 1908, and 93½c. in 1907. South Lima oil has brought 5c. per bbl. less in each of these years.

Oil in California

As shown in a preceding table, California produced 58,250,300 bbl. of crude petroleum in 1909. This represents an increased output of 13,250,300 bbl. The Coalinga field was the largest producer in the State. Considering all of the fields in the State the average price per barrel brought by the petroleum was 56c. The daily average production per well was 13 barrels.

A record production amounting to 5,300,000 bbl., was made during December, the number of producing wells being about 4000. Producers are optimistic in looking for higher prices and expect that contracts made after Jan. 1, 1910, will be made on a basis close to 60c. per barrel.

The Oriental Consolidated Mining Company, with mines in Korea, crushed during the year ended June 30, 1909, 296,417 tons of ore, yielding $889,139 in gold.

Arsenic in 1909

The domestic production of arsenic was increased during 1909 by the introduction of a new producer, the United States Smelting Company, which started its arsenic plant to treat the product of the baghouse of its lead smeltery near Salt Lake City, Utah. The other producers in this country are the Everett plant, of the American Smelters Securities Company, at Everett, Wash., and the Anaconda Copper Mining Company at Anaconda, Mont. The production in the United States in 1908 was 2,600,000 lb., but the consumption was about 12,200,000 lb. The commercial white arsenic produced in this country, being a by-product, the production was not materially affected by the exceptionally low prices which prevailed during the year. The greater part of the arsenic consumed in the United States was imported from Europe, some also coming from Canada and Mexico. The Canadian production was made by three companies: The Deloro Mining and Reduction Company, at Deloro, Ont.; the Canadian Copper Company, at Copper Cliff, Ont.; the Coniagas Reduction Company of St. Catherine's, Ont. The Compañia Minera de Peñoles was the principal producer in Mexico.

Arsenic was quoted at the beginning of 1909 at 2⅞@3c. per lb. There was a slight advance during January and February when the manufacturers of Paris green and other insecticides were making their final purchases. The price worked down to about 2.7c. in March and April, but there was a rally during the succeeding months, especially in June and July, largely the result of speculation as to the adoption of a duty for this product. It was still left on the free list by the Payne law and the price dropped to about 2⅞c. with some quotations for large lots as low as 2⅝c., closing at about 2¾c. at the end of 1909. At these unremunerative prices it is not likely that much profit can be made by many of the producers and it is understood that there has already been a falling off in production abroad, particularly in England.

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*[illegible] Wisconsin Mining Trade School, Platteville, Wis.

Tin in 1909

lthough the United States is the larg- consumer of tin, taking about 40 per t. of the world's output, no tin was duced in the country in 1909. No k was done at Gaffney in South Caro- , where some concentrates were pro- ed in 1908, though it is understood t preparations are being made to re- e operations there. There is a pros- t that the Harvey Peak mine in South kota may be worked by the new com- y which has been formed, and which ow carefully prospecting the ground. e prospecting work has been done in ska, and some on the more recently overed deposits in Texas; but neither. arently is near the producing stage.

he world's supply of tin continues to e from the Straits Settlements—in- ding the Malay Peninsula; from the ka and Billiton mines in the Dutch t Indies; from Australia; from Bo- a; and from the ancient mines of nwall in England. The Straits, as the al term is, produced in 1909 the larg- quantity, approximately 55 per cent. the total. In addition to the output which we have record, there is tin duced in China, but the quantity is ertain. It is enough, however, to ply the consumption of that country to permit occasional exports.

o much of the production of tin is n countries where no statistics exist. we are largely dependent on the le reports and statistics for the fig- s. These undoubtedly approximate rectness, since the movement of the al is closely watched. From the cir- ars—especially those of Ricard & Frei- d and of De Monchy & Havelaar, the ompanying tables have been compiled.

'or the 12 months ended Nov. 30 the duction of tin may be estimated as ows, in long tons:

TIN PRODUCTION OF THE WORLD.

	1908.	1909.
its	62.392	59,870
ka and Billiton	13,785	15,014
tralia	6 119	5,800
via	16.250	16,500
iese exports	4,000	3,500
wall (England)	4,400	4,800
ellaneous	250	500
otal	107.196	105,984

lo attempt was made to estimate the nese production, and it is not in- ded above. The total output showed mall decrease.

he deliveries of tin, in long tons, for 12 months ended Nov. 30, are esti- ed by the trade authorities as below, ong tons:

TIN CONSUMPTION.	1908.	1909.
ted States	31,700	39,550
at Britain	29,400	29,334
er European countries	28.050	30,068
a and China, from the traits	3,265	3,400
er countries	4,250	4,350
tralian consumption, etc.	500	500
otal	97,165	107,202

he available figures indicate that there was an increase in deliveries in 1909; and that the consumption exceeded the production. This condition, of course, cannot last; but at present there are no indications of any large new supplies. In the Malay Peninsula more careful and thorough methods of mining are being introduced, and the same is the case in the Banka mines. In Australia, however, the industry appears to be declining.

The production of the Federated Malay States for the 10 months ended Oct. 31 was as follows: Perak, 372,333 pikuls; Selangor, 216,408; Sembilan, 39,597; Pahang, 33,935; total, 662,273 pikuls—or 39,421 long tons—which is a decrease of 46,203 pikuls as compared with the previous year.

Imports of tin into the United States for the 11 months ended Nov. 30 were 89,217,882 lb., and for the full year will probably be close to 100,000,000 lb. This is a substantial gain over 1908, when the imports for the full year were 82,772,678 lb. Nearly 90 per cent. of the imports are Straits tin.

THE TIN MARKET IN 1909.

The statistical position of tin, which toward the end of 1908 and during the first quarter of 1909 was a most unfavorable one, improved gradually throughout the balance of the year. The consumption in this country assumed larger proportions, and as shipments from the East did not increase correspondingly, the existing stocks had to be drawn upon. New fields of production were not discovered and the consumers of tin the world over have still in the main to rely for their supplies upon the Straits Settlements and the Dutch colonies in Asia. Reliable figures with regard to the production of tin, especially in the Straits Settlements, are unobtainable, but notwithstanding the somewhat smaller shipments from there, it may be safely estimated that the production has remained at about the same level for the last few years. Whenever shipments came in smaller volume, it was in most cases due to a desire upon the part of the Chinese merchants to influence the European market, rather than through a decrease in the supplies.

The month of January and the early part of February witnessed a considerable decline, brought about by bear operators in London, who were on the one hand supported in their policy by the statistical position of the metal, and, on the other hand, by the Banka sale advertised by the Dutch government. The year opened with prices at about 28¾c. per lb., and this had declined to 27⅝c. by the end of January. The lower quotations created a livelier demand from the American dealers and consumers, and this, coupled with advises of smaller shipments from the Straits, has a sustaining influence on the market. Prices advanced gradually to 29¾c. at the end of March.

Until the middle of August, the market remained rather stationary and did not exhibit any of the violent movements which are characteristic of tin. Thenceforward, the bull leaders in London became more aggressive and succeeded in advancing prices to 30¾c. by the end of September.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	32.913
			Av. year	29.465	29.725

Prices are in cents per pound.

During October, the tightening in the money market caused speculative holders in New York to liquidate so that business was transacted at prices below the parity at which tin could be imported. The London market, however, remained firm in view of the favorable statistical position and the good consumptive demand in this country. When the domestic deliveries for the month of October, which showed a remarkable expansion in consumption, became known, and when it became manifest that the consumption of tin in this country would continue at an increasing rate, it was easy for the bull party in London to mark prices up rapidly. By the middle of December 32¾c. was being paid in New York, and at the close of 1909 the metal was quoted at 33¾@34c. per pound.

Cripple Creek Production

The gross value of Cripple Creek ores treated during 1909 in the gold-reduction plants at Colorado Springs and Colorado City was $12,158,874, according to preliminary estimates. A total tonnage of 587,442, with an average value of slightly more than $20 per ton is reported for the year. The Golden Cycle mill handled 329,688 tons, worth $6,758,604; the United States Reduction and Refining Company's plant, 147,734 tons worth $3,200,270; and the mill of the Portland Gold Mining Company, 110,000 tons valued at $2,200,000. This amount does not represent the entire production of the Cripple Creek district for the year, as considerable low-grade ore was treated in the district. It is estimated that a total of $15,500,000 was produced.

Dividends Paid by Mining Companies in 1909

The table given below shows the dividends paid in 1909 by a number of the principal mining, metallurgical and industrial companies in the United States and mining companies in Canada, Mexico and Central America; the foreign companies listed are mostly those in which American capital is heavily interested. Totals of such a list necessarily cannot be regarded as complete as there are many very profitable close corporations, the dividends of which are not published and other companies are omitted for various reasons. However, when 66 mining and metallurgical companies in the country paid $54,024,811 to their stockholders, 31 foreign companies paid $11,287,637 and 18 domestic industrial companies paid $85,730,015 in one year, 1909, one cannot fail to realize the immense import of this basic industry.

Comparison of 1909 and 1908 Records

A comparison of the table herewith given and the similar one published a year ago will show that many more mining companies throughout the States paid dividends in 1909 than in 1908. Iron Blossom of Utah, Nevada Consolidated, and Golden Star of Arizona appear in the table for the first time in 1909: These payments were respectively $480,000, $431,700 and $120,000. Goldfield Consolidated paid in 1909, $3,909,616 out of a total $4,621,530 declared to the beginning of 1910. A number of our great mines, such as the Calumet & Hecla, Homestake, North Star, Alaska-Treadwell, Boston & Montana, etc., in all 44 companies, appear in the tables for both years; in 1908 a total of $34,548,859 was paid; a slightly increased total, $34,826,892 was paid in 1909 but nearly all these companies will start 1910 in a much stronger position than they were in at the beginning of 1909. Nineteen foreign companies appear in the list for both 1908 and 1909, the total of these companies for 1909 being $1,386,983 larger than in 1908. The chief gains here are in the Cobalt companies, 13 of which appear among the dividend payers in 1909. Among the industrials listed the chief note of interest is the great payments made by the Standard Oil Company and the United States Steel Corporation.

DIVIDENDS PAID BY MINING AND METALLURGICAL COMPANIES.

U. S. Mining and Metallurgical Companies.	Situation.	Paid in 1909.	Paid per Share in 1909.	Total Paid to Jan. 1, 1910.
Alaska Mexican, g	Alas.	$360,000	$2.00	$2,400,381
Alaska Treadwell, g	Alas.	650,000	3.25	10,885,000
Alaska United, g	Alas.	234,000	1.30	657,680
Amalgamated, c	Mont.	3,077,756	2.00	71,557,871
Am. S. & R., com	U. S.	2,000,000	4.00	17,000,000
Am. S. & R., pf	U. S.	3,500,000	7.00	32,375,000
Am. Sm. Sec., pf. A	U. S.	1,020,000	6 00	4,475,000
Am. Sm. Sec., pf. B	U. S.	1,500,000	5.00	6,732,000
Anaconda, c	Mont.	1,200,000	1.00	44,250,000
Arizona Copper com	Ariz.	455,969	0.30	11,287,228
Arizona Copper, pf	Ariz.	106,354	0.084	1,240,933
Arizona Copper, pf. A	Ariz.	11,537	0.12	172,797
Boston & Montana, c	Mont.	1,800,000	12.00	54,300,000
Bunker Hill & Sullivan, l.s.	Ida.	615,000	2.05	11,286,000
Butte Coalition, c.	Mont.	250,000	0.25	2,700,000
Calumet & Arizona, c	Ariz.	800,000	4.00	10,900,000
Calumet & Hecla, c	Mich.	2,700,000	27.00	110,550,000
Camp Bird, g.s	Colo.	787,000	0.96	5,766,650
Colorado, l.s.	Utah	960,000	0.96	2,030,000
Colo. Gold Dredging	Colo.	50,000	0.50	50,000
Copper Range Con., c	Mich.	1,536,740	4.00	8,836,255
Daly West, g.s.l	Utah	162,000	0.90	6,039,000
Doctor Jack Pot, g.	Colo.	45,000	0.01½	75,000
Doe Run, l	Mo.	380,301	6.00	2,145,306
Elkton Con., g.	Colo.	237,500	0.09½	2,479,460
Federal M. & S. pf.	Ida.	840,000	7.00	5,171,250
Florence Goldfield, g.	Nev.	210,000	0.20	630,000
Golden Star, g	Ariz.	120,000	0.15	120,000
Goldfield Con., g	Nev.	3,909,616	0.90	4,621,530
Great Nor. Iron Ore Prop.	U. S.	1,495,720	1.00	....
Hecla, s.l	Ida.	30,000	0.03	1,900,000
Homestake, g	S. Dak.	1,310,400	6.00	25,136,840
International Nickel, pf.	U. S.	534,756	6.00	2,139,024
Iron Blossom, s.l	Utah	480,000	4.80	480,000
Iron Silver, s.l	Colo.	50,000	0.10	4,650,000
Jamison, g.	Cal.	23,400	0.06	354,900
Mary McKinney, g	Colo.	39 126	0.03	880,320
Mohawk Mining, c	Mich.	300,000	3.00	1,950,000
Nevada Con., c	Nev.	431,700	0.37½	431,700
New Idria, g	Cal.	120,000	1.20	1,434,000
North Butte, c	Mont.	1,200,000	4.00	8,600,000
North Star, g	Cal.	575,000	2.30	2,486,988
Old Dominion, c	Ariz.	586,488	2.00	1,294,035
Old Dominion M. & S., c.	Ariz.	618,000	4.00	1,012,500
Oroville Dredging, g	Cal.	350,000	0.50	1,383,036
Osceola, c	Mich.	769,200	8.00	7,997,150
Phelps, Dodge & Co	U. S.	5,392,152	0.12	5,392,152
Portland, g	Colo.	120,000	0.04	8,227,080
Quincy, c	Mich.	440,000	4.00	18,890,000
Round Mountain, g	Nev.	128,311	0.16	224,000
Silver King Coalition, s	Utah	937,500	0.75	1,490,850
Sioux Con., s.l.g	Utah	440,383	0.58	694,393
Skidoo, g	Nev.	50,000	0.05	50,000
Snow Storm	Ida.	225,000	0.15	825,000
St. Joseph, l	Mo.	600,000	0.60	6,758,357
Tennessee Copper, c	Tenn.	250,000	1.25	2,306,250
Tonopah, s.g	Nev.	1,300,000	1.30	4,950,000
Uncle Sam Con., g.s.l	Utah	50,000	0 10	340,000
United Verde, c	Ariz.	449,890	1.50	1,610,267
U. S. Ref. & Min., com	Utah	702,020	2 00	2,499,070
U. S. Sm., Ref. & Min., pf.	Utah	1,700,156	3.50	6,156,896
Utah Con., c	Utah	600,000	2 00	6,900,000
Utah Copper, c	Utah	1,464,036	2.00	2,160,424
Vindicator, g	Colo.	112,500	0.07½	2,047,500
Wolverine, c	Mich.	300,000	5.00	5,400,000
Yuba Con., g	Cal.	300,000	0.12½	....
Total		54,024,811		

Foreign Mining Companies

Foreign Mining Companies.	Situation.	Paid in 1909.	Paid per Share in 1909.	Total Paid to Jan. 1, 1910.
Buffálo, s	Ont.	310,000	0.31	557,000
City of Cobalt, s	Ont.	94,492	0.06	139,385
Cobalt Central, s	Ont.	188,460	0.04	188,460
Coniagas, s	Ont.	360,000	0.45	1,160,000
Crown Reserve, s	Ont.	1,242,500	0.71	1,336,000
Dolores, g.s	Mex.	270,000	0.67½	774,866
Dominion Coal, com	N. S.	600,000	4.00	3,750,000
Dominion Coal, pf	N. S.	350,000	7.00	3,690,000
El Rayo, g. s	Mex.	21,601	0.06	21,601
Esperanza, s. g	Mex.	505,050	1.11	9,895,567
Granby Con	B. C.	270,000	2.00	3,778,630
Guanajuato Dev., pf., s	Mex.	30,000	3.00	184,356
Guggenheim Expl	Mex.	525,000	5.00	5,535,000
Kerr Lake, s	Ont.	690,000	1.15	1,530,000
La Rose, s	Ont.	1,056,732	0.80	1,228,450
Le Roi No. 2, g	B. C.	115,200	0.96	946,800
Lucky Tiger-Comb., g	Mex.	247,000	0.37	481,000
McKinley-Darragh, s	Ont.	224,769	0.10	472,015
Mex. Mill & Trans., pf., s	Mex.	31,500	3.00	65,858
Mines Co. of Am	Mex.	280,000	0.14	3,665,000
N. Y. & Hond. Rosario, g	C. A.	105,000	0.70	2,572,000
Nipissing, s	Ont.	1,350,000	1.12½	3,390,000
N. S. St. & Coal., pf	N. S.	41,200	4.00	721,000
Peregrina M. & M., pf	Mex.	700,000	7.00	258,656
Pinguico, pf., s	Mex.	120,000	6.00	360,000
Right of Way, s	Ont.	184,820	0.37	324,644
Temiskaming, s	Ont.	300,000	0.12	525,000
Temiskaming & H. B., s	Ont.	69,759	9.00	1,171,911
Trethewey, s	Ont.	244,554	0.25	461,998
U. S. & B. C	B. C.	60,000	0.10	1,168,925
Yukon Gold, g	Yukon	700,000	0.20	700,000
Total		11,287,637		

U. S. Coal, Iron and Industrials.

U. S. Coal, Iron and Industrials.	Situation.	Paid in 1909.	Paid per Share in 1909.	Total Paid to Jan, 1. 1910.
Am. Ag. Chem. pf	U. S.	$544,590	$3.00	$2,292,210
Am. Cement	Penn.	120,000	0.60	1,348,000
Central C. & C., com	Mo.	153,750	3.00	2,613,750
Central C. & C., pf	Mo.	46,876	2.50	1,456,562
Col. & Hock. C. & I., pf	Ohio	207,732	3.00	591,550
Consolidation Coal	Md.	358,750	3.50	17,020,770
General Chem., com	U. S.	296,412	4 00	2,445,399
General Chem., pf	U. S.	600,000	6.00	6,555,000
Maryland Coal	Md.	47,125	2.50	2,061,122
Nat. Lead, com	N. Y.	745,268	5.00	3,642,789
Nat. Lead, pf	N. Y.	1,043,280	7.00	18,676,708
Republic I. & S., pf	Ill.	2,143,773	10.50	8,546,406
Sloss-Sheffield, com	Ala.	250,000	2.50	2,133,000
Sloss-Sheffield, pf	Ala.	234,500	3.50	4,338,000
Standard Oil	U. S.	38,800,000	40.00	668,322,000
U. S. Steel Corp., com	U. S.	13,478,317	2.75	94,784,862
U. S. Steel Corp., pf	U. S.	25,219,672	7.00	250,499,867
Va. Car. Chem., pf	U. S.	1,440,000	8 00	15,420,869
Total		85,730,015		

AVERAGE MONTHLY PRICES OF CHEMICALS, EARTHS, MINERALS, ETC., IN 1909

(IN CARLOAD LOTS AT NEW YORK)

Material.	Unit.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average 1909.	Average 1908.
Abrasives															
Corundum, f.o.b. Niagara Falls, pow	C. per lb.	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	7.00
Emery, Turkish flour, in kegs	C. per lb.	2.125	2.125	2.125	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.939	1.75
Emery, Naxas flour	C. per lb	2.125	2.125	2.125	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.939	1.75
Emery, Chester flour	C. per lb.	1.50	1.50	1.50	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.688	1.50
Emery, Peekskill flour, f.o.b. Easton, Pa	C. per lb.	1.375	1.375	1.375	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.469	1.25
Garnet	$ per Sh. T.	30.00	30.00	30.00	30.00	30.00	30.000	30.00	30.00	30.00	30.00	30.00	30.00	30.000	30.00
Boric acid	C. per lb.	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.000	7.00
Borax, sacks	C. per lb.	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.375	4.723	4.25
Alum, lump	$ per 100 lb.	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Aluminum sulphate, com'l	$ per lb.	1.425	1.425	1.56	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.585	1.11
Ammonium sulphate	$ per 100 lb.	3.075	3.075	3.025	3.025	2.90	2.875	2.875	2.825	2.6475	2.625	2.625	2.625	2.815	3.07
Arsenic, white, spot	C. per lb.	3.25	3.195	3.125	2.907	2.912	2.907	3.187	3.042	2.875	2.725	2.739	2.739	2.97	3.81
Barytes, American ground	$ per Sh. T.	16.50	16.50	16.50	14.50	14.50	14.50	14.50	14.50	14.50	13.50	13.50	13.50	14.75	17.06
Chrome ore, New Caledonia, 50 per cent. ex. ship N. Y	$ per Lg. T.	18.75	18.75	18.75	18.75	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	16.24	17.50
Cobalt oxide	$ per lb.	2.025	2.025	1.30	1.30	1.30	1.30	1.30	1.40	1.425	1.125	1.425	0.825	1.42	1.61
Copperas, bulk	C. per 100 lb.	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
Fluorspar, lump	$ per Lg. T.	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Fullers' earth, lump	C. per 100 lb.	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	80.00
Magnesite, Greece, crude, 95 per cent	$ per Lg. T.	9.00	9.00	8.00	8.00	8.00	7.75	8.00	8.00	8.00	8.00	8.00	8.00	8.15	9.00
Magnesite, calcined, powdered	$ per Sh T	30.50	30.50	30.50	32.50	32.50	32.50	31.50	31.50	31.50	31.50	31.50	31.50	31.50	32.75
Gilsonite, Utah ordinary	$ per Lg. T.	32.00	32.00	32.00	32.00	32.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	34.34	33.58
Litharge, Am. powdered	C. per lb.	6.875	6.25	5.875	6.00	5.875	5.875	5.875	5.875	5.875	5.875	5.875	6.000	6.010	6.17
Red lead, American	C. per lb.	6.875	6.625	6.625	6.250	6.250	6.250	6.250	6.250	6.250	6.250	6.250	6.375	6.380	6.52
White lead, Am. dry	C. per lb.	5.437	5.437	5.437	5.625	5.625	5.625	5.625	5.5625	5.5625	5.5625	5.5625	5.5625	5.50	5.52
Nitrate of soda, 95 per cent. spot	$ per 100 lb.	2.175	2.175	2.15	2.148	2.17	2.20	2.15	2.125	2.10	2.10	2.087	2.0875	2.139	2.25
Zinc white, Am. extra dry	C. per lb.	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.1375	5.380	5.13
Phosphate rock:															
*Florida hard, 77 per cent	$ per Lg. T.	8.75	8.75	8.75	8.75	7.75	7.00	7.00	7.00	7.75	7.75	7.75	7.75	7.887	10.00
Florida land pebble, 68 per cent	$ per Lg. T.	4.125	4.125	4.125	3.875	3.875	3.875	3.875	3.875	3.875	3.875	3.875	3.875	3.937	4.12
†Tennessee, 78 to 80 per cent	$ per Lg. T.	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	6.12
Tennessee, 75 per cent	$ per Lg. T.	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	5.15
Tennessee, 68 to 72 per cent	$ per Lg. T.	4.375	4.375	4.375	1.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	1.375	4.31
‡South Carolina land rock, 60 per cent	$ per Lg. T.	7.125	7.125	7.125	7.125	3.750	3.750	3.750	3.750	3.750	3.750	3.750	3.750	4.875	6.17
Potassium cyanide, 98 and 99 per cent., 5 ton lots	C. per lb.	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
Kainit, bulk	$ per Lg. T.	8.25	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.475	8.50
Pyrites:															
Dom., non-arsenical furnace, f.o.b. mines	C. per Unit S. per L.T.	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
Dom., non-arsenical fines, f.o.b. mines		10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25
Imp., non-arsenical furnace		12.50	12.50	12.125	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.29	12.71
Imp., arsenical furnace		12.00	12.00	11.875	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.79	12.21
Imp., arsenical fines		8.75	8.75	8.75	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.93	8.75
Imp., non-arsenical fines		10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75
Soda, caustic. 76/60	$ per 100 lb.	1.80	1.80	1.80	‡‡1.95	1.95	1.95	1.95	1.95	1.875	1.90	1.90	1.90	1.895	1.80
Saltcake, bulk	C. per 100 lb.	40.00	40.00	40.00	45.00	40.00	40.00	40.00	40.00	40.00	10.00	40.00	60.00	42.08	42.50
Sodium bromide	C. per lb.	13.50	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.46	15.30
Sodium cyanide, 120-130 per cent. KCN per 100 per cent., 5-ton lots	C. per lb.	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
Sodium sulphate, com'l calcined	C. per 100 lb.	75.00	75.00	75.00	75.00	70.00	70.00	70.00	70.00	70.00	75.00	75.00	75.00	72.93	60.00
Sulphur:															
Louisiana, prime to New York	$ per Lg. T	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.08
Talc, domestic	$ per Sh. T.	20.00	20.00	20.00	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	16.00	18.00	20.00
Zinc chloride, gran	C. per lb.	4.625	4.625	4.625	5.50	5.50	5.50	5.50	5.50	4.50	4.50	4.50	4.50	4.948	4.75
Zinc dust	C. per lb.	5.0625	5.0625	5.0625	5.0625	5.0625	5.0625	5.375	5.825	6.375	6.75	6.75	6.75	5.683	5.23
Zinc sulphate	C. per lb.	2.125	2.125	2.375	2.75	2.75	2.375	2.375	2.375	2.375	2.375	2.375	2.25	2.385	2.16
Copper sulphate, carload lots	C. per lb.	4.750	4.700	4.600	4.600	4.324	4.240	4.225	4.225	4.175	3.980	3.9625	4.05	4.319	4.86

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel, Ashley river, S. C. ‡‡78/60 grade quoted hereafter.

NOTE—These quotations were for ordinary wholesale lots at New York unless otherwise specified and were generally subject to the usual trade discounts. In the case of some of the important minerals such as pyrites, sulphur, etc., in which there are well established markets the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers asked of consumers and not what producers realized in selling their outputs as matter of private contract. The monthly figures are the averages of the quotations published in the JOURNAL, except the quotations for white arsenic, copper sulphate and nitrate of soda which are averages of weekly quotations.

Chronology of Mining in the United States in 1909

Jan. 1—General strike of miners in New Zealand on account of Workers' Compensation Act, effective Jan. 1, requiring medical examination for certain diseases.—Strike of miners at Broken Hill, N. S. W.

Jan. 5—Outside steel makers reduced prices.

Jan. 6—Tennessee Steel Company incorporated in Maine with $20,000,000 capital stock.

Jan. 7—U. S. Steel Corporation offers common stock to employees at 50, besides the usual offer of preferred at 110, this being held to imply increased confidence in the common stock.

Jan. 8—Concentrator of Arizona Copper Company, Clifton, destroyed by fire.

Jan. 9—Statistical number of the JOURNAL gave world's mineral production for 1908.

Jan. 10—Explosion in Leiter mine, Zeigler, Ill., killed 27 men.

Jan. 12—Organization of Copper Producers' Association to report monthly production and stock of refined copper. Announcement that Cole and Ryan secured control of Giroux Consolidated Mines Company. Explosion at Lick Branch colliery at Switchback, W. Va., killed more than 105 men. Goldfield Consolidated mill began dropping 100 stamps.

Jan. 13—Explosion of gas at Almassy mine, Resicza, Hungary, killed 12 men.

Jan. 14—Explosion of gas, followed by a dust expolsion, at Aika colliery, Veszprem, Hungary, killed 56 men.

Jan. 19—U. S. Circuit Court of Appeals affirms decisions of Circuit Court and Board of General Appraisers that zinc ore is not dutiable under the Dingley Act.

Jan. 22—The President, in a message to Congress on the conservation of resources, recommended that the coal, oil, gas and phosphate rights still remaining with the Government be withdrawn from entry and leased under conditions favorable for economic development. Flood on the Rand, Transvaal, broke dam and flooded a mine, drowning 160 miners. Kelvin-Calumet copper properties acquired by Ray Consolidated Company, a $5,000,000 corporation.

Jan. 24—Judge Hunt, in the Federal Court, Helena, Mont., gave a decision against the farmers in the Washoe smelter fume case, refusing the injunction asked for. Shutdown of all the mines at Globe, Ariz., because of labor agitation.

Jan. 26—U. S. Steel Corporation quarterly report showed gain in unfilled orders.

Jan. 27—Reports multiply of price cutting by independent steel manufacturers. Explosion in Merchants coal mine of the United Coal Company, Boswell, Penn., killed five men.

Jan. 28—Copper River railroad, Alaska, completed from Cordova to Abercrombie rapids. Fire in Sutro tunnel, Comstock lode, caused minor damages.

Jan. 29—Resumption of work at Globe, Ariz.

Feb. 2—Explosion in slope No. 2 in Short Creek coal mine of Birmingham Coal and Iron Company killed 17 men.

Feb. 8—Strike of men at Velardeña smeltery, Mexico. Second explosion in Leiter mine at Zeigler, Ill., killed three men.

Feb. 10—First report of the Copper Producers' Association shows 144,130,045 lb. copper on hand Feb. 1. Stock of American Smelting and Refining Company transferred from unlisted to listed department of New York Stock Exchange.

Feb. 11—Marianna coal mine resumed operations.

Feb. 12—Three copper companies of Arizona, Copper Queen, Old Dominion and Detroit Copper, filed complaints against railroads for excess freight charges on coke.

Feb. 15—First steel made at Gary, Ind.

Feb. 16—Explosion in West Stanley coal mine, Durham, England, wrecked 700-ft. shaft and killed 120 men.

Feb. 17—Trinity copper mine shut down.

Feb. 19—U. S. Steel Corporation declared open market for steel products. Heavy cuts in prices of steel. Judge Hunt, United States Court of Montana, denied injunction to ranchers to stop dumping of tailings in creek by Butte companies.

Feb. 24—Annual meeting of A. I. M. E. opened at New Haven, Conn. Rolling mills at Gary, Ind., finished their first rails.

Feb. 26—Settlement of dispute between Calumet & Hecla and Osceola announced.

March 2—Explosion at Colliery No. 14, Pennsylvania Coal Company, Port Blanchard, Penn. Six men killed.

March 4—A round of 25 shots exploded prematurely at the bottom of a 2500-ft. shaft at the Diamond mine in the Butte district. Four men were killed.

March 8—The United States loses its suit against the Standard Oil Company in the case of the $29,000,000 fine.

March 11—The Utah legislature passed a bill giving smelteries right of eminent domain in counties of less than 20,000 population. This was done over the governor's veto. The stock of the Phelps-Dodge company listed on the New York Stock Exchange.

March 12—Crows Nest Pass Coal Company passes into the control of the Great Northern Railroad Company and the Granby Consolidated Copper Company.

March 16—A stock dividend of 60 per cent. was declared by the Consolidated Coal Company of Maryland.

March 18—The appointment of a receiver for the Idaho Smelting and Refining Company.

March 20—Explosion at Sunnyside Coal Mine, Ill., caused by a windy shot. Five men were killed.

March 24—A joint meeting of the Mining, Civil, Electrical and Mechanical Engineers was held in New York to discuss the conservation of national resources.

April 1—Explosion in the Echo mine of Buery Brothers Coal and Coke Company, Fayette county, W. Va.; four men killed. Utah Fuel Company fined by the United States Government for conspiracy to defraud the Government of coal lands.

April 2—Coal strike inaugurated at Alberta, Canada.

April 4—Fire broke out on the eighth level of the North Mahoney colliery, Pennsylvania.

April 9—Explosion at du Pont Powder Works, Wayne, N. J. Damage to property, $20,000—Oil still at Point Richmond, Cal., exploded; two men killed; loss, $50,000—Dynamite explosion in Berwind-White Coal Company's mine at Windber, Penn.; seven men killed, four entombed.

April 13—Gas explosion at Superior coal mine at Linton, Ind.; 20 killed.

April 14—Sale of Alaska Copper and Coal Company's Bonanza mine to J. P. Morgan and the Guggenheims.—Eight hundred union coal miners of the Bend Coal Corporation, Johnstown, Penn., go on strike.

April 15—Gas explosion at George's Creek Coal and Iron Company's mine, Farmington, Va. Three men killed.—Over 600 officers of the United States Steel Corporation met at Scottdale, Penn., to receive reports from the commission which visited coal industrial plants in Europe.

April 16—W. K. Niver Coal Company sold by receiver to J. V. McDonald, of New York, for $200,000.

April 17—Bald Butte Mining Company passes into hands of receiver.—J. O. Rogers appointed receiver for Lanyon Zinc Company.

April 18—The directors of the United States Smelting, Refining and Mining Company purchased 100,000 shares of the company's stock from R. D. Evans.—Consolidated Silver Cobalt Mines, Ltd., umed control of the Greene-Meehan ning Company, Cobalt.

April 19—Pittsburgh Coal Company ncelled contract with Pittsburgh Ternal Railroad and Coal Company, to e effect October 31.—Explosion of gas Elnora mine, Highland Coal Company, rnock, O. Six men injured.—La Rose nsolidated Mining Company acquires ntrol of the Lawson mine, Cobalt.

April 20—Judge Goff, of the U. S. Cirt Court of Appeals issues order reaining Chesapeake & Ohio railroad m increasing freight rates on coal from st Virginia points.

April 22—Isabella-Connellsville Comny voted first appropriation of $2,000,) to begin construction work of plant the Monongahela river.

April 23—Cave-in of M. & B. mine, enweg, Mo. Three men killed.

April 27—Judge Hunt dismissed the noke" case of F. J. Bliss vs. Anaconda pper Mining Company and the Washoe elter Company.—The New York & ginia Copper Mining Company was ced in the hands of receivers.

April 30—The three-year wage agreent between the anthracite miners and erators signed.

May 1—Sale of the Walsh & Seibert l lands in Indiana for $1,500,000 to Equitable Trust and Savings Comny, Chicago.—Strike at St. Joseph Lead mpany's mines, Bonne Terre, Mo.; lls closed.

May 3—Supreme Court of the United ates declared the commodity clause of Hepburn Railroad Rate Act as conutional.—Fire broke out in the Forest ll mine of the Pittsburg Coal Company, nithdale, Penn.—Fire in North Manoy Colliery, Penn., under control.

May 4—Lake navigation opened at ughton, Mich.

May 5—Pittsburg Coal Company, Westld, Penn., resumed operations after beg closed 8 months.

May 6—Construction of 560 by-product ke ovens at Gary, Ind., begun by the ited States Steel Corporation.

May 7—The Stockton Colliery, Penn., ploying 800 men, suspended operations til the fall.

May 11—The directors of the Shannon pper Company voted to finance the annon & Arizona Railroad.

May 12—The merging of the Consolition, Fairmont, Somerset, Clarksburg, d the Pittsburg & Fairmont Coal comnies, and their subsidiaries, controlling 0,000 acres of coal land.—The Ohio al Company, Evansville, Ind., resumed erations.

May 19—Death of Henry H. Rogers, esident, Amalgamated Copper Comny.—Frick Coke Company started 1000 ditional ovens.

May 21—The $60,000,000 merger of ke plants was completed.

May 22—Largest week's zinc-lead shipent from Joplin district, for more than one year.—Price of zinc ore reached $43.50.

May 23—A silver nugget weighing 3000 lb. was found at Cobalt, Ontario.

May 25—Six thousand miners go on strike in the Kanawha field.

May 28—A formal agreement made whereby the Standard Oil Company will control the Galician oil fields.—Hayden, Stone & Co., purchased control of Santa Rita Copper Company.

June 1—Frick Coke Company fired 1200 additional ovens in the Connellsville region.

June 2—The Morris Coal Company, Zanesville, O., resumed operation; 500 men are employed.

June 4—Strike of 400 men at the Charleroi coal mine ended; operations resumed.

June 5—Dominion Copper Company's property sold under foreclosure at Vancouver, B. C.

June 8—The Yukon Gold Company completed a 70-mile ditch from Twelve Mile river.

June 9—A steamer carried away the lower gate of the lock in the Canadian canal at the Sault.

June 10—John D. Ryan elected president of Amalgamated Copper Company. Benjamin B. Thayer elected president of Anaconda Copper Mining Company.

June 11—Fire started in the Jumbo mine of the Pittsburg Coal Company near MacDonald.—Strike at the Iola, Kansas, plant of the Prime Western Spelter Company.

June 15—The Ontario Government sold 15 tracts of land on the Gillies Limit, Cobalt.—Plant of the Nevada Sulphur Company, Humboldt, Nev., burned. Loss, $100,000.

June 16—Jones & Laughlin Steel Company closed deal for coal land involving an expenditure of $4,000,000.

June 17—Jameson Coal and Coke Company closed deal for 7000 acres of coal land near Fairmont, W. Va. Consideration $2,000,000.

June 18—A shipment of gold valued at $3,200,000 arrived at Seattle from Alaska.

June 21—Thomas Iron Company, Easton, Penn., announced an increase of 10 per cent. in wages effective July 1.—The same action taken by several other iron companies.

June 23—Explosion in mine No. 4, Lackawanna Coal and Coke Company, Wehrum, Penn.; 17 killed.

July 1—The eight hours act, limiting the working hours of coal miners in Great Britain, went into effect except in the counties of Northumberland and Durham, where the new rule will not be effective until January 1, 1910.

July 2—The town of Cobalt, Ont., swept by fire, destroying the surface buildings of some of the mines.

July 6—Strike of employees belonging to the United Mine Workers of America, in the Cape Breton mines of the Dominion Coal Company for recognition of their organization, as against that of the Provincial Workingmen's Association, the members of which remained at work.—Explosion at the Cedar Coal and Coke Company's mine at Tollerville, near Trinidad, Colo., killed nine men who were descending in a cage.

July 7—The Delaware, Lackawanna & Western Coal Company organized to handle the sales and transportation of coal mined by the Delaware, Lackawanna & Western Railroad Company, this action being taken to comply with the Hepburn law prohibiting railroads from carrying coal which they own.

July 8—Militia called to Glace Bay, Nova Scotia, to preserve order at the Dominion Coal Company's collieries.

July 10—Announcement of acquisition by the Cananea Consolidated Copper Company of the old W. C. Greene concessions for constructing four lines of railroad in northern Mexico, mainly in Sonora.

July 11—Serious explosion in the Belmez coal mine in Spain.

July 12—Formal organization of the Instituto Mexicano de Minas y Metalurgia.

July 14—Approval of the Secretary of the Interior of the right of way for an 8-in. pipe line to be laid by the Prairie Oil and Gas Company from the Glennpool field in Oklahoma, southeasterly to the Oklahoma-Arkansas State line, and to be eventually extended to Baton Rouge, La.

July 16—Fire started by lightning destroyed two tanks containing 100,000 bbl. of oil, belonging to the Prairie Oil and Gas Company, at Bartlesville, Okla.; also, one tank, each, beolnging to the Creston and the Matson oil companies.

July 22—New agreement, running until Sept. 1, 1910, signed by the coal miners and operators in Wyoming.

July 23—Announcement of purchase by Calumet & Arizona interests of the San Felipe group, comprising 260 pertenencias in the Arizpe district, Sonora, Mexico.

July 24—The German Potash Syndicate concludes a temporary agreement for one year, but without Schmidtmann's Sollstedt mine, with which the American fertilizer interests had secured a favorable contract.

July 26—Publication of the Mineral Industry, Vol. XVII.

July 30—Repeated earthquake shocks in Mexico, being particularly severe at Acapulco and Chilpancingo.

July 31—General strike in the coal mines of Great Britain averted by an agreement providing a minimum wage of 6s. per day for the striking Scotch miners.

Aug. 2—The United States Smelting, Refining and Mining Company obtained modified injunction permitting it to smelt copper and other ores in the Salt Lake valley, under certain restrictions, including the baghousing of the fumes and neutralizing of acid gases.

Aug. 3.—Announcement of the purchase of the Tula iron properties in the state of Jalisco by the Mexican Iron and Steel Company, which is controlled by Boston capitalists.

Aug. 5—At Cordova, Alaska, a $50,000,000 mortgage was filed by the Copper River & Northwestern railroad, a Guggenheim corporation, in favor of the Standard Trust Company, of New York, this being the largest mortgage ever filed in Alaska.

Aug. 6—New United States tariff law became effective, having been signed on the preceding day by Persident Taft.

Aug. 7—Preliminary proceedings for foreclosure of mortgage on Newhouse Mines and Smelters Corporation property in Beaver county, Utah, in accordance with the plan of reorganization.

Aug. 10.—Strike of United Mine Workers results in the closing of the Spring Hill coal mines in Nova Scotia.

Aug. 11—Title to the various powder mills of the Laflin & Rand Company passed to the E. I. Du Pont de Nemours Powder Company, which has had a stock control since 1902.

Aug. 12—The timber and mineral lands of the Sierra Madre Land and Lumber Company, formerly owned by Col. W. C. Greene, were transferred to the F. S Pearson Syndicate, the consideration being $2,000,000.

Aug. 21—During this week, zinc ore in the Joplin district touched $51.50 base, the highest price since 1907.

Aug. 23—The merger of the principal Canadian producers of portland cement completed by the organization of the Canadian Consolidated Cement Company with headquarters at Ottawa.

Aug. 25—Lake Superior Mining Institute convened at Ishpeming, Mich., for the fourteenth annual meeting, a 3-day session on the Marquette range.

Aug. 29—Serious floods in the vicinity of Monterey, Mex., interfered with transport of ore.

Sept. 5—Union Copper mine, Copperopolis, Cal., sold to Calaveras Copper Company by Ames estate, Boston.

Sept. 6—Hercules mill, Burke, Idaho, burned. Loss, $100,000. No insurance.

Sept. 8—Iron Mountain mine, Indian Springs, Cal., sold to United States Smelting, Refining and Mining Company.

Sept. 9—Announcement of closing of option on Butte-Ely property, Ely, Nevada, to Cole-Ryan interests.

Sept. 17—Old Dominion Copper Mining and Smelting Company awarded $2,029,000 in suit against A. S. Bigelow.

Sept. 24—Florence, Colo., smeltery sold at sheriff's sale.

Sept. 25—Announcement of purchase of Santa Gertrudis mine, Pachuca, by Camp Bird, Ltd., of London.

Sept 27—Strike at Butte arising from internal dissension in the union settled and mines all resumed work.

Sept. 27—American Mining Congress convened at Goldfield, Nevada.

Sept. 28—Boston & Colorado Smelting Company announces liquidation and the dismantling of the Argo smeltery at Denver.

Sept. 29—Tintic smeltery, Utah, closed.

Oct. 1—Copper converting plant started at the Torreon smeltery in Coahuila.

Oct. 3—Fifteen men killed in explosion in Northwestern Improvement Company's coal mine at Roslyn, Washington.

Oct. 5—Explosion in Extension coal mine at Nanaimo, B. C., resulted in loss of 30 men.

Oct. 6—Doyle-Burns suit involving an interest in the Portland mine, Cripple Creek, Colo., settled out of court.

Oct. 8—Announcement of the purchase of the Burro Mountain mine in New Mexico by Phelps, Dodge & Co., Inc.

Oct. 15—Smeltery of the Arizona United Mines Company at Johnson, Ariz., blown in.

Oct. 19—Receiver appointed for the Frances-Mohawk Mining and Leasing Company, of Goldfield, Nevada.

Oct. 21—Explosion in the Rock Island Coal mine at Hartshorne, Okla., several men being killed.

Oct. 29—Explosion in Rhymney Iron Company's colliery at Glamorganshire, Wales, killing 20 men.

Oct. 30—Twelve men killed in explosion in Cambria Steel Company's coal mine near Johnstown, Pennsylvania.

Nov. 1—Last spike is driven in Western Pacific railway.—Plant of North Ontario Reduction and Refining Company at Sturgeon Falls, Ont., burned.

Nov. 2—The Saddle Mountain properties and a large interest in the London-Arizona Copper Company in Arizona sold to the Development Company of America.

Nov. 3—Announcement that A. Goerz & Co., of London and South Africa, have purchased control of La Fe property at Zacatecas, Mexico.

Nov. 6—W. A. Clark wins in prolonged suit brought by George A. Treadwell, alleging mismanagement of United Verde Copper Company.

Nov. 10—A fire at the Great Boulder Mines of over $1,000,000.—Nine men killed in mine fire at Auchingloss coal mine, Wilkes-Barre, Penn.—Tipple and power house of Neffs Coal Company at Neffs, Ohio, burned; loss, $125,000.

Nov. 13—Fire in the St. Paul mine at Cherry, Ill., resulting in loss of life of more than 300. After a week 20 men were taken alive from the mine.

Nov. 20—Decision declaring the Standard Oil Company, of New Jersey, a violation of the Sherman law.—The new mining law for Mexico approved by the senate without material change from that passed by the lower house and will become effective Jan. 1, 1910.

Dec. 1—Needles smeltery and mining property of Arizona-Mexican Company sold to U. S. Smelting, Refining and Mining Company.—Over three million acres of oil lands in California, Utah and Wyoming withdrawn from entry by order of the President.—Strike of railroad switchmen in the Northwest interferes with mining at Butte and in Minnesota.—Majority of Cumberland-Ely stockholders exchange shares of that company, on basis of 3¼ for 1, for stock of the Nevada Consolidated Copper Company, thus practically effecting a merger.—Homestake mine, South Dakota, closed for indefinite period on account of threatened labor strike. Dividends suspended.

Dec. 4—Suit commenced against Utah Copper Company by E. A. Wall for $3,870,000 for alleged trespass.—Fire at London mine of Tennessee Copper Company destroyed shaft house, imprisoned men being safely rescued.

Dec. 10—Utah Ore Sampling Company, capital $200,000 organized at Salt Lake, as a merger of Utah sampling works.

Dec. 11—First unit of 750 tons capacity of the Ohio Copper Company's mill started at Lark, Utah.—British Columbia Copper Company placed orders for fourth blast furnace.

Dec 12—Gold Belt mill in Clifton district, Arizona, started, this being the first gold mill in the district.

Dec. 13—Continental Copper Company at Keystone, S. D., closes mine on account of pending difficulties with the labor unions.

Dec. 15—The Pittsburg-Buffalo Coal Company bought a large tract of coal land in the Fairmont district, West Virginia.—Option on Reforma mine in Guerrero, Mexico, taken by Exploration Company, Ltd., of London for $10,000,000.

Dec. 16—Numerous arrests in connection with an alleged "high-grading" combine at Cobalt.—Government royalties on several of the Cobalt mines reduced.

Dec. 17—Merger of Dominion Coal Company and Dominion Iron and Steel Company of Nova Scotia effected at meetings at Montreal.

Dec. 18—Contracts let for 110 Koppers by-product coke ovens for the Lake Superior Corporation at Sault Ste. Marie, Ontario.

Dec. 21—Republic Mines Company of Spokane purchases from the Pearl Consolidated Mining Company the Lone Star-Surprise mines at Republic for $225,000.

Dec. 23—Eight men were killed in a gas explosion at mine "A" of the Chicago & Cartersville Coal Company, Herrin, Illinois.

Dec. 31—J. H. McKenzie retired as general manager of the Goldfield Consolidated and J. R. Finlay succeeds him.—Southern Pacific railroad opened as far as Rosamorada, Tepic, Mexico.

Coal Mining in the United States in 1909

Reviews of Mining Conditions in Many Important Centers of Anthracite and Bituminous Production, with Forecasts of Future Production

TOTAL PRODUCTION 437,176,241 TONS

The production of coal in 1909 was eater than in 1908, but did not reach e record total of the banner year 1907. here was an increase of about 10 per nt. in the production of bituminous al; the anthracite production showed a crease of about 2½ per cent. The rst six months of the year were parcularly dull, and the entire coal trade as enshrouded in an atmosphere of oom. The coke trade began to pick up immediately after the activity in the iron and steel industry commenced. The larger anthracite production in 1908 was caused by the desire on the part of hard-coal operators to store fuel previous to the meeting of the wage-agreement committee, April 1. There was considerable apprehension at the time for fear that a general strike of the miners might result. This increase in the production of anthracite continued through the latter part of 1908 and during the first three months of 1909. When labor troubles did not materialize, production was curtailed in order that the surplus stock might be worked off. The wage scale that was renewed in April, 1909, was practically a continuation of the same agreement that had been in force since the settlement of the big coal strike by the anthracite commission in 1903. The agreement is for a period of three years.

The Coal and Coke Industry in 1909

BY FLOYD W. PARSONS

The close of 1909 showed great acvity in all branches of the coal trade. he weather during the last month of the ear was sufficiently cold to stimulate the mestic trade, while the demand for eam coals has continued on an ineased scale. Prices have not been eatly increased, but the mines have en able to work better time and the ineased output has been well taken up. he stagnation that existed in the coke dustry during the first half of the year as been entirely dispelled and this anch of the trade has been undergoing real old-fashioned boom.

Coke prices have been above $3 at the ens, which prosperous condition used the opening of many plants and ens that had been temporarily abanoned. It was the purpose of a number large operators to bring about a conlidation of all the coke-producing companies with the exception of those plants ntrolled by the Steel Corporation. For me unknown reason, this combination ll through. The price at which most of e independent operators valued their ldings was about $5000 per acre.

The greatest gain in the coal and coke ade during 1909 was made in the Conellsville coking region. This increased tivity in coke manufacture was caused the rapid recovery in the iron trade in 909. The production of coke in 1908 ll off nearly 50 per cent., while the utput in 1909 returned well toward the gh record established in 1907. In the tter part of 1909, the coking industry as greatly handicapped by a lack of laor and a scarcity of water. Shipments ere also handicapped by a scarcity of ilroad cars. This scarcity of labor and ars was felt in practically all of the eastern coal districts during the latter part of the year.

Perhaps the most noteworthy fact connected with the coal industry of the United States in 1909 was the absence of labor troubles. What few strikes occurred were of a local nature. The year was also exceptional so far as accidents were concerned. In the Eastern States the mines were unusually free from serious explosions, the only important accidents of this character being the explosion at Wehrum, Penn., where 21 men were killed, and the disaster at the Lick Branch colliery in West Virginia, where 65 miners perished.

The Cherry Disaster

The year 1909, however, preserved the record of former years by showing at least one horror. This accident came in the form of a mine fire at the St. Paul mine, Cherry, Ill. It is a mistake to designate the St. Paul disaster as a mine explosion. There is little satisfaction in casting reflections or criticizing the management of mines where such accidents take place. It seldom occurs that such disasters happen without a sufficient cause, which is generally negligence or incompetency on the part of mine officials. The St. Paul mine was not properly equipped to successfully combat a serious mine fire, and as a consequence, nearly 400 lives were sacrificed. The main criticisms with reference to the Cherry disaster were that fire drills had not been practised, and that the shaft and the bottom near the shaft, and about the mine stable were far from being fireproof. The accident did impress mining men with the importance of constructing fire-proof shafts and landings. The fatality also drew attention to the rapidity with which mine timbers covered with dry coal dust will flame and burn.

One other important question brought up by the St. Paul mine fire was the problem of providing safety chambers underground in coal mines. The dangers from mine fires are as great as those from explosions of gas and dust; this latest accident, therefore, has caused strong arguments to be advanced favoring the installation of safety chambers underground. One large Illinois company has prepared plans for an underground safety chamber, which station is to be supplied with oxygen tanks, food supplies, medicine, etc., besides being connected to the surface by a bore-hole permitting the extension of a telephone line to the chamber. Some mine experts have suggested plans whereby it is possible to isolate certain mine areas from contact with the after-gases of an explosion. One such suggestion was that mine managers could install a series of boiler-plate doors in the main entry, the intakes and the return roadway. This engineer conceded that the inner doors in the explosion panel would be blown from their fastenings, but asserted that the outer doors would remain intact, and the men behind them might be safe.

The greatest problem confronting coal men is the question of establishing a proper selling price for their product. Our coal areas are so great and so widely distributed, that every year brings forth a new list of producing mines. The result is that few mines are working more than 75 per cent. capacity; in such important coal-producing States as Illinois, the shipping mines of the State operated on an average less than two hundred days during 1909. It is easy to see, therefore, that any increased demand for coal is met, not by a betterment in the price of the product, but generally by an increase in production. In some instances the demands of labor have been excessive, so much so that one mine in Pennsylvania recently closed down and is filling its contracts by purchasing coal from other producers, rather than to operate on what is claimed would be an unprofitable basis.

In conclusion, it is safe to say that the great problem confronting the coal industry at the close of 1909 is, how to restrict production so that the present destructive competition will be eliminated and the entire industry placed on a safe and profitable footing. Such a step would be in the interests of the safety of our miners and the conservation of our coal resources, rather than in netting a higher money return to coal owners. Under present conditions, it is impossible for coal operators to adopt necessary precautions and at the same time mine coal profitably. Those mine owners who desire to advance the industry to a high plane and thus preserve their mines and the lives of their employees, are prevented from carrying out any such purpose by the keen competition of other operators who are less careful and whose sole aim is the production of coal at the lowest possible cost.

The Coal Trade in 1909

BY JOHN H. JONES *

The business prospects for 1910 look very encouraging and I feel confident that the half-billion mark will be passed in the production of coal in 1910. Many contracts have been renewed in the different districts at this year's prices, to run another year, which will make it practically impossible for any company assuming such contracts to make satisfactory returns to its stockholders; and the only way in which any coal company will be able to make satisfactory returns to its stockholders, will be by strenuous action on the part of the larger companies in advancing the prices and maintaining them, to permit them to show the earnings which their stockholders are entitled to. We are now enjoying the greatest industrial prosperity that the country has ever witnessed, and in the judgment of many financiers and business men, the next two or three years will be very prosperous.

The production in the Pittsburg district this year will amount to about 50,000,000 tons, and for next year I estimate it will be 55,000,000 to 60,000,000. A settlement will have to be made with the miners as of effect April 1, 1910. As a great many complications have arisen on account of the introduction of safety explosives, and other problems will have to be solved, it is questionable whether the miners and operators will be able to arrive at a satisfactory settlement unless a great deal of diplomacy is exercised in negotiating the settlement. Many of the largest operators and miners' officials are of the opinion that the situation must be handled with great care, the operators now contending that it will be necessary to have a reduction of the scale on account of the additional cost of mining which they think the miners should share, and the miners think the scale should be advanced, owing to the increased cost of living.

The lake tonnage from all districts for the nine years ending 1909, was as follows:

Year.	Pittsburg District.	Ohio District.	W. Va. District.	Total.
1901	3,795,706	1,954,825	787,572	6,538,103
1902	4,704,093	2,689,974	965,769	8,359,836
1903	6,092,047	2,458,265	1,539,435	10,089,747
1904	6,058,383	2,138,274	1,279,876	9,476,506
1905	7,443,883	2,062,692	2,109,262	11,615,837
1906	9,287,272	2,560,906	2,743,732	14,591,910
1907	10,549,995	4,074,296	3,420,941	18,037,232
1908	8,700,000	3,600,000	3,450,000	15,750,000
1909	8,687,305	3,002,815	3,874,570	15,364,690

These figures show the Pittsburg district about at a standstill, and quite an increase in the West Virginia district, with quite a reduction in the Ohio district. Much more coal would have been shipped to the head of the lakes had the railroad companies been able to furnish more cars during the months of October and November. They should not be censured for this, however, as they were prepared to move the coal in the early part of the season had the docks at the head of the lakes been willing to accept the coal.

The majority of the operators of this country are sparing no effort to provide safeguards to the health and safety of their employees. The best thoughts of the mining experts of the world are being brought to bear on the great problems confronting the mining industry. The testing laboratory situated in Pittsburg has been of great good, and I sincerely believe that with the continued use of the combined ideas of brain and skill, the United States will continue to lead the countries of the world in the low mortality rate per million tons of coal mined. The following table will show that we now head the list:

LIVES LOST PER MILLION TONS OF COAL PRODUCED.

United States	3.84
Great Britain	4.15
Germany	6.35
France	5.56
Belgium	6.71
Austria	8.16

There have been and are a number of conditions to be overcome in coal mining which are as yet unrecognized and unknown, but these are rapidly being discovered and overcome. For instance, in past years, explosions in the mines were not nearly as serious as they are to-day because there was not enough air in the mines to render them serious, and the gas would simply burn without spreading and do practically no damage. Modern sanitary ideas demand sufficient air to give every man in the mine enough to breathe and to carry off the foul air and gases, yet an overabundance, in case of a slight explosion at any point, is liable to render such explosion serious on account of the dust it carries in suspension.

In interviews during the last three years, I have recommended a tax on the pay rolls of employers of labor, this tax to be deposited in a special fund which will be administered by a commission, one-third chosen by the governor and two-thirds elected by the people, this commission to administer the fund, and in case of death to see that the widow is provided for and the children properly educated; and in case of injury not involving death, to pay to the injured person a weekly sum equal to the average wage earned by him in the three preceding years. The idea is to prevent employees and their wives and families from suffering want on account of accidents over which they had no control, placing them in position to secure money which would be due them under the law and

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*President Pittsburg Buffalo Company, Pittsburg, Penn.

which would not be given to them as a charity.

The mining laws of this State are very explicit in saying to the operators: "You must employ certificated mine foremen and fire bosses, and give them absolute charge of your mines. You must provide them with the supplies necessary for the operation of the mines, and your superintendents (practically meaning the owners) must not interfere with these men in the discharge of their duties." These precautions are wise, but notwithstanding all this great care, many serious disasters have occurred. Certainly these State officials (mine and fire-bosses) would not spend their entire time in the mines and permit them to operate if they did not consider that the mines were safe.

Great strides have recently been made in the knowledge of mining conditions, but the personnel of the men in charge and the men employed is a great factor in the safe working of the mines. The fact that a man has done something a hundred times without observing the necessary care and has always escaped injury, breeds within him a contempt for the ever present danger and sometimes causes a reckless disregard not only for his own safety but for the safety of others. This is a factor most difficult to overcome.

It is manifestly impossible to prevent all accidents, but we must figure out the best methods of reducing their possibility to the lowest degree. When we consider that about 85 per cent. of the accidents are not caused by explosions of gas or dust, or blown-out shots, and that more than 50 per cent. of these accidents could be prevented by ordinary care on the part of the injured person, it is easy to see what effect a more rigid police regulation will mean in the future production of coal in this country.

Our State mine inspectors have police power, and they have all risen by their ability from the ranks of the miners, and by the careful study of mining conditions they have fitted themselves for their present positions. They are constantly studying to improve methods and conditions, and I am confident that if we will all coöperate (the mine inspectors, the miners and the operators) it will only be a short time until this country will be able to show a much lower proportion of accidents to the number of men employed.

Coal in the Pittsburg District in 1909

BY B. E. V. LUTY

Coal production in the Pittsburg district in 1909 showed a slight gain over 1908, but fell far short of the output in 1907, the record year. Prices, except toward the close of the year, averaged a trifle below those of 1908, but on account of the greater regularity of operations the results of 1909 were on the whole more satisfactory than those of 1908.

Prices were almost stationary during the first nine months of 1909, averaging on the basis of $1.05 for mine-run. In October, toward the close of the lake shipping season, coal became somewhat scarce and prices took a jump to $1.15@1.25, and during the closing three months of the year the average price was fully $1.15 for mine-run.

The production of the Pittsburg Coal Company, the leading interest, compares as follows:

	Tons.
First nine months, 1907..........	13,302,634
First nine months, 1908..........	9,726,387
First nine months, 1909..........	9,718,334

There was a decrease of 8053 tons from 1908 to 1909, but the output in the three closing months of 1909 ran well ahead of the output in the corresponding period in 1908, indicating a total for the year of about 14,000,000 tons, against 13,217,545 tons in 1908.

The total output of the Monongahela River Consolidated Coal and Coke Company, the leading river shipper, was about 6,500,000 tons. Of this total about 2,000,000 tons was shipped south by water, about 2,000,000 tons was shipped by rail and the balance, considerably in excess of 2,000,000 tons, was shipped by water to consumers in this industrial district.

The river shipping season was unusually short, as it did not open until Jan. 10 of the year, extending to the middle of June, a trifle over five months. During this period there were short spells of low water, not long enough to interfere with steady mining operations. After the close of the regular season there was but one rise, in September, giving only a barge stage, upon which about 100,000 tons was shipped.

The lake coal trade reached a greater tonnage than in 1908, but fell far short of 1907. The season was late in opening, although not as late as in 1908.

No Serious Labor Troubles

No serious labor questions arose in the year as a two-year agreement had been signed in 1908 with the United Mine Workers of America, to run through March 31, 1910. In July some friction arose over the kind of explosives to be used, and for a short time a strike was threatened, but such trouble was averted.

The railroad-car supply was fairly adequate throughout the year, although the usual difficulties were experienced toward the close of lake navigation. On account of the increase in industrial operations a severe car shortage was expected for November and December but the unusually good weather averted serious trouble.

Connellsville Coke in 1908

The production of coke in the Connellsville and lower Connellsville regions may be estimated as below, compared with an estimate for 1908 and the Geological Survey's figures for the three preceding years:

Year.	Short Tons
1905..........................	17,236,387
1906..........................	17,215,975
1907..........................	19,100,327
1908..........................	10,700,000
1909..........................	17,800,000

Coke production in the Connellsville and adjacent fields naturally followed the course of pig-iron production in the central west. The year opened with increasing production all along the line, but a backset occurred in March and April, after which there was a steady gain until the two closing months of 1909, during which production was practically stationary.

Prices of coke in 1909 showed the most spectacular movement in the history of the industry. Late in 1908 contracts for Connellsville furnace coke were made at $1.90, and later at $2, for both the first half of 1909 and for the entire year, the majority of furnaces making contracts. Pig iron declined steadily in the early months and by April reached a point which induced many furnaces having $1.90 and $2 contracts to insist that they would have to have a readjustment of the contract price or go out of blast. In a number of cases the coke producers consented to a readjustment, the new price generally being $1.60@1.70. In the case of half-year contracts the operators generally insisted upon a contract being signed for the second half at the new price, as a condition of the readjustment. Straight sales for the second half were also made at from $1.60@1.70.

Thus the opening of 1909 saw furnace-coke contracts in force at $1.90 and $2 the middle of the year contracts at $1.60 and $1.70. Then the market turned and a tremendous advance occurred; in August a few far-sighted furnacemen made contracts for 1910 at higher than $2, and in September others contracted at $2.90; in the case of two or three, small tonnages of high-grade coke were contracted for at $3 for the whole of 1910. It has been but rarely that prices approaching $3 have been obtained on contracts for furnace coke, and then only as the culmination of a protracted rise extending over a series of years. The strongest period was in September and early October, the market softening slightly thereafter until at the close of 1909 it was possible to place contracts for 1910 at $2.80 or possibly less.

Monthly average prices for prompt Connellsville coke in 1909 were as follows, per net ton at ovens:

	Furnace.	Foundry.
January	$1.70	$2.10
February	1.65	2.00
March	1.55	2.00
April	1.43	1.90
May	1.45	1.85
June	1.50	1.85
July	1.55	1.85
August	1.75	2.00
September	2.30	2.50
October	2.80	2.75
November	2.85	3.00
December	2.70	3.10

An illustration of the vagaries of the market was given through the contract made in May between the Thompson-Connellsville Coke Company and the Jones & Laughlin Steel Company, covering 30,000 tons of furnace coke monthly for a period of three years, shipments to begin nominally Sept. 1, or upon the completion of the steel company's three new blast furnaces at Aliquippa. The price was $2, the steel company at the same time agreeing to help the coke company finance the erection of the 400 new ovens required to supply the tonnage. When the news of the contract came out it was received with incredulity in many quarters, it being urged that no large consumer would agree to pay so high a price, but it was merely a case of the steel company being wiser than its critics, since at $2.75 for 1910 coke the price for two following years could be down to $1.62½ and still make the $2 average for the three years.

In the latter part of March, there was launched the ambitious project of consolidating all the coke operations of the Connellsville and lower Connellsville region with the exception of the H. C. Frick Coke Company and some of the independent steel and blast-furnace interests. The real parties back of the movement were never completely identified, their representative being John W. Boileau, of Pittsburg.

Letters were mailed March 19 to all the independent coke operators asking for options on their properties good until Oct. 1. The options were given, although usually at very high prices, much of the coal in the old basin and in the lower district being priced in the neighborhood of $5000 an acre. On June 20, all the options expected having been received, appraisements commenced. It had been given out that the operations would be purchased on a cash basis, but that some of the higher-priced options would have to be scaled down. The appraisements were very thorough, and altogether a large amount of money was spent by the promoters, but the final outcome was a complete failure. Practically none of the options were revised. Instead of the cash basis at first promised, the promoters proposed that the sellers should take stock in the new company, except for a modicum of cash which in most cases would have been insufficient to clear the properties of bonded and floating indebtedness.

When the enthusiasm of the promoters was at its hight the statement was made that the history of the Connellsville coke merger would be made the subject of an exhaustive magazine article, so novel were the principles involved and so skillfully was the work being done, but the outcome of the deal was not as was expected, and it remains that the identity of the principals has not been definitely disclosed, and that the causes prompting the effort and the reasons of the failure are matters purely for speculation. Perhaps the most adequate explanation of why the Connellsville coke properties could not be merged can be found in the one thing of all which time and place change least—human nature. The Connellsville coke operators were ready cheerfully to take their chances for the future, large profits or small profits as time should develop, but to change their hopes into present realization required the offering of the maximum of the possibilities in the form of cash or negotiable securities of guaranteed value, and to do that no capitalists could undertake. The irony of the failure was brought out in the antithesis that in May the critics of the proposition found their *reductio ad absurdum* in the computation that the new company, to make adequate returns on its capitalization, would have to obtain an average of $2 a ton for its coke—a thing apparently not to be thought of in the then temper of the market—whereas before those options expired, Oct. 1, furnace coke on 1910 contracts, made in competition in the open market, carried prices well in excess of $2.75.

NO MORE BEEHIVE OVENS

It is understood to have been definitely decided in the year by the United States Steel Corporation that it will erect in the Connellsville region no more coke ovens, neither the beehive now used nor by-product, except possibly to round out some plants already in operation, and that future expansion with Connellsville coking coal will be with by-product ovens at the point of consumption. The first operation will probably be in the Youngstown district. The advantages of by-product coking have been patent to students of the subject for years, and need not be referred to here. It may be noted, however, as germane to this review, that the H. C. Frick Coke Company is at the present time shipping Connellsville coal from some of its operations to other properties in the region at which the coal is worked out, and paying the railroads something at least for the service, whereas the freight on coke from the Connellsville region to Youngstown, paid regularly on the large shipments being made, is $1.30, while the coal rate is 90c., so that at 75 per cent., the yield expected from Connellsville coal in by-product ovens, against its yield of 66⅔ per cent. obtained in beehive ovens, the freight on the coal required to make a ton of coke would be $1.20, a saving of 10c. per ton of coke in the mere matter of transportation.

The Chicago Coal Market in 1909

SPECIAL CORRESPONDENCE

Considered as a whole, the year 1909 was much more satisfactory to coal dealers in Chicago than the previous year, and in its latter half conditions grew steadily better, making the outlook at the end promising for prosperity in the coming year.

Illinois and Indiana coals, the chief source of supply for Chicago's wholesale trade, sold at about the same prices as in 1908. These prices were low, permitting only a small margin of profit; on screenings, a size largely used, they were lower, for a good part of the year, than in 1908. Competition is keen on these coals; their field of production is large and new mines are coming into existence constantly; so prices have reached a low level at which they seem bound to stay until some sweeping change comes over the coal-producing or the coal-consuming industries.

Opening with a fair sale for domestic coals, because of the weather, 1909 showed in its first half depression for steam coals of all kinds and sizes. Shipments had been largely curtailed to this market in the closing months of 1908, but this condition did not continue to the extent of regulating receipts to the market's consuming capacity. Every few weeks some impatient operator or operators consigned to Chicago enough coal make a cut in prices that sometimes is so low as to leave no profit. Strict en- rcement of demurrage rules by the rail- ads caused such sales on almost all nds of coal at different times in the ar; yet the market was free from such moralization as occurred in some previ- s years, from general over-shipments.

Early in 1909 Illinois and Indiana reenings were unusually strong because their use as a substitute for more ex- nsive coals. By September, however, ey became very weak and in the latter rt of 1909 sold for lower prices than at ıy time in 1908. In proportion, lump ew strong. Very low prices prevailed lump during the summer months, but ter August it gained steadily in strength. un-of-mine from Western mines held a edium course between lump and screen- gs. With the increasing use of auto- atic stokers, fine coals become more and ore in demand in the Chicago market, ide from the months of mild weather hen they are popular with steam users.

Sales of coal for harvesting use were obably greater than ever before. This mand, coming in the summer and early itumn, was marked by a preference for gh-grade coals on the part of harvesters, and it was accompanied by the general revival of manufacturing and general business, making the summer unusually a busy season for coal dealers.

Average prices, for car lots of Illinois and Indiana coals (which constitute two-thirds or more of the total supply sold in the Chicago market), were as follows:

PRICES OF WESTERN COALS AT CHICAGO.

Month.	Lump and Egg.	Run-of-Mine.	Screenings.
Jan...	$1.85@$2.65	$1.60@$1.75	$1.30@$1.60
Feb...	1.75@ 2.50	1.60@ 1.75	1.30@ 1.60
Mar...	1.75@ 2.50	1.60@ 1.75	1.30@ 1.60
Aprli..	1.75@ 2.30	1.60@ 1.75	1.40@ 1.60
May...	1.75@ 2.25	1.60@ 1.75	1.40@ 1.70
June..	1.75@ 2.25	1.60@ 1.75	1.10@ 1.70
July...	1.75@ 2.25	1.60@ 1.75	1.50@ 1.75
Aug...	1.75@ 2.35	1.60@ 1.75	1.30@ 1.65
Sept...	1.75@ 2.40	1.60@ 1.75	1.20@ 1.15
Oct...	1.75@ 2.50	1.65@ 1.75	1.00@ 1.30
Nov...	2.00@ 3.00	1.75@ 1.85	0.95@ 1.15
Dec...	2.00@ 3.00	1.75@ 1.85	0.95@ 1.15

Eastern bituminous coals gained with the revival of business and smokeless especially found increased favor, though for the greater part of the year it was in over-supply and sold at discounts from the circular prices. Pocahontas and New River brought $3.15 @ 3.80 for lump and egg, and $2.85 @ 3.15 for run-of-mine, the lowest prices being received in the summer. These quotations represent $2.05 over prices at the mines, that being the freight rate to Chicago. Hocking Valley coal throughout the spring and summer was too plentiful for maintenance of the circular price of $3.15, and at times sold for 40c. less than that price. This coal was in good demand throughout 1909, especially in the last quarter, when shipments of it were well regulated to the demand and the circular price was generally adhered to. Youghiogheny, the leading gas coal, sold at $3.15 steadily and figured almost wholly in contract sales. Contracts for supplies of steam coal, of all grades, were made in the spring months of 1909 to a greater extent, probably, than ever before, but at low prices.

Anthracite sold to about its usual amount throughout 1909, at the same prices as in 1908, and the market for it was not marked by any extraordinary features except an unusual amount of free coal, sold at an average of 25c. under established prices, in the summer and early autumn months. All sizes were in good supply throughout the year; in November and December the demand for nut was so large as to make its prompt movement occasionally difficult.

The Alabama Coal Market in 1909

The Alabama coal market suffered eatly through two-thirds of the year 09. If general conditions throughout e country had not improved greatly iring the last few months, the report of e Alabama coal industry in 1909 would ive been distressingly poor. The great rides made in coal mining from October the last of the year succeeded in bring- g up the production, and while the ficial figures will not be out for at least vo or three months, there is enough nown to place the aggregate around hat the production was in 1908, or about 1,523,299 tons. In addition to the busi- ess depression that existed in 1908, a rike of four months' duration took place Alabama. The production of coal for iat year went down from 14,424,863 tons 1907), to 11,523,299 tons (1908). In 909 there was nothing but the after- ffects of the panic that had any effect, nd the severity of the same can well be nagined when it is stated that the coal utput will not exceed the production of 908.

The consuming element, the iron blast ırnaces, called for a large proportion of ıe coal that was produced during the ear. The commercial trade was very ull, in fact, in some instances, mining ompanies were willing to sell at practi- ally cost, including the wear and tear n machinery and the depreciation in the rospective coal. It was in October before any appreciable improvement in the coal market conditions was felt. The iron making in this State then had a big impetus and the demand for coke improved wonderfully. A scarcity of miners and mine laborers became noticeable and concerted steps were taken to bring in more laborers. The wages of the men in the mining industry in this State were not inducive to bring forth much exertion, and at all properties, except the mines operated with convict labor, several in number, there was nothing better than half-work during the greater portion of the year. An advance in the wage scale among the miners and mine laborers was allowed on December 1. This acted as an incentive for the men to seek the mining work and to urge those at work already in the industry to give better effort.

The State had but little, if any experience, with organized labor around the coal mines in 1909. Very few companies recognized the union during the year, in fact there was so little given out publicly of the existence of an organization among the coal miners and mine laborers that there is doubt as to whether such an organization is being kept up. Former leaders were heard complaining, occasionally getting into print, but the operations in the mining district did not feel any of the effects and those men who remained in the State were glad to accept any little pittance in the way of work that was offered. When the conditions changed for the better there was great activity at the mines and the production grew as if by magic. The Chief State Mine Inspector, Edward Flynn, and his two assistants, watched the mining operations carefully and issued several warning circulars to the operators and to the mine workers to keep down the fatality list, and at the same time to improve the grade of the coal produced.

The Coke Business

Coke was a strong commodity practically throughout the year. By autumn the demand became exceedingly strong, and there was talk of importing some of this product to help out. Old coke ovens were put into shape and started up. Improvements were made at coke ovens already in operation. During the depression last year and a great part of 1909, there was quite an accumulation of coke, but, as soon as the consumption of coke started in and went above the output, the stocks began to dwindle. There was some little coke shipped out, too, during the dull period, but this practice was abandoned as the home demand improved.

Plans are on foot for the construction of several hundred more coke ovens during 1910. An immense by-product plant has been planned by the Tennessee Coal, Iron and Railroad Company, steam and gasses from which will supply a large power plant, which will in turn furnish power for several industries.

There were a number of transactions during the year 1909 in coal tracts in Alabama, and development has started in several portions. The new year starts in with an activity equal, if not greater, than prevailed in 1907 when the banner production was secured. The prospects are bright for a continuation for some time to come. Should there be no backset, the output at the Alabama coal mines should easily exceed 15,000,000 tons in 1910.

The advance made in coal production in Alabama has been phenomenal. The figures show that in 1870 the State was given credit for an output of 13,200 tons. There was an increase year after year, excepting two or three years, until 1907, when the aggregate output was stated at 14,424,863 tons. Since 1902 the coal production in Alabama has been above the 10,000,000 ton mark.

The coke production in Alabama during the year 1909 was about 2,500,000 tons. In 1908 the State received credit for 2,335,602 tons and in 1907, 3,096,722. The largest output in coke was in 1906, when 3,217,068 tons were reported. Nearly 20,000 men, including convicts, were employed in the coal-mining industry in Alabama. This number will be increased by at least 5000 in the next few months, if the labor can be induced to come here.

Production of Coal in Illinois During 1909

BY DAVID ROSS

From the reports of the ten coal mine inspectors of the State, it is shown that the total output for the fiscal year ended June 30, 1909, was 49,163,710 tons, distributed between the different classes of mines as follows: 384 shipping mines, 47,958,562 tons; 502 local mines, 1,205,148 tons.

The loss in gross tonnage compared with last year was 108,742 tons. There were in use 1246 mining machines, cutting 16,407,692 tons. This is the largest machine output, being an increase of 7.9 per cent. over last year, and an increase of 193.9 per cent. over the product of 1900. This increase in the volume of machine-mined coal is remarkable in view of continued complaints against the differential fixed for this State. Their operations are confined chiefly to the thick veins in the southern part of the State where conditions are more favorable to their employment. The average value of coal at the mines, as returned by the operators, was $1.032 per ton, varying but little from the prices reported during the last several years. Shipping mines operated on an average of 180 days. As evidencing the capacity and equipment of some of the Illinois mines, it may not be improper to mention those of the Superior Coal Company operating at Gillespie, Macoupin county; the No. 3 mine, working 317 days, produced 696,869 tons; No. 2 mine working 226 days, produced 642,075 tons, or an average per day of eight hours each of 3211 and 2841 tons respectively. Two mines furnished more than half a million tons, while 13 produced over 400,000; twenty exceeded 300,000 and 50 produced more than 200,000 tons each.

As a result of the year's work (fiscal year ending June 30), 212 men lost their lives and 781 sustained injuries entailing a loss of 30 or more days' time. This record of fatalities indicates an increase of 16 per cent. compared with 1908 and marks the highest ratio of loss ever experienced during any previous corresponding period. The number of fatal accidents resulted from the following causes: Falling coal and rock, 84; gas and powder, 73; mine cars, 23; other causes, 32.

Coal Mining in New Mexico in 1909

The year 1909 showed a healthy condition of the coal-mining industry in the Territory, notwithstanding the rather stagnant situation in the copper-smelting centers of the southwest, the copper smelteries furnishing one of the principal sources of demand for the products of the coal mines.

The gross production was 3,010,000 tons, an increase of 285,000 tons over 1908, or 10.4 per cent. Of the gross product 35,000 tons was used in operating the mines; the small quantity used for operating is explained by the fact that in the largest producing camp, Dawson, the waste gases from the coke ovens are conducted at high temperature to the boiler plant and furnish the fuel for necessary power at the mines, as also for heating many of the larger buildings. At some of the smaller mines slack is used for boiler fuel and no account of it is kept. The net production, deducting fuel used for operating the mines, was 2,975,000 tons. Of this total net product 2,175,000 tons was shipped to market and was sold at an average price of $1.35 per ton at the mine, or a total of $2,936,250, the price ranging slightly less than in the preceding year, which was $1.40 per ton; although prices strengthened in fall and winter months.

About 800,000 tons of unwashed slack and coal was sent to the washeries and thence to the coke ovens, where 430,000 tons of coke was made from it, which sold for $3 per ton at the ovens or a total value of $1,290,000. The total value of coal and coke was $4,226,250.

While the tonnage of coal produced was greater than in 1908, there was a less number of men employed in and about the mines; 2550 men being employed underground and 550 outside; 34 boys worked underground and 28 outside, a total of 3162 persons employed at the mines; this compares with 3200 men underground and 740 on top, making a total of 3940 men and 120 boys, or 4060 persons employed in 1908.

The greater production with the lesser number of men is accounted for by the fact that during the preceding two years the majority of the miners were engaged in development work, or narrow work, while 1909 had the advantage of an ample number of rooms which were turned during the two previous years of the initial development stage; the majority of the miners being employed in rooms allowed a greater production per man than in the previous years when on narrow work. The same is true of the men employed on top; the equipment was perfected and it required fewer men to handle the product at the surface.

Eleven men were killed in the mines during the year, or 3.47 for each 1000 persons employed or 0.347 per cent. for 1909, as against 21 during the preceding year, or 0.517 per cent., a gratifying decrease, but not as good as it should be. Six of the fatalities were due to falls of rock; 3 by falls of coal and 2 by being run over by mine cars.

Coal Production of Colorado in 1909

BY JOHN D. JONES*

The total output of the various grades of coal in 1909, in Colorado, amounted o 10,736,459 tons, which is an increase over 1908 of 963,452 tons, or 9.85 per cent., and shows that the market conditions have decidedly improved since 1908. The increase is considerably arger in the domestic than in the steam fuel.

The Huerfano county product is classified as bituminous and noncoking, but s in reality a domestic coal and in great demand for its merits as such. Since 1907, Colorado has not been so heavy a consumer of steam coal as it had been for a long time previous to that date. The closing down of the metalliferous mines hen and other steam plants depending upon the bituminous mines for their fuel supply has made the demand for this product rather dull. However, they are gradually resuming their normal activity and there will be a marked improvement n the demand for this grade of fuel.

The increased demand for the domestic coals can be attributed to the arge additional acreage of farming land placed under cultivation, resulting in the growth of the population and the bountiful crops harvested. Therefore, the increase was only normal and what could be reasonably expected. Yet in the face of this growth of the industry, the operators complain of 1909 as being a lean year for them. This probably was due o the fact that a number of large producing mines opened up about a year ago, putting out large quantities of coal, dividing the business and quickening ompetition.

NCREASED DEMAND FOR DOMESTIC FUEL

There was an increased demand for domestic fuel in the adjoining prairie States to which much of our coal is shipped, with the possible exception of Texas, which I understand has not taken as much of our product as expected on account of the drought and consequent crop failure. Colorado ships coal to Nebraska, Kansas, Texas and other States where the freight rates are not prohibitive to competition with neighboring coal-producing States. Colorado being situated further away, the rates are higher than those of other States, which is a handicap to our shippers, and it is only due to the superior quality of Colorado coals that this difference in the freight rates can be overcome. There has been considerable agitation in this State for a lower freight rate and should the railroads make concessions the market would expand proportionately.

A COAL WAR WAGED

Owing to overproduction and a slack demand for fuel, a coal war was waged in the lignite districts of Boulder and Weld counties, which resulted in a reduction of 50c. per ton and lasted from February to November 22, when a truce was declared and the old prices were resumed. This probably had the effect of increasing the Boulder-county output, while in Weld county it caused the production to fall below that of 1908. The prices in the other districts were not affected.

In the last 60 days, the demand for coal has been heavy and it is not anticipated that there will be a serious break in the market for several months to come, as there is little coal stored at any point, and the present severe weather will keep the demand steady.

In the early autumn, there was a decided car shortage which has been relieved since the bulk of the crops has been shipped. Never before was there such a demand for cars in Colorado and it was fortunate that the supply had been augmented; the local railroads have also been in better shape to handle the cars, having more ample motive power and an improved method of handling the freight traffic.

No labor troubles occurred in any part of the State and the wage scale of a year ago prevailed. The coke industry also shows a marked increase.

Much development work was done at the Oak Hills and Pinnacle mines situated on the Moffat road in Routt county. The former has attained a monthly output of 15,000 tons and the other at present 2500 tons. From 3000 tons in 1908, Routt county has increased to 89,900 tons. Outside of these two mines, no other mines of any consequence have been opened up in this district. In the accompanying table, the December output was estimated.

SUMMARY OF COLORADO COAL PRODUCTION IN 1909.

Number of mines in operation....	193
Tons of lignite coal produced.....	2,150,280
Tons of semibituminous coal produced	842,927
Tons of bituminous coal produced	7,612,308
Tons of anthracite coal produced	60,944
Tons of unclassified coal produced, estimated	70,000
Total tonnage produced..........	10,736,459
Increase over 1908..............	963,452
Tons of coal mined by hand......	9,107,349
Tons of coal mined by machine...	1,629,110
Total number of mining machines used	198
Total tons of coke produced......	1,091,882
Total number of coke ovens......	3,309
Number of employees in and about the mines.....................	13,156
Number of employees at the coke ovens	1,089

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*Chief State mine inspector, Denver, Colo.

Coal Mining in Wyoming During 1909

About two-thirds of all the coal mined n Wyoming comes from what is known s the southern field or district No. 1. For the fiscal year ended Sept. 30, 1909, his southern field produced 4,993,819 ons of coal; this output showed an increase over 1908 of 1,224,904 tons.

The State of Wyoming is fast coming o the front as an important coal proucer, and the 1909 production exceeded he output of any previous year. Miners n Wyoming are thoroughly unionized nd the labor problem is a question of reat importance in the Wyoming coal industry. Although miners were plentiful in 1909, it is likely that there will be a scarcity of labor in 1910 similar to what occurred in 1907. Approximately 25 per cent. of the coal production in 1909 was machine-mined. The chain-breast machine was slightly more favored than the puncher type.

Coal Mining in West Virginia

BY JOHN LAING†

The West Virginia coal-mining industry has been freer from accidents during 1909 than for some years previous; the only serious accident we have had in the State was an explosion at the Lick Branch mine of the Pocahontas Consolidated Coal Company, on Jan. 12, which killed 7 men; aside from this, West Virginia had fewer explosions and accidents of a minor nature in 1909, than was the case in previous years.

The condition of the mines in West Virginia was much improved in a sanitary way during the year, and the operators spent considerable money in this direction.

The coal production for the year was about 4,000,000 tons less than in 1908; this is caused, first, by the depression of business, and during the last three months by shortage of railroad cars. Many of the mines in West Virginia at present are not working more than three days per week. Following is the production for the first half of 1909, from Jan. 1, 1909, to June 30, 1909: Coal, 20,940,992 tons, coke 1,710,412 tons.

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†Chief State mine inspector, Charleston, West Virginia.

From June 30, 1909 to January 1, 1910, the West Virginia coal production, estimating the production for December, was about as follows: Coal, 16,000,000; coke, 1,200,000 tons. Grand total for year 1909, coal, 36,940,922; coke, 2,910,412 tons.

The fiscal year of the department ends June 30, of each year, so the Mining Department will not make a definite statement of production until July 1, 1910.

The Utah Coal Industry in 1909

By J. E. Pettit*

The coal and hydrocarbon-mining industries of Utah in 1909 increased 479,855 tons, making a total output for the fiscal year of 1909 of 2,324,715 tons. The amount of coke was 180,969 tons. There were 15 fatal accidents, 25 serious and 63 nonserious accidents.

There were no labor troubles, and the average wage paid to the miners of this State is the highest in the coal-mining history of Utah. The mines have worked on an average of 280 days, during the past year. The railroads have handled the product in a satisfactory manner, except during the heavy storm period of the latter part of December.

Coal Mining Industry of Indiana in 1909

The total production of coal in Indiana for the year 1909, with the reports for November and December estimated, was 12,200,000 tons. Although the production of the volume of coal of the Indiana mines was materially decreased in 1908, as compared with 1907, the output for 1909 will almost equal that of the banner year.

The improved facilities adopted by some of the older properties and the operation of a number of new mines occasioned a substantial increase in production over the previous year. A portion of this development of the industry is due to the extension of railroad facilities, and a more adequate car service. The primary, as well as prevailing cause of increased production is the rush of orders due to returning prosperity, and the unusually large consumption of Indiana coal by the United States Steel Corporation's immense plant at Gary, Indiana.

The gradual improvement in the productive capacity of the miners, on account of a more general use of coal-mining machinery, has been perceptible in a large degree. The machine-mined product increased in this State until only a few States outrank Indiana in the percentage of machine-mined coal as compared to the total output.

The aggregate total wages reported for mining in both the bituminous and block coalfields, with estimates for November and December, will amount to about $12,000,000, making the cost of production range from 90c. to $1.20 per ton. The selling price for bituminous coal during the year will average about $1.25 per ton for mine-run, while the block coal prices averaged nearly $2.40 per ton.

According to the monthly reports, about the same number of men are employed this year as last: namely, 19,100, to whom was paid an aggregate of $10,500,000 in wages (November and December estimated).

New Mines Opened

Ten new mines were opened, and five mines formerly closed or abandoned were reopened during the year. The new mines and the rejuvenated mines are pretty well distributed over the 18 producing counties of the State. The drilling for oil in the western portion of the coalfield has resulted in locating excellent coal beds, and the work of developing the finds is progressing rapidly in several locations. It is generally conceded that the number of mines in the western portion of the field will be increased 10 per cent. within a year.

According to reports made to the Inspection Bureau, there was about $75,000 expended on improvements of various kinds in and about the mines. These improvements are modern, including electric haulage systems, electric mining machines, and improved ventilating equipment. A visit by experts from the United States Geological Survey during the early part of the year resulted in much praise of the modern equipped and excellent condition of the Indiana mines.

Twelve mines were abandoned during the year, as against 28 the previous year. Various causes were assigned for the abandonment, the principal one, perhaps, being the flooding by reason of high waters during the Spring months.

Fatal accidents were fewer, and the number injured decreased materially in comparison with the record for 1908. The fatalities reported were found to be due, for the most part, to the carelessness of the miners and their wanton disposition to violate the provisions of the law intended to protect them from injury or death. Illegal shot-firing was found to be a common cause of a majority of the accidents reported to the department of mining. The recklessness and disregard for laws of safety exhibited daily by the miners when using explosives seemingly increased during the year.

Strikes and labor troubles were less frequent than during the previous year. The controversies arising over provisions of the wage contract were few and of short duration. A riot occurred at the Hymera mine between the American and French miners, resulting in the driving of the French miners out of the community.

Coal and Coke Production in the United States

The following table has been compiled largely from data communicated by the several State mine inspectors, estimates having been made only where no such statistics were available, but in all cases upon the basis of good information:

PRODUCTION OF COAL IN THE UNITED STATES.

States.	1908. Short Tons.	1909. Short Tons.
BITUMINOUS:		
Alabama	11,523,299	11,983,920
Arkansas	1,866,565	1,950,000
California and Alaska	21,760	25,000
Colorado	9,703,567	10,666,459
Georgia and North Carolina	301,640	300,000
Illinois	51,507,991	(a) 49,163,710
Indiana	10,987,419	12,200,000
Iowa	7,490,000	7,500,000
Kansas	5,960,417	6,000,000
Kentucky	9,805,777	9,950,000
Maryland	4,377,094	4,600,000
Michigan	1,839,927	1,900,000
Missouri	3,547,000	3,600,000
Montana	1,979,417	2,204,000
New Mexico	2,772,586	3,010,000
North Dakota	317,840	336,000
Ohio	28,101,949	28,107,000
Oklahoma	3,633,108	3,187,200
Oregon	60,000	72,000
Pennsylvania	118,309,680	130,157,582
Tennessee	6,082,851	6,234,922
Texas	1,280,490	1,310,400
Utah	1,786,204	2,324,715
Virginia	4,224,821	4,310,000
Washington	2,977,490	3,307,000
West Virginia	41,360,500	47,469,797
Wyoming	6,100,000	8,197,200
Nevada and Idaho	10,240	10,000
Total bituminous	337,929,632	360,076,905
ANTHRACITE:		
Colorado	69,440	70,000
New Mexico	20,000	20,000
Pennsylvania	80,240,138	77,009,336
Total anthracite	80,329,578	77,099,336
Grand total	418,259,210	437,176,241

(a) For the fiscal year ending June 30.

PRODUCTION OF COKE IN THE UNITED STATES.

States.	1908.	1909.
Alabama	2,336,602	2,500,000
Colorado	854,662	1,091,882
Georgia and North Carolina	60,000	50,000
Illinois	310,540	315,200
Kansas	10,000	10,000
Kentucky	54,515	64,20
Missouri	5,000	5,00
Montana	29,482	35,60
New Mexico	353,210	430,00
Ohio	240,000	250,00
Oklahoma	24,580	55,00
Pennsylvania	12,287,828	18,717,41
Tennessee	250,491	224,20
Utah	321,200	180,96
Virginia	1,219,927	1,250,00
Washington	37,381	41,0
West Virginia	3,107,000	2,910,41
Other states (a)	1,994,218	2,270,00
Total	23,496,666	29,100,97

(a) Includes output of by-product coke fo Massachusetts, Maryland, Minnesota, New York Michigan, Wisconsin.

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*State coal-mine inspector, Salt Lake City, Utah.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of inerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING ND MINING JOURNAL to miss any important article published anywhere.

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CEMENT.

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11305—TESTING—A Comparison of Re- orts on Tests of the Same Cement by Va- ous Laboratories. Alexis Saurbrey. (Eng. ews, Dec. 9, 1909; 3 pp.) 20c.

11306—TESTING—Portland Cement: The mediate Immersion or "Cold Plunge" Test r Soundness. Arthur C. Davis. (Proc. st. Civil Engrs., Vol. CLXXVII, Part III, 09; 5 pp.)

CLAY.

11307—INDIA—China-Clay and Fire-Clay eposits in the Rajmahal Hills. Murray uart. (Rec., Geol. Surv. of India, Vol. XXVIII, Part 2, 1909; 15½ pp.)

COAL AND COKE.

11308—ACCIDENTS—Les Catastrophes Mi- ères Americaines, de Monongah, Darr et omi. J. Taffanel and P. Dunaime. (Ann. s Mines, Tome XVI, livr. 7 and 8, 1909; 5½ pp.)

11309—BRITISH COLLIERIES—The Nav- ation Colleries, Crumlin. (Iron and Coal . Rev., Nov. 12, 1909; 4 pp., illustrated.) c.

11310—CANADA—The Production of Coal, ke and Peat in Canada during the Cal- dar Years 1907 and 1908. (Can. Dept. ines, 1909; 26 pp.)

11311—CHILE—The Coalfields and Col- eries of the Republic of Chile. Archibald ssell. (Trans. Min. Inst. of Scotland, Vol. XXII, Part 1, 1909; 54 pp., illustrated.)

11312—COAL CUTTER—The Siskol Coal tter, Rock Drill and Hammer Drill. (Coll. ard., Nov. 12, 1909; 2¼ pp., illustrated.) c.

11313—COAL DUST—Suppressing Coal ust at the Dourges Collieries. M. Bonneau. ron and Coal Tr. Rev., Nov. 26, 1909; 1⅓ ., illustrated.) Translation from *Bull.* de Soc. de l'Ind. Minérale. 40c.

11314—COAL HANDLING—The McMyler al Hoist for Discharging Coal from Wag- s into Ships. (Iron and Coal Tr. Rev., v. 26, 1909; 1 p., illustrated.) 40c.

11315—COAL WASHING—Un Grande Lav- oio di Carbone. (The Cardiff Washery.) assegna Mineraria, Dec. 1, 1909; 13¾ pp., ustrated.) 40c.

11316—COAL WASHING—Bituminous Coal ashing. Lee Fraser. (Mex. Min. Journ., c., 1909; 3¾ pp., illustrated.) Continua- n of article previously indexed. 20c.

11317—COKE—The By-Product Coke-oven stallation at the Chilton Colliery, Ferry- ll, County Durham. (Iron and Coal Tr. v., Nov. 19, 1909; ¾ p., illustrated.) 40c.

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11319—ELECTRIC POWER—The Electrification of the Ferndale Collieries. W. H. Patchell. (Coll. Guard. Nov. 19 and Dec. 3, 1909; 5½ pp., illustrated.) From a paper before the South Wales Inst. of Engrs. 60c.

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The Alaska Coal Cases

The Ballinger-Pinchot controversy, the Cunningham claims, and all the rest of this trouble will be thrashed out in a Congressional inquiry, pending which the country may relieve its mind of the criminations and recriminations that have been flying fast and furious. We refer to the matter now only in the hope that Congress may learn enough about the mineral-lands laws of the United States to overcome its own supine stupidity and become ready to enact something adequate.

We hope, moreover, that the Congressional committee will enlist the services of mining engineers of recognized standing and will not rely merely upon bureaucratic advice.

We say this in the hope that such wisdom may arise in the Congressional mind to make it perceive that there is something more important involved than the mere quarrel between Mr. Ballinger and Mr. Pinchot, this being the policy of the nation with respect to the bestowal of its remaining mineral resources. As to the coal lands, it is impossible under the existing law to acquire coal, develop a mine, and stick to the letter of the law. Consequently it has been necessary to dodge the law, which has thereby put a premium upon perjury.

In the scandal over the Alaska cases there is a great deal more smoke than there is fire. In a recent article in *McClure's Magazine* there is an "exposure" with a thread of truth which is involved among a distressing lot of nonsense. The talk about billions of tons of coal, worth $1 per ton, in the ground, *now*, is bosh, and even 50c. per ton is highly doubtful. But whatever might be a fair royalty, capitalization on basis of the probable period of realization would be a very much less amount than the simple multiplication of tonnage by a value per ton. We are inclined to think that the alleged plunderers of the Government are by this time a much disgusted lot of people, of whom the only happy ones may be some promoters who have been successful in selling stock.

Even the "Guggenheims" have their troubles. In this case it is not the affair of either of the smelting companies or the exploration company, but a venture of some of the Guggenheims personally along with J. P. Morgan & Co., The building of the Copper River & Northwestern railway ought to be to the benefit of Alaska. It never could have been done by the "hardy prospector," or by any but a powerful group of capitalists, and the boldness of this group in spending $22,000,000 excites the admiration of most intelligent persons, accompanied by doubts as to the successful outcome of the adventure.

The Katalla coalfield and the Copper River mines are of no value without a railway to serve them, and the railway along with other necessary developments costs a great deal of money. We are not defending any of the malefactors in this part of Alaska, but are only seeking to correct the false impression that there are billions of treasure merely awaiting removal without risk to anyone if a complaisant Government will permit.

The persons who have been trying to evade the letter of the law ought to be turned down, whether they be Guggenheims, or senators, or bartenders.

The law ought to be amended, with the aid of a commission of experts and without the meddling of Congressional wirepullers, so as to permit an honest development of natural resources by necessary methods and upon an adequate scale.

The Government ought not to give away its resources for a song, but in behalf of all the people it ought to derive a return from them commensurate with their value, as is done by some of the States in the disposal of their coal and iron lands.

It is particularly absurd that the nation should be practically defenceless on the Pacific coast for lack of coal, the transportation of huge quantities from the Atlantic coast for naval purposes being even now required, when it possesses immense deposits of its own in Alaska.

All of these things have been repeatedly brought to the attention of Congress by President Roosevelt, by the executive authorities, by representatives of the mining industry and by the press. If the inquiry be broad enough to open the eyes of Congress to the importance of this subject and lead it finally to act sanely in the interest of the nation, neither Mr. Ballinger nor Mr. Pinchot will have lived in vain.

The Copper Statistics for December

The American statistics, published on Monday last, have been regarded as the most favorable that have appeared for many months, and there is some ground for this opinion, but the statistics should not be taken too optimistically or wholly upon their face. The deliveries, both for export and for domestic account, increased largely over the deliveries in November, representing the shipment of copper contracted for during the large sales of November. Upon the face of the returns, the most hopeful feature of the December statistics, is the falling off in production, which has been regarded on the street as showing the curtailment of which there has lately been much talk. However, if any material curtailment has been inaugurated at the smelteries December would have been too early to show it in the refinery statistics. The ability of a refiner to curtail on his own account is rather limited. We are disposed to think that the decline in production shown by the December statistics was accidental rather than intentional. However, the result was a decrease of over 11,000,000 lb. in the visible supply in the United States, and nearly 4,000,000 lb. in the world's supply. For this we may be thankful, even if not made much more buoyant in our hopes.

North Butte

The air has been full of rumors respecting the conditions of the North Butte mine, where there are supposed to have been some adverse changes in the lower levels. What has happened is wholly a matter of surmise in so far as the public is concerned, the management of the company refusing to communicate any information. The stockholders of the company are entitled to an official report as to the facts. The silence of the North Butte company at this time compares unfavorably with the frankness that has been exhibited by some other companies, the Homestake, for example, when there have been developments seriously affecting the interests of the stockholders. There is at present strong suspicion as to the status of North Butte, which has been intensified by the reduction of the dividend. The longer Mr. Cole and Mr. Ryan withhold their confidence from their stockholders the greater will be their sacrifice of esteem.

The Pittsburg Coal Company

The position of the Pittsburg Coal Company is still uncertain. The proposed voting trust for a controlling interest in the stocks hangs fire, having received no general response from large holders, who seem to believe that they can do better individually than collectively. The current reports are that the recent buying of the stock is in the interest of the owners of the Western Maryland railroad, who are planning the extension of that line to Pittsburg at an early date. This would mean the bringing of coal from the Pittsburg district to the seaboard in much larger quantities than heretofore; a result that would be anything but welcome to the districts now supplying the seaboard trade. Operators in those regions have already about all the competition they can stand up against, and have worked for the past two years on a margin of profit so small that it has frequently reached the vanishing point. An invasion by the Pittsburg interests would probably result in little profit to the new comers.

The Pittsburg incident has led to the revival of the report which has been more or less current at times during the past two years, of a great bituminous coal combination. According to the present version such a merger is in process of formation with the Consolidation Coal Company as a nucleus, the Pittsburg company to be the first addition. These reports are still vague, and can only be given as current, any confirmation at the present stage being impossible. It may be said, however, that the interests concerned are too large and too divergent to make such a combination easy or possible except after long negotiation.

Stealing or "High Grading"

The eleventh arrest made on Dec. 19 in connection with the theft and sale of Cobalt ore gives some idea of the extensive organized thieving, which has been a concomitant of mining in the rich Ontario camp ever since its advance from the stage of the one-man prospect to that of incorporated operating companies. The present prosecution involves those who are alleged to have used a small smelting plant at Chippewa as the outlet, *via* various middlemen in Cobalt and Toronto, for ore stolen from the Cobalt mines. Managers of rich mines in every mining camp have been confronted with this problem which is at present receiving more definite and organized attention in the United States, as well as in the territory of our northern neighbor. Recently at Goldfield the three principal operating companies united in asking the court for an order to restrain the promiscuous sale of ore, except upon notification to the complaining companies. Though this savors of special legislation, it was perhaps the logical outcome of the peculiar conditions.

It seems unquestionable that some provision should be made to require authentic proof of the ownership of ore that is subject to sale. The exact form of legislation that would be effective is a matter that requires careful consideration. The Ontario mining act makes it a criminal offense to purchase ore without a certificate from the mine management, but this had not served to eliminate the stealing when there were channels for easily disposing of the stolen ore. This practice of ore stealing, though not new, has received a particular impetus in recent years from the ideas promulgated by certain socialistic organizations which have declared that the ore in a mine does not belong to the shareholders of the company that put up the capital to work he property.

The effect of these statements upon the unorganized or atrophied conscience s apt to be that its owner becomes more prone to appropriate an opportunity to distribute this "unattached" wealth, under he vague impression that it is only "high grading." We believe that this is frequently done by men who would not ake money or merchandise above ground, because to their minds that plainly would be stealing, the other being merely "high grading," a sort of "sport" indulged in by those about them under propitious circumstances. Many men now indulge in his practice, simply because it is done by others about them, and would cease o do so if more stringent legislation were enacted eliminating the easy channels for disposing of the stolen ore. If he practice were persistently referred o by its actual and proper designation of stealing, instead of the sugar-coated appellation of "high grading," it would assist official legislation in this matter by reating a malodorous and unpleasant tmosphere for its devotees.

The Corporation Tax on Mining Companies

It is reported from Boston, on apparntly good authority, that some of the Lake Superior copper companies are making steps to contest the validity of the ew Federal corporation-tax law. The est point will be on the constitutionality f the law, and the arguments will probbly be based on the limitations of the axing power of Congress, under which he Supreme Court declared unconstitutonal the income-tax law. Whether the rovisions of the law itself will be rought into question is not stated.

Under the law no special provision is made for mining companies, and they re classed with the manufacturing companies. The tax is imposed on net earnings, and under the interpretation of the Treasury Department, recently issued, these would be the difference between the cost of production and the actual selling price of the article made. In the case of an ordinary manufacturing company there would be usually no great difficulty in determining costs, but with a mining company the questions arising are much more complex. In making copper, for instance, most of the Lake companies publish yearly reports showing the cost of mining, treatment, etc., and giving the cost per pound of copper produced at the mine. Presumably the difference between this and the selling price would be assumed as the net earnings; but the cost of transportation and selling are legitimate charges and would, we believe, be allowed under the law.

The questions most likely to arise in the enforcement of the law are connected with the provision for a "reasonable" allowance for depreciation. Probably in the case of an ordinary factory this could be determined within moderate limits. In the case of a mine the actual depreciation of the machinery and equivalent can also be determined. But the production of the mine each year diminishes its resources and consequently its value. No provision is made in the law for this progressive depreciation or for amortization in any form; though it would seem only just to include some such charge in the expenses of the year. Friction and litigation are pretty sure to arise on this point, should the law be held valid.

The same point holds with all mining companies. The extraction of 1,000,000 tons of ore from one of the great iron mines of the Mesabi range, for instance, leaves the mine worth so much less. The value of the iron ore in the ground, in this case, would be a fair addition to the expenses of the year; but we do not see any provision of the law which would allow such a charge. The difference between actual cost of mining and the selling price, minus a "reasonable" allowance for depreciation of equipment, seems to be the basis on which the tax is to be calculated.

It is quite possible that the determination of such questions may be postponed till the courts pass on the general constitutionality of the law. The Lake copper companies, probably, will not be the only ones to raise this question.

The Australian Colliery Strike

The strike of the coal miners in New South Wales has become general, and has reached a point where there is serious embarrassment to business and manufacturing in Australia. The New South Wales collieries furnish the greater part of the supply for the Commonwealth, and the prolonged stoppage of shipments is being severely felt in all the large cities and towns. The miners recently offered to submit all the points in dispute to an open conference, but the operators refused to accept the offer. Lately negotiations have been resumed, but the proceedings are kept secret and the outcome is uncertain.

The absence of exports from Newcastle is making an opportunity for Japanese coal in eastern ports where Australian coal has heretofore held the market, both for local and steamship coal. It is an opportunity of which the Japanese will not be slow to take advantage.

The change in royalty demanded by the Ontario government from a number of non-dividend paying mines at Cobalt will be a welcome relief to those mines which have not been fortunate enough to develop bonanza properties, and to which the royalty heretofore demanded has proved onerous under the conditions existing in the district. The action taken on Dec. 16 by the Provincial government at Toronto changes the royalty from 25 per cent. of the gross value of the ore at the shaft mouth to 25 per cent. of the net earnings. If, however, the annual profits are less than $10,000, no royalty is to be paid. Four shipping mines will be immediately benefited and it is likely that other properties will be stimulated to increased development.

If the enlarged Utah Copper Company is going to improve its position by increasing its output; and if the proposed general merger is going to improve the status of copper by curtailing the output; if Phelps, Dodge & Co., Calumet & Hecla and W. A. Clark, besides others, stay out; and if Nevada Consolidated maintains independence; it would appear that the burden would fall wholly upon the Amalgamated and the Cole & Ryan groups. Even Mr. Morgan may find it difficult to reconcile this discordancy.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS AND THE EXPERIENCES OF READERS

Spurious Potassium Cyanide

The letter of F. A. Ross in the JOURNAL of Oct. 23, 1909, raises several interesting questions, and emphasizes the necessity of carefully analyzing the products supplied by manufacturers to mines and metallurgical works. At the outset it may be remarked that much mystification would be avoided if the practice were adopted of reporting the cyanogen contents of cyanide samples in terms of cyanogen instead of calculating them as KCN or NaCN. The absurdity of talking about commercial sodium cyanide as 125 per cent. KCN would thus be avoided.

Let us first consider the analyses No. 1 and No. 2 quoted by Mr. Ross. It is obvious, if these are correct, that any difference between the two brands of cyanide cannot possibly have been due to the different properties of KCN and NaCN, as the proportions of these two cyanides are identical within ordinary limits of error. The analyses, however, leave 1.8 per cent. unaccounted for, and it is quite possible that one or the other may have contained some ingredient detrimental to the extraction of gold or silver. The mysterious and contradictory differenees between KCN and NaCN which are noted from time to time in the correspondence columns of technical journals, may, I think, be safely referred to entirely different causes.

If, as there is good ground for supposing, all the soluble metallic cyanides (with the exception of mercuric cyanide) are completely dissociated in dilute solutions into the metal and cyanogen, it would seem that the primary reaction on the gold or silver must depend solely on the presence of the cyanogen. Be this as it may, it is easy to convince oneself by actual experiment that the nature of the alkali metal exerts absolutely no influence on the extraction. I have on more than one occasion made laboratory experiments in which portions of the same ore were treated respectively with solutions of potassium, sodium and calcium cyanide, each containing the same weight of cyanogen and otherwise similar, the extraction being identical in each case.

It may, I think, safely be asserted that no ore has ever yet been treated commercially with pure KCN. The commercial product sold under the name of "potassium cyanide" is, and always has been a mixture in variable proportions of the two cyanides with more or less considerable quantities of carbonates, chlorides and cyanates, and usually smaller amounts of sulphides, sulphates, thiocyanates, ferrocyanides, formates and perhaps other substances. These impurities are not intentionally introduced, but arise from the process of manufacture or may be originally present in the raw materials. In most methods of making cyanide, a ferrocyanide is produced as an intermediate product. This is treated with sodium carbonate, or in more modern practice with metallic sodium. By the former method a certain percentage of cyanate is due to the reaction:

$$K_4Fe(CN)_6 + Na_2CO_3 = 3KCN + KCNO + 2NaCN + Fe + CO_2.$$

In the latter case a mixture of cyanides is formed:

$$K_4Fe(CN)_6 + 2Na = 4KCN + 2NaCN + Fe.$$

As pointed out by Mr. Ross, one reason for the employment of sodium or sodium compounds is to be found in the relative scarcity of potassium salts. Also there are greater difficulties in preparing metallic potassium than metallic sodium. Probably the chief reason why potassium ferrocyanide is still largely used in preference to sodium ferrocyanide in the manufacturing process is that the latter crystallizes with 12 molecules of water whereas the potassium salt has only 3.

Now a few words as to the impurities in commercial cyanide. If carbonates, chlorides and cyanates alone are present, these substances neither help nor hinder the extraction of the precious metals, though the carbonate may be of some benefit as "protective alkali." Small quantities of sulphides frequently occur; large amounts would certainly be detrimental, but the minute quantities generally present are rapidly eliminated in practice by oxidation or precipitation as zinc sulphide. It occasionally happens that ammonium salts are found. In such cases, when the cyanide is exposed to the air there is a loss of cyanogen in the form of volatile ammonium cyanide, and probably also the cyanide, after it has been dissolved, will show a somewhat rapid deterioration in cyanogen strength owing to some such reaction as the following:

$$NaCN + NH_4Cl = NaCl + NH_4CN.$$

Ammonium cyanide is volatilized and partially decomposed at 36 deg. C. On one occasion a brand of cyanide supplied to a metallurgical plant was found to contain a perceptible amount of a soluble hyposulphite (thiosulphate), which had the effect of making the apparent strength in KCN, as determined by $AgNO_3$ and KI indicator, higher than the truth. The presence of this impurity may easily be detected and its amount estimated as follows: A weighed quantity of the cyanide is dissolved in distilled water and standard acid run in until, on adding a few drops of methyl orange, a pink tint is just permanent. If now a standard solution of iodine in KI be added, the disappearance of the iodine color indicates that a hyposulphite is present, and its amount may be accurately estimated by running in standard iodine until a permanent tint just remains, adding a little starch near the finish as indicator.

Not long ago I had occasion to examine a brand of NaCN sold as "cyanide of sodium, 126 per cent." When dissolved in distilled water and titrated in the ordinary way with $AgNO_3$, the full strength was apparently obtained. When, however, a case of this cyanide, weighing about 200 lb., was dissolved in the calculated quantity of solution in a storage tank, (which already tested 0.12 per cent. KCN or thereabouts), to give a 0.25 per cent solution, the actual strength obtained was only 0.21 per cent. Time and opportunity were lacking for the investigation of the mystery, but it would be interesting to know if any of the readers of the JOURNAL have had similar experiences.

J. E. CLENNELL.

Creston-Colorado Company, Torres, Sonora, Mexico, Dec. 24, 1909.

The Sauntry Process

On Feb. 20, 1907, we prepared a report on the Sauntry process for E. F. Colborn, William Sauntry and others. On June 26, 1907, E. F. Colborn told us that he had met with difficulty in bringing our rather long report to the attention of people who ought to read it, because they would not take the trouble to do so unless they first had a brief statement putting the matter in such a light that it would seem worth their while. He asked us to sign such a brief statement which he had drafted, assuring us that it was to be used solely as an introduction to our report, and we did so.

Since then we have been informed by Mr. Sauntry and others that he has been in the habit of showing our letter without showing or mentioning the report itself. We have repeatedly addressed him by registered post, asking him to permit us to add a few words to our brief letter mentioning the existence of our full report in order that those to whom he showed the letter might know of the report, to which the letter was to be used only as an introduction. As the matter has now been running along for several months without our receiving any answers to our several letters, we feel compelled to inform the public that our letter to Mr. Sauntry is not our report upon the Sauntry process, and we ask the JOURNAL to publish this letter, of which we are sending a copy to Mr. Sauntry.

H. M. HOWE.
BRADLEY STOUGHTON.
New York, Dec. 30, 1909.

Recording Claims in Ontario

The Toronto correspondent of the JOURNAL in the issue of Dec. 11, in referring to a lawsuit brought by one Caley to enforce an interest in some mining ands, made some reflections on the Onario Department of Mines which are not warranted by the facts. It might be inferred from these statements that "inside information" was secretely or surreptiously given out by some one in the department with regard to the situation of certain mining claims, and that an investigation by the department is in order.

As a matter of fact the department, at he date in question, was the recording office for filing claims in the Gowganda erritory, and under the mining laws of his province these records and the maps upon which the claims are laid down, arc public and may be examined by anyone, upon payment of a small fee. There was nothing clandestine or improper in the ransaction so far as the department is concerned.

THOMAS W. GIBSON.
Deputy Minister of Mines.
Toronto, Ont., Dec. 18, 1909.

Dust Problem in Coal Mines

The experience of Joseph Virgin with he use of calcium chloride to lay dust n coal mines, as described in the JOURNAL, Oct. 9, 1909, under the title of "Dust Problem in Coal Mines," is of intense interest to those engaged in that work. I would, however, like to correct in one particular an erroneous impression which eems to be given in this description.

Mr. Virgin used ordinary salt and ound it to be about 50 per cent. as effiient as calcium chloride. As a matter f fact, it is perfectly well known that rdinary salt, if pure sodium chloride, is not in any degree hygroscopic. It has o affinity for water whatever and will emain dry in any atmosphere however moist. Ordinary salt, however, as sually furnished (crude) is decidedly ygroscopic, taking up moisure from the ir to such an extent that the containing acks may become wringing wet. This absorption of moisture is due to the calcium and magnesium chlorides present in the crude salt as impurities, often to the extent of 3 or 4 per cent. Pure sodium chloride (the best table salts are almost pure) has no affinity for water whatever. It cannot, therefore, be of any value for dust laying.

It must be a case of mistaken judgment to say that ordinary salt, even if it contains 4 or 5 per cent. of calcium chloride, is about one-half as efficient for dust laying as pulverized calcium chloride containing from 60 to 75 per cent. The ground calcium chloride which Mr. Virgin found more convenient for mine use can be obtained, though at a slightly higher cost, from the Solvay Process Company, Syracuse, N. Y., under the name of granulated calcium chloride.

L. C. JONES.
Syracuse, N. Y., Dec. 13, 1909.

Mining Investments

I would add one further piece of advice to investors to the list of warnings given by John Hays Hammond, in the admirable address published in the JOURNAL, Jan. 1, 1910, and that is: Never invest in any mining enterprise what you cannot conveniently afford to lose.

JAMES DOUGLAS.
New York, Jan. 4, 1910.

Precipitation of Gold by Lime

Some time ago the JOURNAL mentioned an experiment to test the reducing power of lime containing unfixed carbon on certain gold solutions, and, if I remember rightly, over 80 per cent. of the gold was precipitated. Two experiments carried out on lime used for neutralizing the acid in an ore may be of interest.

To a rich solution of chloride of gold made by dissolving pure gold in nitrohydrochloric acid, boiling nearly to dryness and diluting, was added ¼ a.t. of lime. This was allowed to stand for 24 hours, after which the lime was filtered and washed. The lime and solution were assayed, showing a precipitation of 82 per cent. of the gold or $1280 per ton of lime.

Next a solution of $AuCl_3$ was digested with hot KCN solution, forming the double cyanide $KAu(CN)_2$. This was allowed to stand 24 hours with ¼ a.t. of lime. In this case the lime precipitated $1.06 per ton of lime, or about ½c. per ton of ore, using 10 lb. of lime to the ton.

The question is, why should lime that precipitates $1280 per ton from the chloride precipitate only $1.06 from the double cyanide? Can it be that so much acid was present in the $AuCl_3$ as to neutralize some of the lime and precipitate $Au(OH)_3$, or is it likely that the CO_2 set free by the action of $CaCO_3$ on HCl had a precipitating effect?

ALGERNON DEL MAR.
South Pasadena, Cal.

The Murex Magnetic Process

In the JOURNAL of Aug. 21, 1909, one of its correspondents had an article about the Murex Magnetic Company's process. In it reference is made to the expression "magnetic solution" and it was intimated that it was like a quack medicine. The inclosed pamphlet will convey an understanding as to the nature of the "quack medicine" to which the JOURNAL'S correspondent referred. At the time the article must have been written our patents were not published and we think it must be agreed that we, therefore, had a very good reason for not giving too many particulars on the subject. At the end of the article reference is made to a weak point in the statement, viz., as to the weights of the products of which assays and extractions were given. The particulars in the pamphlet are those obtained from official tests and the extractions are from actual weights.

MUREX MAGNETIC COMPANY, LTD.
London, Nov. 26, 1909.

[The pamphlet inclosed with the above letter consists chiefly of a technical article by W. H. Goodchild. After reading this article we are of the opinion that our London correspondent was in no way unfair in his comments. Briefly the Murex process consists of stirring pulverized ore in an emulsion of oil and magnetite, the oil being treated with a small amount of a solution of alum. This produces a magnetic paint, which, according to the description of the process, coats certain kinds of mineral particles, but not all. The pulp, suitably diluted, being discharged upon a traveling belt, a magnet picks off and discharges the painted particles. By calcination the oil is burned from the latter and the magnetite is recovered by feeding the calcined concentrate under a magnet.

The article sent us by the company does not go into many matters that we should like to know about. It states that it has been found feasible to prepare liquids possessing widely different properties. Thus when calcite is present it may be put into the concentrates or tailings at the will of the operator. In the treatment of blende-galena-pyrites it is claimed to be possible to pick out the blende and galena, leaving the pyrites behind, and the blende and galena can then be separated efficiently by treating with a solution of sodium silicate and passing over concentrating tables. Unfortunately no explanations as to the remarkable behavior of these minerals is offered, while the data as to extraction and working cost are still unsatisfactory, just as our London correspondent said last summer.—EDITOR.]

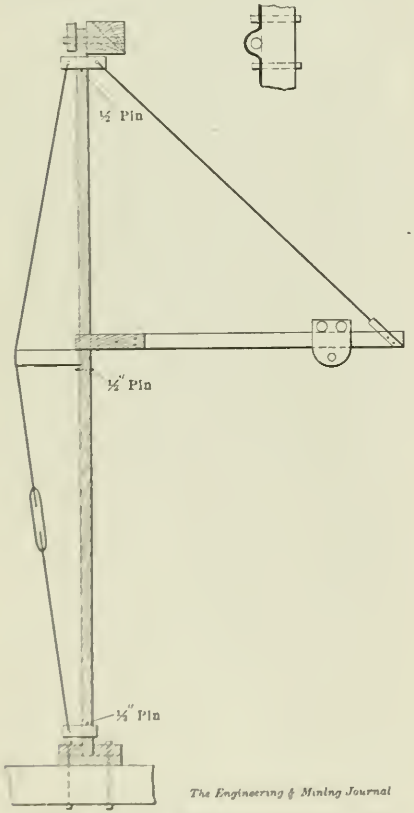
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES ~ THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Crane for Mill Machinery

The accompanying sketch shows a cheap and easily constructed crane used for handling rolls, crusher and other machinery in mills. There are also many places in shops and quarries where it could be used to advantage.



DETAILS OF CONSTRUCTION OF CRANE

It is 16 to 18 ft. high, the main column being a 4-in. pipe. The arm is of 1¼x4-in. iron and about one-half the length of the column. On the arm is a carriage or truck to which a differential block is attached. The truss rod is 1 in. thick, and is in two parts, connected by a turnbuckle.

A crane of this description will handle 3000 to 4000 lb. One stationed between two sets of rolls will serve both, and in case it is necessary it is not difficult to move the crane. These cranes are used extensively in the Joplin district in Missouri.

Bucket Dumping Device

BY HORACE F. LUNT*

The essential part of this bucket-dumping device is the door to the chute leading to the ore pocket, waste bin or car. This door, when raised as in Fig. 1, in the accompanying sketch, allows the bucket to be hoisted between the supporting beams. The door is then lowered as in Fig. 2, and the brake on the drum of the hoist released; this allows the bucket to dump itself as in Fig. 3, when the door is supported by the sides of the chute. The bucket is then hoisted to the position shown in Fig. 2, the door raised and the bucket lowered into the shaft.

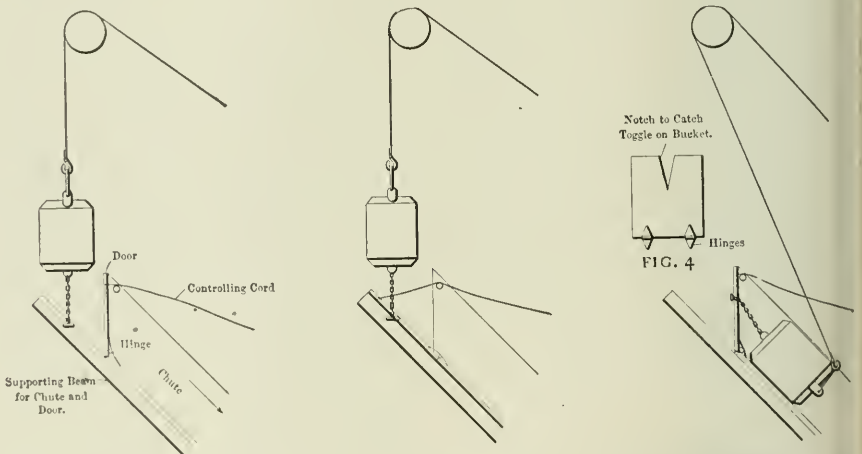

Door
Controlling Cord
Hinge
Chute
Supporting Beam for Chute and Door.
Notch to Catch Toggle on Bucket.
Hinges
FIG. 4
The Engineering & Mining Journal, N. Y.

FIG. 1 FIG. 2 FIG. 3

BUCKET-DUMPING DEVICE

The door is operated by a lever within reach of the hoistman. The same lever may be used to operate a trap door over the shaft. The door may be built of heavy sheet iron or of wood. Two-inch plank is heavy enough for a 500-lb. capacity bucket. The wood should be ironed to prevent too rapid wear.

It is possible to have double doors with two chutes—one toward, and one away from the hoist—thus keeping the ore and waste separate. It is also possible to dump to one side of the line from hoist to sheave providing precautions are taken to keep the hoisting rope from jumping out of the groove in the sheave.

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*Mining engineer, French Gulch, Cal.

Dewatering Tailings

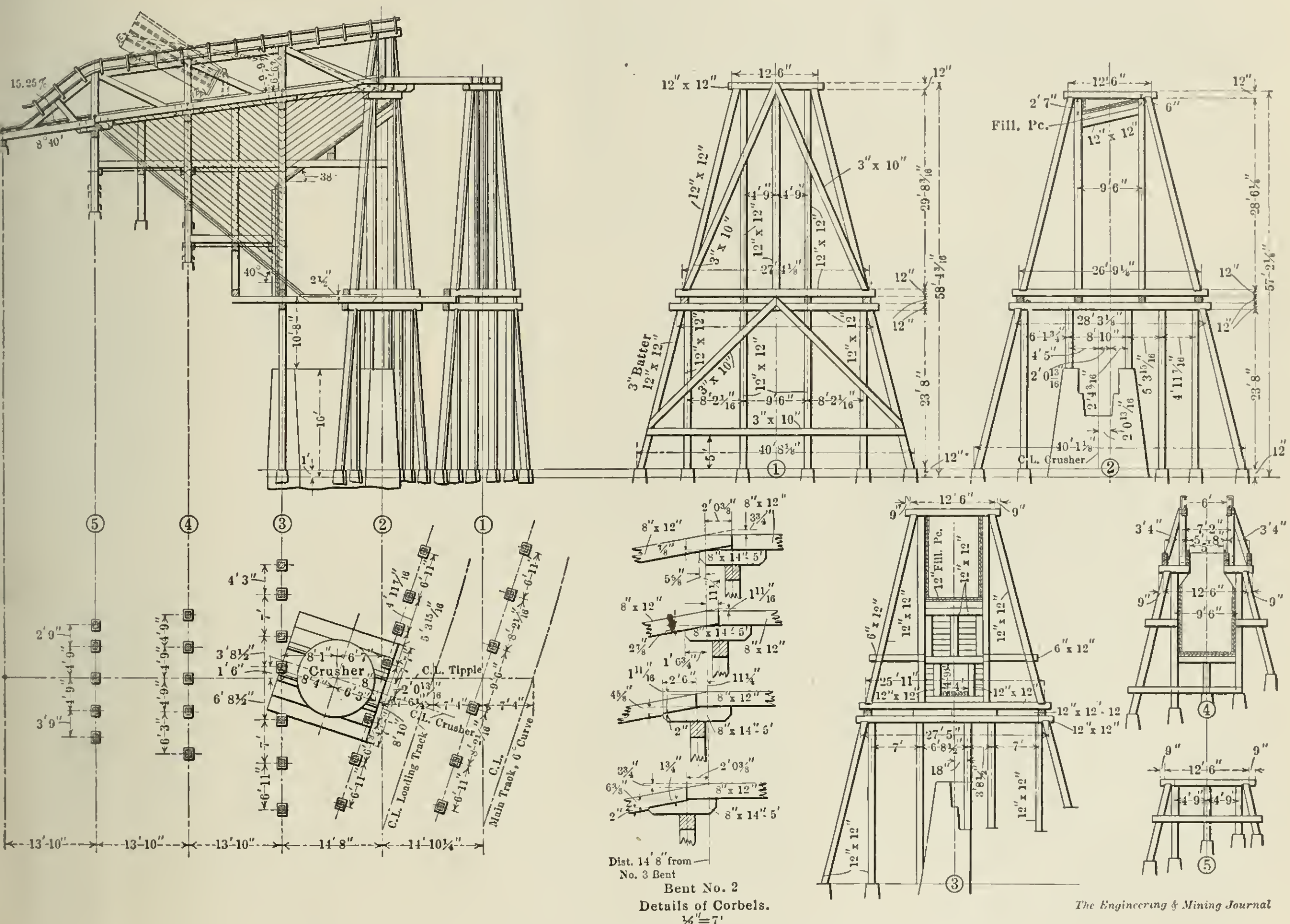
A system of dewatering tailings was recently installed at the Oronogo Circle mines which is essentially as follows: The coarse chats from the roughing jigs are elevated and passed through a 36x48-in. trommel. The screen used is 1½ mm. The water and fine sand pass through the screen and return to the slimes, while the coarse material, minus the water, goes into a storage bin. The sands and slimes from the sand jigs pass by another ele vator to a second trommel, 36x120-in placed above the same receiving bin. The screen on this trommel is ¾ mm. The sand size from this trommel is delivered into the same bin with the coarse chats from which it is emptied into cars and deposited on the waste dump. The slimes and fine sand that pass through the sec ond trommel go back to classifiers to be distributed upon tables for further treatment. By dewatering the tailings in this way they may be stacked much highe without encroaching upon adjoining prop erty. The slimes from the tables are run into large settling ponds.

Tipple Construction in the Birmingham District

The tipples used by the Tennessee Coal, Iron and Railroad Company and the Republic Iron Company at the slopes of their iron-ore mines on Red mountain, Alabama, are different from those seen at any other slopes in the Birmingham district. These companies hoist in 10-ton skips, whereas most of the other companies use trains of five 2-ton cars. The accompanying drawing shows the constructional details of the tipples at a slope on the Muscoda division of the Tennessee company's ore mines. The slope entry is not perpendicular to the main railroad loading-track below the tipple, this accounting for the angle at which the Nos. 1 and 2 bents are placed.

The tipple carries two sets of tracks one above the other. The upper one, set at 6-ft. gage, engages the rear wheels of the skip, thus elevating it into the position of dump shown by dotted line. The front wheels follow the lower tracks which are set at the regular 5-ft. spacing. The door of the skip is hinged at the top and held tightly closed during hoisting, by the bale of the skip. When the rear of the skip is raised the bale swings up and allows the door to open and the load to discharge. The ore is dumped into a bin, holding about 150 tons and made long enough at the top so that the skip will not have to be dumped within close confines in order to discharge entirely within the bin. The ore bin is built with double planking on bottom and sides and is 9 ft. wide, about 26 ft. deep at the No. 3 bent and has slopes to the bottom, of 40 and 38 deg. as shown in drawing. This insures that the ore will feed freely to the gyratory crusher, which is set on a concrete base, between No. 2 and 3 bents. The crusher, a No. 8 Austin, delivers its product directly into railroad cars which are let down the track by gravity.

Details of the framing of the bents, five of which are used in this particular tipple, are shown fully in the drawing. They are framed from 12x12 timbers battered 3 in. to 1 ft. and cross braced with 3x10 plank. The bents are set on concrete bases. The details of the corbels of the No. 2 bent are also given in the cut. This construction gives a strong and satisfactory tipple at a not too excessive first cost. The Tennessee company uses these wooden tipples at all of its ore mines on Red mountain, but the Republic company has substituted steel construction for the wooden type. The general form of tipple, however, is retained.



Constructional Details of Tipple Used in Birmingham District

Origin of Mine Fires

The origin of mine fires is often mysterious and unaccountable. The case of the recent disaster at Cherry, Ill., in which so many lives were lost, due to fire starting in a pile of hay brings to mind two cases, the damage of which was practically nil, yet show how the fire may originate. In one case the mine surveyor and assistant superintendent had walked down an incline shaft at about 1:30 p.m. Upon returning within an hour, the mouth of the shaft was a mass of flames. The only way in which this fire could be accounted for was that a miner had walked out shortly after the surveyor had entered the mine, and hung his lamp on the dry timbers. This is often done in order to keep the lamp out of the draft at the surface, and also to dispose of the lamp while the miner is in the open air. The other case was where a miner was seen to deliberately set his lamp behind a post and against the side of a bin to prevent the wind from blowing out the light while he walked away 75 yd. to get some track timbers. By the time he had made three trips for ties, the lamp had thoroughly charred the dry pitch-pine timbers and a small blaze was seen. When the miner's attention was called to this by a bystander, he replied, "I did not think it would burn." It is just such carelessness and thoughtlessness as this that has resulted in many of the fires and explosions in mines. The miner above referred to should have been made to feel the sting of the burn by being "fired."

Rapid Estimation of Pulp in Cyanide Tanks

By Mark R. Lamb*

The table presented herewith is compiled as an aid to the calculation of the pulp contents of cyanide tanks and should be extremely useful to all who are in actual contact with cyanide-plant operations. All calculations in the table are based on the weight (in grams) of the liter of pulp, placing the specific gravity of the slime at 2.5.

The tonnages per foot of depth cover various sizes of slime tanks and may be made to include the intermediate sizes if thought desirable, but as the internal diameters of wooden tanks are not ordinarily made to even feet and as steel tanks are not always made exactly to specified dimensions, each operator must calculate a column to fit his own tanks. Such a column can be interpolated easily and quickly by using a slide rule, setting the area of any tank over the area of one of the tanks in the table and reading the desired capacities per foot depth over the various capacities given in the table for various consistencies. A space is left for writing in an additional column.

The figures could have been worked out to a greater accuracy but as the measure of the depth of slime in the tank is rarely made closer than within an inch of accuracy and as the sample weighed usually contains less slime than the real average of the charge owing to the settlement in the tank and in the sampling bucket or dipper, the accuracy of the table is much greater than that of observation. The figures opposite the lower percentage of the moisture are, of course, only accurate with saturated pulps. I am indebted to a similar tabulation by E. M. Hamilton for the idea and for some of the figures.

PULP TABLE FOR CYANIDE TANKS.

TONS OF DRY SLIME PER FOOT OF DEPTH OF TANK.							Wt. of Liter in Kilos, Sp.Gr.	Weight per Cu.Ft., Tons.	Cu.Ft. of Pulp per Ton.	Cu.Ft. of Pulp per Dry Ton of Slime.	Water in Pulp, Per Cent.
Diameter of Tank, Feet.											
12′	16′	20′	24′	28′	30′						
0.07	0.125	0.20	0.28	0.38	0.441	....	1.012	0.0316	31.6	1600	98
0.145	0.26	0.40	0.58	0.78	0.907	......	1.024	0.032	31.2	780	96
0.22	0.39	0.61	0.88	1.17	1.37	......	1.037	0.0324	30.8	515	94
0.30	0.53	0.83	1.18	1.6	1.86	......	1.050	0.0328	30.4	380	92
0.38	0.67	1.05	1.5	2.02	2.36	......	1.064	0.0332	30	300	90
0.46	0.81	1.27	1.82	2.45	2.85	......	1.077	0.0337	29.7	248	88
0.54	0.956	1.5	2.15	2.9	3.36	......	1.092	0.0341	29.3	210	86
0.63	1.12	1.75	2.5	3.36	3.92	......	1.106	0.0346	29.9	180	84
0.71	1.25	1.95	2.82	3.80	4.42	......	1.121	0.035	28.5	160	82
0.80	1.44	2.24	3.22	4.33	5.05	......	1.136	0.0355	28.2	140	80
0.90	1.59	2.5	3.57	4.8	5.6	......	1.152	0.036	27.8	126	78
0.99	1.76	2.76	3.96	5.32	6.20	......	1.168	0.0365	27.4	114	76
1.09	1.93	3.02	4.34	5.83	6.80	......	1.184	0.037	27	104	74
1.19	2.12	3.3	4.76	6.4	7.45	......	1.201	0.0375	26.6	95	72
1.29	2.29	3.6	5.15	6.9	8.04	......	1.219	0.038	26.2	88	70
1.41	2.50	3.9	5.64	7.6	8.84	......	1.237	0.0386	25.8	80	68
1.51	2.68	4.2	6.02	8.1	9.14	......	1.255	0.0392	25.4	75	66
1.62	2.90	4.5	6.45	8.7	10.10	......	1.275	0.0398	25	70	64
1.74	3.08	4.85	6.95	9.3	10.85	......	1.295	0.0404	24.7	65	62
1.86	3.30	5.15	7.42	9.9	11.6	......	1.315	0.0411	24.3	61	60
1.98	3.53	5.5	7.93	10.6	12.4	......	1.337	0.0417	23.9	57	58
2.10	3.73	5.8	8.37	11.2	13.1	......	1.358	0.0424	23.5	54	56
2.26	4.02	6.18	9.05	12.12	14.15	......	1.381	0.0431	23.1	50	54
2.40	4.28	6.7	9.6	12.9	15.02	......	1.404	0.0438	22.8	47	52
2.51	4.47	7	10	13.45	15.70	......	1.429	0.0445	22.4	45	50
2.7	4.78	7.5	10.7	14.4	16.8	......	1.453	0.0454	22	42	48
2.86	5.03	7.85	11.3	15.3	17.7	......	1.479	0.0462	21.6	40	46
2.98	5.30	8.3	11.9	16	18.6	......	1.506	0.0470	21.2	38	44
3.11	5.57	8.75	12.5	16.8	19.6	......	1.533	0.0479	20.8	36	42
3.33	5.92	9.25	13.3	17.8	20.8	......	1.562	0.0488	20.1	34	40
3.51	6.28	9.85	14.1	18.9	22.1	......	1.592	0.0497	20	32	38
3.65	6.43	10.4	14.6	19.5	22.8	......	1.623	0.0507	19.7	31	36
3.91	6.91	10.9	15.6	20.4	24.1	......	1.655	0.0517	19.3	29	34
4.03	7.17	11.3	16.1	21.6	25.2	......	1.689	0.0528	18.9	28	32
4.20	7.45	11.7	16.7	22.3	26.2	......	1.721	0.0539	18.5	27	30
4.51	8.05	12.6	18.1	24.2	28.3	......	1.760	0.055	18.2	25	28
4.70	8.36	13.1	18.8	25.2	29.4	......	1.798	0.0562	17.8	24	26
4.92	8.73	13.7	19.5	26.3	30.7	......	1.838	0.0571	17.4	23	24
5.15	9.13	14.3	20.5	27.5	32.1	......	1.879	0.0587	17	22	22
5.38	9.56	15	21.5	28.8	33.6	......	1.923	0.0601	16.6	21	20

Note—Column left blank for insertion of exact figures representing tank in use.

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*Mining and consulting engineer, Milwaukee, Wis.

An Iron Smokestack Constructed in a New Way

The usual method of erecting smoke stacks has been to place the laps on the outside of the stack, so that the rain flows down and runs off on the outside without lodging in pockets. No account was taken of the fact that the rain also runs down on the inside and lodges in the pockets formed at each lap joint, as shown in Fig. 1 at *A*; also, that the soot and ashes lodge at *A* in the same pockets.

Everyone who has had charge of ash-conveying machinery knows how very destructive wet ashes are to the iron, and how short-lived the iron conveyer buckets are. All gas-plant men also know that gaspipes must not be laid in ground containing ashes.

W. N. Zurfluh in *Power*, Oct. 26, 1909, says that by constructing the smokestack so the laps are reversed, as shown in Fig. 2, the rain runs down on the inside without collecting in pockets filled with ashes, as there will be none with this method of construction. The pockets formed on the outside with the Fig. 2 construction can be looked after and kept painted, whereas it is a difficult matter to get at the lap joints on the inside of a stack after it has been sooted up. It has also been noticed that the iron stacks always start to rust out first at the joints on the inside of the stack. This is, as mentioned, due to the ashes in the pockets being wetted by the rain. It is claimed that this reverse method of construction will give double the length of service compared to the old style.

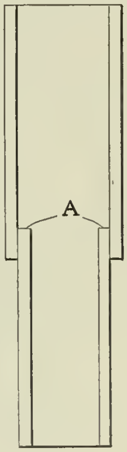


Fig. 1

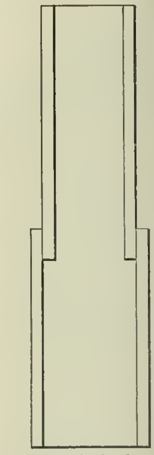
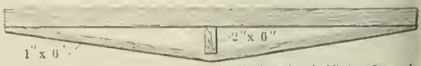

The Engineering & Mining Journal

Fig. 2

Wooden Truss for Troughs

The accompanying sketch shows a form of truss that is used in the Joplin district in place of metal rods. It is simple and consists of a 1x6-in., or possibly two 1x4-in. boards bent over a 2x6-in. strut, the width of the trough in the center, and nailed at both ends of the trough as shown. This truss is also used to strengthen foot-boards which are put up along the tailings troughs. It has the advantage that it may be used in acid water.



The Engineering & Mining Journal

Truss for Wooden Launders

Mineral Land Legislation

Special Correspondence

Congress has now practically deter- ied to undertake an investigation of iditions relating to public lands. The dence seems to indicate that this uiry will last during much of the re- inder of the session and will be one the chief, if not absolutely the chief, ture of the months still remaining. moving purpose of the inquiry is loubtedly political, otherwise it would have been allowed to occur at this ticular time. There is, however, a ng disposition to have the investiga- deal in part with the conditions ler which public lands producing min- ls and metals are allowed to pass into ate ownership. This object has been ely talked of among those members Congress who believe that present lic-land legislation is obsolete and ds to give rise to fraudulent opera- s. The idea of separating the mineral metallic deposits of public lands from right to the surface of the soil has n a good deal discussed since the ning of the session, but there has n a substantial degree of opposition ts being put into effect. The proposed icy is too unfamiliar to numbers of slators to enlist their hearty support, others find that the interests of ir constituents would not be served it. Still others, while really of the nion that some such change of policy uld be desirable, do not think they as yet sufficiently familiar with the ails under which it would have to be ried out to act intelligently. On all se accounts, it is urged by various nbers that the investigation shall be lly a public-land inquiry rather than ely an investigation into the doings the Land Office or of the head of Department of the Interior. The idea not altogether opposed even by some the antagonists of the leasing policy, ch President Taft has proposed for control of the public lands. Unless e means of delay can be contrived, nediate legislation looking toward a land policy might be forced through igress and the proposed inquiry, un- much shorter than is now expected, uld doubtless defer the legislation il another session—perhaps even until ther long session, two years hence.

Political Aspect of Inquiry

he purely political aspect of the de- nd for an investigation is seen in the uest made by Secretary Ballinger and friends that the Forest Service shall studied by the Congressional com- tee which is to take the matter up. s request means that the investigation ired is to deal very largely with per- alities. Only one point of importance is really open between the Interior Department and the Forest Service and that is the question of jurisdiction over mineral deposits situated within national forests. The view of the Forest Service is that this point was thoroughly adjudicated under President Roosevelt who issued an order on the subject. Interior Department officials do not acquiesce in this attitude, but the chief interest they have at the present time in connection with the Forest Service is that of fastening upon the latter organization responsibility for the charges against Secretary Ballinger that have been so generally set afloat. In connection with all of these matters, however, the subject of Government control of mining lands and its relation to the mining industry in general will be likely to receive a great deal of attention. It is still uncertain whether the investigation will be so directed as to bring about a real study of mining legislation and the problem of amending it in such a way as to eliminate the causes of criticism that have been alleged against the existing methods.

Tombstone Consolidated

The annual report of the Tombstone Consolidated Mines Company, Tombstone, Ariz., for the year ended Sept. 30, 1909, is largely devoted to a resumé of the situation in regard to the pumping operations at the mines, and is described elsewhere in this issue by W. F. Staunton. The mill has been operated and ores and concentrates shipped from the 700- and 800-ft. levels, but the product did not pay the expenses of operation and pumping. Development was done on the various properties of the company to the amount of 4543 ft., mostly on the Contention group.

During the year there were produced and treated 15,070 tons of ore, of which 10,670 tons were milled and 4400 were smelted. Of the milling ore, 4443 tons were zinc ore and averaged 0.04 oz. gold, 10.5 oz. silver, 13.3 per cent. lead, and 22.6 per cent zinc; the silicious ore averaged 0.12 oz. gold, 7.5 oz. silver and 2.7 per cent. lead. The total recovery from mill and smelting is given as 1710 oz. gold, 137,408 oz. silver, 1,812,329 lb. lead and 1,122,478 lb. zinc. The costs of working are not stated.

Smelting in Bond

Special Correspondence

Professor Hofman, of the Massachusetts Institute of Technology, and a number of men interested in the new rules governing smelting in bond under the tariff of 1909, had a conference with Secretary McVeagh, on Dec. 30, at which Chief Montgomery, of the Customs Division of the Treasury was also present. The conference related to the details of the rules which are in process of preparation and is understood to have resulted in determining several points that had previously been unsettled. Professor Hofman is now about ready to make his report on the question of wastage and the conditions of smelting the ores under the new tariff from the technical standpoint. This will enable the officers of the department to begin at once the work of drafting the official test of the regulations, and it is believed that they may be made public within five or six weeks. It would be possible to get them ready sooner, but the fact that the smelting interests have moderated their impatience and are willing to proceed under the tentative regulations which were established by the customs division in letters written some weeks ago.

A Newspaper Lie That Might Mislead

A couple of weeks ago the newspapers published a made up story of a $15,000,000 merger of trade papers that included the three papers of the Hill Publishing Company.

The *New York American* called up our president, Mr. Hill, said they had the story "from a reliable source" and asked if it was true.

Mr. Hill declared that it was not true, he had not been asked to go into any such combination and would not go if he was asked—yet they published the story.

Now comes *The Paper Trade Journal*, taking us to task for "going into the hands of Wall Street," and abandoning the things that "built up our papers."

This editor did not even take the pains to call us up and inquire. He says, "Naturally the whole story is denied by the men concerned" and intimates disaster when subscribers and advertisers learn that outsiders own the paper, etc.

We need hardly assure our readers that this whole story is a malicious falsehood; that the Hill papers at least have gone into no combination; that all our stock is owned by employees and one exemployee of the concern; that Mr. Hill owns an overwhelming majority and intends to keep it.

This concern has been built up on the line of minding its own business and making the best newspapers that it knows how in the industries it represents.

This policy will be followed in the future as in the past. We shall "do things" in the publishing line, and "do them first." This is now the largest independent engineering publishing house in the world. The only "merger" we will ever go into is one that we own and control.

Cripple Creek in 1909

By E. P. Arthur, Jr.*

During 1909 the Cripple Creek district made steady shipments of ore, but there were no spectacular developments in the mining industry in this camp. The output was not quite up to the mark of 1908, due principally to the fact that no attempt, especially during the latter part of the year, was made to do any mining below the water level. With the exception of six or eight of the large mines the bulk of the output was produced by lessees both as large leasing companies and individual miners.

The Roosevelt drainage tunnel made rapid progress during 1909 and it is expected that it will be completed in 1910 to where it will commence to drain some of the mines

As has been the case for several years the Mine Owner's Association controlled the labor situation in the Cripple Creek district in 1909. The stock market was rather quiet during the year, but the stocks of the good properties commanded fair prices.

The milling situation remained practically unchanged. The Golden Cycle mill at Colorado City continued to handle the bulk of the mill ore and the balance was treated by the United States Reduction and Refining Company, the Portland mill and a few local mills. The smelting ore as usual was treated principally by the American Smelting and Refining Company.

Mining Operations

The Golden Cycle mine was, in 1909, the heaviest producer in the district. This mine, with the Portland, Strong, Elkton, Vindicator and Cresson, are the only ones that are being worked heavily on company account. The Golden Cycle made a number of improvements in its plant and is blocking out a large amount of ore. About the middle of the year the Portland made a number of retrenchments and is not making any great effort for a heavy production, especially of the lower-grade ores, but is waiting until the new mill at the mine is completed. No pumping has been done by this company for several months. The pumps at the Strong were also pulled about the middle of the year. The Strong, Cresson, Vindicator and Elkton mines produced regularly. The Isabella is partly worked by lessees and partly on company account. The Victor mine is being worked under lease and is making a fair production. The Mary McKinney and Gold King joined the ranks of large mines which are being operated by lessees. The Jerry Johnson is making a heavy production under lease as is also the Gold Dollar. The Independence is being worked principally by lessees.

The Mills

No noteworthy change in the local milling situation was recorded in 1909. The Independence mill is running on dump ore from that mine and is said to be doing quite well. The Isabella mill operated all year on low-grade ore of that mine. The W. P. H. mill is treating Jerry Johnson ore. A wire-rope tramway was constructed from the Midget mine to the Wishbone mill on Spring creek and some ore is being handled. The Ironclad mill suspended operations in April and no work has been done since. The Anaconda mill is being repaired and will run on ore from mines in its vicinity. Work is being pushed on the new Portland mill, but it will not be ready to run for some time. This mill is designed to treat ore of a very low grade by a process developed by metallurgists in the employ of the Portland company. The outcome is being watched with interest by local operators. The Golden Cycle erected a plant at the mine in which crushing and screening of the low-grade ores is being done. The Wild Horse, Blue Flag and Trilby mills operated part of the year on ore from those mines. The Homestake, Little Giant, Copper Mountain and Trail Mountain mills were idle all year.

Dividends

The Elkton, Vindicator and Portland were regular dividend payers in 1909, though the latter reduced its payments considerably, due principally to the reduction of its force and the building of the new mill. (The sums paid in 1909 were respectively $237,500, $112,500 and $120,000.) It is also understood that the Strong and Cresson paid good dividends, but as they are close corporations the amount is not known. The Golden Cycle did not pay any dividends during the year but is reported to have accumulated a large treasury reserve. The Gold Dollar Consolidated, Doctor-Jack Pot, United Mines, Acacia, Mary McKinney, Jerry Johnson, El Paso Consolidated, Stratton's Cripple Creek Mining and Development, Granite and Free Coinage companies also paid dividends in 1909. The Moose and Gold Coin made payments from sale of property.

The mining outlook for the district in 1910 is good, but the output will probably not be increased over that of 1909 as the drainage tunnel will not be completed in time to allow much mining below the water level. The tendency during 1910 will most likely be for the big companies to exploit new ground above the water level; and leasing companies will take hold of the ground of smaller companies not hitherto developed. Tribute mining will be carried on to a large extent as it is at present. Toward the end of the year, if the predictions with regard to the completion of the drainage tunnel are carried out, some preparation especially on Beacon hill, will be made for deeper mining.

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*Mining engineer, Old Mining Exchange building, Cripple Creek, Colo.

The Copper Deposits of Katanga

The section of the Rhodesia-Katanga railway, from Broken Hill to the Congo border, 131 miles, was opened Dec. 11 1909. Of the Belgian section, 160 miles from the border to Star of the Cong mine, eight miles have been built. At th meeting of Tanganyika Concessions, Ltd. in London, Dec. 17, Robert William made the following report:

"The railway contractors have mor than kept up to their promise, and, give a fairly accommodating wet season, wil be at the Star mine next June, instea of October as expected. Work at th Star mine and smeltery is being rapidl pushed and according to Allan Gib chief engineer, the Union Miniére d Haut Katanga should be ready in 1 months to produce 2500 long tons of cop per per month. Drill prospecting at Sta mine has proved about double the or previously estimated. Mr. Gibb no estimates the development of ore tha will yield 50,000 tons of copper by ordinary smelting methods in the Star mine and 150,000 tons in Kambove. The proposed smelting plant at Lubumbashi wi produce about 12,000 tons of copper pe annum."

In spite of all criticism, Mr. William is of opinion that all of the silicious or of Katanga can be treated profitably b special process when copper content i upward of 4 per cent. The Star min is developed to yield 50,000 tons of cop per from ore of this class, and Kambov 250,000. The plant under erection fo this class of ore is expected to produc 1500 tons of copper per month.

Smelting is now being done at th Kansanhi mine, where about 1000 tons o copper bars are now awaiting arrival o the railway, and the small furnace, producing 80 tons per month, is being en larged. Mr. Williams states that the firs shipment will represent in value mor than the entire money spent on this min since it was discovered. Also that cos of production approximately bears ou the previous estimates.

Coal supplies appear to have been developed in the region traversed by th railway and other deposits are being explored. It seems highly probable therefore that Katanga will begin to ship cop per in the latter part of 1910, and i Mr. Williams' expectations be borne ou it will in 1911 have works in operatio that will produce at the rate of abou 70,000,000 lb. per annum when com pleted. The chief doubt exists respec ing the successful treatment of the sil cious ore.

The London Lead Market in 1909

The market opened firm for metals enerally, the most notable feature in ad being the high premium paid for orward delivery. This was chiefly due the serious aspect of the strike at the ines of the Broken Hill Proprietary ompany, which threatened to cut off upplies from that important quarter for ome considerable time. Up to £13 17s. d. was paid early in the month for April elivery, while prompt delivery could be ad at £13 6s. 3d. This state of things revailed more or less throughout the onth, the value of prompt metal being eld down by heavy arrivals. The conumptive inquiry was intermittent and no time sufficient to raise values, hich registered a slight decline on the onth; foreign brands closing at £13 2s. d. for early delivery, and English at 13 5s.@£13 7s. 6d. per ton.

February found consumption still lanuid and supplies in excess of demand or prompt delivery. Opening at £13@13 2s. 6d. for foreign brands, price fell way gradually to £12 15s. on Feb. 8. y this time the stoppage of supplies om the Broken Hill mines began to be elt, particularly in Australian and eastrn markets. Reports were current of eshipments from England to Australia, nd of China turning to English smelters or supplies. This naturally prompted peculative purchases which, coupled ith slightly improved trade demand, iniated an improvement in values which as persistent for the rest of the month. significant feature was that a certain umber of producers and smelters met n conference, exchanged opinions in reard to the position and prospects of the arket and the possibility of their exrcising some collective control, and adourned the meeting. No such event had reviously occurred in the trade. The ondon market developed considerable ctivity toward the close, when foreign rands commanded £13 11s. 3d., and nglish £13 15s.@£13 17s. 6d. per ton.

March was uneventful, consumptive emand being very moderate and retricted to early requirements; otherwise, rices might have advanced sharply in iew of the total cessation of arrivals rom Australia and the reshipment of everal parcels to that country. The abor dispute at the Broken Hill mines as submitted to arbitration, and the ward was given in favor of the men hich, however, did not indicate an immediate resumption of work. The turnver on the London market was at no time arge, but the tendency indicated increasng firmness, closing prices being £13 13s. d.@£13 15s. for foreign brands for arly delivery, with a few shillings preium for extended delivery, and £13 15s. @£13 17s. 6d. for English brands.

In April business opened on a small scale, though supplies were none too plentiful, and prices eased in consequence of some arrivals just before, and during and immediately after the Easter holidays. Starting at £13 15s. for foreign brands, the price gradually declined to £13 3s. 9d., demand being very quiet and the consuming industries very slack. It was not until April 22 that the first sign of recovery was manifest. Thereafter inquiry improved, and a fair volume of business was transacted on the exchange. The price recovered to £13 7s. 6d., but eased a little at the close of the month, again in consequence of arrival parcels being pressed in the absence of demand. Closing values were £13 6s. 3d. for foreign brands, and £13 11s. 3d. for English.

May opened with a depressed market wherein sales of early arrivals were forced, and realized no better than £13@£13 2s. 6d. Other markets, however, developed considerable activity, and lead soon shared in the general improvement. A large business was done with consumers, though little transpired on the Metal Exchange; so that by the middle of the month foreign brands commanded £13 5s., and English £13 7s. 6d.@£13 10s. Demand for export also improved and—with some speculative support—maintained these values for the rest of the month.

June was uneventful on the whole. A fair volume of business kept the market steady for the first few days, and this was followed in the second week by a few shillings' advance, due to improved trade in America and more general activity in the metal markets. Starting at £13 2s. 6d., foreign brands advanced to £13 6s. 3d., while £13 7s. 6d. was paid for July delivery. From this point values drifted slowly downward, partly by reason of consumers' apathy, but more in consequence of forced sales of English brands. The turnover on the Metal Exchange was relatively small, but there was a fair volume of business with the Continent. Closing prices were £12 17s. 6d. for foreign brands, and £13@£13 2s. 6d. for English.

July opened with a firmer market on cessation of recent sales forced by speculative and other holders. Foreign brands were held for £13; but the general slackness of trade deterred consumers from supporting the market which—on renewal of speculative realizations—drifted gradually down to £12 12s. 6d. A transient renewal of activity improved values by a few shillings; but demand slackened. Political trouble in Spain then caused some apprehension as to the continuance of supplies from that country, and some active buying took place in consequence; closing values being £12 12s. 6d.@£12 13s. 9d. for foreign brands, and £12 15s.@£12 17s. 6d. for English.

August opened with a loss of 2s. 6d. per ton in values, due to pressure of sales for early arrival. These brought down the price to £12 6s. 3d. on Aug. 10, by which time the low price began to attract consumers, and speculative interest revived on the London exchange. Thereafter for a fortnight there was a large volume of business done with consumers who had hitherto held back but were now alert to participate in the general improvement in trade. The closing days of the month found demand fairly satisfied but the market steady and with improved inquiry for forward delivery. Foreign brands stood at £12 12s. 6d. with £12 15s. for English.

In September the market opened quietly but with a firm undertone and a slight improvement to £12 13s. 9d. for foreign brands and £12 17s. 6d. for English, which figures were maintained with little variation down to Sept. 27; consumptive inquiry being fair throughout and sufficient to absorb all incoming supplies. Thereafter demand improved and enabled sellers to command up to £13 3s. 9d. and £13 6s. 3d., respectively.

October opened with brisk inquiry for home and foreign consumption, with some improvement in the value of mining shares. Prices gradually advanced, in spite of unfavorable conditions in other metals, incoming supplies being hardly equal to current demand, until—on Oct. 18—foreign brands commanded £13 6s. 3d. to £13 7s. 6d. per ton. By this time demand was fairly satisfied and speculative holders pressed what little they had for sale. Values gradually relapsed under the influence of dearer money and reduced demand, the month closing quietly with £13@£13 2s. 6d. asked for foreign brands, and £13 2s. 6d.@£13 7s. 6d. for English.

November was free from any wide fluctuations in values, which were fairly maintained throughout the month. Consuming industries were active, and some scarcity of supply was threatened by a widespread strike of coal miners in Australia; but the supplies were sufficient for current requirements, and speculative holdings sufficed to check any rapid upward movement. Early in the month a fair business was done with consumers in foreign brands at £13. A slight advance toward the middle of the month gradually improved the price. Closing values were £13@£13 2s. 6d. for foreign brands, and £13 5s.@£13 6s. 3d. for English.

In December buying was restrained by the approaching end of the year and the reduced demand incidental to the season.

The Passing of Anthracite

SPECIAL CORRESPONDENCE

The approximate and inevitable exhaustion of the anthracite coal mines of northeastern Pennsylvania, is a question of more than academic interest to the rest of the country. It is one which affects the business and domestic interests of the American people. The disappearance of anthracite as a commercial product and an industrial asset will affect concurrently the economic conditions of the population of the bituminous regions and also that of the hard-coal territory.

Hard coal is sometimes placed in the category of domestic luxuries, not always appositely, but sometimes with an appreciation of the actual conditions that transforms a generalization into a qualified truism. Anthracite is not at the present moment a luxury either for poor or rich. It is relatively cheap and plentiful, although each year that passes will see the supply more restricted and the cost enhanced.

The hard-coal measures vary from place to place in breadth, thickness and estimated weight of volume. It would be rash to assume that there remain no undiscovered seams of anthracite that can be made commercially profitable. There are yet large tracts of coal land in the anthracite regions surveyed and appropriated, from which a ton of coal has never been extracted. These facts tend to allay the apprehension expressed in some quarters that the visible and covert supply of anthracite will begin appreciably to dimininsh within the next 15 years or sooner as a dominant factor in the coal trade. One authority declares that the profitable exploitation of anthracite coal cannot be carried on over a period, which he estimates from 20 to 25 years.

Coal companies, whose taxation is partially estimated by the quantity of coal assumed to be below the surface of an acre of coal land, emphatically assert that at the existing rate of production, anthracite will be exhausted for all practical purposes in 14 or 15 years in the most productive of the strata, and within 10 years in the least productive. Others again, disinterested perhaps, enthusiastic at any rate, maintain that they have been listening during the past 40 years to warnings of the proximate exhaustion of the anthracite coalfields, but that so far from the hard-coal measures giving out, they are more productive, more varied and more valuable than they ever were before. These statements are not as conflicting as they seem. So far as the personal equation enters into them, they may be taken as erring on the side of optimistic anticipation rather than pessimistic formularies that have little or no foundation in reality. The truth probably is intercalated between the extremes of the asservations. Anthracite coal occurs only in a comparatively small section of northeastern Pennsylvania, geographically in 16 or 17 valleys, in 5 or 6 counties.

The centenary of the discovery of anthracite, if it can be called a discovery, was celebrated some three or four years ago. Of course the rate of production bears a direct ratio to the decrease of the supply in the mines. The production of anthracite has increased from 52,000,000 tons in 1897 to 70,000,000 tons in 1908 (I am eliminating the odd numbers). The question is postulated by a consideration of existing facts, whether it is too late to make an attempt to conserve the anthracite that remains, not niggardly, but with such circumspection as would prolong the amount of anthracite coal still in the earth. Concerted effort might do something in this direction, despite the disheartening factors that seem to contravene the hope.

It is inevitable under existing conditions, that the wholesale and retail price of anthracite is conditioned by the wholesale and retail price of bituminous. While this is so, the expectation that economy in the use of anthracite will arise automatically in sympathy with a diminishing supply, is as foolish to postulate as it would be to assume that Sunday newspapers will diminish their circulation in view of the fact that there is a diminishing area of timber from which to manufacture wood pulp.

National economy of natural resources is not characteristic of the American people. There is, however, no reason why anthracite should come into competition with bituminous for steam-generating purposes, beyond the fact that the smaller sizes of anthracite coal are not altogether suitable, as at present prepared, for stove fuel. An immense, if not the larger bulk of anthracite coal in the past was absorbed in the generation of steam. This was a ruthless misapplication of a mineral more precious relatively than gold. In order to comply with the "smoke ordinances" of our large cities, the manufacturers in towns like Philadelphia and New York used nothing but anthracite, and in fact they were compelled to do so. It is now too late to suggest that boiler rooms can be easily and effectively adapted to consume their own smoke. They do so and have been doing it for years in London; they have done it and are doing it still more effectively in Berlin.

THE MANUFACTURE OF BRIQUETS

One of the most effective, and as far as I can see, the only effective method of conserving anthracite is by briquetting. As I have already stated, the production of anthracite has reached the enormous productiveness of 70,000,000 tons annually. We may go on in the anthracite regions for a few years longer to dig that amount; however, the day is fast approaching when the law of diminishing returns will come into full and tangible operation, and when, instead of producing 80,000,000 tons of anthracite to meet a demand for 90,000,000 tons, we shall be producing 50,000,000, 40,000,000, 35,000, 000, or even 20,000,000 tons, where 100,000,000 tons would be marketable. In the meantime, by eliminating anthracite as a steaming fuel, and briquetting al the smaller sized coal that is cast into the furnace, say, nearly one-half of the entire output of the anthracite mines the time at which the law of diminishing returns would come into active play might be indefinitely postponed. In the meantime, native ingenuity would probably have called into existence a method of utilizing bituminous coal in a way tha would bring about its combustion withou smoke or smell.

A Disastrous Coal-mine Explosion in Japan

A terrible explosion occurred at th Onoura colliery, Fukuka Prefecture Japan, on Nov. 24, involving a loss of 76 lives. The Onoura mine is one of th largest in southern Japan, employin 4755 miners, having an output of 44,00 tons monthly. Only 43 of the miner employed underground, managed t reach the surface. The mine management gave $100 to the family of eac victim.

Coal Mining in Michigan Durin 1909

The coal production in Michigan durin 1909 was approximately the same as th output in 1908. It is stated that 30 mine were in operation the entire year, an that 2000 men were employed in th mine at a wage of $3 per day. The cost production averaged about $1.70 per to Labor and transportation facilities we adequate throughout the year. Almost a of Michigan's coal output is used by th local trade in the manufacturing citi along the lake front.

Coal Mining in Iowa in 1909

BY JAMES H. LEES *

The coal industry has been marked ring 1909 by a gradual recovery from effects of the financial and industrial pression of 1907-1908. Although fig- es for the production of coal during the ire year are not yet available, suffi- ntly reliable data are at hand for a se estimate. These figures show that ile the increase in the output will prob- y not bring the total quite up to that 1907, the difference is quite small. year 1907 was the banner year in va coal production. The output was 74,322 tons. The next year the pro- ction dropped to 7,149,517 tons and ring the year just closed the improve- nt of conditions brought the output up approximately 7,500,000 tons.

There are several reasons for this in- ase in adition to the betterment in ancial matters. As one of the most portant of these, may be mentioned the t that during 1908 a number of import- mines were abandoned, and while ers were opened and considerable specting was carried on, the tonnage derived would not counterbalance the s from the closing of the large mines. 1909 the new mines increased their put and the results of extensive pros- ting and development became evident in the larger tonnage. Another factor which contributed to an increased output in 1909 was the fact that there were no serious strikes or other disputes, and that freedom from these was practically assured by the agreement between the miners and operators regarding wages and other conditions. This agreement was made in April of 1908, and while it was pending considerable time was lost by the mines being idle. The agreement terminates on April 1, 1910, and it is to be expected that a similar cessation of activity will tend to reduce the production somewhat during this year. Aside from this, however, the indications are that the industry will at least retain its present position. There will be probably considerable development work in 1910, as several fields have been thoroughly prospected and found to be underlain by large bodies of coal. Parts of Monroe and Lucas counties seem to give the best promise of any undeveloped coalfield in Iowa.

In the first and third of the three inspection districts of Iowa there was a decided increase in the quantity of coal mined and also in the number of men employed. The second district, however, shows a decline in the output and also a slight reduction in the number of employees. The total number of persons engaged in mining was 18,150 in 1909, as compared with 17,312 in 1908. Accidents to miners were of about the same frequency as in the preceding year. No figures are yet available for exact comparison. The use of mining machinery was less extensive than it was in 1908, as all the machines in the first district have been taken out following an arbitration board's ruling advancing the price of loading machine-mined coal.

Perhaps a word regarding the southwestern Iowa field may be in place. The coal here is in the Upper Coal Measures and unlike that of eastern Iowa, which is in the Lower Coal Measures, lies in one continuous seam. It is only 12 to 20 in. thick, and while the market is good the output is diminishing annually owing to the scarcity of labor which in turn is caused by the difficulty of mining. The output from the three counties in which mining is carried on amounted to 41,000 tons, in securing which 245 men were employed. The price at the mine ranges from $2.50 to $3.50 per ton, varying in different localities. The statistics for this article have been kindly supplied by the State mine inspectors.

Coal Mining in Tennessee in 1909

BY R. A. SHIFLETT †

The year 1909 was not especially couraging to the coal operators of nnessee. The market was low, par- ılarly on steam coal. The long mild ring and fall contributed to some ent to the slump in prices and oduction, and a number of the mines re idle throughout the summer months d many are still idle. Present con- ions, however, are more encourag- , but the price of steam coal has not vanced perceptibly. The cold weather v prevailing has caused large orders domestic coal and the mines that are position to fill these contracts will undoubtedly realize a profit from this source.

MMARY OF COAL PRODUCTION IN TENNESSEE DURING 1909.

l production (estimated), tons..	6,234,922
al value	$7,481,906
e production, tons	224,204
al value	$504 459
mber of fatal accidents	25

Only five new mines were opened during 1909 and 42 mines are still idle, waiting for better prices and better conditions. As the market for Tennessee coal is exclusively in the South, the trade will depend largely on local developments.

The fatal accidents occurring in Tennessee coal mines in 1909, were due to the following causes: Falls of roof, 18; haulage, 3; motor, 1; explosions (kegs of powder), 2; electricity, 1.

More Than Two-thirds of the Accidents Due to Falls of Roof

It will be seen that over 66 per cent. of the fatal accidents in the coal mines in this State were due to falls of roof, and a large per cent. of them were due to carelessness and negligence. While the number of fatal accidents was not large, many of them could have been avoided by reasonable degree of care and caution.

The mining department is making every effort to reduce the number of accidents to the minimum by using every precaution that can be devised, also by instructing the miners in their work, formulating special rules governing the employees and the operation of the different mines, restricting the number of shots in working places, the charge of powder used, character of tamping used and forbidding the storage of explosives in mines, allowing the miners to take into the mines only a sufficient quantity of explosives for actual use for each shift, the employment of skilled men as shot-firers, gas bosses and inspectors, competent mine foremen and assistant foremen, competent men for timbering, employment of trip riders and trip conductors, and the employment of competent men on ventilation.

Assistant State geologist, Des Moines, a.

Chief mine inspector, Harriman, Tenn.

While a number of Tennessee mines are liberating explosive gases, we have been fortunate thus far in the freedom from serious accidents. The mining department is endeavoring to keep the mines free of dust as far as possible, and to have haulage roads and working places sprayed when there is a tendency to dryness. I am also using my best efforts in trying to bring about more rigid discipline in the mines and in getting the miners and officials to observe the mining laws, the result of which has been exceedingly encouraging, and when the miners and operators are forced to observe the law as they do in England and other foreign countries, we will have fewer appalling disasters now of such frequent occurrence. Only a small area of Tennessee is in the coal-mining belt, thus the mining department does not receive the support it should have throughout the State. However, the people are awakening to the great importance of protecting the lives of the miners who have very little opportunity to study and to familiarize themselves with the dangers that surround them. The department should have a force of inspectors, competent men trained for this specific purpose, to make more frequent and thorough inspections of the mines than can be made with the present force, and I shall use every effort in securing additional help when the legislature convenes, as the present force is inadequate.

The North Dakota Coal Industry in 1909

BY T. R. ATKINSON *

The State engineer, who is ex-officio State coal-mine inspector, has been actively engaged during the past two months making his annual inspection of the mines as provided by law. Jay W. Bliss, assistant to the State engineer, has made personal examination of about four-fifths of the mines, and from the mines already inspected, it is estimated that the total output for 1909 will be slightly less than for 1908. The output for 1909 will be about 336,000 tons while that of 1908 was 338,000 tons. The number of mines now in operation is 96, and 835 men are employed in mining operations. Many of the mines only operate during the fall and winter months.

It is generally known that North Dakota contains a large area of workable seams of lignite coal estimated at 32,000 square miles and an estimated total tonnage of workable coal of 500,000,000,000 tons. Thus far only 4,000,000 tons have been mined. The beds are usually nearly horizontal and at a depth of from 50 to 200 ft. beneath the surface.

Our lignite coal is exceptionally free from sulphur, which is so common in Eastern bituminous coals, and it contains only 8 per cent. of ash, while Eastern bituminous coals contain from 8 to 20 per cent. Properly burned, North Dakota lignite coal never clinkers. The fuel-testing department of the United States Geological Survey, located at Pittsburg, is making extensive investigations into the problem of briquetting lignite, and Professor Babcock, of the North Dakota school of mines at Grand Forks, is likewise studying this problem, so it seems quite probable that within a short time the manufacture of briquets from North Dakota lignite will be a profitable business.

The Use of Lignite for Manufacturing Producer Power Gas

The State engineer believes that the most important method of handling our lignite and the method which will prove extremely profitable to North Dakota is the manufacture of producer power gas. The United States fuel-testing department has made exhaustive tests with North Dakota lignite in the gas-producer plants, and surprisingly successful results have been obtained. They have found that North Dakota lignite burned in the gas producer will develop more power than any of the Eastern bituminous coals burned on the grate. To develop one horsepower per hour by steam engine requires 4.46 lb. of Virginia anthracite and 3.97 lb. of Ohio bituminous, while one horsepower per hour can be obtained from only 2.29 lb. of North Dakota lignite when burned in the gas producer. Assuming Ohio bituminous in North Dakota at $6 per ton and lignite at $3 per ton, a saving of 71 per cent. would be effected by using lignite in a gas-producer plant, over the use of Ohio bituminous in an ordinary steam engine. However, the proposition that will very likely be the most practical for the future use of our lignite is the burning of this coal at the mines in the gas producer and transmitting the power electrically to all parts of the State, furnishing power to light our cities, for our manufacturers and for electric-railroad lines constructed for the benefit of our people.

Coal Mining in Arkansas During 1909

BY JAMES DOUGLAS †

There were 65 mines in operation in the State of Arkansas. Of this number, 34 were worked by shafts, 25 by slopes, and 6 by drifts. About 4516 men were employed in the mines in 1909. There are 6 coal-producing counties in the State, viz: Johnson, Pope, Logan, Sebastian, Scott and Franklin. They are situated in the northwestern part of the State. The counties producing the most coal are Johnson, Franklin and Sebastian. There are 12 slopes, nine shafts and one drift in Sebastian county; three slopes in Scott county; seven shafts and one slope in Johnson county; three shafts in Franklin county; three slopes in Pope county; four slopes and 1 shaft in Logan county.

The mines in Sebastian county are owned by the Bolen-Darnell Coal Company, Central Coal and Coke Company, Woodson Coal Company, Smokeless Fuel Company, Western Coal and Mining Company, Sebastian Smokeless Coal Company, Smokeless Coal Company, Pig Coal Company, Patterson Coal Company, Bach-Denmen Coal Company, Conrady Coal Company, Greenwood Coal and Lumber Company, Fidelity Fuel Company, Hoffman Coal Company, Finey Coal Company, Mammoth Vein Coa Company and Quillin Coal Company.

The mines in Scott county are owned by the Harper Coal Company and the Bates Coal Company.

The mines in Franklin county ar owned by the Western Coal and Mining Company and the Doddson Coal Company.

The mines in Johnson county are owne by the Pennsylvania Anthracite Coa Company, Little Rock Packet Coal Company, and Western Coal Company.

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*State engineer and ex-officio mine inspector, Bismarck, North Dakota.

†Chief State mine inspector, Hartford, Ark.

he Protection of the Surface above Anthracite Mines

SPECIAL CORRESPONDENCE

Mine Inspector H. B. Johnson delivered
emarkable address a few days ago to
members of the West Scranton Board
Trade. This is the section of the city
which mine cave-ins have most fre-
ntly occurred and where they are most
orehended. The Board of Trade in in-
ng Mr. Johnson to speak on this sub-
t anticipated that the speaker would
ume the attitude that is thoughtlessly
mulated by nine out of every ten of
se who speak or write on the subject,
t is, that the operators should be pre-
ted by legislation from "robbing" pil-
s. Mr. Johnson pointed out, however,
t the supreme court of Pennsylvania
already decided that the terms of the
ginal grants of coal lands to the rail-
d companies, and to the individual
erators who are now in possession of
h lands, are of such a character that
legislation that the legislature might
opt would be unconstitutional; that it
uld be as subversive of constitutional
perty rights as if the legislature were
circumscribe the agricultural opera-
ns of the farmer by prescribing to him
at character of crops he should sow,
what not to cultivate. Inspector John-
said that he was not there to criticize
fact; he was there merely to point it
; to remind those who were making
lish and extravagant proposals, that
y were dealing with a condition and
with a theory. The speaker said that
ing to the economic conditions that pre-
led in the coal trade, every pound
coal available would be brought to the
rface regardless of surface conse-
ences. He pointed out that the actual
erators were not the only persons in-
ested in the anthracite-coal industry.

Mr. Johnson said he knew of operators
o would willingly abandon mines that
re not producing an adequate return on
capital that was invested in them by
y of improvements, not to speak of the
ginal capital, yet who were forced to
ntinue working these mines, which
ant practically robbing pillars in order
meet the terms on which these mines
re leased or transferred.

Mr. Johnson declared emphatically that
only remedy for the existing situation
s to raise the price of coal to the
rchasing public. In most instances, he
serted, coal was sold at the breaker
ow the cost of production, and that
only revenue derived from its sale
d production was the profit made by
lroads on transportation.

Mr. Johnson also said that it was within
power of the legislature to tax the coal
fore it left the confines of the com-
nwealth to such an extent that the money derived from this tax might be applied to safeguarding the ground surface over localities from which pillars have been and will be "robbed." He said that the consuming public could not legitimately complain of this. The public, the American people, have been procuring anthracite coal for nearly a century far under its intrinscic value. The individual operators who became millionaires in the strict sense from the sale and purchase of anthracite coal might be counted on the fingers of two hands yet it is an indisputable fact that there is no section of the globe from which so much mineral wealth, relatively and absolutely, has been reproduced as in the anthracite coalfields of northeastern Pennsylvania during the past 60 years.

List of State Mine Inspectors in the United States

The following list of State mine inspectors is as complete as possible, and has been corrected to September, 1909:

ALABAMA—Edward Flynn, chief mine inspector, Birmingham. James Hillhouse, assistant mine inspector, Birmingham. Robert Neill, assistant mine inspector, Wylam.

ARKANSAS—James Douglas, State mine inspector, Hartford.

ARIZONA—

COLORADO—John D. Jones, State coal-mine inspector, Denver. David J. Griffiths, deputy coal-mine inspector, Denver.

GEORGIA—No inspector; no mine laws.

IDAHO—F. Cushing Moore, State inspector of mines, Boise.

IOWA—John Verner, State inspector of mines, Charlton. R. T. Rhys, State inspector of mines, Ottumwa. Edward Sweeney, State inspector of mines, Des Moines.

INDIANA—James Epperson, chief mine inspector, Indianapolis. Jonathan Thomas, assistant inspector of mines, Brazil. Robert M. Irving, assistant inspector of mines, Cayuga. Frank I. Pearce, assistant inspector of mines, Brazil. Albert A. Sams, assistant inspector of mines, Chandler.

ILLINOIS—David Ross, secretary, bureau of labor statistics, Springfield. State inspectors of mines: Hector McAllister, Streator. Thomas Hudson, Calva. James Taylor, Peoria. Thomas Weeks, Bloomington. Thomas Moses, Westville. John Dunlop, Peoria. W. W. Williams, Litchfield. Walton Rutledge, Alton. W. S. Burris, Duquoin. Thos. Little, Carbondale.

KANSAS—Frank Gilday, secretary of mine industries, Pittsburg. Deputy mine inspectors: John Gilday, Chicopee. Thos. Morrisey, Leavenworth. William Harvey, Peterton. John Halliday, Pittsburg. Joseph Ryan, Mineral.

KENTUCKY—Chas. J. Norwood, chief inspector of mines, Lexington. Assistant inspectors: Thos. J. Barr, Lexington. Perry V. Cole, Pittsburg. William Burke, Pikeville. Thos. O. Long, Earlington. Huw D. Jones, Central City.

MARYLAND—John H. Donahue, mine inspector, Frostburg.

MICHIGAN—Richard H. Fletcher, commissioner of labor, Lansing. Peter Daw, mine inspector, Calumet. John T. Quine, mine inspector, Ishpeming.

MINNESOTA—W. H. Harvey, mine inspector, Eveleth.

MISSOURI—George Bartholomaeus, secretary, bureau of mines and mine inspection, Jefferson City. Inspectors zinc and lead mines: I. J. Pirtle, Frederickstown. Chas. P. Wallace, Carterville. W. S. Brown, Joplin. Coal-mine inspectors: Robert Richards, Bevier. Michael Gavin, Lexington.

MONTANA—Joseph B. McDermott, State coal-mine inspector, Helena.

NEW MEXICO—Jo E. Sheridan, U. S. mine inspector, Silver City.

NORTH DAKOTA—T. R. Atkinson, State engineer, Bismarck.

OHIO—George Harrison, chief inspector of mines, Columbus. Thomas Waters, Wellston. Edward Kennedy, Sand Run. Jno. L. McDonald, Glouster. W. C. Wiper, Malta. W. H. Turner, Cambridge. Alexander Smith, Mineral City. W. H. Miller, Massillon. Lot Jenkins, Bellaire. Thos. Morrison, Sherrodsville. L. D. Devore, Bellaire.

OKLAHOMA—Wm. Cameron, U. S. supervisor of mines, South McAlester. Peter Hanraty, chief mine inspector, McAlester. District mine inspectors: Wm. K. Patterson, Coalgate. Martin Clark, McAlester. Frank Haley, Henryttta.

OREGON—No inspectors. See letter Aug. 9, 1909.

PENNSYLVANIA—James E. Roderick, chief of department of mines, Harrisburg. Anthracite inspectors: P. J. Moore, Carbondale. L. M. Evans, Scranton. H. O. Prytherch, Scranton. D. T. Williams, Scranton. H. D. Johnson, Scranton. Hugh McDonald, Pittston. Thos. H. Price, Wilkes-Barre. P. M. Boyle, Kingston. D. T. Davis, Wilkes-Barre. Jos. J. Walsh, Wilkes-Barre. David J. Roderick, Hazleton. P. C. Fenton, Mahanoy City. A. B. Lamb, Shenandoah. Jas. A. O'Donnell, Centralia. Benjamin I. Evans, Mt. Carmel. H. McLaughlin, Shamokin. Isaac M. Davies, Lansford. John Curran, Pottsville. M. J. Brennan, Pottsville. Chas. J. Price, Lykens. Bituminous inspectors: Alexander McCanch, Monongahela. C. B. Ross, Greensburg. Thomas K. Adams, Mercer. Elias Phillips, Du Bois. Isaac G. Roby, Uniontown. T. D. Williams, Johnstown. Arthur Neals, Crafton. Joseph Knapper, Philipsburg. P. J. Walsh, Connellsville. Joseph Williams, Altoona. D. R. Blower, Scottdale. Roger Hampson, Punxsutawney. John F. Bell, Dravosburg. David Young, Freeport. Alexander Monteith, Patton. W. H. Howarth, Brownsville. John I. Pratt, 7812 Kelly street, Pittsburg. Thomas S. Lowther, Tyrone. Charles P. McGregor, Irwin. Nicholas Evans, Somerset. F. W. Cunningham, California; temporarily Charleroi, Hotel Walfred.

TENNESSEE—R. A. Shiflett, chief mine inspector, Nashville. J. W. Allen, district inspector and statistician, Nashville. District inspectors: L. O. Stone, Coal Creek. E. P. Tipton, Dayton.

UTAH—J. E. Pettit, State coal-mine inspector, Salt Lake City.

VIRGINIA—James B. Doherty, commissioner of labor, Richmond.

WASHINGTON—D. C. Botting, State coal-mine inspector, Seattle.

WEST VIRGINIA (Corrected to Dec. 9, 1909)—John Laing, chief of department of mines, Charleston. District mine inspectors: Karl F. Schoew, Fairmont. F. E. Parsons, Clarksburg. L. D. Vaughan, Grafton. W. B. Plaster, Elkins. E. A. Henry, Clifton. B. H. Hill, Chelyan. James Martin. Charleston. R. Y. Muir, Prince. L. B. Holliday, Beckley. Arthur Mitchel, Bluefield. Wm. Nicholson, Bluefield. P. A. Grady, Huntington.

WYOMING—State coal-mine inspectors: Joseph Bird, Diamondville. E. S. Brooks, Big Muddy.

Coal Industry in Australia During 1909

BY F. S. MANCE

The record of the coal-mining industry in New South Wales made a disappointing showing when compared with that of the preceding year, and the exports for the first nine months of the year under review show a decline of 1,100,000 tons and £516,500 in value. The decrease is especially noticeable in the shipments to over-sea ports. At the time this article was being written, the whole of the coal mines in the State had been idle for a fortnight owing to the miners coming out on strike, and the situation was one of considerable gravity. The coalfields in the other States are being more systematically opened up than formerly, and in Queensland and West Australia particularly a steady trade in bunker coal is being established. At Powlett river in Victoria, a coalfield of some extent has recently been opened up, the seams being proved by means of bores to be of good thickness and quality.

The Coal Industry in Virginia During 1909

Approximately 6200 miners were employed in the coal mines of Virginia in 1909. Practically all of the mine workers in the State are unorganized and most of the coal-mining operations are conducted on the basis of the 10-hour day. Labor troubles are probably less frequent in Virginia than in any other State in the Union. About one hundred mining machines were in use during the year and there has been an increase in the tonnage won by these machines.

The first bituminous coal mined in the United States was taken from what is usually termed the "Richmond basin," a small area in the vicinity of the city of Richmond. The coal beds in this field are much distorted and the coal is of rather low grade when compared with the product from other districts in the State. At present what little coal is produced in this Richmond basin is for local consumption only.

It has been estimated that the total coal area in Virginia originally contained 22,500,000,000 short tons. From this source, approximately 65,000,000 tons were mined up to the close of 1909.

New Mine Explosives

E. S. McCullough, national vice-president of the United Mine Workers of America, has returned to headquarters in Indianapolis from Pennsylvania, where the executive board met the joint committees of the miners and operators of the Pittsburg district, that have had under consideration the matter of the new mine explosives and the effect of these explosives on the safety and wages of the miners.

No agreement was reached between the committees, however, as the method of procedure in the investigation had not been agreed upon. President Feehan, of the mine workers of the Pittsburg district, objected to the joint committees' reporting to other than the international executive board, in regard to any recommendations they might have to make. Mr. McCullough attended the meeting as a member of a committee that had been appointed by the executive board, to hear what recommendations the joint committee had to make, and he says the miners are unduly exercised over the alleged use of the new explosives.

The Shan-si coalfield in China has an area of 55,000 sq.m. One bituminous seam in this field is 20 ft. thick. According to the *Queensland Gov. Min. Journ.*, Sept. 15, 1909 there are probably larger deposits of anthracite coal in China than in any other country.

A Bill for the Separation of Mining Rights on Coal Lands

Special Correspondence

Representative Mendell, chairman of the House Committee on Public Lands, has prepared a bill assigned to provide for the separation of mining rights on coal lands from the agricultural surface of the soil. The bill entitled, "A Bill to Provide Agricultural Entries on Coal Lands," has been referred to the Committee on Public Lands, and during the past week was by that body sent to the secretary of the Interior for his study and analysis. A reply has just been received from the secretary and will shortly be published. In this Mr. Ballinger expresses his approval of the bill in the main, but makes some suggestions for amendment and modification along lines suggested quite fully in his annual report. The bill applies only to the mainland territory of the United States, and has no reference to Alaska.

Chairmban Mondell says that he believes the conditions surrounding mining in Alaska are sufficiently stable and satisfactory for the present, and should not be disturbed for some time to come. It is further his opinion that the system of separating the land from such minerals as may be found there ought not to be applied to public lands in general. An exception is made by him with reference to coal lands because he says of the special conditions which govern the mining of coal and occurrence in nature. Mr. Mondell expects to antagonize any proposals for general substitution either of the lease system or of a plan like that put forward in this bill for the present mode of passing mineral lands into private ownership.

The bill introduced by Mr. Mondell will be reported in nearly its present form shortly after the holidays. As now drafted it reads as follows:

That from and after the passage of this act lands which have been classified as coal lands, or are known to be valuable for coal, shall be subject to appropriate entry under the homestead laws, the desert-land law, in selection under section four of the act approved Aug. 18, 1894, known as the Carey act, and to withdrawal under the act approved June 17, 1906, known as the Reclamation act, whenever such entry, selection, or withdrawal shall be made with a view of obtaining or passing title, with a reservation to the United States of the coal in such lands and of the right to prospect for, mine, and remove the same. But no desert entry made under the provisions of this act shall contain more than 160 acres, and all homestead entries made hereunder shall be subject to the conditions, as to residence and cultivation, of entries under the act approved Feb. 19, 1909, entitled, "An Act to provide for an enlarged homestead."

Sec. 2. That any person desiring to make entry under the homestead laws or the desert-land law, any State desiring to make selection under section four of the act of Aug. 18, 1894, known as the Carey act, and the Secretary of the Interior in withdrawing under the Reclamation act lands classified as coal lands, or known to be chiefly valuable for coal, with a view of securing or passing title to the same in accordance with the provisions of said acts, shall state in the application for entry, selection, or notice of withdrawal that the same is made in accordance with and subject to the provisions and reservations of this act.

Sec. 3. That upon satisfactory proof of full compliance with the provisions of the laws under which entry is made, and of this act, the entryman shall be entitled to a patent to the land entered by him which patent shall contain a reservation to the United States of all the coal in the lands so patented, together with the right to prospect for, mine, and remove the same. The coal deposits in such lands shall be subject to disposal by the United States in accordance with the provisions of the coal-land laws in force a the time of such disposal, and the United States or its grantees shall at all times have the right to enter upon the lands so patented for the purpose of prospecting for, mining and removing the coa contained therein, but the owner under such limited patent shall be entitled to damages, the amount of which shall be determined by a court of competent jurisdiction, for any damage to the surface or his improvements, not necessarily o reasonably incident to the prospecting for, mining, and removal of such coal Provided, that the owner under such limited patent shall have the right to mine coal for use upon the land for domestic purposes at any time prior to the disposa by the United States of the coal deposits Provided further, that nothing herein contained shall be held to deny or abridge the right to present and have promp consideration of applications to locate enter, or select, under the land laws o the United States, lands which have been classified as coal lands with a view o disproving such classification and securing a patent without reservation.

Heretofore hyacinth has been found i California mainly at the gem mines i San Diego county, but now hyacinth bearing rock has been discovered on th Wells place in Frazier valley near Porterville, Tulare county. Whether or not th new find is a commercially valuable on is yet to be determined, though the stone so far found are said to be of goo quality.

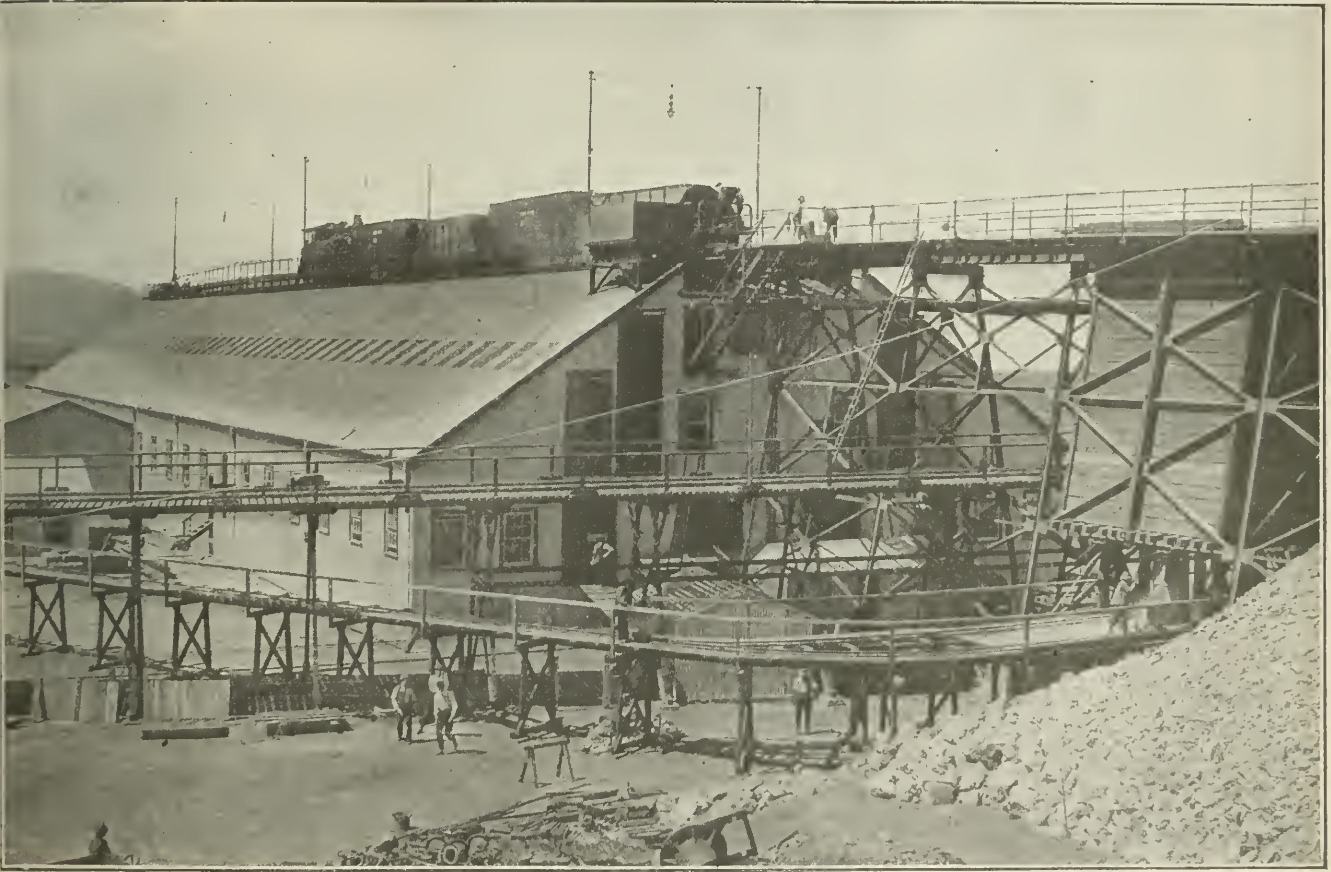
Analysis of Mine and Mill Practice on Rand—I

The Tendency Is toward Consolidations to Permit Large-Scale Mining and Milling; Discussion of Equipment and Operation of the New Mills

BY E. M. WESTON*

The economic evolution of the Rand mining industry still proceeds apace, and the lines along which this evolution proceeds are, as might be expected, those along which are moving the organization and development of other industries all over the world under the stress of the economic forces which make up our present civilization. These lines of development as represented among the mines of the Witwatersrand are:

(1) The consolidation of a number of smaller mines into others of large area with consequent reduction of administration and other general expenditure charges.



SIMMER DEEP 300-STAMP MILL, SHOWING TRANSPORTATION ARRANGEMENTS

(2) The development of these areas by a smaller number of shafts of large dimensions.

(3) The equipment of these mines with larger units of machinery having a greater efficiency and capacity per unit than those hitherto installed.

(4) The provision of power generated electrically by large units in central stations under a most favorable load factor.

(5) The adaptation of electric power for traction, winding and crushing operations above and below ground.

(6) A striving after greater efficiency in the labor force employed in all mining operations, by means of better organization and supervision and by the provision of better conditions of living, work and recreation.

(7) The attention turned to the utilization of all byproducts, and to extracting the greatest percentage of all valuable mineral from material treated in the smallest possible number of operations.

TENDENCY TOWARD CONSOLIDATIONS

The greater number of mines on the Rand have long been under the control of a few financial houses. This development took place on the Rand long before the tendency became apparent in America and England, where now the chief mines tend more and more to fall under the control of large corporations. Consolidations are thus easily arranged whenever the controling houses think them advisable. In many cases outcrop mines were approaching the exhaustion of ore of a grade payable to work on a small scale, while their plants and financial resources were available to aid in the development of adjoining deeper areas. When such areas were united work could be carried out on a larger scale and the older mine exploited for undiscovered or neglected reserves of low-grade ore now rendered profitable to extract. As the chairman of the Rand Mines, Ltd., explained at the last annual meeting of the company, many other considerations make such amalgamations advisable.

"The knowledge acquired since the inception of operations on this field has proved that the formation is remarkably regular over large areas; but not necessarily so over any small area. Acting on this knowledge, larger blocks of ground than were given to any one company in the past are now necessary; regular returns on capital are thereby insured. By developing large bodies of ore, selective mining is avoided as much as possible and concentration of work averts constant removals of the labor force. Underground costs are thus reduced, especially under the heads of development, stoping, shoveling and tramming, to the lowest limit compatible with efficiency. While it may be remunerative to install mechanical appliances for the handling of ore underground where levels contain large tonnages, it is not so for small tonnages, the cost of amortization and and removal of plant being too heavy.

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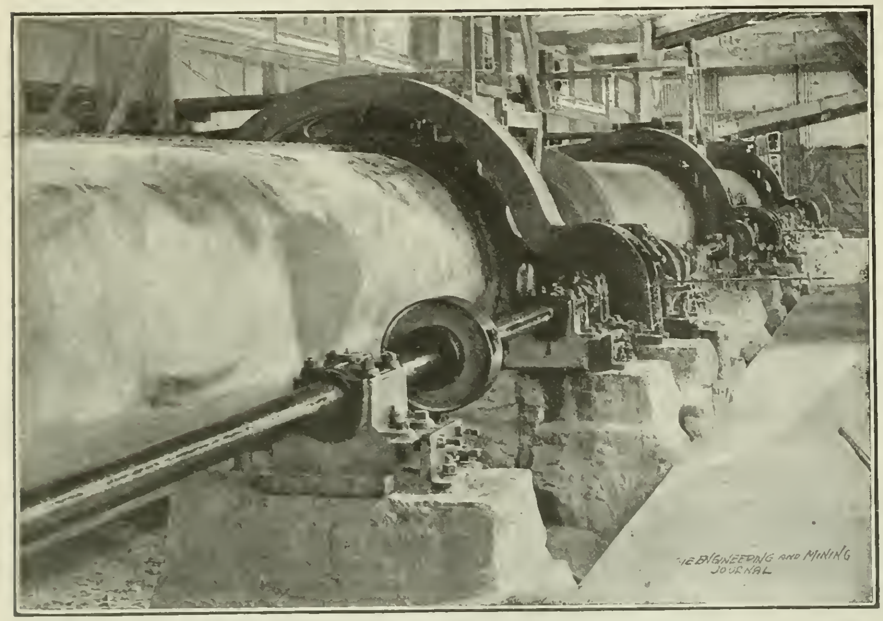
*Mining engineer, 20 St. Mary's buildings, Johannesburg, South Africa.



Tube Mills at New Modderfontein Mill

"Fluctuations of yield which have to be counteracted in small areas by selective mining, can be obviated by large reduction works, which again are justified only if the total tonnage to be mined warrants the expenditure. Development becomes less costly as the number of drives, shafts, stations, etc., is reduced."

Public Wants Long Lived Mines

Such are some of the arguments advanced in favor of consolidation. Other considerations had, however, weight with the mining houses. They found that the public was not content with the policy of short life and maximum production for a given area, and was reluctant to buy shares in mines having a short life. Again, they held large areas on the dip of the main reef where the deposit lay at a depth of 3500 to 6000 ft. To hold this ground entailed considerable outlay and the mining houses were threatened with increased taxation and a confiscation of these unworked areas by the Government so it was most convenient to sell them for shares in a producing or dividend-paying mine which at the same time could be offered the advantage of having its life "prolonged indefinitely."

In other cases some of these "Deep" companies had a considerable sum of working capital on hand which, though not sufficient to develop their mines, became most useful in extending the equipment of the shallower mines. Differences of opinion may exist as to the advisability of some of the schemes proposed and carried out, particularly in the case of the amalgamation of large self-contained companies having their mines already equipped and developed, and having separate crushing plants of 100 to 200 stamps already in operation. There is undoubtedly a danger of some concerns being too large and scattered for efficient management under one control.

New Bantjes Mill—Shaking Amalgamating Tables After Tube Mills

Companies Own Large Territory

The policy has already led to the formation of some large mines; but it seems probable that most of the more desirable schemes are not carried out. One of the largest mines thus formed is the Crown Mines, Ltd., a fusion of several large producers with deep-level ground. The share capital is £2,000,000, with a working capital July 1, 1909, of £740,000. It possesses 1979 unworked claims, or 4.8 square miles of ground, underlain by reef.

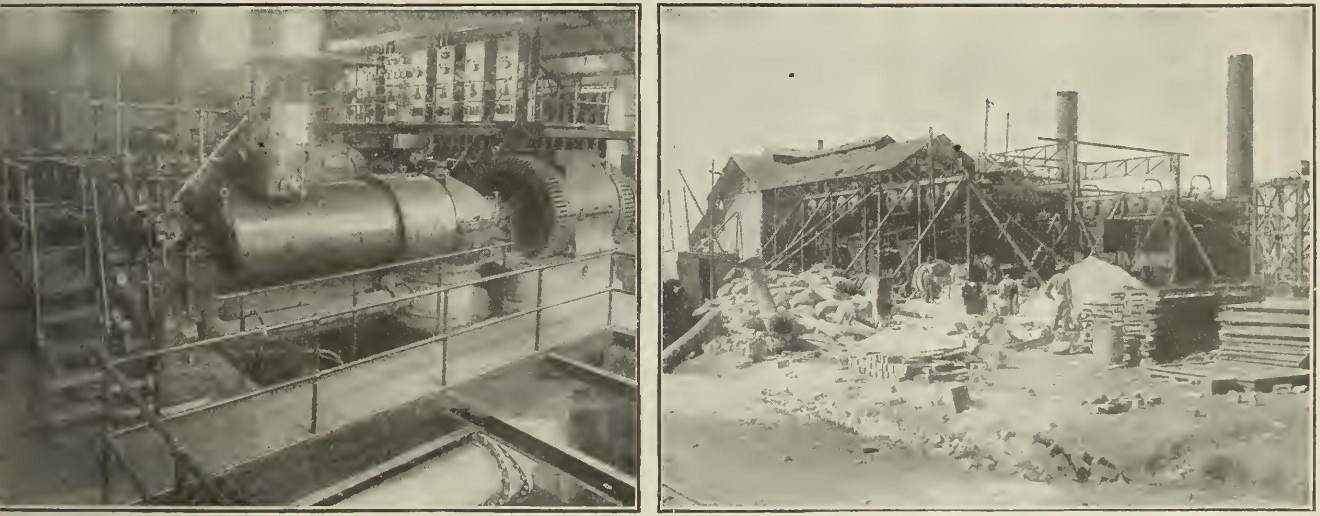
In its various plants there are 675 stamps and 15 tube mills; 100 heads of new stamps, 1650 lb. weight, to crush 10 to 15 tons per day each are under order. It is intended to crush 1,620,000 tons per year. Ore reserves now stand at 4,500,000 tons of 7.94-dwt. grade. An average yield of 29s. 10d. per ton at a working cost of 15s. 6d. is expected, while the life of the mine may be anything from 25 to 50 years, depending on the value of the very deep ground and the working costs at great depths. This subject will be returned to later.

Another large fusion is the East Rand Proprietary Mines, formed by amalgamating four crushing companies with a number of deep-level claims. This immense corporation crushed 156,000 tons in one month, milling with 820 stamps and 15 tube mills. The value of the output was £224,200; profit, £103,253; working cost, 15s. 1.4d. This property has its own central power station and central air-compressor station. The Simmer Deep, Knight Central, Nourse Mines, Village Deep, Kleinfontein Deep, West Rand Consolidated, Randfontein and Randfontein Central are all great mines with long lives formed by amalgamations.

The City Deep

Perhaps, however, the most interesting mine on the Rand at present is the City Deep, formed by the fusion of several undeveloped deep-level properties. It holds 1084⅔ claims and a large freehold. The reef (the main reef leader) was struck in No. 2 shaft in March, 1908, and ı No. 1 shaft some months later. These hafts are 4400 ft. apart. From No. 2 haft levels have been driven at 2725, 875 and 3000 ft., and from No. 1 shaft t 2984 and 3174 ft. The average dip of ne reef is 38 per cent. (about 21 deg.) nd 35,000 tons per claim are expected rom the main reef leader alone over a toping width of about 60 to 66 inches.

On the level connecting the shafts this eef has been driven on over 6000 ft., and ı this distance there is no stretch of unayable ore shown. The full length of nis level will be over 10,000 ft. The verage assay of the ore is between 8 and dwt. per ton. There are about 1,500,00 tons of ore developed and 1,000,000 ons available for stoping. For the quarter nded June, 1909, 328,000 tons assaying 0.8 dwt. across 60 in. were developed. uch rapid and favorable development t such a great depth is a most remarkble record and has renewed confidence ı the deeper portions of the main reef.



Parsons Turbines and New Boilers, Randfontein Central Power Station

So far little development has been one on the south reef, but as this reef as been one of the main ore producers ı the outcrop mines, it will probably lso be found to contain payable ore. he main reef lies under the main reef eader, separated by 18 in. of quartzite. his reef where driven on for over 100 ft. nowed 4.4 dwt. over 22.8 in., so that places it also will be worked.

Another Large Mill

The foundations have already been beun for a plant designed to treat 60,000 ons per month, which is expected to art work in twelve months. This plant ill later he increased to a capacity of 0,000 and finally to 120,000 tons. There ill first be installed 200 stamps of 2000 . falling weight and the design of this attery will introduce several novel features. The stamps are estimated to crush 1 tons per day; but as lighter stamps ı the Cinderella Deep already approach this duty, and as 10 stamps of 1960 lb. weight on the West Rand Consolidated have already attained a duty of 15 tons per day (which constitutes a world's record), it is probable that the capacity of these stamps will approach that figure. This tonnage was crushed through a 100-mesh screen. Open-front boxes are being adopted and it is probable that in the future screens of 81 to 64 per sq.in. will be employed.

One of the chief difficulties encountered in the design of stamps of such a weight has been that the cam shaft has been exposed to severe stresses which, combined with constant vibration, have tended to shorten its life to a few months. To overcome this difficulty a patented design has been adopted.

In this design timber king posts are replaced by reinforced concrete pillars having a 6-ft. base length parallel to the end of the stamper box and a width of 14 in. They will be 7 ft. high and 4 ft. long on the summit and capped by 12x14 x48-in. timber blocks to give resilence. A single steel casting is laid between the concrete king posts in front of the stamp stems and parallel to them. This casting is held down by six $1\frac{3}{4}$-in. bolts, 14 ft. long.

The casting carries the lower guides for the stems and takes the shape of a girder with a curved lower member designed to support the cam shaft over its whole length by means of 5-in. bearings set between the cam bosses. The stamp heads will be 46 in. long and $9\frac{1}{2}$ in. in diameter, with shoes 14 in. long.

Number of Tube Mills Increased

The coarse pulp from the stamps is classified and goes direct to 7 tube mills, another mill being kept as reserve; one tube mill is thus installed to 25 stamps. Eckstein's engineers, being evidently satisfied with the tube mill's efficiency as a secondary grinder, have thus nearly doubled the number hitherto installed per 100 stamps. These mills will be driven by separate motors by helical gearing. All amalgamation will be done after the tube mills on 72 shaking tables of the Frue vanner principle, shown in the illustration of the Bantjes mill. These will be placed in one building with precipitation boxes and all other gold-handling and collecting appliances.

In the cyanide and slimes plant native labor will be reduced to a minimum. Blaisdell distributors and excavators will be employed in the sands, tanks and sands will be stacked by belt conveyers. Slimes will be agitated by compressed air in modified Brown tanks with an estimated saving of 60 per cent. of power over centrifugal pumps. The agitation vats will be 42 ft. in diameter and 30 ft. deep, being thus much wider and shallower than usual. Solution sumps will be built of reinforced concrete.

On the main or 8th level double track with mechanical or electric haulage will be installed, as it is estimated that there are 7,000,000 tons of main reef leader lying on the dip of the reef above this level. Bins to hold 1000 tons will be placed at the loading station. To haul the ore to the battery two 50-ton electric locomotives drawing 40-ton side-discharge trucks will be employed. The mill will be driven by electricity from the new central power station.

The Randfontein Central

The Randfontein Central is one of the largest consolidations of unworked claims on the western Rand and is formed by the amalgamation of several unworked mines of this group. Owing to the steepness of the reef, claims here contain a large tonnage though the reefs are somewhat narrower than on the central Rand. The mine will be developed from 5 main shafts, one being inclined and the other vertical to 700 ft., and then inclined on the plane of reef which in this portion of the Rand is about 38 degrees. The curve at the turn will be laid out as a modified hyperbola.

Electric winches will be installed on these shafts, taking their power from a central power station. The motors for these hoists will be supplied by the German Allgemeine Electricitäts Gesellschaft and will have plain rheostat control of the Ward-Leonard type. One 350-h.p. motor using direct current will be directly coupled to each end of the drum shafts of each winder. These two motors take current at 250 volts from a single 800-h.p. motor-generator set worked by 3-phase current transmitted from the central station at 6600 volts and transformed down to 2200 volts. This motor-generator is capable of carrying a large overload.

The two drums have separate clutches and are of plain cylindrical design, 10 ft. in diameter. They carry 3000 ft. of rope designed to haul two 3½-ton skips at a winding speed of 2000 ft. per minute. This speed is somewhat low owing to the curve in the shafts. The central station should have no difficulty in supplying current to start all five hoists at once. It is expected that in about two years 3,000,000 to 4,000,000 tons of ore will be developed ready for milling.

Central Power Station

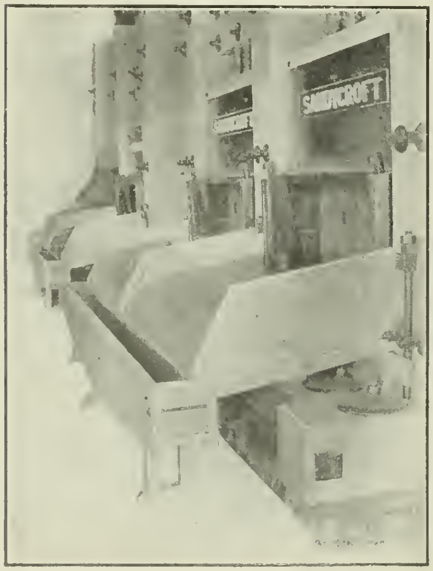
The central station for electric supply at present consists of two 1000-kw. Parsons turbines of the parallel-flow type. These furnish about 1,200,000 units at a cost of under 0.5d. per unit. They are supplied by four 700-h.p. Babcock & Wilcox water-tube boilers equipped with mechanical stokers and forced fan draft. This station is being enlarged by the addition of three 2000-kw. generators and two 6000-kw. generators, also with Parsons type turbines. Twenty more boilers are also being added. Photographs accompanying this article show a view of the turbines in the central station, and also the new battery of boilers.

The mine will be equipped with a central reduction plant of 600 stamps weighing 1650 lb., designed with 16 tube mills to crush 150,000 tons per month. Steam traction will convey ore from the various shafts to a central crushing station where the fines will be taken out and sent direct by belt conveyer to the mill. The mechanical engineers of the Randfontein do not believe that belt conveyers, owing to high first cost and cost of upkeep, show any superiority over mechanical haulage by trucks which can be adapted to use old mine haulage ropes, and this is the only conveyer belt in the plant.

The excavations for 600 stamps are being dug and the spoil is deposited to make mounds on which to place feed-water tanks. Stamps are driven in groups of 10 by a 40-15-h.p motor. These stamps are driven by a pulley set in the middle of the cam shaft to reduce torsional stresses. To render broken cam shafts available for further service some sets of 5 stamps are provided, driven by separate motors. From the stamps the pulp goes direct to classifiers. Fines and the discharge from tube mills go direct to amalgamating tables. The battery is in one building and amalgamating plates in a second with the extractor boxes of the cyanide plant. Centrifugal pumps driven by separate motors are used to elevate tailings to 12 collecting vats set over 24 steel treatment vats, 60 ft. in diameter. The slimes plant consists of 6 collecting vats and 16 treatment vats, 70 ft. in diameter.

The Bantjes Mill

Another typical crushing plant is that being erected on the Bantjes mine. The sorted ore from the crusher station is stacked in a large ore dump designed by A. M. Robeson, and holding a week's supply for the battery. The dump is built up by a conveyer on a level space floored with concrete and with tunnels beneath it. In the tunnels run belt conveyers fed by chutes at regular intervals. These belt conveyers discharge into a main line of belt conveyer which distributes the ore over the mill bins. These bins have a capacity of only 400 tons and can be filled in a few hours; thus large storage accommodation is provided at a reduced capital cost.


Batteries at New Bantjes Mill

The first section of the mill consists of forty 1650-lb. stamps. The boxes are laid on a rubber sheet on a layer of timber laid in bitumen on a concrete mortar block. These blocks are wider at the base and the hold-down bolts are laid in deep grooves on the surface, thus being easily replaced if broken.

The mortar boxes are lined to a hight of 3 in. above the discharge level with 1-in. hardened steel plate. A jet of feed water discharges behind each die. The automatic feed is of the roller type. The pulp from the stampers goes direct to a concrete launder and is elevated to a 23x5-ft. tube mill. More of these will be added. All amalgamating is done in a separate extractor house on 7 shaking tables, shown in illustration.

In the extractor house are the precipitation boxes and sludge filter press. From here the pulp is elevated again to classifiers, the coarse product returned to the tube mill and the overflow to sand and slime classifier. The sands go to 2 sands and 2 slimes settlers and thence by duplicate belt to a bin from whence they are fed by trucks to 4 sand vats, 40 ft. in diameter, fitted with vacuum suction. In this plant the 40 stamps are driven in sets of 10 by belts and band friction clutches from a main line of shafting operated by a 3-phase motor of about 200 h.p. working at 2000 volts. Two separate direct-current motors drive the crushers.

Plates Removed from Batteries

The Vogel Deep mill of 40 stamps is just completed but it shows few departures from the usual practice. Conveyer belts are largely employed. The mill is steam driven and amalgamating plates are placed as usual in front of the stamps. Where plates are left in front of stamps it is now a common practice, in order to avoid loss of time caused by stopping the battery to clean plates, to adopt one of the two following methods of procedure: (1) To clean the plates at 12-hour instead of 8-hour intervals. (It has been found by experiment that on most ores here this can safely be done without reducing the percentage recovered by amalgamation); or (2) to deflect the pulp from the top of the plates into a launder and send it over a spare table without stopping the stamps.

With the coarse mesh now used in mill screens it was found that the large quantity of coarse sand and water passing over the plates tended to scour them, and also, as shown by H. Denny, that the finer crushing of the tube mill rendered additional gold free for amalgamation; hence shaking amalgamating plates were put in behind the tube mills, causing unnecessary complication.

It was also felt that all gold-recovery operations should be in one building apart from other machinery, having one exit only in order to reduce the chance of theft of amalgam or slimes, which is said to be still prevalent on the Rand. These considerations have led to the abolition of tables in the mill in newer plants in favor of shaking amalgamating tables placed below the tube mills.

Partial Amalgamation Advisable

It has, however, long been a debatable question if it were economical to spend uch effort over the amalgamation of the ner gold particles when cyanidation nethods have become so perfect. It is asy to argue that any gold so fine that ts specific gravity will not render it easily rrested in some simple concentration, will e rapidly dissolved in the cyanide plant nd recovered without expense, as it will vidently cost little more to precipitate and melt rich slimes than poor slimes. On he other hand, advocates of careful malgamation have held that gold should e recovered as soon as possible and that malgamation is a cheap process.

Having for many years been aware of he fact that on the Ballarat goldfield at east one mill has been run successfully vithout the use of amalgamated copper lates at all, I have long held the opinon that they were unnecessary here; but hat it was not unnecessary, as argued y some, to make any attempt to separate he bulk of the fine and coarse gold beore entering the cyanide works. The old in the ore in Ballarat East is mostly oarse and free milling, but there is quite percentage of fine gold.

The manager of the mine referred to nstalled a cast-iron tipping table of his wn invention, having a peculiar arrangenent of staggered riffles followed by lankets; he always contended that much old was lost in the neighboring mills wing to the flouring of mercury. The oncentrates were amalgamated in a barel. A somewhat similar system is, I elieve, in use at the Giant mines, Rhodesia. On many ores there is no doubt that amalgamating plates would show a much better saving of very fine gold than any such device; but on the Rand such gold could be left for the cyanide plant, and all the attention such concentrators would require would be tipping up and transferring their contents to amalgamation barrels at stated times.

SANDS FILTER AT SIMMER DEEP

The Simmer Deep mill has already been described in the technical press and I take only the following description of the Caldecott continuous sands filter furnished to the members of the Chemical, Metallurgical and Mining Society during their recent visit to the plant. The pulp coming from 300 stamps when entering the cyanide plant is run to twelve cone classifiers in parallel. These are 6 ft. in diameter and 6½ ft. deep, with a 2½-in. nozzle regulated by an internal cone plug.

The overflow goes to the slimes plant; the underflow, carrying sands with 4 per cent. slimes is elevated by a 6-in. centrifugal pump with some make-up water to the Caldecott plant, which consists of two rotary filter tables, 20 ft. in diameter, with a filter bed, 2 ft. 6 in. wide, having a filtering surface of 137 sq.ft. each.

These tables revolve once every three minutes. The filter is of strong screening placed on wooden slats, 4½ in. center to center. On this is laid cocoa matting covered by strips of unbleached cotton cloth. These tables are fed from the underflow of 8 cones placed directly over them, the overflow going to the slimes plant. By means of these cones the proportion of slimes is reduced to 1 per cent. and moisture reduced to 30 per cent. in the underflow.

The undersides of the filter beds are connected to a vacuum pump through a receiver from which the filtrate is removed by a plunger pump. The vacuum is from 5 to 10 in. of mercury and if a higher reading is shown it indicates that the filter beds require cleaning, usually done every 24 hours and requiring 25 minutes per table. The sands, containing 15 per cent. of moisture, are removed from the tables by a scraper and fall into a launder where they are mixed with 0.03 per cent. KCN solution.

The four feed cones for each table are each 8 ft. in diameter and 8 ft. deep, 3 cones being in use for each table except when one is being cleaned. One table working with 4 cones can handle 60 tons of sand per hour for 4 or 5 hours. All cones have a diaphragm placed about 2 ft. above the underflow. By the use of these filters cleaner sand is sent to the sand plant and the collecting vats can be used as treatment vats without getting cyanide into the mill water, thus largely reducing the initial cost of the plant owing to fewer number of tanks required for treatment.

ron and Steel in Foreign Countries in 1909

In nearly all the chief iron-producing ountries 1908 was a year of depression nd 1909 one of gradual recovery. In ll of them, however, both depression and ecovery were less sharp than in the Jnited States. A few notes on foreign roduction follow:

Germany—The German Iron and Steel Jnion reports the make of pig iron in the German Empire for the 11 months ended Jov. 30 as follows, in metric tons:

	1908.	1909.	Changes.
oundry iron	1,978,775	2,260,743	I. 281,968
orge iron........	585,537	600,394	I. 14,857
teel pig..........	836,840	1,002,075	I. 165,235
essemer pig.....	339,285	374,085	I. 34,800
homas(basic)pig	6,976,548	7,504,554	I. 528,006
Total........ ...	10,716,985	11,741,851	I. 1,024,866

Steel pig includes spiegeleisen, ferro-nanganese, ferrosilicon and all similar lloys. The total increase was 9.6 per ent.

The Stahlwerks Verband reports deiveries for the 11 months ended Nov. 30 s follows: Blooms, billets and other alf-finished material, 1,350,779; railroad naterial, 1,691,125; plates, shapes and olled material, 1,513,850; total, 4,555,-54 metric tons; an increase of 140,855 ons over 1908 deliveries.

Foreign trade showed comparatively little change. Exports and imports of iron and steel and of machinery, 10 months ended Oct. 31, were, in metric tons:

	Exports.	Imports.	Excess.
Iron and steel....	3,219,169	377,000	Exp.2,842,169
Machinery	269,829	59,004	Exp. 210,825
Total......	3,488,998	436,004	Exp.3,052,994
Total, 1908.......	3,447,286	544,204	Exp.2,903,082

Imports of iron ore this year, 6,943 000 tons; exports, 2,345,079 tons. Imports of manganese ore, 330,928 tons; exports, 3704 tons.

France—The production of pig iron for the first half of the year was 1,713,461 metric tons, a decrease of 33,173 tons from 1908. Steel production, however, showed an increase of 141,350 tons, the total for the half-year being 1,506,329 tons; of which 46,143 tons were acid converter steel; 909,995, basic converter; 541,598, open hearth; 7973 crucible, and 620 tons electric steel.

Great Britain—The British Iron Trade Association reports the make of pig iron in Great Britain in the first half of 1909 at 4,715,679 long tons; which compares with 4,635,851 tons in the first half of 1908 and 4,653,989 tons in the second half. The average number of furnaces in blast during the half year was 313, showing an average make of 15,066 tons per furnace. The estimated output of pig iron for the year was 9,525,000 long tons. The steel production showed little change. The foreign trade showed a decrease, chiefly in new ships. Exports and imports of iron and steel and their manufactures, 11 months ended Nov. 30, as valued by Board of Trade returns were:

	Exports.	Imports.	Excess.
Iron and steel	£34,780,368	£ 7,250,034	Ex. £27,530,334
Machinery ...	25,925,063	4,099,017	Ex. 21,826,046
New ships....	5,660,509	....	Ex. 5,660,509
Total..... ..	£66,365,940	£11,349,051	Ex. £55,016,889
Total, 1908..	73,310,614	11,227,453	Ex. 62,083,164

Decrease in exports, £6,944,674, chiefly in new ships; increase in imports, £121,-598. The quantities of iron and steel were, in long tons:

	1908.	1909.	Changes.
Exports..............	3,786,699	3,850,559	I. 63,860
Imports..............	1,017,201	1,085,925	I. 68,724

Exports of scrap iron and steel, 117,362 tons in 1908, and 146,063 in 1909; increase, 28,701 tons.

Imports of iron ore into Great Britain, 11 months ended Nov. 30, were 5,521,199 long tons in 1908, and 5,712,220 in 1909; increase, 191,021 tons. Of the imports this year 4,288,795 tons were from Spain.

The Pumping Problems at the Tombstone Mine

Mine Flooded to 800-ft. Level June 1, 1909; Average Flow at That Time 6,659,401 Gallons Daily. New Equipment to Handle 12,000,000 Gallons

BY W. F. STAUNTON*

The flooding of the mines of the Tombstone Consolidated Mines Company, at Tombstone, Ariz., was caused by a sudden reduction of steam pressure at 2:30 a.m., June 1, 1909, on account of water entering the fuel-oil supply pipe feeding the burners on the boilers. The recording gage shows that the steam pressure was down to 50 lb. until 5:15 a.m., or a total time of 2 hr. and 45 min. The men on duty were unable to find and correct the difficulty as promptly as they should, or to summon assistance promptly owing to the failure of the local telephone service, and by the time steam was again up to normal pressure the pumps on the 1000-ft. level of the pump shaft, on the Flora Morrison claim, were submerged and could not be started. Sinking pumps were put in at once, but it was found that the station-pump capacity above the 1000-ft. level was inadequate to handle the water and it was allowed to rise to the 800-ft. level, where it now stands.

Pumping Equipment

The principal pumps on the 1000-ft. level are two 22 and 42x6½x36-in., Prescott corliss cross-compound, condensing, crank-and-flywheel engines, and one 15 and 23 and 39x13x24-in. Prescott duplex, triple-expansion, condensing pump, the latter relaying with a duplicate on the 600-ft. level. There is also a 10 and 16x10½x12-in. Dow duplex pump on the 1000-ft. level.

During the effort to get down to the 1000-ft. level after the flooding, there were in the shaft 6 Prescott duplex 14x8x12-in. sinking pumps, operated by steam, and it was found that the heat developed made the conditions almost prohibitive of work. As it will be necessary to use 8 of these sinking pumps in unwatering the 1000-ft. level, some plan for reducing the temperature during the time the work is in progress had to be adopted and it was decided to accomplish the result by operating some of the sinking pumps by compressed air. During the early stages of the work it will probably be practicable to operate them all by air and substitute steam one by one as it becomes necessary, but keeping as many as possible on air to the end. We had available compressor capacity of about 1250 cu.ft. per min. and have added 4000 cu.ft., making a total of 5250. The operation of sinking pumps with air under the conditions proposed will be uneconomical, but seems to be the most feasible way to secure the necessary reductions of temperature.

The new equipment ordered to effect the unwatering consisted of two Prescott pumping engines (duplicates of those now on the 1000-ft. level except that they will have 7-in. plungers while on the 800-ft. level, this dimension to be reduced to 6½ in. when the pumps are later placed on the 1000-ft. level) and a Nordberg corliss, cross-compound, condensing air compressor giving 4000 cu.ft. per minute.

Pumping Records

The day before the accident the amount of water pumped was 6,706,080 gal. and the average daily amount for the ten days previous was 6,659,401 gal., equivalent to a rate of 4624 gal. per min. The maximum daily amount during this time was 6,969,840 and the minimum 6,454,711 gal. There is no doubt that at times the inflow exceeded a rate of 5000 gal. per min. At the present time, while holding the water at the 800-ft. level, the daily amount is about 3,300,000 gal. and is showing a daily increase of about 12,000 gallons.

WATER HANDLED AT THE TOMBSTONE MINES.

	Total Gal.	Gal. per Day.
Jan. 1, 1902, to Mar. 31, 1903	108,630,607	1,207,465
Apr. 1, 1903, to Mar. 31, 1904	795,824,622	2,180,341
Apr. 1, 1904, to Mar. 31, 1905	1,221,100,021	3,345,477
Apr. 1, 1905, to Mar. 31, 1906	1,319,138,819	3,164,079
Apr. 1, 1906, to Mar. 31, 1907	1,511,595,663	4,223,550
Apr. 1, 1907, to Mar. 31, 1908	1,760,994,113	4,824,642
Apr. 1, 1908, to Sept. 30, 1908	899,609,748	4,915,900
Oct. 1, 1908, to Sept. 30, 1909	1,828,215,012	5,008,808

Considering the time which has elapsed since operations began, a resumé of the principal facts in regard to the work, in so far as the water is concerned, is of interest. Pumping commenced in December, 1902, at 570 ft., and the 700-ft. level was reached in April, 1903, the water being held at that point for 11 months against an average flow of 1528 gal. per min. while crosscutting. It was found necessary to go deeper and the 800-ft. level was reached in October, 1904, where the water was held 12 months with an average flow of 2430 gal. per min. The 1000-ft. level was reached in December, 1906, and held 27 months with an average flow of 3509 gal. per min., but during the last ten days, owing to cutting the dike in the west crosscut, this had increased to 4624 gal. per min., as stated above. Considering the fact that the water is now back at the 800-ft. level, it is evident that in unwatering the 1000-ft. level pumping capacity largely in excess of the maximum flow found on that level should be provided if the work is to be done in a reasonable time. When the new pumps are in operation there will be station-pump capacity above the water of about 6750 gal. per min. as against the maximum observed flow of about 5000 gal. per min., so that there will be an excess of 1750 gal. per min. to apply against the accumulation, provided the sinking pumps can be made to supply the water, which there is no reason to doubt.

It would seem to be certain, therefore, that with the equipment provided the 1000-ft. level can be recovered, as the capacity will be fully 50 per cent. greater than the average rate of inflow encountered in getting down at first. The uncertain factor is the time required, which would appear dependent upon the quantity of water which has accumulated and which there is no way of estimating with any degree of accuracy. When the pumps at the 1000-ft. level are recovered the maximum total station-pump capacity will be about 12,000,000 gal. daily or 8500 gal. per minute.

Drainage Hastened

The large amount of water we have had to handle, as shown by the above figures and the accompanying table, explains the slowness with which operations at Tombstone have seemed to proceed. The conditions have also made great caution necessary to avoid jeopardizing the entire situation by sudden inrushes beyond the pumping capacity. It should be understood that notwithstanding the apparent steady increase shown by the figures, there were, at the time of the flooding, strong indications that the worst was over, as shown by the rapid decline in the pressure and by the winzes sunk from the 800-ft. level, one of which, at a distance of 300 ft. from the shaft, was down 100 ft. and perfectly dry. Furthermore, we were intentionally pursuing the policy of letting in all the water that could be conveniently handled so as to hasten the drainage. These explanations are necessary to a proper understanding of the situation, for, taken by themselves, the figures indicate a rate of increase which, if continued, would soon have exceeded the pumping capacity.

It may not be out of place to state

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*General manager, Tombstone Consolidated Mines Company, Tombstone, Arizona.

ere that the work so far done fully con- rms the expectations formed at the be- inning as to geological conditions, in- uding the positions of the various ore- earing strata. It has been conclusively roved that the same conditions which accompanied and apparently gave rise to the great orebodies above the original water level persist below, and furthermore, the work done during the last year on the 700- and 800-ft. levels has shown the grade and character of the ore to be little, if at all, affected by the water, so that there is still every reason to believe that with the obstacle of the water once overcome so as to permit unrestricted exploration of the ground, the results originally anticipated will be realized.

The Fluorspar Industry in 1909

BY F. JULIUS FOHS *

I estimate the total amount of Amer- an fluorspar marketed in 1909 at 50,774 ort tons. Illinois leads with about 1,000 tons; Kentucky second, with 8774 ns; Colorado and New Mexico produced intly about 1000 tons. The official stat- tics for 1909 are not yet all at hand but om returns received there is indicated n increase of about 11,000 tons over 908. The production in 1909 exceeded at of any previous year and as the pro- uction of fluorspar was kept pretty well ithin the demand heretofore, it shows e wholesome effect of the tariff, al- ough not yet in force six months. Of e total amount shipped about 20 per ent. was ground, 15 per cent. lump, and e remainder was marketed as gravel.

The number of firms active in market- g fluorspar in 1909 was as follows: ew Mexico, 1; Colorado, 4; Kentucky, , and Illinois 4. The following were the rgest shippers: Albany Mining and In- estment Company, Kentucky Fluorspar ompany and Geo. P. Roberts in Ken- ucky; the Fairview Fluorspar and Lead ompany and Rogers, Brown & Co., Rosiclare mines,) and the Marion Lead nd Fluorspar Company in Illinois.

MARKETS

The range in prices for 1909 was: nwashed gravel at $4.50 @ 5.00; washed ravel, $4.75 @ 5.50; No. 2 lump, $5.50 6.50; ground in bulk, as low as $8; o. 1 and No. 2 ground sold at $10 @ 11, arrelled, white extra No. 1 sold at $11.40 12.50. Fluorspar, usually barrelled, etails in quantities from 50 lb. to ton ts, as follows: Crude, from $10 @ 20 er ton; ground, $20 @ 32 per ton.

According to Burchard, the price of uorspar in Colorado varies, depending pon the calcium fluoride and silica con- ained. The spar is hand-cobbed gravel. The rices for 80 per cent. calcium fluoride nd not exceeding 15 per cent. silica, is 5; for each per cent. of calcium fluoride n additional 20c., so that 85 per cent. rings $6 and 90 per cent. $7 per short on.

EFFECT OF THE TARIFF

The imposition of a $3 tariff on fluorspar has resulted in broadening the market for American fluorspar, without permitting an increase in prices. The latter are still regulated by foreign importations at Atlantic coast ports, and not at Pittsburg as was formerly the case. The present cost of English fluorspar, including tariff, at Baltimore, is $6.10 per short ton, as against a minimum sale price of $8 for domestic unwashed fluxing gravel, leaving a good margin in favor of the English. At Pittsburg, however, the conditions are now reversed. The present minimum cost of English fluorspar at Pittsburg would be $7.44, whereas domestic unwashed gravel can be sold there for about $7. This gives American producers the advantage of trade at practically all the openhearth steel furnaces, since few, if any, are situated at coast ports, or sufficiently near them to take advantage of English importations. The effect of English fluorspar competitors will be felt at Pittsburg and vicinity until the large stock of fluorspar imported prior to the tariff is exhausted and until such time as the American mines are in a position to meet the demand. Some of the producing companies refuse to meet the cut prices of other companies. The Kentucky companies, which are in a position to turn out large quantities, are still handicapped by a difference of 20 to 80c. in freight rates. This accounts for the poor showing both in shipments and amount marketed in 1908 and 1909.

Plants are being enlarged to meet increased demand. It is hoped that the new Foust jig will solve the unusual problem presented by fluorspar concentration.

NEW DEVELOPMENTS

No developments were reported from Arizona, but New Mexico was a producer for the first time. In southwestern New Mexico fluorspar veins traverse limestone and shale and the American Fireman's Mining Company opened one of these at Mirage, Luna county, near Deming. This is more accessible to market than the Arizona deposits.

Kentucky has been rather inactive for two years or more, the companies awaiting better conditions. The imposition of the tariff has caused renewed activity to some extent. The Albany Mining and Investment Company sunk the Nancy Hanks mine to a depth of 340 ft. and report the fluorspar to be 6 ft. wide at that depth with a 9-ft. shoot at the 330-ft. level. The Kentucky Fluorspar Company opened the Beck vein and found excellent fluorspar near the surface. At the Memphis incline development work was vigorously carried on to open new shoots. The Kentucky and Indiana Mining Company recently began the development of properties on the Kentucky and Yandell veins. The Franklin Mining Company cut a 7-ft. vein on the Ada Florence vein. James Persons developed a vein of fluorspar varying from 6 to 20 ft. in width on the Ebbie Hodge property.

In Illinois, the Fairview Fluorspar and Lead Company sunk the Fairview incline to a depth of 520 ft. and intend continuing at the rate of 20 ft. per month. At the 460-ft. level a 20-ft. fluorspar shoot was opened. The new shaft 1200 ft. north is down 240 ft. and still sinking, and good spar is being mined from the 200-ft. level. The old No. 1 shaft was reopened and a 20-ft. shoot is being mined. The Rosiclare mine was developed materially so that it is ready for a large production in 1910. The Marion Lead and Fluorspar Company continued mining near Shelterville. The Fairview mill is being rebuilt with a view of increasing its capacity to 300 tons per day, installing three of the new pattern double-plunger Foust jigs, and conveying belts for handling finished products. The Rosiclare has two new Foust jigs, and adequate additional power equipment.

USES

The use of fluorspar is on the increase in the manufacture of glass, enamel and sanitary ware, electrolytic refining of antimony and lead, the production of aluminum and in the iron and steel industries. In the latter, the value of fluorspar in small amounts in conjunction with limestone flux is becoming more and more appreciated. The increase in the number of openhearth furnaces, and hence the increased production of basic-openhearth steel, is especially encouraging. Only in the manufacture of hydrofluoric acid (aside from that used in electrolysis) was there an apparent falling off in demand.

NOTE—Prepared with permission of the di- ector of the Kentucky Geological Survey.

*Lexington, Kentucky.

Mine and Mill of Le Roi No. 2, Ltd., Rossland

Coarse and Medium Ore Sorted Separately; One or More Diamond Drills Constantly Employed; Mill System Simple and Economical

BY ROY HUTCHINS ALLEN*

The property of the Le Roi No. 2, Ltd., includes the Josie mine and several claims upon which little or no work is being done at the present time. The property is immediately west of the Le Roi and War Eagle mines and is the most westerly of the large producers in the Rossland camp.

Mine Plant and Equipment

The Josie mine has a three-compartment shaft 1200 ft. deep, having two hoisting compartments and a manway, each 4 ft. 3 in. by 5 ft. in the clear. The shaft was sunk on the Josie vein and has an inclination of 73 deg. 52 min. toward the north. The wall- and end-plates are of 10x10-in. timbers, with 8x10-in. dividers. The shaft is closely lagged on three sides.

Cages are used in the shaft and the ore is handled in end-dumping cars of 11 to 12 cu.ft. capacity, holding 1600 to 1800 lb. of ore. The hoisting engine was made by the Denver Engineering Works Company, and is driven by a 150-h.p. alternating-current motor taking current at 220 volts. It has two conical drums, each 6 ft. in diameter at the larger end and 4½ ft. at the smaller, with a capacity of 1000 ft. of 1-in. hoisting cable. The speed of hoisting is slow, 500 ft. per minute, and as the capacity has already been exceeded the hoist is to be replaced by a larger one with cylindrical drums, to be operated by compressed air.

The cars are hoisted to near the top of the headframe and are there run out to the sorting house where the ore is dumped on a double set of grizzlies. The first and second classes of ore are hoisted separately and there is a double set of grizzlies for each class. Three sized products are made; coarse ore (4 in. and larger), medium (4 in. to 1½ in.), and fines (through 1½-in. openings). The two coarser sizes go to sorting tables where the ore is sorted by five men, one of whom works on the coarse and four on the medium sized ore. Two products are made; the first-class or smelting ore, and the second-class, which is sent to the mill. The fines of the first-class ore go to the smeltery, those of the second-class to the mill. The fines are not sorted, the classification being made underground in the stopes.

The Josie Mine and Concentrator of the Le Roi No. 2 Ltd.

The ore from the sorting house is trammed by hand a distance of 375 ft. and dumped into bins. From these bins the smelting grade of ore goes by an inclined three-rail tram, 1100 ft. long, to the ore bins at the railroad, about 250 ft. lower; the low-grade ore is trammed by hand a distance of 400 ft. to the mill and dumped into a small bin. The monthly output is about 2600 tons of smelting ore and 1600 tons of milling ore.

Air for the drills and mine pump is furnished by a Canadian Rand compressor leased from the Nickel Plate mine and situated about three-quarters of a mile distant. The compressor has cylinders 36 and 22x48-in. stroke. The low-pressure air cylinder is provided with Corliss valves for both inlet and exhaust. The compressor is driven by rope drive from a 660-kw. synchronous motor taking current at 2200 volts, and having a speed of 257 r.p.m. The compressor is run at 61 r.p.m., and at that speed has a capacity of about 2800 cu.ft. of free air per min., compressed to 100 lb. per square inch.

The mine has a blacksmith shop well equipped with the usual tools and a Word Brothers drill sharpener. The carpenter shop contains a circular saw, but all the mine timbers are framed by hand. In spite of the fact that the region surrounding Rossland is well wooded, the cost of lumber is high, that which is suitable for mine timbers costing $18 per thousand board feet.

Vein System

The Josie mine has three veins upon which work is now being done. These have a strike a little north of east and are cut by dikes of "mica trap" running north and south. The dikes sometimes cut off the ore completely; in other cases the vein is found on the other side with little or no displacement. A number of faults, having a strike a little west of north also cut the veins, and in most places produce considerable displacement

The veins vary from 6 in to 16 ft. i width, and often pinch out entirely. Th ore, which consists of pyrrhotite, chalcopyrite and pyrite in a gangue of altere country rock, occurs in shoots or lenticular masses having an average length no exceeding 100 ft. The ore minerals occu as masses of the mixed sulphides and a disseminations through the vein rock. N banded structure is exhibited and th veins are to be regarded chiefly as metasomatic replacements of the diorite porphyrite along planes of fracture.

The ore averages about 1.5 per cen copper, but as in the other mines of th district, the most important mineral is th gold associated with the sulphides. Th smaller size of the orebodies is counte balanced by the fact that the value the ore is several dollars per ton abov the average for the Rossland district.

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*Mining engineer, Lunenburg, Mass.

SHRINKAGE STOPES USED

The mine is opened by levels at 100- . intervals, the lowest level at present ing 900 ft. below the collar of the aft. The crosscuts and drifts are 5x7 . to 6x8 ft. in the clear and the latter e usually driven at least the length of e orebody before any stoping is comenced. In stoping the drift is widened the full width of the ore and the back oken down as high as can be reached ith the drills set on columns. The oken ore is then cleaned up and the nbers placed.

Where the vein is less than 12 ft. in dth, stulls 12 to 18 in. in diameter are aced about 9 ft. above the bottom of the vel and lagged with 6-in. poles. If the in is more than 12 ft. wide square sets used. Formerly these sets were made 10x10-in. sawed timbers, the set being ft. in hight, giving a clear headroom of ft. 2 in., but at present all are of round nbers, 12 to 16 in. in diameter, with sts 8 ft. in hight. The sets are 5 ft. in. by 5 ft., the caps being 5 ft. 4 in. length and the girts 4 ft. 4 in. Above sill set, or single row of stulls, the ping is carried on without further nbering. The broken ore is allowed to cumulate in the stope, only enough be- drawn off to give the miners room for lling.

Few of the ore shoots are over 100 ft. length, and barren ground furnishes pillars necessary to support the works when the stopes have been emptied. nd 3⅝-in. machine drills are used for ping. These machines drill on an aver- five 7-ft. holes per 8-hour shift. ven machines furnish the output of out 165 tons of ore per day. The lling is done in two shifts, and all the holes are loaded and fired by the sting crew during the "graveyard" ft.

The mine chutes have openings 24 in. le by 20 in. high furnished for the most t with arc gates. In the square sets y are placed in every third set, while the narrow stopes where stulls are d, they are from 25 to 30 ft. apart. sides of the chutes are made of 10-in. timbers to withstand the efts of bulldozing, and the bottoms are de of a double thickness of 3-in. nks. The ore is trammed by hand to shaft in cars of 11 to 12 cu.ft. capac- holding 1600 to 1800 lb. of ore, and sted to the surface in single-deck es.

SHAFT SINKING

Vith the exception of shaft sinking all elopment work is done by company on company time. Drifts 5x7 ft. to ft. in the clear cost about $16 per . A round of ten 5-ft. holes is drilled wo shifts and blasted in the third, or veyard, shift.

he shaft is now being sunk from the -ft. to the 1300-ft. level, and has already attained a depth of 1200 ft. The work is being done by contract and two drills are kept at work three shifts per day, every day in the month. The shaft is 18 ft. by 7 ft. 6 in. in the clear, and has been sunk 97½ ft. in a month with 13 rounds of holes. A round consists of 18 to 20 holes, usually nine 8-ft. holes on each side, the cut being in the center of the shaft. Almost no water is encountered in sinking. The rock is hoisted in a bucket by a compressed-air hoist to a pocket just above the 900-ft. level from which the cars are loaded and taken to the surface.

During the sinking the timbering is kept within about 25 ft. of the bottom of the shaft. In placing the timbers a staging is hung by chains and hooks from the sets already in place. No built-up staging is used, and by this method the work of the drill-men is not interfered with. Prospecting is done for the most part with diamond drills. One machine is kept constantly at work, and two for the greater part of the time. Each machine averages 20 ft. of hole per day, at a cost of about $2 per foot.

THE MILL

The Le Roi No. 2 mill was widely mentioned in the mining press a few years ago when extensive experiments were made with the Elmore oil process, and the idle mixing cylinders and centrifugal separators still in place in the lower portion of the mill building are a monument to the economic failure of that process at this mine. The present system of milling is far simpler, and though the extraction is not high, ores as low as $1 per ton can be treated at a profit and the mill is considered a reasonable success.

The ore is received in a bin having a capacity of about 50 tons. From this it is fed to a Blake crusher where it is broken to pass a 3-in. ring. The product of this crusher is divided and goes to two smaller crushers having jaws set with a 1-in. to 1¼-in. opening, and yielding a product whose maximum size is not over 1½ in. in diameter. This broken ore goes to storage bins, from which it is fed by a Challenge feeder to a chilean mill where it is crushed to pass a 30-mesh screen. The wear on the screens is severe and they have to be renewed every two days. The pulp from the chilean mill flows to a 4-spigot, rising-current cone classifier, of which only three spigots are used. The product from each spigot is fed to a Wilfley table. The middlings product from these three tables is combined and treated on a fourth Wilfley.

The chalcopyrite in the ore slimes badly and strips of canvas are suspended over the Wilfleys in such manner that they sweep the table and deflect the slimes into the concentrates settling box. These strips interfere with the action of the wash-water and give rise to a large middlings product, but this is considered to be warranted by the increased extraction. The tailings all go to waste though it seems that the installation of canvas tables or vanners would be justified by the increased saving.

The crushing plant is operated only during the day shift. The mill treats, on an average, 60 tons per 24 hours and is run by one man on each of the three 8-hour shifts. Throughout both the mine and mill economy of labor and careful attention to details are observed, with the result that this mine is one of the most profitable of the Rossland district.

Equipment at the Clara Consolidated

The Clara Consolidated Gold and Copper Mining Company owns about 200 claims situated at the new town of Swansea, Yuma county, Ariz., 22 miles from the station of Bouse on the Arizona & California railroad. About 19 miles of the grading on the Arizona & Swansea railroad to the mines has been completed and part of the tracks and ties are laid. This railroad was expected to be completed in December, 1909.

The smelting plant comprises one Mitchell furnace complete with Mitchell dust-collecting chambers, the furnace dimensions 44x293 in. at the tuyeres. The blast is supplied by two Connersville blowers, which have a capacity of about 15,000 cu.ft. of air per min. The furnace will be fed by the gravity dump-car system. Slag from the smeltery will be handled by Jeffrey electric motors. The converter building is a structural-steel building throughout, including the relining plant. There are two converter stands of the latest electrically operated type. One 45-ton overhead traveling crane handles converter shells to and from the relining floor to the converter stands.

The ores will be handled from the shaft of the mines by cars hauled by Jeffrey electric locomotive. The collar of the mine shaft is on a level with the top of the smeltery bins. The ores will be handled as direct as possible from the mine to the smeltery, storage bins being placed at the smeltery. Another new feature in the production of steam power in the plant will be a battery of the latest type of Mitchell slag steam generators, as perfected by George Mitchell. This device is for the production of power from the heat of slags, and it is claimed to produce steam pressure of any degree wanted.

The mines department of the Victorian government maintains prospecting parties in the field in search of new auriferous deposits.

Progress and Developments in Cyanide Practice

Drag Classifiers and Coarser Feed for Tube Mills; Ribbed Linings Used. New Slime Thickeners Devised. Vacuum Filters in General Use

BY MARK R. LAMB[*]

Improvements in the cyanide process appeared constantly during 1909 though not with such spectacular strides as did vacuum filters, air agitation tanks and ribbed tube-mill liners during 1908.

Sorting of ore before milling was not adopted by any plant of size built in America during 1909. Some plants in Mexico, where low-grade ores absolutely require it, have picking belts and this should be as a great light to such companies as are milling high-grade ores. Even at Goldfield it is cheaper to sort out ore which will not pay for milling than to mill it. In Mexico with 35c. labor the omission of sorting is nothing short of a waste of natural resources and should have the attention of the conservation cohorts.

The phenomenal results attained in the preliminary test runs with 1900-lb. stamps on the Rand came just at the end of the year. A capacity of 15 tons per stamp is something unheard of in America. However, the results attained at the Mexico mill at El Oro justify the belief that a variation in tube-mill feed of from 20 mesh to 3/16 in. has little effect on tonnage or fineness of output, and would indicate that the field of the stamp mill will be narrowed shortly by the return to favor of rolls, and the intrusion of the steam stamp of the copper miner. Where no concentration or amalgamation is necessary, the gravity stamp will have a hard time holding its own.

To concentrate high-grade ores is still considered necessary. With silver, while concentration facilities were not omitted except at the Mexico mill, the majority of metallurgists look upon the wages of the concentrator men and upon the first cost of the concentrating plant as an unnecessary expense. It is even proposed to conduct the concentrate from tables and vanners direct to the tube mill, returning the tube-mill discharge to the tables. This would result in grinding the concentrate so fine that it could not be caught on the tables, whereupon it would certainly yield its gold and silver to cyanide in slime-agitation tanks. This method, so far as the actual grinding is concerned, is better than providing a special tube to grind the concentrate, as a certain amount of sand is required for the fine grinding of the concentrate in any case.

Drag Classifiers Favored

For separating sand and slime some form of drag classifier is preferred, though a few plants obtain excellent results in feeding tube mills with the underflow from cones. However, the success of these latter depends much more upon the attention given them. Under the title drag classifier may be included the Dorr, the Empson, the one in use at El Oro and the ordinary shovel-wheel as used in dewatering during coarse concentration. The value of the latter as a tube-mill feeder for all ores has not been demonstrated, though neither has the machine failed where tried. It is small and inexpensive, requires little power and has few wearing parts.

Tube-Mill Practice

Various tube-mill linings have been invented, with attached patents of incidental details of construction. The original El Oro lining invented by Brown has held its position in El Oro. The Tonopah ribbed lining invented by Rotherham, which differs in that no holes in the shell of the mill are required, is becoming quite as popular with those who see it. Except in isolated cases the silex lining is *passé*. Even silex pebbles have lost their former dignified position and are now used only to start a new plant, the wear being met by the addition of lumps of ore. As this ore wears out much more rapidly than the silex pebbles (the ratio of wear is about 10 to 1) provision must be made for feeding in some way other than through the manholes. Spiral feeders are made large enough to pass rock of suitable size while with tube mills which are provided with cone-shaped end liners, discharge gratings can be omitted, so that pebbles can be fed to the mill directly through the trunnion. This shape of liner prevents the discharge of pebbles from the mill and, at the same time, allows pebbles to be fed while the mill is in operation. Such features together with the long life of the lining itself permit of the operation of a tube mill almost 100 per cent. of the possible operating time. Only a short while ago it was considered necessary to provide two mills to do the work of one, on account of the time lost in adding pebbles, replacing loosened silex bricks and in the frequent replacing of worn linings, with the attendant loss of two weeks' time necessary for the setting of the cement binder.

New Zealand has outdone America in its appreciation of the tube mill. In the former country it is considered advisable with gold ore to have a tube mill for each 10 stamps, increasing the capacity of the latter by using coarser screens until a suitable tonnage of tube-mill feed is secured. Africans seem to lean toward heavier stamps rather than toward more tube mills, probably on account of the difficulty they experience in breaking away from the practice of amalgamation after the battery, and in adopting milling in solution. To be sure, these changes are not always advisable in old plants with their leaky tanks and light stamps but would seem to be entirely feasible in new plants, if New Zealand and American practice can be used as a guide Two strong advocates of all-sliming and vacuum filtration recently invaded Africa from America: C. G. Patterson, chie engineer for Chas. Butters, and Dr. F. L Bosqui. Both have had wide experience in slime treatment and filtration and undoubtedly will have a notable influence on Rand practice.

Handling of Slime

Slime thickening is one of the operations about a plant which requires constant attention. Until recently the practice was to settle in cone-bottomed tanks or else in flat-bottomed tanks in which the slime was allowed to form its own cone. The latest development, put ou by J. V. N. Dorr, and consisting of a settling tank provided with a slow-moving discharge, was favored in the new plants and during 1909 replaced cones in some of the older ones. It has numerous advantages over the cone, but like the latter, is not entirely automatic since the discharge of the settler must be regulated to the tonnage of the inflowing pulp However, it is so vastly better than cone for cyaniding plants that to all intents and purposes it may be considered perfect. The appearance, late in December of the new method of slime treatmen evolved by Mr. Nichols after an extended study of the problem, can be credited to 1909 though the process was not put into operation far enough away from the inventor for one to pass upon its practica merits.

The Frenier sand pump holds its own though quite a number of plants using tall tanks or requiring to lift tailing ove 50 ft. built or are building bucket elevators for the work. For a 55-ft. tank three or four Freniers in series would be required. As noted in last year's review, there is a crying need for a sand pump at least as dependable as a wate pump. It was attempted to build a plunge

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[*] Milling and cyaniding engineer, Milwaukee, Wis.

with parts so hard that they could
ear out. This pump is under test
far has not proven entirely satis-
y. The ideal pump will be built
a flexible but impervious partition or
ragm between the plunger and the
as in acid pumps of German manu-
re and in grout pumps used where
nt must be forced under heavy
ures.

ers maintained about the same po-
as during 1908. Prices and roy-
demanded were much lower. The
r had numerous partisans. The Moore
is doing good work at Pachuca
ne Butters holds its own, having just
ordered for the 1000-ton plant of the
Estrellas company. The first type
irt filter, the cylinder set on an in-
was not exploited so vigorously as
rly on account, probably, of the
better results attained with the new
ing model. It seems that the much
ssed filter-patent litigation made
headway, but all patent litigation is
ously slow.

tall air agitation tanks are as
ar as ever, and no plant is com-
without them. Some users have
ed that the central tube is not ne-
ry for good and economical ex-
on, although with equal certainty the
l tube is of advantage in starting a
y settled tank or one having a
y proportion of sand.

d treatment of precipitates, whether
nc dust or shavings, fell into dis-
, and deservedly so, and the man-
of even the smallest plant now in-
upon a precipitate filter press. Zinc-
precipitation was provided for sev-
plants during 1909. It has the ad-
ge of preventing theft, which is de-
g of consideration. This method of
itation is being considered by Man-
Shanks for the Rio Plata plant and
uilt into the Yoquivo mill, both to
high-grade ores.

recent open letter written by Presi-
Haigh of the Moore Filter Company
Pacific Miner indicates that the
y process was described in the
ical press. The paper by Mr. Crowe,
ich the Moore company claims its
ss was described without due credit
given to the inventor, attracted at-
n on the Rand and the process as
described will undoubtedly be tried
y many independent investigators.

OTES ON EQUIPMENT OF PLANTS

ver equipments of plants built dur-
909 followed the usual lines—elec-
and hydraulic power where avail-
otherwise steam or gas engines.
lvarado Milling Company of Parral
acted for a steam-power plant for
ew 60-stamp mill, with the results
gas-power plant of the Tecolotes
efore them, and as the directors are
ith much experience with mills and
, there seems to be room yet for
argument on the power question. A very impressive small plant was contracted for by the Tehuantepec Silver Mines Company of Oaxaca during December. This plant included gas-engine power. Direct connection to motors is favored for all such machines as compressors, tube mills and pumps. The Yoquivo mill and plant, designed by A. H. Kennedy, is an example of a plant with all motors direct connected.

Following are a few recently completed plants with special features which merit mention. The Butters plant at Copala obtained a capacity of six tons per day per stamp and operated successfully on $8 silver ore. Slime treatment was by mechanical agitation. The mill of the Lluvia de Oro mine is steam-turbine driven, and treats an all-slime product by mechanical agitation and Burt filters. Concentrates are reground and amalgamated before transportation to the railway. San Rafael at Pachuca has the largest Moore filter in the Republic. La Union, also at Pachuca, is a remodeled amalgamation mill in which crushing to slime was done in one operation in heavy, slow chilean mills. El Bote at Zacatecas has air-agitation tanks with outside air lifts which give practically the same results as the inside tube. This plant also uses heavy chilean mills. Esperanza has a battery of air-agitation tanks, tube mills and Merrill filter presses, and successfully treated tailings which would not be touched in Africa. Goldfield Consolidated is placing high-speed chilean mills with the expectation of greatly increasing capacity at a less expense than by adding stamps and tubes.

The majority of the plants completed or begun in America during the year followed, with slight variations, the same lines. Crushing in breakers was followed by crushing in stamps (finely for concentration or coarsely if this is omitted.) This was followed by drag classification, tube milling, air agitation and filtration of the entire pulp. The Eagle Mining Company and R. P. Chattin, of Idaho, and Dr. S. B. Smith, of Sonora, adopted the Rhodesian practice of using steam stamps for small concentrating and cyanide plants.

The mill which is destined to hold the record for low cost of installation and maintenance in America for a long time was the one designed by Geo. L. Kaeding, of the Eureka Windfall Mining Company, of Eureka, Nev. The plant consisted of gyratory breaker, 24x24-in. rolls and leaching tanks, the power being supplied by a 40-h.p. gas engine. Including road building and mill construction the cost of the plant complete was under $30,000, only two men per shift were required, extraction was well above 95 per cent, and the plant showed a capacity 140 tons per day. These results are are due to the nature of the ore, a soft, easily leached sandstone.

The Conservation Engineer

The regents of the University of Michigan have just taken a step which may end by doing away with the old reproach that since Aristotle the field of human knowledge has grown too wide for any one man to embrace. The regents have established a six years' course of study leading to the degree of master of conservation engineering. The argument, as advanced in the *Michigan Alumnus*, may be summed up as follows: It was the surveyor and civil engineer, following in the footsteps of the pioneer, that blazed the way for our lavish exploitation of those magnificent natural resources, the end of which is now coming into sight. "What more natural than to call on the man who started the machine to slow it down, to regulate its speed? The engineer has been the one great factor in making possible the creation of the conditions of our modern civilization. His great work in the future must be to serve mankind in an even more important capacity—to prolong the life of the things which he has helped create." Now a man capable of doing such work must be something more than a narrow expert; he "must prepare himself to live his life along conservation lines."

Hence our future master of conservation engineering will have to pass through a following curriculum: In mineralogy and lithology, geology, biological sciences (general biology, economic botany, economic zoölogy and general forestry), astronomy, drawing, surveying, civil engineering (structural mechanics, strength and resistance of materials, hydraulics, municipal and sanitary engineering, water supply and waterpower), mechanical engineering, electrical engineering, chemical engineering (general metallurgy and mineral and botanical technology), political economy, law (elementary law, contracts, constitutional law, and conveyancing).

Even if such a course should fail to make a good conservation engineer, says the *Evening Post*, it will supply the republic with a set of desirably educated citizens.

Bromine

During 1909 the price for commercial bromine remained steady at 10c. per lb. at place of production. Potassium bromide was quoted at New York at 18c. per lb. in January, after which the price rose to 20c. at which figure it remained steady during the remainder of the year. The advance was due to the withdrawal of the German producers from this market, which took place Dec. 31, 1908. So far as we are aware no bromine or bromides were exported from the United States in 1909. The domestic bromide production was about the same as in 1908.

Condition of Phosphate Industry in Tennesse

Production below Normal. Prices Low. Ground Phosphate Output to Be Increased; International Agricultural Corporation Organized

BY H. D. RUHM*

Actual statistics of phosphate shipments are not available as yet but there is little doubt that in 1909 production and shipments continued to be somewhat below the normal of the Tennessee field, although quite a stimulus was felt after Aug. 1, and 1910 bids fair to again show a normal production. R. A. Shiplett, State mine inspector, estimates production of phosphate rock in Tennessee for 1909 to have been 436,000 tons.

During the stagnation period the manufacturers of fertilizers took advantage of the opportunity to thoroughly fortify themselves with supplies of rock in the ground, so that for a long time to come, the chances are that values as shown by sale prices, will consist merely of the nominal figures at which the phosphate-mining departments charged up the rock to the fertilizing departments.

Company Organization

The Independent Fertilizer Company, organized last year by T. C. Meadows with the aid of J. P. Morgan & Co., was finally dissolved by the manufacturers who were in it, at a time when Mr. Meadows was on the other side of the ocean. On his return he organized the International Agricultural Corporation, which was composed of the Buffalo Fertilizer Company and its affiliated concerns, the National Fertilizer Company of Nashville, Tenn., the Tennessee Valley Fertilizer Company of Florence, Ala., the Germo-Fert Company of Atlanta, Ga., and Montgomery, Ala., the Blue Grass Phosphate Company, the Jackson Phosphate Company, Middle Tennessee Phosphate Company, Brown Rock Phosphate Company, Maury Phosphate Company, Little Bigby Phosphate Company, T. C. Meadows & Co., Richland Phosphate Company, France & Co., Ruhm & Barrow, Ruhm & Gregory, Sterling Phosphate Company, all of Mt. Pleasant, the American Phosphate Company at Wales, Tenn., and the Kaliwerke Sollstedt, of Sollstedt, Germany.

With their already strong position augmented by the recent purchase of the Prairie Pebble Phosphate Company's holdings in Florida, and with the expected increase in the sulphuric acid production at Ducktown, Tenn., which it has the contract to consume, the International Agricutural Corporation stands without a rival in the world today. Its possessions of raw material for the manufacture of fertilizer and facilities for its manufacture and distribution are ample and ideally located, and the organization is successfully at work.

The organization of this company marks a new era in the formation of such concerns, in that not a dollar was paid out for good will or business or bonus of any kind, everything going into the company having been appraised at cash valuation and paid for in equal amounts of preferred and common stock at par. The company has no bonded debt of any kind.

The officers of the new company are: Waldemar Schmidtman, president; W. N. Shaw, vice-president; John W. Fry, secretary; E. M. Rounds, treasurer; A. C. Floyd, assistant treasurer; T. C. Meadows, general manager; H. C. Sickler, assistant general manager; W. D. Huntingdon, manager Buffalo Department; Lee Ashcraft, manager Southern Fertilizer Department; G. W. Killebrew, manager Phosphate-Rock Department.

Operations

The American Agricultural Chemical Company continued to operate its plants at Wales and Centerville, but with a reduced output. The Virginia-Carolina Chemical Company greatly increased the capacity and efficiency of its washing and drying plant at its Arrow mine, and is now transporting the waste product from the Howard and Ridley mines to Arrow for washing and drying. Its blue-rock mines at Mayfield were operated regularly and it greatly increased the drying capacity there. The Independent Phosphate Company operated at Satterfield and Solita, and is rapidly pushing ahead the development of its blue-rock mines at Leatherwood. The latter mine and Mayfield mines of the Virginia-Carolina Company are the best blue-rock mines in the field.

The Middle Tennessee Railroad Company was about completed from Nashville to the Leatherwood mines and contract was signed for its completion on to Mt. Pleasant during 1910. This will give the phosphate field of Tennessee the much-needed competition in railroad facilities and should go far toward relieving car-shortage troubles.

In the Centerville district only the Volunteer State Phosphate Company and the Meridian Fertilizer Factory ran to any extent during 1909. The Virginia-Carolina operations at the Fogg mines are reported to have about worked out the Duck River Phosphate Company's holdings. At the Bear Creek mines, owned by the T nessee Chemical Company, recently sorbed by Armour & Co., considerable tivity was manifested and plans are n in preparation for installing an uptod washer and dryer. The Federal Chemi Company at Century and Ridley opera continuously, having the largest and b equipped washing and drying plants the field.

The Independent Phosphate Comp had one washing plant. The Internatio Phosphate Company one, Federal Che ical Company two, Ruhm Phosphate M ing Company one, International Agric tural Corporation four in operation in Maury County field.

General Conditions and Prices

The prices of rock for the few outs sales that were made, were in sympa with general conditions at $3@3.40 72 per cent. rock with 6½ per ce Fe + Al, and $3.50@4 for 75 per ce 5½. Blue rock was quoted around $2 @3.25 for 60 to 65 per cent. rock w 3 per cent. Fe + Al.

The ground-rock business continued increase and the following firms are n engaged in grinding: Ruhm Phosph Mining Company, Farmers' Ground R Phosphate Company, Mt. Pleasant Fert zer Company, International Agricultu Corporation, Central Phosphate Compa and Cooper & Jackson.

The western freight association hav recently decided to give the same rate ground phosphate in bulk that is given lump rock, the use of ground rock rectly, without acidulation, will grea increase, the discrimination in rates he tofore, having prevented much of it fr being used.

The new process of washing and sav all the phosphate granules about treb the supposed available tonnage of bro rock of 72 per cent. or higher.

On the whole conditions in phosph circles seem to be healthy and the pr pects for owners of phosphate property make reasonable sales of their holdi will doubtles remain favorable for so time to come.

According to telegraphic despatches, Chilean government has contracted w a London syndicate for the construct of that section of the Longitudinal ra way, which will lie between Copiapo a Iquique. The price is $15,250,000. Wh completed the road will extend from frontier of Peru to the Strait of Magell

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*Mining and civil engineer, Mount Pleasant, Tenn.

eport of the Coniagas Mines, Ltd., Cobalt

Mined Nearly 25,000 Tons During Year; Total Costs, $8.61 per Ton Mined. Stamp Mill to Be Doubled. Output to Date 4,863,323 oz. Silver

DIVIDENDS TO DATE $1,160,000

: directors' report of the Coniagas
,"Ltd., recently published, gives a re-
of the work of this important Co-
property during the year ended
31, 1909. On account of the present
st in Cobalt mining properties the
/ report of the company is here
d at considerable length. The claims
: Coniagas Mines, Ltd., are situated
e town of Cobalt, adjoining the
-of-Way and Nipissing holdings.
its incorporation in November of
the Coniagas company has paid
0,000 in dividends on its capitaliza-
of $4,000,000.

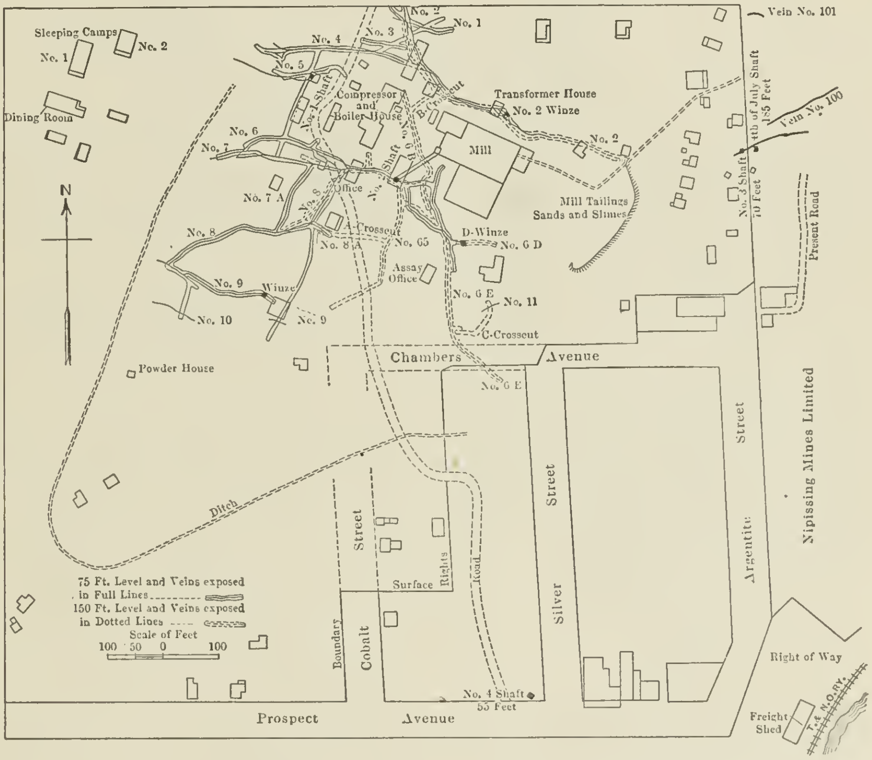
the annual report John Redington,
intendent, states the amount of rock
ved during the past 12 months as
9 tons, of which 1130 tons were bar-
ock removed in cross cutting; 3760,
ock from drifting; 19,472, pay rock
d; 380, pay rock from winzes and
ons barren rock from shaft sinking.
the beginning of operations of the
ıgas mines 60,229 tons of rock have
removed, or about 40 per cent.
g the past year.

the accompanying illustrations, Fig.
a surface plan of the Coniagas
rty and shows the situation of the
ent veins proved. Fig. 2 shows the
opment of these veins, the cross-
ed portion of the stopes represent-
ne material removed during the year
ig Sept. 30, 1909. Of the 60,229
mined from the time operations were
d to Oct. 31, 1909, 33,229 tons were
hrough the concentrating mill and
s 19,038 tons were milled during the
year. During the year 51 ft. of shaft
ng were accomplished, 1254 ft. of
ng, 376 ft. of crosscutting and 80 ft.
in winzes.

e No. 4 shaft shown in Fig. 1 to the
of the property, near the corner of
r street and Prospect avenue, has
sunk to a depth of 55 ft.; it will be
to connect with the extension of
50-ft. level. In winze No. 6D ore was
ved for 68 ft. below the 150-ft. level.
No. 3 shaft is down 70 ft. in barren
rial, but the Fourth of July shaft on
Nipissing property to the east is 164
ep in good ore. The total develop-
of the property to date is 473 ft. of
, 5010 ft. of drift, 1017 ft. of cross-
nd 174 feet of winze. The ore re-
s actually developed on three sides
estimated at 106,000 tons of high-
: ore, carrying 12,500,000 oz. of sil-
The estimate is based on the silver
nts of the ore removed to date.

Mill to be Enlarged

During the past year the output of the mine has been restricted by the inefficiency of the gas-engine plant installed to run the concentrating mill. The present mill comprises 30 stamps with a capacity of about 70 tons per day and on June 12 the directors authorized the addition of 30 more stamps and the installation of electric equipment, power to be furnished by one of the hydro-electric companies now constructing plants to supply the Cobalt camp. In this connection it is interesting to note that a contract has been made with the Cobalt Hydraulic Company for supplying compressed air for mining operations.



The Engineering & Mining Journal

FIG. 1. PLAN SHOWING BUILDINGS AND UNDERGROUND WORKINGS OF THE CONIAGAS MINES, LTD.

The Coniagas Mines, Ltd., began concentrating ore Sept. 24, 1907. From Nov. 1, 1905 to Oct. 31, 1906, 289 tons of ore containing 657,513 oz. of silver were shipped; during the next year 2655 tons carrying 1,341,372 oz.; during 1907-08, 627½ tons of mine ore and concentrates carrying 1,457,210 oz.; 350 tons of mine ore carrying 807,253 oz. of silver and 426 tons of concentrates carrying 599,975 oz. were shipped during the last year. The total shipment from the Coniagas mine has therefore been 4347½ tons carrying 4,863,323 oz. of silver.

Troubles at Cobalt

A controversy has arisen between the town of Cobalt and the Coniagas company in the delimiting surface rights acquired by some citizens on the southeast portion of the company's property, since mining rights on the same property were acquired by the company's predecessors. To date the company's contention has been upheld in the courts. There are also some minor legal disputes pending in the courts with the town of Cobalt regarding assessments.

Recently Cobalt has been afflicted with a severe epidemic of typhoid fever, the result of a badly located townsite and inadequate government in a rapidly growing mining camp. The epidemic spread to adjacent camps and resulted in much loss of life, health and wages to hundreds of families, and a large expense to the whole camp. The Red Cross hospital, suported by the mines and managed by a board of directors presided over by R. C.

Rogers, assistant to the president of the Coniagas company, contained at one time 188 fever patients. It is proposed that the Coniagas company acquire 1500 shares at par of $1 in the proposed company which is being formed to acquire this hospital.

The average silver content of the rock mined during this same period was about $27, thus leaving a profit of almost $19 per ton on all material broken. The total year's profit is credited in the report as $477,410, of which $360,000 was paid in dividends, $1500 as a directors' fund and $2475 as an employees' bonus—4 per cent. of each man's yearly salary as a Christmas distribution. The balance on hand Oct. 31, 1908, was $326,480, and $440,014, at the close of the last fiscal year.

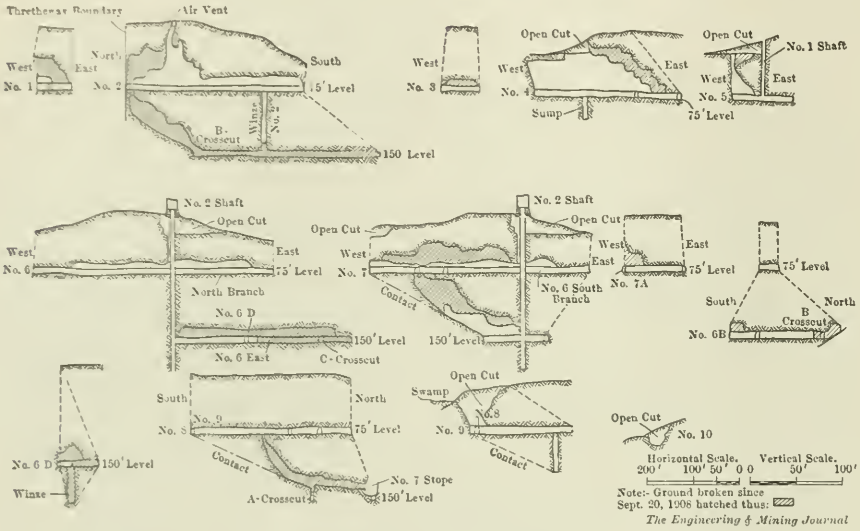


Fig. 2. Sections Along Veins on Coniagas Property

At the cost of the experiments performed and the patents, the Coniagas company has obtained a 55 per cent. interest in the Redington rock drill, invented by John Redington, superintendent of the Coniagas mine. These drills have been manufactured at the mine machine shop and have proved efficient and cheap in first cost and maintenance. In order to take up a portion of the floating debt of the Coniagas Reduction Company and provide working capital and cash reserve it is also proposed that the directors of the Coniagas Mines, Ltd., subscribe to 1494 more shares in the reduction company in preference to the immediate payments of dividends. The Coniagas Reduction Company has a floating debt of $164,000, incurred in the construction of the plant and for providing working capital. The extensions to the reduction plant, now under way, were to be completed in about three months. Heretofore this plant has only marketed silver and arsenic and has accumulated a large stock of cobalt and nickel in various stages of refining.

Costs and Profit for the Year

As shown by the statement accompanying the report the average cost of mining for the year was $3.14 per ton of ore and waste removed; the cost of milling was $2.05 per ton of ore milled or $1.57 per ton of rock mined. The expense of administration, supervision, camp maintenance, lands and roads, fuel, oil and waste, sale of ore, legal advice, taxes and royalties, and transportation figures at $3.90 per ton of rock mined. This gives a total expense of $8.61 per ton of ore and waste removed during the year under review.

Ammonia Production in 1909

By C. G. Atwater*

In 1907 the production, or perhaps more accurately, the recovery, of ammonia reached its high-water mark in this country. Reckoned as sulphate of ammonia the output for that year was 99,300 net tons, as closely as can be estimated. In 1908, owing to business stagnation, the output was but 83,400 net tons of sulphate equivalent according to the figures recently given out by the U. S. Geological Survey and with due allowance for production from sources other than bituminous coal. This was a loss of nearly 16,000 tons, and was due principally to the smaller number of by-product coke ovens in operation and the consequent drop in by-products recovered, though the production from coal-gas works also fell off to some extent.

As the drop in the recovery from the last-mentioned source was due to the increased favor manifested for carbureted water gas and oil gas rather than to business conditions, there is little reason to expect much increase in output from the coal-gas works for 1909 or for the year to come. This is not the case, however, with the by-product coke ovens. Their number was augmented early in 1909 by 280 new ovens built at Joilet, Ill., the oven addition to the Hamilton, O plant, the 50-oven plant at Indianapo Ind., and 15 additional ovens at Gen N. Y., and the ammonia production increased as well by the resumption operations at a number of other pla that had been wholly or partly idle f time. There is, therefore, good reaso estimate the 1909 production of am nium sulphate and equivalent at as m if not more than was made in 1 Furthermore, the probable completion placing in operation during the con year of the 500-oven plant now buil at Gary, Ind., and the possible com tion of other plants, and additions to isting ones, as well as the prospec business conditions that will require operation of all at full capacity, p to a continuous increase in produc However, in ammonia recovery we not as yet approach the development has taken place in Germany and Eng where increases of from 12,000 to 1 000 tons yearly have regularly occu for years. It is also worthy of note these large increases have not been lowed by a glutted market nor by no price reductions.

The United States imports for the f year ended June 30, 1909, amounte 40,192 net tons, as compared with 3 tons in 1908 and 32,669 tons in 1 showing that the consumption has its own better than production.

The price fluctuations during were considerable, due to the rev of the tariff. The price ranged tween $2.89 and $3.01 per 100 lb. fo first half of the year, the maximum reached during February. At the b ning of August the price was still $ but on Aug. 6 the new tariff bill, w removed the existing rate of 30c. 100 lb., went into effect, and this, by the fact that it was the quiet se for fertilizer materials, resulted drop of the price to $2.65. Since the market has stiffened some an prospect is that a part of the loss be recovered. The former imports in the nature of dumping surplus into this country for what it would b and, as is shown by the fact tha whole reduction of the duty was n flected in the lowering of the price future foreign business seems like partake of the same character, wit difference that the door is now a wider open.

There is not, however, any large plus of sulphate of ammonia ava to bring in here from any source spite of the fact that the world's duction has now increased to nearly 000 tons per year, there is a mark it all, and for any considerable inc in our imports a price must be paid will divert it from other consumers. real prospects of the sulphate of a market in this country lie rather ie direction of developing our own ly from our enormous consumption tuminous coal, less than 3 per cent. hich is now treated for the recovery iis valuable by-product, and in the ase that is bound to come in the use ımmercial fertilizers in the agricul- of the nation.

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*Engineer for United Gas and Coke Company, New York

Magnesite in 1909

e mining of magnesite on a com- ial scale in the United States was ucted during 1909 in the State of ornia only. Even there but few of known deposits are being utilized, he reason that the Pacific coast de- is comparatively light and the sub- e will not profitably bear transpor- ı charges across the continent to s of greatest consumption. Large tities are therefore annually im- d from Greece and Austria.

California the principal use to which ineral is put is, in a calcined form, digester of wood pulp in paper man- ure. Some is also used for manu- ring carbonic-acid gas and smaller tities in making tiling, wainscoting, ng and other building materials. The al annual demand from the Cali- ı mines is from 6000 to 8000 tons ıde material but a much larger out- ould be made did consumption war- The spot price at the principal ; in the San Joaquin valley was $3 ɔn for the crude. The calcined was ıt $14@16 per ton, according to the given. It takes 2.6 tons crude to one ton of calcined magnesite. y all that is mined is calcined at the ; before shipment, there being little) demand for the crude mineral. ɔnly crude magnesite shipped from ines is that used in the manufacture ırbonic-acid gas. In this process ıineral is calcined, the gas saved, he calcine sold to the paper mak- For building material only the cal- s utilized.

onditions in California in 1909

ring 1909 there was an increase in mount of building material made, h most of the manufacturers con- d their business on a small scale no sive plants having been erected the destruction of the works of the ican Magnesite Company at East ınd by the earthquake of 1906. That any has since virtually gone out of ess and its mines at Red mountain relocated by others.

first attempts to manufacture ıg and kindred substances in Cali- ı were not successful owing to lack ıowledge of the proper "binder." difficulties having been overcome reat extent, the products now turned re quite satisfactory. The first failures did some harm to the industry and it is still difficult to get architects and contractors to name this substance as a building material. Although of late large quantities are being put in use in prominent and expensive buildings, it will be necessary for a large company with extensive capital to establish a plant where the work can be conducted upon a scientific basis and thus insure uniform products which will stand the necessary tests.

More interest was manifested in magnesite in 1909 than ever before but this did not lead to the opening of any new deposits of magnitude. Several companies were organized to manufacture building materials, etc., and to mine the substance, but their efforts were mainly directed toward selling stock and they did not open new mines or build plants. Of the factories that operated, all were small and each man seemed to be working on some plan or "secret process" of his own, making just enough to fill immediate contracts and extending the business but slowly.

Operating Mines

The most productive mines in the State were operated in the interest of the manufacturers of paper from wood pulp, who utilized almost the entire output. These mines are at South Tule and Porterville, Tulare county, and are provided with their own calcining furnaces. Another mine which is equipped with furnaces is in Fresno county, near Sanger, but it was not in operation during 1909, owing to cost of the long haul to the railroad. The deposit at Winchester, in Riverside county, was also worked in a small way. Small quantities were also taken from the Red mountain deposits in Santa Clara and Stanislaus counties but the distance from rail connection prevented mining these deposits on a large scale. A 21-mile railroad must be built before it will pay to work these mines extensively. There is quite a group of them and more or less development work has been done, showing, on the surface at least, apparently large bodies of mineral.

Although there are several known deposits of some extent in both Sonoma and Napa counties there was little or no production from these sources; formerly the Napa county mines were the most productive in the State. Those near railroad facilities have been worked out, and those where long hauls are necessary cannot compete with mines in other counties where shipping facilities are better.

One of the difficulties in the mining of magnesite is that of knowing with anything like exactness the extent and continuity of the deposits. They may give out at any time or intrusions of serpentine may unexpectedly cut them off. Often there are immense croppings with not very much below them. On account of this uncertainty as to the extent of the deposits and the small local demand few deposits have been exploited. A very complete description of the magnesite deposits of California was published in *Bull.* No. 355 of the U. S. Geological Survey, by Frank L. Hess. A map accompanies this bulletin and shows the situation of all known mines or deposits.

The Dutoitspan Diamond Mine

The Dutoitspan diamond mine, one of the larger producers in South Africa, was closed down early in 1908, on account of the sudden decrease in the buying of diamonds which began late in 1907. With the revival of business the De Beers Company has decided to reopen the mine and preparations are being made to resume production in January.

The reports of the company give the following results from the Dutoitspan mine during four full years of its operation. The statements are for the years ended June 30; the loads of blue ground are of 16 cu.ft. each:

	1903-'04.	1904-'05.	1905-'06.	1906-'07
Blue hoisted, loads.	39,914	311,499	1,685,714	2,481,987
Blue washed, loads.	24,359	65,784	617,028	1,539,327
Loads on floor, June 30......	15,555	261,270	1,329,956	2,272,616
Diamonds, carats...	3,032	17,122	151,335	365,822
Diamonds, value...	£6,457	£59,847	£612,608	£1,455,330
Value, per carat....	.....	$16.78	$19.43	$19.10
Carats, per load....	0.12	0.26	0.25	0.24
Value, per load....	.....	$4.37	$4.77	$4.54
Cost per load....	.....	2.95	1.71	1.56

In 1903-4 the blue ground reported was taken out in development work, no regular production being attempted. In 1904-5 also there was a large amount of development work, and heavy production did not begin till the following year. The decrease in cost per load with the increase in production is noticeable.

Tungsten

In the United States in 1909, about 2500 tons of tungsten ore, averaging 60 per cent. WO_3, were used, of which about one-half was produced in this country and the other half was imported. The price for ore averaged about $6 per unit of WO_3 on the basis of the short ton—2000 lb. During the last quarter of the year the price for ore rose to $7 per unit and the market became very delicate, consumption having increased. On the other hand, the miners are preparing for a much larger production. With the present 10 per cent. duty on foreign ore, the domestic production in 1910 is likely to be considerably larger than in 1909. The domestic production in 1908 was 497 short tons, compared to 1468 tons in 1907. The production in 1909 consequently was close to the maximum.

Developments in the Florida Phosphate Industr

Great Depression in 1909. Hard-rock Producers Curtailed Output; Pebble-Phosphate Market Better and Mines Run at Full Capacity

BY C. G. MEMMINGER*

Almost unprecedented depression prevailed during 1909 in the Florida phosphate industry. There appeared to be an absolute lack of demand for phosphate, in both domestic and foreign markets. The prices during the first half of the year continued to decline, and sales of Florida high-grade hard rock were reported to have been made at $5 f.o.b. mines, and Florida land pebble was reported to have been sold at $2.60 f.o.b. mines.

These conditions are largely to be attributed to the fact that during the period of high prices of phosphate, some three years back, heavy contracts covering long periods were entered into by the consumers, who, fearing a shortage, covered their requirements fully under these contracts. As a consequence the offerings for new business were extremely restricted, and at the same time, there being no coöperation or unity on the part of the miners in disposing of their product, the result was a general struggle to secure what little new business there was, and subsequently cutting and lowering of prices. During the second half of the year these conditions became somewhat mitigated; conditions steadily improved during the last quarter of the year, and indications are that 1910 will bring an active demand, with a marked increase in prices.

HARD-ROCK DISTRICT

The policy of the producers in the hard-rock district was an extremely wise one, they having restricted their output to meet only current contracts. Stocks were reduced, fully 60 per cent. of the mines in the hard-rock district closed down, and it is evidently the intention of the producers of this grade of rock to keep their mines closed until the market improves and rock can be disposed of at profitable figures. This action will unquestionably bring about the desired results in a short period. There were no new mines opened in the hard-rock district, and the producers of this class of phosphate fully realize the necessity of conserving their deposits, knowing that the quantities of high-grade, Florida hard rock are by no means unlimited. There is therefore every evidence that there will not be an increase in the production of hard rock, but rather a decrease, from year to year.

In the hard-rock district transportation facilities were largely increased by extension of the Seaboard Air Line tracks into various portions of the field where hitherto the Atlantic Coast Line exclusively handled the product from the mines. The rivalry between these two traffic lines will unquestionably be of great benefit to the producer, giving betterment of service and added facilities.

There are two marked changes in the methods of handling hard rock, which were successfully exploited by the Cummer Phosphate Company and the Dutton Phosphate Company. These two companies, instead of following the former method of drying the rock at their mining stations by a crude method previous to making shipment, adopted plans whereby the phosphate, after being washed, is transported to terminals at Jacksonville. Here the rock is dried by rotary driers of an improved type, and stored in bins adjacent to the ship's side. This method proved extremely successful and economical, especially in the case of the Cummer Phosphate Company, where fuel was obtained as a by-product from its saw mills. The rock is stored in quantities at the terminals, which gives the added advantage of permitting prompt loading. There has always been a prejudice in connection with the use of the rotary driers in the handling of hard rock, but the method adopted by these companies fully demonstrated that driers of this type can be successfully and economically employed. The port of Jacksonville, owing to the establishment of these drying and storage plants, became one of the chief export terminals in Florida.

PEBBLE-PHOSPHATE DISTRICT

In the pebble-phosphate section the miners, through lack of coöperation, did not adopt the plan pursued by the hard-rock people in restricting their output, and practically all of the mines were run up to their maximum capacity. The market for pebble phosphate, however, fortunately increased so largely that the results were not as disastrous as might have been expected, though a heavy restriction in the output in this district would have been extremely advantageous under the circumstances.

There were no new plants constructed during 1909, the only new plant going into operation being that of the Coronet Phosphate Company, construction on which was begun about June, 1908. The Coronet and Medulla phosphate companies are producers of practically a new class of pebble, which is sold on an a solute minimum guarantee of 74 per cer phosphate of lime. Cargo shipmen from both of these plants show analyses running from 76 to 77 per cer phosphate of lime, which is practically the same class as the Florida, high-grad hard-rock phosphate. The demand f this class of phosphate is practically r stricted to foreign consumption.

A feature of interest in 1909 was t completion of the Seaboard export te minals, at Tampa, Fla. These termina are designed along the most approved e gineering lines, and excellent facilities a afforded for the prompt handling a despatch of phosphate. The elevators a constructed with storage bins of 3000 to capacity, so that a cargo for an ordina vessel can be held ready for its arriv The Seaboard Air Line also had co structed about 200 steel, hopper-bott cars, of 100,000 tons capacity, especia designed for handling pebble phospha the cars being arranged so that the ph phate may be directly loaded into the t This is a decided improvement over t old type of car, where the phosphate w loaded from the sides, and a consideral amount of hand manipulation was nec sary. The Seaboard is also extending lines further into the pebble district, a will unquestionably become an act competitor with the Atlantic Coast Li in the handling of this class of phospha

Sale was reported of the holdings the Prairie Pebble Phosphate Compa the largest producer in the pebble d trict, to the recently organized Intern tional Agricultural Corporation, which the reported owner of one of the larg potash mines in Germany, and wh also, it is claimed, controls the sulphur acid output of the Tennessee Cop Company at Copperhill, Tennessee.

There were no marked changes in general method for the mining and ha ling of pebble phosphate, except that more modern and uptodate plants int duced greater refinement in the prepa tion, and also installed the most appro and economical types of prime move In both the hard-rock and pebble distri every effort was made to lower prod tion cost, but owing to the constantly creasing depth of overburden to handled, the exhaustion of the m economically handled and richest dep its, higher fuel costs and increased d tances for transportation to central pla the cost of production must of neces constantly increase.

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*Consulting mining engineer, Lakeland,

The New York Curb Market in 1909

The trading in mining stocks on the New York Curb increased during 1909. According to official tables the total sales 1909 were 51,358,428 shares; in 1908, 41,946,351; in 1907, 32,420,517 shares.

The number of shares traded in during 1909 and the price on the first trading day and the high and low during the r and the price on the last trading day are given in accompanying table. †Means cents per share.

NEW YORK CURB STOCKS IN 1909.

		Open.	High.	Low.	Close.
100	Adams	5	5	5	5
5200	Alaska	⅜	†73	9	14
2250	Alpha Copper	5⅛	6⅜	5⅛	6⅜
25	Arcadian	3⅞	3⅞	3⅞	3⅞
3100	Argentum	†24½	28	10½	12
5250	Atlanta Goldfield	†18½	18½	10	10
10	Atlanta Copper	16⅜	16⅜	16⅜	16⅜
1800	Banner Mining	†9	11	9	10
5850	Barnes-King Devel	13-16	1⅛	⅝	⅞
2325	Beaver Cobalt	†22½	43	20	43
2220	Big Vein Copper	5⅛	11	5⅛	9⅛
1300	Bingham Central	¼	7-16	¼	⅜
1430	Blue Bell	†6	6	3	3¼
1500	Blue Bull	†15	15	10	12
2700	Bonanza Creek	3¼	3¼	2⅜	3
600	Boston Ely	2¾	4⅝	2¾	4⅝
7324	Boston Copper	17	23½	10½	22¼
7100	Boston Copper rights	5	8	3	8
1600	Boston Goldville	†84	100	84	100
9300	Bovard Cons	†10	12	4¼	5
9280	Braden Copper	4⅞	5 7-16	3¼	4 13-16
6705	Bradshaw M	†42	42	24	24
3000	Branch Mont. M. & M	†3	3	3	3
3956	Brit. Col. Copper	8½	9	5⅞	8⅛
6241	Buffalo Mines	3½	3½	2¾	3½
0696	Butte Coalition	26¾	33⅞	21½	28¾
100	Butte & London	†35	35	35	35
6955	Butte & New York	2¼	2½	½	1¾
250	Butte & Balaklala	15½	15½	15	15¼
160	Calumet & Ariz	101	101⅝	98	98
730	Canadian Mines	3¼	9¼	3¼	8¼
985	Carisa	†95	1.20	50	50
500	Chambers Ferland	†84	84	49	55
635	Chino Copper	8	13	6½	12½
400	Cobalt Central	†56	59½	23½	24½
400	Colonial Silver	½	1 1-16	¼	⅜
400	Colorado Dredging	†26	28	24	26
200	Combined M. & L	3	5½	2	3
450	Combination Frac	1.35	1.35	.37	.37
010	Commercial Mining	†47	53	47	51
400	Commodore G. M	†12	16	11	16
300	Con. Ariz. Smelt	†9	10	1	4½
125	Con. Ariz. Smelt., new	† ¾	3¼	⅝	3¼
900	Consolidate Va	1.65	1.80	1.65	1.80
365	C. O. D. Cons	†38	42	7	7½
10	Copper Range	78	81	78	81
100	Cracker Jack	†6	6	4	4
668	Crown Reserve	2.70	4.00	2.65	4.00
711	Cumberland-Ely	8⅜	10	6	9
200	Daly West	10	10	8½	8½
900	Davis-Daly Copper	3¼	7½	2⅝	4¾
500	Diamonfield B. B	†9	9	7½	7½
122	Dolores Limited	7	8	4¾	6¾
175	Dominion Copper	9-16	9-16	7	7
010	Douglas Copper	3	4¼	⅞	1⅜
435	East Butte	10⅜	16	10⅜	13½
075	El Rayo	3⅜	4	2	3
160	Ely Central	½	4¼	7-16	2
170	Ely Consolidated	†17	1.06¼	9	79
700	Ely Verdi	†25	28	24	25
150	Ely Witch	¼	⅜	¼	¼
400	Eureka Copper	5	9	2½	3
100	Eureka Copper pfd	37	38	34	35
050	First Nat. Copper	7¾	9⅜	4⅛	6 7-16
580	Florence	4 9-16	4⅝	2⅝	2⅝
200	Florence Ext	†9	9	9	9
600	Foster Cobalt	†51	56	32	32
000	French Am. Mining	1⅛	1⅛	1	1⅛
500	Furnace Creek Copper	†12	12	5	5
565	Gila Copper	6	11⅛	4	11
750	Giroux Mining	6¼	12¼	6¼	11
400	Gold Bar	1	1½	¼	1½
550	Gold Hill Con. w. i	1¾	2⅝	1¾	2
650	Gold Hill Copper	⅜	½	3-16	¼
700	Gold Reef M	†15	19	14	14
000	Golden Sceptre	1¼	1¼	1¼	1¼
090	Golden Star	6	6¼	4¼	4¾
067	Goldfield Cons	9	9 3-16	5⅝	7⅞
810	Goldfield Daisy	†70	84	18	23
150	Goldfield Daisy Lease	†5	10	1	3
100	Gould & Curry	37	37	37	37
100	Gowganda Cop. Cent	†19	19	19	19
150	Gowganda Exp	†28	60	24	60
250	Greene Cananca, new	12½	14⅜	8⅞	11¾
314	Greenw. Cop. M. & S	6½	14½	3½	12½
560	Guanajuato Con	2	2¾	1⅝	2
919	Guggenheim Exp	181	255	175	250
900	Harcuvar	†28	50	25	50
500	Hargraves	†61	63	35	50
110	Imperial Gold	3½	3⅝	3	3
780	Ind. Valley Consol	3⅝	3⅝	2¼	3⅛
200	Inter. Smelt. & Ref	130	170	120	150
244	Inspiration Copper	5	9 9-16	5	9 9-16
050	Jim Butler	†17	21	10	11
400	Jumbo Extension	23	24	11½	13
100	Justice	†17	17	17	17
200	Kewanas	†25	25	14	18
525	Kerr Lake	7⅝	9 5-16	7½	9⅛
755	King Edward	15-16	1½	⅜	¾
00	Lake Copper	35⅛	36⅜	35⅛	36⅜
1519021	La Rose Com	6¼	8½	4 3-16	2 11-16
456800	Little Florence	†11	13	1	2
9800	Majestic Copper	†98	1 3-16	¾	1
67659	Mason Valley	2½	3 5-16	1⅞	2 5-16
410	Mass. Con	9¾	9⅞	9⅛	9⅛
1000	Mex. Exp. & Min	7¼	7¼	5½	5¾
500	Mex. Gold & Silver	2	2	2	2
811920	Miami Copper	15¼	28	12⅜	28
89500	Miami Copper rights	9-16	1	¼	¾
74180	Micmac Gold Min	2⅛	2⅛	½	½
283500	Mines Co. of Amer	15-16	1	⅜	½
182040	McKinley-Darragh	1.01	1.09	.80	.89
4200	Moose Horn M	50	52	49	49
250	Mohawk Min	63	63	62½	62½
4600	Mont. Mt	8	12	8	11
1365315	Montezuma of C. R	†17	40	2	7
400	Montana Tonopah	†73	73	71	71
12405	Montana Corbin	3¾	4¼	3½	3⅞
48040	Mont. Shoshone, new	1 5-16	2 5-16	15-16	1⅜
10800	Mountain Flower	†13	18	13	18
13720	National Ore	6	7½	6	7
972635	Nevada Cons	19¼	30	16⅜	27
775	Nevada Hills	1½	1 9-16	1⅛	1⅛
7200	Nevada National	8	17	8	17
159575	Nevada Smelting	15-16	1⅝	⅝	1⅛
65350	Nevada Victor	1⅛	2¼	1⅛	1⅜
495340	Nev. Utah M. & S	3	3⅝	1	1 9-16
51165	Newhouse	2½	4¼	2⅜	3½
4400	Nickel Gold	†10	10	10	10
347530	Nipissing Mines	10	13¼	9⅛	10¼
2000	North Cobalt	†15	15	15	15
48310	North Butte Exp	†6	14¼	4	5
6765	North Butte Copper	78	78	51	51
4100	Nova Scotia	59	74½	52	62⅜
5500	N. Y. Gold Leasing	†9	9	7	9
1449286	Ohio Copper	5⅝	8¾	4	5⅞
10125	Old Hundred	11-16	11-16	⅜	½
1400	Ophir	1.80	2.30	1.80	2.30
28925	Orphan Copper	1 3-16	1½	½	½
842600	Otisse	†54	57	19	20½
146600	Pacific Smelters	1	2	1	1¾
80	Parrot Mining	34¾	34¾	33⅝	33⅝
600	Peterson Lake	†31	27	27	27
2000	Penn Wyoming	†12	12	12	12
16900	Poldavia M. Co	†61	66	36	65
100	Potosi	†82	82	82	82
180735	Precious Metals	2¾	3	1¼	1⅜
43800	Rawhide Mining	†23	25	15	18
5311720	Rawhide Coalition	†47	73	17	19
491330	Rawhide Queen	†30	46	20	28
449120	Ray Con	7⅝	27⅜	7½	26⅝
9300	Ray Con. rights	1¼	1¼	¾	1
1019700	Ray Central	2⅜	4	2	3 7-16
23800	Red Hill	†18½	18½	8	8
7450	Red Top Ex	†12	12	11	11
366200	Red Top Leasing	†12	13½	1¼	1¼
84700	San Carlo	1.42	1.42	1.30	1.35
45000	San Toy	†33	52	22	41
164700	Searchlight	1.22	.10½	1.22	.10½
60	Shannon Copper	14	14	14	14
20	Shannon Copper	14	14	14	14
1100	Siera Con	5¾	5¾	5⅝	5⅝
350400	Silver Leaf	†13	21½	12	13½
18575	Silver Limited	†60	60	40	20
383300	Silver Queen	1.00	1.00	.20	.21
15000	Southwestern Dev	†50	90	23	38
32650	South Utah M. & S	3⅝	4 9-16	3⅝	4¼
10350	Starlight M. & S. D	1.00	1.03	1.00	1.01
100520	Stewart Mining	½	1⅛	7-16	⅞
50	Superior & Boston	16¾	16¾	16¾	16¾
32906	Superior & Pittsburg	17¾	18½	12¾	16⅛
11100	Temiskaming	1.76	1.76	.87½	.90
106960	Tenabo M. & S	1	2⅞	1	1 15-16
111860	The R. Exploration	1⅝	2½	⅛	⅜
2750	Tintic	4⅛	4⅛	2⅛	2⅜
11974	Tonopah Belmont	†76	1¼	76	13-16
132445	Tonopah Ex	†55	80	45	72
72357	Tonopah M. of Nev	6⅜	8	5¾	7 9-16
467100	Tramps Cons	9½†	11	4	4½
167055	Tri-Bullion	⅞	1¼	9-16	1
6126	Trinity Copper	16½	16½	9¾	9¾
35800	Tularosa	1¼	1⅝	1¼	1½
119225	Tuolumne Copper	1 13-16	4⅝	1⅛	3⅜
2090380	Union Mines	⅝	4⅜	5-16	2
397922	Union Pacific Cobalt	†17	21	9	12
693796	United Copper	14¾	16¼	7	8¼
8308	United Copper pfd	30	37	21	21
486886	United Rico	†18	32	10	25
2804	Utah Apex	6	6½	4⅞	5⅛
323665	Utah C. & G. S	.93	1.27	.92	1.06¼
320	Utah Con	39½	42⅜	38¼	42⅜
5600	Utah Copper rights	⅞	1	¾	⅞
44700	Venture	†27	27	24	24
1400	White Knob	23	24	12	14
2305	White Knob prd	½	1	½	1
301900	Willets Silver Mine	†30	38	11½	12½
317560	W. Va. Wyo. Cop	1⅜	2¼	1	2 3-16
3350	Yankee Girl	3¾	4¼	3¾	4
168700	Yucca Cyan. M. & M	†23	23	6	16
303282	Yukon Gold	4 9-16	6	4	4 15-16

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

John S. Oglesby, of Dallas, Texas, has been recently in Yerington, Nev., and San Francisco.

Leo Von Rosenberg, of New York, has gone on an examination trip to Peru, South America.

Harry F. Lefevre has just finished an examination of the Abengarez goldfields of Costa Rica.

Elton W. Walker, of Detroit, Mich., is examining some mines in the Joplin district in Missouri.

R. S. Burdette is examining the mines of the Utah Lead Mining Company at Montello, Nevada.

Albert J. Bone is assistant smelter superintendent for the Tennessee Copper Company at Copperhill, Tennessee.

W. D. Healy, formerly of Detroit, Mich., has been engaged as manager by the Union Pacific Cobalt Company.

I. Wayne Von Leer, of New York, has become manager of the Arizona United Mining Company at Johnson, Arizona.

George E. Sanders has been appointed receiver of the Golden Drift Mining Company in Josephine county, Oregon.

W. B. Murdock, of Mexico City, is in New York on his way to Europe in connection with a Mexican mining-tunnel deal.

A. J. Anderson has been appointed superintendent of the Santa Barbara mine of the American Smelters' Security Company.

Quincy A. Shaw, vice-president of the Calumet & Hecla Company, has returned to Boston from a visit to the Lake Superior district.

Andrew McFarland, of Colorado, has taken charge as general superintendent of the Lucia Mining Company, Gabriel, Durango, Mexico.

A. A. Hassan, consulting engineer, Cobalt, Ont., has been in New York conferring with some capitalists regarding the new Porcupine goldfields north of Cobalt.

Martin J. Heller has returned to New York, having made a visit to the Consolidated Arizona Smelting Company plant, Humboldt, Ariz., the affairs of which he is managing.

Rowland Feilding has been taken into partnership by Hooper & Speak, of London. The firm is now Hooper, Speak & Feilding, and the offices have been removed to London Wall building, London.

Selwyn Goldstein, an Australian mining engineer, for some time engaged in consulting work in Mexico, has been appointed general manager of the English-owned Tominil mine in Durango, near Guadalupe de las Reyes.

Dr. Henry M. Payne recently resigned his position as professor of mining engineering at the University of West Virginia, and has been appointed field manager of the Hydraulic Mining Cartridge Company, of 42 Broadway, New York.

M. E. MacDonald, president of the Zacatecas Mining and Metallurgical Company, left New York Jan. 6 for an extended business trip to Mexico, where he is now engaged in the erection of a 150-ton cyanide plant at the mines of the company at Zacatecas.

S. F. Bretherton has just returned to San Francisco from Mazatlan, Mexico. While in Mexico he examined several mining properties and made a successful smelting campaign for the recovery of bismuth, gold and silver for the Rey del Bismuto Company, near Culiacan.

Dr. J. W. Robertson has resigned his position as president of Macdonald College, McGill University, Montreal, and leaves to visit Europe, Australia, South Africa and India in connection with the work of the Canadian commission for the conservation of natural resources.

George G. Vivian has severed his Utah mining connections, and has returned to Colorado, where on Jan. 1 he took charge as manager of the Golden smelter of the North American Smelter and Mines Company. He is now engaged in supervising improvements and repairs at the plant.

C. M. Eye has resigned as manager of the Benguet Consolidated Mining Company at Baguio, Philippine islands, to take charge of the Colorado Mining Company at Aroroy, in the island of Masbate. His successor with the Benguet company is Amos W. Cole, recently with the Oriental Mining Company in Korea.

A. B. Emery has been appointed assistant general manager of the Southern Division of Mexico mines of the American Smelters' Securities Company. R. E. Adams succeeds Mr. Emery as superintendent of the Velardeña district. W. M. Drury has been appointed assistant general manager of the Northern Division of Mexico mines of the company.

John B. Farish, widely known as a mining engineer of the highest standing, has resumed the general practice of his profession and is prepared to examine and report on gold, silver, copper, lead and zinc mines and metallurgical processes; also to supervise the development and operation of properties of that class. He has associated with him his son, George E. Farish, a graduate of Columbia University, of some years' experience in the field, who is also prepared to contract for his personal services along the above lines. Their offices are at 25 Broad street, New York, and Colorado building, Denver, Colorado.

Obituary

B. W. Clair, of Douglas, Ariz., president of the Pawnee Mining Company, was shot and killed Jan. 2, while at the mine in the Chircahua mountains, by the owner of an adjoining claim.

Thomas G. McCutcheon, a member of the old firm of Lindsay & McCutcheon, operating the Star Iron and Steel Works at Pittsburg, now owned and operated by the Carnegie Steel Company, died on Dec. 26, aged 46 years.

Frank H. Jermyn, of Scranton, Penn., was run over and killed by a street car in San Francisco, Jan. 3. He was 53 years old, and was a large owner of anthracite mining property, being a son of the late John B. Jermyn.

Frank B. Smith, president of the Crucible Steel Company of America, dropped dead at his home at Pittsburg, on Dec. 30. He was 50 years old and had lived in Pittsburg all his life, and had been engaged in the steel business from an early age.

Arthur Brock died at Philadelphia, Dec. 24. Mr. Brock, who was prominent in the iron and steel industries, was a director of the Pennsylvania Steel Company and chairman of the board of directors of the American Iron and Stee Manufacturing Company. He was 59 years old.

Henry Curtiss Elliott, of Chicago, and H. Y. Greer, of Seattle, Wash., were killed by a snowslide at the mines of the Hubbard-Elliott Copper Mines Development Company, near Tonsina Alaska, Dec. 31. Mr. Elliott had been for years largely interested in copper mines in the Lake Superior district and in the West. Mr. Greer was a mining engineer and well known in Washington and Oregon.

Ottokar Hofmann, the eminent metallurgist, whose work is known all over the world, died at Kansas City, Mo., Dec 24, aged 66 years. His last work was done in Mexico, in 1907-8, and the hardships he encountered there injured his health seriously. About six months ago he broke down completely, and had since been confined to his house. We hope to publish a fitting account of his life and work in our next issue.

Societies and Technical Schools

Mining Institute of Scranton—This institute wound up a successful year on the evening of Dec. 23 by holding it annual banquet at Scranton, Penn., with a large attendance. The speakers wer Superintendent Phillips, of the Lackawanna, Superintendent Jennings, of th Pennsylvania Coal Company, Prof. A. H Welles, a chemist who is interested i mine gases and Superintendent William H. Allen, of the Scranton Coal Company.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Jan. 8—In so far as indicated by the ınk clearings, California shows a ·markable recovery from fire and panic. he San Francisco bank clearings for)09 amount to $1,970,248,000, only 162,535,000 less than in the banner :ar of 1907.

According to the California Stock and il Exchange, the dividends of the Cali- rnia oil companies listed on that ex- ıange amounted to about $500,000 in ecember, 1909, and this is said to be e record monthly showing for these mpanies. Unprecedented activity for 10 in the oilfields is anticipated. The quirements of the Standard, Associated d Union companies for the coming ar are estimated at 65,000,000 bbl. the Coalinga field, the Valley Oil mpany is reported to have struck oil 3270 ft. on the flat, a mile from the arest proved well. This if true means considerable extension of the oilfields that direction. In the North Midway, : new Santa Fé well is producing 2000 l. daily. The Monte Cristo Company, erating in the Kern and Midway fields, having domestic troubles over the h salary ($20,000) paid to Henry Ach, attorney, for his services as presi- ıt. The governing board claim that s also covers legal services, but as re is no litigation, some of the stock- ders think the amount excessive. Of 3,621,062 acres of supposed oil land hdrawn by the Government, pending passage of suitable laws by Con- ss for acquiring oil lands, on Dec. 1909, 378,456 acres were restored to public domain by order of the Secre- of the Interior.

he main coal supply of San Francisco ıes from Australia. As there is now hortage from that source, due to a ke, a fleet of vessels has been patched to Moji, Japan, for an addi- al supply. One of these steamers, River Clyde, consigned to J. J. re & Co., is *en route* here. The Japan l is a semi-bituminous steam coal 50 per cent. of slack and inferior he Australian coal. With the greater l demand in British Columbia, only ıt 8000 tons of Nanaimo coal of the stern Fuel Company per month now ves at this harbor. The opening up he Alaskan coalfields should mean h for California, as this coal is of erior grade and the distance not so t as to Australia.

The Plumas-Eureka gold quartz mine is reported sold to W. S. Prosky and George Wendell of Nevada for $225,000 cash. This famous mine was acquired by an incorporated company (The Sierra Buttes Company) about 1851, and this company was the first mining incorporation in California. Since that date, the mine was worked nearly continuously for 40 years, through tunnels, and the production is reported to have been in excess of $12,000,000. It is believed that much ore exists below the old tunnel levels. An interesting event in the history of this mine, was the discovery many years ago under the floor of the assay office of a number of small bars of bullion (to the value of $26,000), marked with a stamp that was used only in the early days of its operation, and presumably secreted there by one of the officials of that time. The road along Jamison creek to this property exhibited an interesting sight in its palmy days, when a long series of arrastras were working over the slimes. At one time, it is recorded that 30 arrastras were in operation.

In the cañon of the north fork of the Yuba river in Sierra county, there are many quartz veins that deserve prospecting, but this region is practically cut off from sources of mining supplies for four months of the year. There is now a movement on foot to build a road with an all-water grade along the Yuba river from Downieville, which has an altitude of only 2900 ft., to Marysville. The building of this road should rejuvenate the mining industries of the county, as it would result in cheaper freight rates and could be kept open during the entire year.

Denver

Jan. 11—Just outside the town of Ouray is a remarkable blanket deposit of ore known as the Mineral Farm, discovered in 1875 by Gus Begole, one of the most successful prospectors in the early days of the San Juan region, and who also located the great Veta Madre vein at Howardsville, near Silverton. The Mineral Farm was so rich that the first ore mined by Begole was shipped to Alamosa by bull teams 150 miles, and thence by the Denver & Rio Grande to a Denver smeltery, the cost of transportation being from $40 to $50 per ton, but the ore was worth from $300 to $600 per ton at the then high price of silver, which was the chief metal in the ore. This property ultimately passed into the hands of R. J. Lucas, of St. Louis, who stopped work when the price of the metals dropped two years ago, after having built a mill on it and operated it with varying success. Although the vein is continuous and in places 20 ft. thick, one of the chief troubles has been that the richest ore is gray copper in a barite gange, difficult to handle and requiring skilful and scientific management, which up to date the mine has not had. The whole property, generally speaking, is a replacement of limestone with ore, the matrix of which is barite and silica and the contained minerals argentiferous gray copper associated with galena and some chalcopyrite. Some mining men of Ouray have now taken up 17 claims on the southwest trend of the Mineral Farm deposit and are putting down a two-compartment shaft $4\frac{1}{2}$x9 ft. in the clear to reach the ore stratum. It is down 140 ft., and it is believed 100 ft. more will reach the deposit. The projectors of this enterprise are five residents of Ouray, who are putting in their own time and money, and showing the kind of mining faith and pluck that makes for success. The name of the group is the Legal Tender mines, and the manager and part owner is I. A. Martin, for years superintendent of the revenue and later of the American Nettie.

The San Antonio mine of Red mountain, between Ouray and Silverton, a promising copper mine of that once famous region, has shipped 266 cars of ore of an average of 11 per cent. copper, 8 per cent. lead, 7 oz. silver and $2 gold per ton. The ore is enargite and the width of this grade is from 4 to 8 ft.; it is now developed at a depth of 500 ft. below the surface by a tunnel which reached the ore in July, 1909. Operations were suspended Dec. 10 owing to the fact that the Silverton railway was snowed in for the winter and the ore could not be sent to the Durango smeltery. The mine is fully equipped and will be a heavy shipper as soon as the railway is opened in the spring. M. T. Chestnut, of Denver, is manager.

Leadville, having thoroughly explored the blue limestone, has recently been paying more attention to the white limestone. The immense ore deposits discovered in this lower limestone on Iron hill have created widespread attention. There is now persistent rumor that fissures are being worked in the quartzite with highly profitable results and from various quarters one hears of the development of fissure veins.

The gold output of the Cripple Creek district for December is estimated at $1,365,000, and it is said that there are more leasers at work there today than at any previous time in the history of the camp. With the greatly reduced treatment charges, approaching completion of the deep drainage tunnel and steady production of rich ore from the lowest levels of many of the deep mines a very optimistic feeling exists and this is increasing daily, with the outlook for 1910 exceptionally favorable.

It is pleasing to note that a Leadville judge has decided in favor of the lessees on the War Dance mine of Central City, in which a sensational strike of gold ore was made last year. It was a case where the owners had utterly neglected the mine since 1881, but when, under a bond and lease to some adventurous spirits it developed rich ore, some surviving original owners promptly bobbed up and tried to take it away from the lessees. The court properly ruled that the stockholders who had failed to pay any attention to the property or the company's affairs since '81, and made no move until the lessees had found ore in paying quantities, had been guilty of negligence, and had no redress. Their complaint was dismissed, and the costs assessed against them.

News comes from Burlington that a gold-bearing sand has been found on the farm of M. B. Hendricks, of Seibert, a station on the Rock Island railway. Samples are stated to carry $14 to $100 per ton in gold, and the owner, with nine other men, have put up $10,000 to work it under the supervision of three practical miners who have been engaged for that purpose. It is a red sand, and there is said to be an immense deposit of it.

Butte

The JOURNAL's correspondent at Butte, under date of Jan. 10 sends the following telegram concerning the North Butte situation:

"Management refuses information. Best obtainable is as follows: Edith May vein, waste on 2200 and under 6 per cent. on 2000 level. Jessie vein on 2200, waste in east drift and under 6 per cent. in West drift. Jessie vein not cut on 2000 level."

Jan. 7—To an outsider it is a natural inference in view of the continued silence from the responsible heads of the North Butte Mining Company, that there is something in the allegations made by the Tuolumne company in regard to the Jessie vein on which the North Butte Company has developed most of its ore and from which it has extracted considerable ore in the past few years. This Jessie vein outcrops on the Jessie claim and has been opened up by the Speculator shaft and by a tunnel to 2200 ft. from the apex, vertically, and ore has been taken out in the upper stopes. It has been claimed that good ore has been proved at 1400 ft. and at 1600 ft., and that considerable development has been done on the vein. At 2200 ft. it is rumored that the vein is lean and that the conditions there do not look promising. The Tuolumne company has opened from its shaft by a short crosscut drive a vein at 1400 ft. in its shaft, and has been taking ore from it. It is now claimed that this vein opened on the Tuolumne is the Jessie vein, which at the 1200-ft. point divides, and one branch extends to the surface, forming the South Jessie vein, which apexes, throughout most of its course in the length of a claim in territory belonging to the Tuolumne company. Inasmuch as the Tuolumne location is prior to the Jessie location this, under well substantiated decisions will give the Tuolumne the right to the branch apexing in its property and also to the part of the vein which is below the split or juncture and which is supposed to be a continuation of the dip of the Jessie vein proper, which is being worked by the North Butte company. These statements come from the Tuolumne company, and consequently should not be given weight as if they were from an independent source or from the North Butte company. Presumably there are other facts related to the condition which are not available now. But the facts as far as presented tend to excite the suspicion that the future of the North Butte company is doubtful, and if the facts presented are not true then the North Butte company ought to deny them.

The critical situation involving a threatened sympathetic strike of the miners' and smeltermen's unions growing out of the failure to adjust the switchmen's strike on the railroads seems to have passed. The Butte unions faced by the ultimatum of complete suspension took an attitude of hands off and the smeltermen's union asked for the suspension of the order to give them time to try to adjust the local questions involved in the railroad strike. All of the plants were planning to resume and continue in full activity when the extreme weather complicated the situation by endangering the coal supply for the smelteries. The critical state of affairs involved in this seems to have passed with the slight improvement in the weather.

The official announcement of the purchase by the Butte & Superior company of the property of the Butte-Milwaukee company follows continued rumors that such purchase was contemplated. The purchase was consummated by the Butte & Superior acquiring control of a majority of the Butte-Milwaukee stock. The claims acquired are the Colonel Sellers, Bird, Florence and Pollock, all of which are a short distance north of the Butte & Superior group. On the Colonel Sellers claim there is a 730-ft. shaft. It is thought that a crosscut will be run from the Butte & Superior's Black Rock shaft to the Colonel Sellers shaft, a distance of about 1200 ft. and a raise then run to the Colonel Sellers shaft, making it 1600 ft. deep. Since the Colonel Sellers is one of the best shafts in the camp and in solid ground it is possible that it may finally be used as the main hoisting shaft for the company.

During 1909 year on the Butte Mining Stock exchange 1,497,950 shares of stock were traded in, having a total value of $1,332,733.56. The stock of 45 different companies was traded in, Tuolumne leading with 194,122 shares.

Scranton, Penn.

Jan. 8—Employees of the Delaware & Hudson Company learned when they received their last pay envelops, that in future they must consider themselves not as employees of the coal department of the Delaware & Hudson Company, but of the Delaware & Hudson Coal Company. The change has in itself no practical import to the men engaged in the mines. The Delaware, Lackawanna & Western railroad some time ago adopted the same plan in order to meet the requirements of the Elkins law. The change, however, from the public standpoint is of considerable importance, for it means that the mining company and the carrying company are two distinct corporations for legal and administrative purposes.

The neglect of the Delaware & Hudson Coal Company to pay its taxes on its coal lands in Carbondale township, involved the company in a peculiar lawsuit, which might under easily conceivable circumstances have brought about serious consequences. When taxes are not paid, it is the custom of the county commissioners in Lackawanna county to sell the property on which the unpaid taxes have accumulated. After the sale a deed for the land or other property is handed to the purchaser and he becomes the legal owner. In this case, the taxes not being paid on this land, it was sold in the ordinary course by the county commissioners and two men living in the locality bought it in. A number of men in this city, hearing of the sale and purchase of coal land, worth, it is estimated, millions of dollars, purchased the land from the two men who bought it in at the county commissioners' sale. Having done so, they proceeded to mine the coal which lay beneath. The Delaware & Hudson officials then became alive to the situation and brought suit against the men who were mining the coal, on the ground that the coal beneath the land belonged to the company, and that it formed no part of the property which was assessed. The court took this view of the case, and a jury awarded the company the nominal damages of $2. A motion to grant a new trial was denied by the court. The surface land is of little or no value in itself.

Last week President Benjamin McEnnaney, of the miners' union, made an application to the Luzerne county court, that all the officers of the mine examining boards included in their jurisdiction should be superseded on the ground that they were corrupt and incompetent, partial and ignorant of the elementary rudiments of mining; and furthermore, that they have flooded the county with false miners' certificates. He also made another application to the effect that the examining boards that examine candidates for inspectorships be also dismissed or superseded, because, he alleged, these examiners only pass as competent a certain number of men for each district, and that once these men receive the nomination of their respective political parties they encounter and can encounter, no opposition at the polls. The judges listened to the complaint and promised that it should receive their earnest attention. President McEnnaney has followed this step by having warrants sworn out for a few of the examiners, whom he alleges were instrumental in issuing false certificates. It is understood that a number of operators sympathize with this complaint.

Birmingham

Jan. 11—The old rolling mills in Birmingham, property of the Republic Iron and Steel Company, are being dismantled; much of the material will be used in equipping some smaller mills and much will find its way to the scrap pile. The dismantling of these mills removes the oldest mills in the Birmingham district, an industry that attracted much attention. Not until later years when the steel plant came into existence did an institution have such an important connection with the transactions of a community. The plant was erected in 1880. There were additions made from time to time. Finally this, as well as other properties in this district, fell into the hands of the Republic company. When the depression came on in 1907 it became certain that Birmingham mills would never be reopened. The site of the mills is valuable. The Republic company also owns the Gate City rolling mills in a suburb of Birmingham, but these mills are in good shape and can be operated profitably.

In making contracts for the new development in the Birmingham district by the Tennessee Coal, Iron and Railroad Company, time stipulations are being attached to every contract. This means that the plants must be erected at the earliest possible moment.

Cobalt

Jan. 12—The developments for December are only second to those of June, which holds the record for 1909. For the last month of the year 21 mines shipped 2859.22 tons. It is interesting to note that in spite of the fact that the shipments for 1909 were only about 4000 tons in advance of the previous year, the silver production increased about 4,000,000 oz. Up to date the shipments for the years are as follows: Previous to 1908, 23,182 tons; for 1908, 25,362; for 1909, 29,865 tons. Regarding the outside districts, South Lorraine is the only one to have made any important representation. The output for these districts for 1909 is: South Lorraine, 157 tons; Maple Mountain, 6; Gowganda, 6. For the year 1910 South Lorraine will play a much more important part than it has formerly, as this very promising field has not, until lately, come in for the attention it deserves. Now, however, every day men are going in to look over properties, and several important deals have been made. A new road is being built into this section that will shorten the distance by about 10 miles and will materially reduce the cost of freighting. Formerly the road went round by Lake Temiskaming and was available only in the winter time, but the new road can be traveled all the year round.

Toronto

Jan. 11—Mining interest is at present largely centered in the Porcupine Lake gold area, where in spite of the season considerable assessment work is being carried on and many heavy transactions in claims are reported. A. M. Bilsky has purchased three claims in the southwest corner of Tisdale township, adjoining the Hallinger and Miller claims recently bought by M. J. O'Brien. The Timmins interests are stated to have bought four other claims in this neighborhood for $300,000.

Although interest is being diverted from Gowganda to Porcupine, there will be considerable work done in the former district during the winter, and with better roads and lower freight rates, the prospects of the properties should be considerably improved. It is unfortunate, however, at this time that the Bartlett mine should have made such a poor showing. The wide publicity given to this company last year is responsible to a large extent for the unfortunate boom that resulted. Although the property had good surface showings the way it was handled could hardly fail to place it in a poor financial position. Before even a shaft was started a plant that cost altogether about $125,000 was installed, and money was spent like water. The underground development uptodate has not been productive of good results and now it is said that the company is financially embarrassed and if more money is not forthcoming the property will probably be closed.

The amendments to the Quebec mining law recently enacted have been officially declared in force from Jan. 1, all outstanding prospecting licenses issued under the old law expiring Dec. 31. The new law provides for free prospecting on all lands where the mines belong to the Crown. When a discovery is made all that is necessary is to have it registered at the Bureau of Mines, Quebec, provided the prospector has previously taken out a miner's certificate. It is anticipated that this change in the law will do much to stimulate the mining industry in Quebec.

Mexico

Jan. 11—The zinc miners of northern Mexico are confronted with more difficulty. On Dec. 23 the National Railways announced a new freight rate, by which the freight to El Paso from Chihuahua points over the National lines was raised 2.16 pesos per metric ton, making the total rate 5.94 pesos for ore worth under 25 pesos per ton, and at the same time the railroad lowered the rate to Tampico 1.08 pesos per ton, making the rate from Chihuahua points to Tampico 9.21 pesos. There has been a general raise of the rates on zinc ores on the National lines going north and a slight reduction on the same lines going south. It looks as though this action would affect the restoration of shipment of zinc ore to the United States, which has followed from the increased spelter prices offered in the United States since the enactment of the new tariff. The zinc mines of northern Mexico have recently resumed shipments to the United States to an extent almost equal to that prior to the tariff. It is said that unless the steamship companies can make special rates the shipment of ore, particularly from interior points at Chihuahua, will not be possible, even with the reduced railroad rates to the gulf ports. This adjustment of the railroad rates apparently adverse to the zinc-mining interests of northern Mexico has caused considerable complaint.

A prominent authority on mining law in Mexico says that any criticisms at the present time on the new law are untimely as nobody knows how the law will really work, until the mining regulations and the police regulations for mining have been issued as provided in the law. The law throws a great deal of power into the hands of the Secretary of Fomento and the tenor of the regulations which will come from this source must be determined before the scope and effect of the law can be discussed.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY·
INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

Construction of a power plant, opening up of jade and copper mines on the Kobuk river, and development of bituminous coalbeds at Cape Lisburn, are plans which will be carried into effect next summer in Alaska by a syndicate of English capitalists headed by Colonel L. Stuart-Weatherley and Lord Fox Ramsay. The electrical plant at Nome will be enlarged at an initial cost of about $500,000.

Bonanza—This mine, at Cordova, is being worked and will ship ore as soon as the railroad is ready. R. F. McClellan has charge.

Arizona

COCHISE COUNTY

Copper Queen—The Douglas smeltery produced in December 9,504,500 lb. of copper.

GILA COUNTY

Miami—The No. 4 shaft will be sunk 700 ft. from the present depth of 450 ft. This work will be started as soon as the double-drum hoist has been installed, and then one compartment will be used continuously for the shaft sinking, while the other is being used for the hoisting of material from the levels. Three Star churn drills have arrived at the property, but only one has started drilling, as the tools for the work have not been received yet. B. Britton Gottsberger is general manager.

New Keystone—This company, under management of the General Development Company, is said now to show about 2,000,000 tons of ore averaging about 2¼ per cent. copper. The mine is near the Miami, is on the same formation of schist, and like the Miami is being developed by drifts rather than by drill holes.

Old Dominion—The December output was 2,400,000 lb. of blister copper.

Arizona Commercial—The smeltery is turning out 20 tons of 50 per cent. matte daily. The ore supply comes from the fifth and sixth levels. Two Prescott pumps on the sixth level of the Eureka shaft are handling about 2,200,000 gal. each 24 hours. A third 1000-gal. Prescott pump is being installed on the seventh level where crosscutting to the Black Hawk vein will soon be commenced.

Superior & Boston—The McGaw shaft, down to the sixth level, will soon be sunk deeper. The management plans to begin crosscutting from the drift from the Great Eastern winze to connect with the crosscut now driven 125 ft. southwest from the McGaw on the sixth level, thus hastening the connection of the McGaw and Great Eastern workings at a depth of 600 ft. This connection will make it possible to take out all ore and waste from the mine through the McGaw shaft. Work in the Gardner shaft is also progressing on the 400-ft. level.

GRAHAM COUNTY

Detroit—The December output was 1,831,700 lb. of copper. The company reports output for December as 1,498,000 lb. blister copper.

Morenci-Missabe—This company is sinking on the Campbell and Surprise claims, and has now reached 120 ft. in depth with good ore showing.

Shannon—Important underground developments have taken place in the mine below what has been considered the lowest level of the main orebody. A winze has opened up 22 ft. of sulphide ore of good grade, and at 60 ft. a crosscut from the bottom has opened up a large body of high-grade ore.

PIMA COUNTY

Imperial—The December output was 800,000 lb. of copper.

SANTA CRUZ COUNTY

A number of strikes are reported in the Tumacacori, Atascosa, San Cayetano ranges and extreme western edge of the Santa Rita range. Prospecting is being actively done by the building of the new railroad known locally as the Twin Buttes extension from Tucson up the Santa Cruz river to Nogales. The road has about 25 miles yet to construct and on account of bridges over tributaries of the river this may take three months. The road will form part of the through route to Mexico, and will be the main line of the Southern Pacific south. It is believed that the opening of this line will stimulate mining work in a large tract of country which has not been inviting hitherto owing to difficulties of transportation.

Madera—This company, working claims in the Madera cañon, north of the Old Baldy, in the Santa Rita mountains, in doing development work, has crosscut a huge vein, 105 ft. of which assays $6 to $20 gold. There is an iron-stained streak 2 ft. in width of higher grade than the rest. This company has been working 15 or 20 men for a year or more, but made this crosscut in the vein at about 50 ft. under ground. The company is composed of Los Angeles men. The property is not far from the old placer camp of Greaterville.

Arizona-Anaconda—The company will sink a shaft on its claims in Temporal gulch, three miles south of Old Baldy; P. Bruner, manager. The company is erecting buildings and hauling in machinery.

Augusta—The company has caught up the surplus of ore on the dump and has suspended shipments for the present. The plan is to sink the main shaft 200 ft. farther and drift under the ore on the 400-ft. level for additional stoping ground. This is sometimes referred to as the Hosey or Pinal camp. William Kemp is manager.

Arizona - Pittsburg — This company, working on the same zone as above company is crosscutting to strike underneath a known orebody and when the vein is reached will drift toward the shaft which is now down 175 ft. Charles R. Reno, of Colorado, is in charge.

Flux—This mine, in the Patagonia mountains, owned by R. R. Richardson, is showing an important zinc deposit. In the latest work 11 ft. of ore has been exposed.

Ivanhoe—This mine, James Johnson, manager, is being financed by Eastern men, and $200,000 will be expended. A new road has been built connecting with the Salero road and machinery will be bought for the work. This group of claims has paid for all development work out of its shipped ore, which is copper carrying silver and some gold. The mine is in Temporal gulch.

California

AMADOR COUNTY

Garibaldi—Work on this placer property at Volcano has been resumed, but instead of hydraulicking, the ordinary sluicing process has been adopted.

Mitchell—Machinery has been shipped to this mine so as to develop it to greater depth.

BUTTE COUNTY

Double Eagle—This mine, at Berdan, has been put out of business for the present because someone put 76 sticks of giant powder on the boiler to thaw out and the resultant explosion wrecked things badly.

Calaveras County

Around the old district of Mokelumne hill, mining affairs are reviving to some extent. The indebtedness of the Boston mine has been paid off and on the Ariel a contract has been let to run a 400-ft. tunnel. At the Kinross a ditch is being prepared to furnish water.

Del Norte County

Shipments of copper ore are again being made from the Low Divide mines to smelteries in Washington for testing purposes. These mines were the first ever worked in California, ore from them having been shipped to Swansea, Wales, in the early '50's. This was found to be unprofitable and the mines have been closed since. Not long ago a group of these mines was purchased by Utah men who have been prospecting them and making small shipments.

Monumental—This quartz mine is about to be operated again.

Eldorado County

Deer Valley—H. N. Burger, of Placerville, has resumed operations on this mine with H. H. Fisk in charge; a small mill run by a gasolene engine will be built.

Golden Cup—Joy & Chester have arranged to open this mine at Greenwood and necessary repairs are being made.

Inyo County

Bishop Creek—At this property, on Bishop creek, work has been stopped until spring, snowslides interfering with operations.

New Coso—This company is shipping ore from the Lucky Jim mine at Darwin.

Kern County

Blue Mountain—A carload of mining machinery has been shipped to this mine near Delano and it will be reopening under management of J. N. Waughaman.

Mariposa County

In Quartzburg district the Stoddard interests of New York have a bond on the Washington and all the Moses Rogers claims, and are preparing to begin operations.

Red Banks—These mines were recently purchased by a French syndicate and a large crew of men has been set at work.

D. E. Lutes Company—This new company is opening its property at Bear Valley. The mine was formerly called the Mahoney.

Mountain King—At this mine eight miles from Bagby, plans are being made to enlarge the 10-stamp mill.

Champion—Wagner, Mentzer & Ray have commenced work on this mine at Coulterville.

Tyro—McClure Gregory is opening the old works in this mine at Coulterville and the mill is running on ore from the dump.

Number Five—At this company's mine near Hornitos, C. T. Latourneau, superintendent, there is installed an electric hoist and other machinery. The shaft is to be sunk deeper and orebodies crosscut.

Panoche—At this mine on Panoche mountain there is some activity as men are preparing to work it during this winter.

Hite Cove—At this mine near El Portal, John Mason, superintendent, a large force of miners is employed. An aërial tramway is taking ore for 20 stamps. The water-power plant will be enlarged and the capacity of the mill doubled. The shaft will be sunk from the 1200 to the 1500 level.

Modoc County

There are now about eight leasing crews at work in the Hoag district getting out ore ready for the mill in the spring. A strike of importance has been made in the Evening Star group owned by Broadas, Dunnuvan & Shartwell but under lease for two years.

Mono County

Crystal Lake—This mining company at Lundy has suspended operations for a time for reasons not made public.

Masonic Mountain—A 4-ft. vein carrying gold and copper has been found in property at Masonic.

Parrott—This mine at Lundy has been purchased by J. C. McCormick. The property adjoins the May Lundy mine and there are ten known veins running through the 200 acres. There is a good water-power site and plenty of timber.

Nevada County

Grover-Murphy—At this mine, new machinery has been installed in order to carry on sinking.

Golden State—This mine at Chicago Park has been sold to San Francisco men represented by Pownall & Olds and development work has been commenced.

Yuba Consolidated—This company, operating the Eagle Bird, Yuba and Gray Eagle mines at Maybert, with D. J. McFall as superintendent, is draining the old Yuba and has rehabilitated the mill.

Niagara—After a long idleness work has been resumed on this mine on Deer creek near Nevada City, and the shaft has been pumped out.

Norambagua—After 16 months' prospecting work, it has been decided to abandon this mine near Grass valley.

Mooney Flat—This company has been organized by N. F. Kerr of San Francisco to mine at Mooney flat near Smartsville.

Red Cross—The Huntington mills at this property at Omega will be started as soon as the tramway is ready.

Colorado

Clear Creek and Gilpin Counties

Local capital is interested in a new mill to handle custom ores and dumps of local mines. The machinery will be put in by the Denver Quartz Mill and Crusher Company, with Card and Wilfley tables for concentration. Pearl Skelton, Central City, is the manager.

Golden Sheaf—Totman & Co., of Black Hawk, have taken an option on this property, Vermilion district, and have made a payment.

Golden Sun—Good ore is reported in a drift from the main tunnel. E. T. Butler, 203 Kittredge building, Denver, is manager. The company is figuring on a mill and electrical equipment.

Lake County—Leadville

Hopemore—Lessees on this mine have now made arrangements which will enable them to market their ore at a profit, and will hoist 100 tons daily. It is said to be an immense body of iron sulphide, of an average value of $14 per ton.

Iron—T. Trevarthen, lessee on this old mine, is shipping 400 tons per month of good-grade silver-lead ore.

Adelaide—By a lateral from the Yak tunnel, lessees on this mine have caught their shoot of zinc and silver ore, and are starting to ship.

San Juan Region

In this rugged section of Colorado, snowslides have been running during the last week. At Ouray a snowslide on the Camp Bird road has taken out the Telluride Power Company's line from Telluride, and the Ouray Light and Power Company had its water shut off by a snowslide in Uncompahgre cañon. Several telephone lines have also been carried away. From Silverton word comes that 40 slides ran on the Denver & Rio Grande railroad between Silverton and Needleton, six miles below, and railroad traffic to Durango is completely blocked, and Silverton is likely to suffer from a fuel famine and from scarcity of feed for cattle and horses.

Tomboy—December returns: Mill ran 27 days, crushed 8500 tons, yielding bullion, $31,500; concentrates shipped, $41,500; expenses, $47,000; profit, $26,000.

Teller County—Cripple Cerek

The dispute between the Portland and Strong companies regarding apex rights has been settled out of court.

Portland—The new mill of this company, at the mine in Victor, will be started in 90 days. The regular quarterly dividend of 2c. per share was declared at a directors' meeting Jan. 5, payable on Jan. 15, the amount being $60,000, and making the total of $8,497,080 paid in dividends to date.

Stratton's Independence—Results for

November: Production, 2006 tons averaging 23½ dwt. per ton; dump ore milled 5000 tons; net working profit from the mining department $7250; from the milling department, $1600; expenditure on new mine development account, $1100.

Vindicator—At a directors' meeting on Jan. 5, a quarterly dividend of 3c. per share was declared, amounting to $45,000; total dividends to date, $2,092,500.

Isabella—The annual meeting is scheduled for Feb. 7, at Cheyenne, Wyo., and the report is being circulated in Denver that a fight is to be made for the control by parties who are dissatisfied with the present management. The Isabella mine was for many years the leader of the Colorado Springs and Cripple Creek markets, and a check was once received from a smeltery for $315,000 for two carloads of the ore.

Dante—The lower levels at No. 2 shaft are being developed on company account, while the upper workings are being leased.

Union Leasing—This company, operating the Mabel M. and Husted shafts on the Gold Dollar Consolidated property, on Beacon hill, has mined and marketed 16,768 tons of ore of a gross value of $387,550.

Maggie—An odd occurrence has taken place at this mine, inasmuch as its shaft 200 ft. deep is now making 20,000 gal. every 24 hours, notwithstanding the fact that there are four other shafts, each over 1000 ft. deep, in close proximity and all of them dry.

Granite—The output from the Granite, Dillon, Monument and Gold Coin for December is about 2000 tons of gold ore, with a total value of about $60,000. These properties are being worked from the old main working shaft of the Gold Coin mine, which is credited with an early-day production of over $6,000,000, and from a vein (or rather a mineralized shearage zone) in the granite entirely outside the breccia area—the only one of the kind in the district that made a record as a mine.

Idaho

CŒUR D'ALENE DITRICT

The dividends from the Cœur d' Alene mines for 1909 amounted to $2,300,000. The Federal company, owning three lead producers, paid $930,000; the Bunker Hill & Sullivan, $615,000; the Hercules, lead-silver, $250,000; the Snowstorm, the only copper producer, $225,000; the Hecla, a lead property, $220,000.

Reindeer—East drift has concentrating copper ore 50 ft. long and eight ft. wide and milling ore exposed 300 ft. long and 15 ft. wide.

[illegible]—Lead-silver concentrates are being shipped regularly to Carnegie, Penn. Frue vanners and tables are being placed in the mill, which will have a capacity of 200 tons daily. A large electric hoist has been installed.

Federal—The ore bins and sorting plant at Mace were destroyed by fire causing a $10,000 loss. The sorting plant will be rebuilt at once.

Kansas

The year 1909 showed a great gain in the Kansas camps, the monthly production being nearly doubled. The production for December was 4,395,020 lb. of blende, 41,540 lb. calamine, and 288,600 lb. of lead with a total value of $115,364. This month, the Clermont started production from the deep ore level. The Playter camp has started again and will soon be in the producing column.

The Foster land has been the scene of several rich strikes and 17 drill holes have already been put down since this land was thrown open for prospecting.

Michigan

COPPER

Lake—Drifting on the lode exposed in the shaft at the 6th level continues with the formation well charged with copper in the form of epidote. The drifts are following the hanging wall and the width of the formation is not known. A second drill hole is being put down to expose the northern extension of the lode, the first hole being suspended after sinking to considerable depth without encountering anything. The rock house will soon be in shape and shipments to the Franklin mill will be maintained.

New Baltic Copper Company—This company has been organized to take over the Baltic Exploration Company with Robert H. Shields and James P. Edwards, of Houghton, as president and general manager, respectively. Several trenches exposed an amygdaloid formation believed to be the Baltic lode and a core from 400 ft. showed it well charged with copper. Drilling is underway to cut the formation at a greater depth and to ascertain its strike and pitch and when these data have been secured shaft shinking will be started.

Minnesota

The Vermilion iron range is undergoing more development than since the early days and its rejuvenation promises to make this region one of great activity for many years. Shaft No. 5 of the old Chandler mine, Ely, is being put into shape for further mining. Machinery will be installed and another 100 men employed. There is greater activity on Section 30 and 300 men will be added in the spring.

Alberta—This iron mine, at Virginia, has been leased to the Elk Mining Company and will be developed.

Missouri

December was the worst month in years in weather conditions, the thermometer being below the freezing point almost the entire month. This greatly curtailed the production. The production for the month was 42,463,300 lb. of blende, 4,445,145 lb. of calamine and 6,922,925 lb. of lead with a total value of $1,277,673. With good weather the output will average close to $1,400,000 per month for the entire district.

The Gas company has finally enforced its ruling that no fuel gas should be used, but great hopes are entertained that the Quapaw Gas Company, now building a 16-in. line into the district, will relieve this condition. This company will take over several of the camps now supplied by the Kansas Natural Gas Company and this will give a larger supply for the others.

Montana

BUTTE DISTRICT

Coalition—The Rarus has been closed for some time owing to lack of timber due to defective car service. The Tramway is cutting a station on the 2000-ft. level. A wreck in the shaft, together with occasional car shortages, have caused production to be irregular recently, but the average has been between 1300 and 1400 tons.

British Butte—The annual meeting will be held Jan. 19, at which time it is thought that a definite plan of future action will be decided upon. The dredge has not been in operation for several months, but the diamond drill is still being used for prospecting purposes.

East Butte—The management states that a 4-ft. vein of ore assaying better than 6 per cent. copper has recently been struck on the 800-ft. level of the Pittsmont at a point about 1000 ft. north of the main workings. Mining is now being done on the 600,- 800,- 1000- and 1200-ft. levels. About 150 tons of first-class and the same amount of second-class ore is being produced daily. A sampling mill will be installed and another blast furnace put in operation after Jan. 1.

BEAVERHEAD COUNTY

Dillon-Argenta—The company's nine claims together with the machinery were recently sold at sheriff's sale for $3782.

FERGUS COUNTY

Barnes-King—It is rumored that the company has under consideration the purchase of a property in Idaho on the line of the new Pittsburg & Gilmore railway.

JEFFERSON COUNTY

Boston & Alta—The shaft is down 355 ft. An electric plant consisting of a hoist for 1200 ft. and a 10-drill air compressor is being installed. The power vill be supplied by the company's plant t Prickley Pear creek.

Comet—The mine is being sampled nd examined in the interests of Eastern apitalists.

Lewis & Clark County

Bald Mountain—The shaft is down 600 t. and five levels are being worked. The 0-stamp mill near the mine is now operating and also a cyanide plant.

Northwestern Metals Company—The nanagement states that the erection of a 00-ton unit of an electrolytic plant at Helena will be begun as soon as weather permits. The plant will use the Baker-Burwell patents. The experiments at Elkhorn last year are said to have demonstrated the success of this method. The plant will ultimately be enlarged to 00 tons and will treat custom zinc ores.

Missoula County

Fox—A 5-ft. body of galena ore has recently been encountered at the bottom of the winze on this property.

Nevada

Esmeralda County

Nevada Eagles—This property, three miles west of Goldfield, is the scene of new discovery. At 250 ft. the management reports assays running from $30 o $35 from a vein 30 in. wide. The shaft has been sunk to the 450-ft. point and crosscut is now being run to intersect he vein at that depth.

Pittsburg-Silver Peak—The foundations for the 20 additional stamps to be added to the mill of this company t Blair are completed. The 10-stamp mill of the Mohawk-Alpine and the 3-stamp mill of the Valcalda are being dismantled and these will be the stamps o be installed at the Silver Peak mill. The present cyanide department of the mill is of sufficient capacity to handle he increased product from the stamps. Manager Edmund Juissen expects to have he additions completed and in running order by Feb. 15. With the installation of these stamps the mill will have a battery of 120 stamps.

Lincoln County

The Horseshoe mill at Fay has just finished a short run on ores of the Little Buck and Snowflake properties, both under lease to E. E. Fuller, as is also he mill.

Gold Chief—This company, near Panaca, has purchased equipment which is being transported to the mine.

Centennial-Pioche—This mine has sunk its shaft to 340 ft. and has sufficient funds to sink to 800 ft., at which depth t is thought all the bedded veins of the Prince Consolidated territory will be cut. Charles P. Brooks is president.

Atlanta—The second payment has been made by the company, thus assuring the continuance of operations in the district, not only by this company, but others, and on a much larger scale. Large bodies of low-grade ore have been exposed by the developments carried on under the direction of F. Nugent Crosby, and it is expected that a mill will be erected as soon as possible.

Nye County

Mayflower-Bullfrog Consolidated—The anunal report, made to the stockholders for the year ended Nov. 1, 1909, shows the following result of operations: Tons milled 3849; assay value per ton $25.11; losses in milling per ton $7.32; cost of mining per ton $9.30; cost of milling per ton $6.98; profit per ton $1.51; mill saving 0.708 per cent.; gross value of ore $68,459. The company mined 1043 tons of ore having a gross value of $12.89 which has been placed upon the dump.

Keane Wonder—The production from this property for November was $25,000.

Tonopah-Belmont—Upon the 1100-ft. level, after drifting through good mill ore for about 500 ft., the breast of the drift broke into a new shoot of ore having a width of 8 ft. and assaying about $100.

White Pine County—Ely

Giroux Consolidated—The new 5-compartment shaft was connected to the surface Dec. 30. The shaft was started 1000 ft. below surface and made an exact connection with the surface work. The shaft will now be sunk to 1200 feet.

New York

Dover Furnace Ore Company—This new company has leased the old Dover Furnace tract situated on the line of the Harlem division of the New York Central & Hudson River railroad and near the Connecticut line. The lease provides for a minimum of 100,000 tons yearly. The officers of the new company are John M. Coleman, president; S. H. Begeut, treasurer; C. F. Preston, superintendent. The offices are at 115 Broadway, New York. Ore was mined there for many years and supplied the old charcoal furnaces at Dover Furnace and Copake.

Kelly Iron Ore Corporation—This new company has leased from the estate of Eugene Kelly the iron-ore mine at Boston Corners. The ore was mined for some 30 years prior to 1890, most of it going to Salisbury furnace. It is a brown hematite, about 50 per cent. iron, and generally free from sulphur and phosphorus. The new company has its office at 45 Exchange place, New York. Its officers are Robert D. McKay, president and manager; Charles H. McIntyre, secretary and treasurer. This corporation has taken a 20 years' lease of the Kelly property and agrees to mine a minimum of 24,000 tons a year, at the outset, later increasing this to 100,000 tons.

Oklahoma

Oklahoma nearly equaled Kansas in December with a production of 3,518,065 lb. of blende and 702,040 lb. of lead with a total value of $95,327. Baxter Springs has greatly increased its output since the first of the year, while Miami has hardly held its own. With the new 500-ton mill in commission at the Mission mine at Quapaw this camp will equal if not pass Miami.

Pennsylvania

The H. C. Frick Coke Company has bought from the Clairton Iron Company a tract including 2644 acres of coking coal and 296 acres of surface land, situated along the Monongahela river near Uniontown. The price paid was $850 per acre for the coal and $125 per acre for the surface. This is the highest price yet paid for coking coal.

Wilkes-Barre & Scranton Coal and Iron Company—The mining property of this company has been sold at receiver's sale at Wilkes-Barre. It includes 100 acres of anthracite coal with a shaft and breaker. It was bought by Marcus Mayer, of New York, for $128,000, subject to debts for royalty and other claims amounting to $82,000; also subject to a claim to the ownership of part of the land by W. P. Boland, of Scranton.

South Dakota

Homestake—The labor troubles have settled down to a question of endurance between the company and the miners. No dividends are looked for at present.

Utah

A company drilling in the bed of Salt lake reports the discovery of an asphalt-deposit, which will be extensively exploited. L. R. Palmer is in charge of the work.

Beaver County

In the Star district the Red Warrior and the Moscow are active. The Wild Bill is expected soon to ship. The Jim Bartlett has 2 ft. of high-grade lead-silver ore developed and the St. Mary's is developing satisfactorily, as is also the Progressive, now down 150 feet.

Juab County

Copper Jack—Churn drilling will be done on this West Tintic property under control of J. H. Weber with the expectation of developing a low-grade copper deposit.

Tintic Standard—Copper indications are reported in the quartz at 700 ft. which is considered important as tending to correlate the mines on the west side of the district.

Eureka City—This company has purchased the ore rights of the public streets, etc., from Eureka City and the territory will be developed from the Chief Consolidated deep levels. Both companies are in the same hands.

SALT LAKE COUNTY

Utah Apex—This mine has opened a body of lead-silver ore at 1680 ft. on the dip of the Parnell vein. The company has reconstructed the Phœnix mill at the mouth of Parvenue tunnel and is treating 120 tons daily.

Canada

BRITISH COLUMBIA

Granby Consolidated—A circular dated Jan. 4 offers to shareholders of record Jan. 20 the right to subscribe at $85 per share (par $100) on or before Feb. 21 for $1,350,000 new stock to the extent of 10 per cent. of their respective holdings. The circular further says: "During the past five years this company has expended for mining properties, new plant, an interest in the Crows' Nest Pass Coal Company, and other items properly chargeable to capital account, upward of $2,750,000, and there is a balance now unpaid upon obligations incurred for these objects amounting to $875,000. In resuming the payment of dividends, the directors deem it desirable that the company should be free from debt and that at least the portion of this expenditure still remaining unpaid should be capitalized."

ONTARIO

Cobalt Lake—About 25 tons of high-grade ore have been extracted from the vein encountered at the 190-ft. level of No. 6 shaft. Fifty feet of drifting has been done on this vein showing 4 ft. of vein matter carrying high-grade stringers. The winze sunk from the 150-ft. level will be continued 70 ft. farther, giving a 10-ft. sump and a station at 230 ft. from the surface, from which crosscuts will be driven to the veins proved above.

Blackburn—This mine, at Miller lake, has made the first shipment of ore from the Gowganda region, consisting of a carload of 36 tons of high-grade, which has been sent for treatment to the Copper Cliff smeltery. The Blackburn is a close corporation controlled by International Nickel Company interests. The main shaft is down 100 ft. and 50 men are at work.

Nova Scotia Steel and Coal Company—The company's output for 1909 was as follows: Coal, 813,447 tons; steel, 66,700; pig iron, 58,000; coke, 87,000; showing a considerable increase over 1908. The finished materials comprising bars, plates and forgings shipped from New Glasgow amounted to 53,000 tons.

NOVA SCOTIA

Dominion Coal Company—The reported election of Sir Henry Pellatt as president was an error on the part of our correspondent. J. H. Plummer is the president of the company.

Mexico

BAJA CALIFORNIA

The secretary of fomento has granted Flavio Gonzalez a concession for the exploration and exploitation of oil and coal in Baja California. The concenssion comprises 40,000 acres.

DURANGO

Lucia—This company is operating two mines near Avino, 15 miles from Gabriel. Andrew McFarlane of Colorado took charge in December and is introducing the contract system. These mines have been shipping 1000 tons of copper and silver ore per month to Torreon. The output is being increased and 1500 tons will be shipped in January besides putting on the dump a large tonnage of milling on which will be worked later when the mill is built sometime before the end of this year.

GUANAJUATO

Plans involving the expenditure of more than $1,000,000 were ratified at a meeting of the Guanajuato Power and Electric Company, at Colorado Springs, on Dec. 23, when it was voted to increase the capital stock of the company from $3,500,000 to $5,000,000. Offiers announce that the increase will be used in taking over numerous electric power and light concerns in Mexico and in enlarging the present system in the State of Guanajuato. It is planned to acquire the property of companies in several Mexican cities which have a total population of 300,000, giving the company control of a rich mineral and agricultural country embracing 11,260 square miles.

JALISCO

Cinco Minas—The Marcus Daly estate, represented by H. E. Crawford, has closed the deal for the Cinco Minas, Hostotipaquillo district, a check for about 500,000 pesos having been paid Jose Martinez and Jose G. Montero, of Guadalajara mines. It is planned to sink the shaft, put down last year 200 ft. below the old tunnel level, to 2000 ft. The tunnel is the lowest of the old workings, and is 500 ft. below the outcrop. A reduction plant with an initial daily capacity of 250 tons will be erected, and $25,000 will be used in building a wagon road from the mines to the Southern Pacific at Magdelena. A contract for electric current up to 1000 h.p. will be made.

Bramador—Paul de Vilaine, who recently acquired the old Refugio and adjoining ground in the Bramador district, has taken an option on the principal old mines of Bramador.

Boca Ancha—This mine in the Autlan district is developing and has a 50-ton cyanide plant. Charles E. Lee is manager.

MEXICO

The transmission line of the Toluca Light and Power Company from Temascaltepec to the Seguranza company's, mine near Zacualpam, has been completed.

Rincon—The Mexican Rincon Mining Company, of Philadelphia, of which Cassius E. Gillette, U. S. A., is a large stockholder, has made the final payment for the property to Hugh McDonnell and will continue the operation of the mine at Temascaltepec. There is a cyanide mill on the property.

Seguranza—The company is preparing to operate on a large scale. Two electric air drills have been installed and more will be put in operation soon. The mill will receive custom ores.

Carboncillo—The mine is shipping steadily both to the mill and to the smelteries. It has produced about three million pesos during the last three years.

Bella Vista y Anexas—The Madroño tunnel is now in about 600 ft. A crosscut from this tunnel cut the Santiago vein, which is about 3 ft. wide and shows ruby silver. A. J. Hunter is manager.

Chontalpan—This mine under the management of J. F. Berry, is shipping high-grade ore and the exploration work below the old Spanish workings is proving that the ore continues in depth.

Argentina—The mine is idle pending the erection of a mill. This company reports 35,000 tons of ore blocked.

SONORA

Juarez—This mine, near El Plomo, is running a 5-stamp mill with satisfactory results.

Rio Yaqui Copper Company—Absolute titles have been given to this company for its properties and work will be inaugurated.

Tijata—Ten stamps comprise the capacity of this company's mill near Caborca. Until lately a low average of product was realized, but recent runs have shown improved content.

El Moro—A company, capitalized at $600,000, has been organized to operate this group. Robert Hilburn is manager.

Noche Buena—This mine has started a 5-stamp mill. It is 20 miles from the gulf of California.

El Temblor—New York men have bonded this property for $50,000 and have put 30 men to work.

Asia

KOREA

Oriental Consolidated—The cabled December cleanup was $116,500.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Jan. 12—The coal trade in he West is very active, owing to the cold veather, which has brought in heavy lomestic demand on top of the steady all for steam coal. Mines are all busy, out deliveries are interrupted by bad veather and snow. In several of the onsuming centers premium prices are eing asked for early deliveries.

In the East the bituminous coal trade s under very much the same conditions s in the West. There is an increasing lemand but difficulty in securing the eeded deliveries.

The anthracite trade is steady, and Deember production did not fall very much elow the high level reached in Novemer. Business is on a good basis everyvhere.

National Coal Operators' Association —The movement to organize a national ssociation of coal operators, started in hicago recently, has progressed so far hat a provisional constitution has been rafted, and a meeting called to be held n Chicago, Jan. 25, to organize the asociation. The movement so far has the upport of the operators' associations of llinois, Indiana, Iowa, Michigan, Monana, Washington and Wyoming.

COAL TRAFFIC NOTES

Coal tonnage originating on the Southrn railway, 10 months ended Oct. 31 vas: Tennessee district, 1,052,377; Alaama district, 1,991,342; total, 3,043,719 hort tons. This is an increase of 646,79 tons, or 26.9 per cent., over the preious year.

Anthracite shipments from Buffalo by ake were 3,538,098 tons in 1908, and ,052,706 in 1909; a decrease of 485,392 ons, or 13.7 per cent. The larger shipnents in 1909 were 1,245,000 tons to hicago; 918,350 to Superior and Duuth; 389,150 tons to Milwaukee.

Anthracite shipments in December vere 5,775,438 long tons, being 252,362 ons less than in November. For the 2 months ended Dec. 31 the total shipnents by companies were as follows, in ong tons:

	1908.	1909.	Changes.
eading	12,578,883	11,920,757	D. 658,126
ehigh Valley	10,772,040	10,296,627	D. 475,413
. J. Central	8,495,425	7,938,370	D. 557,055
ackawanna	10,088,697	9,531,695	D. 557,002
el. & Hudson	6,461,666	6,136,946	D. 324,720
ennsylvania	6,019,457	5,966,543	D. 52,014
rie	7,450,175	7,461,121	I. 10,946
. Y., Ont. & West.	2,798,671	2,717,826	D. 89,845
Total	64,665,014	61,969,885	D. 2,695,129

The total decrease in 1909 was 4.2 per cent. Adding the usual allowance for coal used and sold at mines, the total anthracite mined in 1909 was 68,786,500 long tons; equal to 77,040,880 short tons.

New York

ANTHRACITE

Jan. 12—Anthracite, as is usual at this time of year, is essentially a weather market. Trade has been good, in fact rather pressing, and local dealers are contending with icy streets and other difficulties in delivery.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are f.o.b. New York harbor points: Pea, $3.10@3.25; buckwheat. $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. Some small lots are reported sold at special prices, but not in important quantity.

BITUMINOUS

The bituminous coal market is in rather a disturbed condition, and dealers are not busying themselves so much in getting new orders as in trying to fill those they already have on hand. The Far East is not doing much, as is to be expected in January. The Sound is rather pressing for coal and New York harbor is rushing orders faster than they can be filled, although the total volume of business is not extraordinary.

Snow and cold have interfered with operations at the mines, while transportation has been bad, owing to the weather obstructing the railroads, to a very general scarcity of cars, and on some roads to a short supply of motive power. Under existing conditions a locomotive cannot move as many cars as when the weather is good and this adds to the delay in deliveries.

The coastwise vessel market is entirely demoralized, and it is difficult to quote prices. The loss of a number of schooners and barges in the Christmas blizzard and the high winds which have prevailed for most of the time since have upset the market for the time being.

Birmingham

Jan. 11—Coal operations in Alabama are back again to the activity that attracted attention a few years ago. The start is being made on a 15,000,000-ton output for the year. Local consumption is heavy while there is a healthy movement of the product into other southern States. The closing up of river transportation from Pennsylvania and Ohio gave an impetus to the movement of Alabama coal into Louisiana and other States. There is a steady increase to the labor in and around the coad mines in Alabama.

Chicago

Jan. 10—Weather conditions support the market, though the stress has passed and deliveries are more free. Illinois screenings sell for $2@2.25. These prices are not normal; they are due to transportation delays and to the growing use of fine coal. Present quotations on Illinois and Indiana coals are: Lump and egg, $3@3.25; run-of-mine, $2.25@2.50 per ton.

Eastern coals have benefitted by weather conditions and are quoted: Pocahontas and New River smokeless, $3.55@3.80 for lump and egg, and $3.05@3.15 for run-of-mine. Hocking Valley brings the full list price of $3.15 for 1¼-in. lump, and Youghiogheny gas brings $3.30, the list price, both being scarce. Anthracite has been an active seller with chestnut still scarce.

Cleveland

Jan. 11—Cold weather, a shortage of natural gas and obstruction to railroad traffic by snow have combined to make the local coal trade extremely active.

Nominally there is little change in prices. For Middle district quotations are, f.o.b. Cleveland, $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.60 for slack. No. 8 district brings 10 or 15c. more on all grades. Pittsburg is $2.15 for 1¼-in., $1.95 for ¾-in., $1.85 for run-of-mine and $1.65 for slack. Premiums are being paid for prompt deliveries, especially on slack. For domestic coals $2.95 Cleveland is quoted for Massillon lump.

Indianapolis

Jan. 11—The last month of 1909 brought about a steady growth in mine operation and they are now being worked overtime to get out sufficient coal to fill orders.

The freezing over of the Ohio river has tied up many coal barges from the Pennsylvania fields and in consequence an unexpected demand is being made on the Indiana mines.

Pittsburg

Jan. 11—The car supply is fairly adequate, but the movement is poor after cars are loaded. The market shows a quiet tone except for such demand as is caused by the continued cold weather. Prices are firm, but not quotably higher, standing at $1.15 for mine-run and nut, $1.25 for [illegible]-in., and 80@90c. for slack.

Connellsville Coke—Early Monday morning the H. C. Frick Coke Company, the coke subsidiary of the United States Steel Corporation, posted notices in the Connellsville and lower Connellsville region announcing a new wage scale, to become effective Jan. 16. The new scale is substantially a restoration of the highest scale ever paid, being based on $1.35 per 100 bu. for mining and loading room and rib coal. Such a scale was in force Jan. 1, 1903, to Dec. 15, 1903, also from Mar. 1, 1907, to Dec. 1, 1907. The 1908 scale was based on $1.20 per 100 bu. The new scale averages just a trifle higher than the old scale based on $1.35, several minor jobs being slightly higher, while very few are lower. The advance was generally expected to be made effective Jan. 1, and considerable surprise was manifested that none was announced at that time.

The coke trade has been very quiet since the first of the year. There is considerable uncovered consumption among furnaces, the furnacemen having played a waiting game in expectation of lower prices. There was little open buying of prompt coke, but it is suspected that in December a considerable tonnage of prompt coke was bought quietly. The market is really nominal this week at $2.65@2.75 for prompt furnace, $2.75 asked for furnace coke on contract, $3.10@3.25 on prompt foundry and $3.25@3.40 on contract foundry.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Jan. 1 at 449,082 tons, and shipments at 4967 cars to Pittsburg, 7809 cars to points west of Pittsburg and 967 cars to points east of Connellsville, a total of 13,743 cars.

St Louis

Jan. 10—This week the highest prices in recent years were obtained for coal in this market. Coal has continued to advance and spot coal is at a premium. Standard 2-in. lump has been quoted at $1.75 per ton f.o.b. mines. Of course, this price was only for spot coal. Everybody is looking for coal. Steam plants and consumers alike have their stocks entirely depleted and have been unable to replenish them. Steam plants are having a hard time to buy enough coal for their requirements from day to day.

Chicago is in practically the same position as St. Louis and all the coal that can be shipped to that point on advantageous freight rates is going north. This, of course, is taking a large tonnage off the St. Louis market which helps to boost prices still further. The car shortage on the Illinois Central is the worst ever known. Today there is scarcely a mine running on the road anywhere. All other roads are short of cars and have been unabla to move coal on hand.

Last Tuesday the worst blizzard of recent years swept over this part of the country leaving a coating of ice everywhere, which hampered the movements of railroads as well as the mines. This with the extreme cold wave which followed made a combination of circumstances which was sure to make coal scarce.

Today the weather has eased off but another cold wave is predicted and indications are that the top has not been reached yet. Railroads and all the large manufacturers are buying coal on the open market. Firms having large contracts are unable to give the full tonnage required.

The terminals all around St. Louis and Chicago are in terrible shape. Thousands of cars are on sidings and it seems impossible to get prompt delivery. Demands from the West and the country are extremely urgent and almost any price is being offered for coal.

Standard 6-in. lump is held at $1.80 per ton mine or $2.32 St. Louis; 2-in. lump is worth $1.75 at mine or $2.27 St. Louis; mine-run coal is $1.35 at mine or $1.87 St. Louis; 3-in. nut is quoted at $1.10 at mine or $1.62 St. Louis; while 1½-in. steam nut and pea bring $1 at mine of $1.52 St. Louis. Screenings bring 70c. at mine of $1.22 St. Louis; ¾-in. pea and slack, 50c. at mines, or $1.02 St. Louis. Most of the activity is still confined to Standard coal as this is the only coal that can be delivered even in tight times like these.

Staunton, Mt. Olive and Springfield district 6-in. lump is worth $2 per ton mines, or $2.52 St. Louis; 2-in. lump, $1.70 at mine, or $2.22 St. Louis; mine-run, $1.50 at mine, or $2.02 St. Louis.

Carterville coal is now quoted at $2 per ton, or $2.67 St. Louis for 6-in. lump or egg. Nut is bringing $1.90 at mine, or $2.57 St. Louis, while 2-in. screenings are 90c. at mines, or $1.57 St. Louis. A premium over the above prices is being obtained for spot coal. However, none of this coal seems to be moving to Chicago.

Franklin county 6-in. lump is held at $2.25@2.50 at mines, or $2.92@3.17 St. Louis; 3-in. nut is $2 at mine, or $2.67 St. Louis. Little of this coal is coming into this market and nearly all of it is moving to the Northwest where nearly any price can be obtained for it.

Anthracite is exceedingly strong and all sizes are scarce. Chestnut is nearly impossible to get and stove coal is being substituted for it in a great many instances.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, 11 months ended Nov. 30, long tons:

	1908.	1909.	Changes.
Anthracite..........	2,579,865	2,644,783	I. 64,918
Bituminous.........	8,371,046	9,009,704	I. 638,658
Total coal........	10,950,911	11,654,487	I. 703,576
Coke................	546,019	810,296	I. 264,277

Canada took in 1909, 9,158,058 tons, or 78.6 per cent. of the coal. The coke went chiefly to Mexico and Canada. The total increase in coal exports was 6.4 per cent.

United States Coal Imports—Imports of coal and coke into the United States, 11 months ended Nov. 30, long tons:

	1908.	1909.	Changes
Anthracite..........	16,483	4,703	D. 11,780
Bituminous........	1,378,211	1,118,794	D. 259,417
Total coal	1,394,694	1,123,497	D. 271,197
Coke................	119,647	157,550	I. 37,903

Canada furnished in 1909 a total of 927,702 tons of coal and nearly all the coke; Australia, 162,987 tons coal; Japan, 14,327 tons coal. Imports are chiefly on the Pacific coast and in the northwestern border States.

Iron Trade Review

New York, Jan. 12—The opening week of the year has been a rather quiet one in the iron and steel trades, but enough has been done to indicate some improvement in business further on.

In pig iron, there has been some buying of foundry and basic, but not enough to make an active market. Southern iron has been rather a disturbing element, owing to offers of considerable quantities of speculative iron for resale at prices below those the furnaces are asking. In finished material buying of bars is reported, with some business in plates, but other branches of the trade have been rather quiet.

Pig Iron Production—The reports of the blast furnaces on Jan. 1, as collected by the *Iron Age*, show 313 stacks in blast, having a total weekly capacity of 595,200 tons. This is 3000 tons less than on Dec. 1. The decrease was caused mainly by the banking of several furnaces in Alabama on account of short ore supply.

Lake Iron Ore Deliveries—Deliveries of Lake Superior iron ore to Lake Michigan ports in 1909 were: South Chicago 4,673,810 tons; Gary, 1,927,818; Milwaukee, 178,720; minor Michigan ports for local furnaces, 155,483; total, 6,929,831 tons.

Lake Ore Prices—Prices of Lake Superior iron ore fo.b. docks at Lake Eri ports are now fixed as follows: Ol Range bessemers, $5 per ton; Mesabi bessemers, 4.75; Old Range nonbessemers $4.20; Mesabi bessemers, $4. The guarantee is the same as last season, 55 pe cent. iron for bessemer ore and 51.5 fo nonbessemers.

Baltimore

Jan. 11—Exports for the week inluded 2363 tons steel rails to Tampico, lexico. Imports included 853 tons feromanganese and 300 tons manganese re from Liverpool; 32,355 tons iron ore rom Cuba.

Birmingham

Jan. 11—A few sales of pig iron have een made already this year by Southern urnace companies and a strong line of nquiries are coming in. The companies re holding their product firmly at $14.50 er ton, No. 2 foundry basis. Iron sellng below that price is resale iron and here is not so much of it being sold nd not much to be had now. The larger ompanies in the South appear to be in position to hold off from the market ntil the quotations improve. Deliveries re being made promptly. The railroads re giving very good service, everything onsidered. The cast-iron pipe makers, oundries and machine-shop people and thers look forward to a continuation of teady operations.

Chicago

Jan. 11—The iron market has hardly ecovered from the holidays and is still aiting developments. Northern iron remains firm at $19@19.50; Southern No. 2 oundry is on a basis of $14@14.50 irmingham. No special developments re looked for before the end of the month.

Sales of iron and steel products are uiet, but there is a firm tone to the market. Coke is firm and steady at $5.50, hicago, for Connellsville.

Cleveland

Jan. 11—Buying of iron ore is very ctive. Those furnaces which do not mine their own ore seem anxious to close s soon as possible at the 50c. advance nd only a few are holding back.

Pig Iron—Some sales of basic are reorted. Iron under contract is being aken closely. Quotations are steady at 18.75@19, Cleveland, for bessemer pig; 18.25@18.75 for basic; $17.75@18 for No. 2 foundry; $17@17.50 for forge.

Finished Material—Contracts expiring an. 1 were, as a rule, fully specified. Most sales this year have been for fixed ots, including some heavy orders for lates at 1.60c. for first quarter. Bars re quoted 1.50c. for first quarter.

Philadelphia

Jan. 12—While the pig-iron market is ot characterized by any special activity n demand, it is even stronger than last week in two or three particulars, chief f which is the unwillingness of makers o encourage the placing of orders for he second quarter. With scarcely any xception, eastern Pennsylvania furnaces are sold up about as far as the companies are anxious to sell. Ore quotations and prices are firm and contracts for coke can be placed only at the high market price. The larger consumers are inclined to let things drift, and even where their contracts secure them supplies for only a short time, they are disposed to wait further developments. Foundry iron is quieter than any other kind. No. 2X is quoted today at $19.25. Some options have been secured on forge iron which are good for 30 days at $18 per ton. Two or three conditional contracts have been made for southern gray forge at $17. The entire market is strong but there will be no haste on the part of buyers.

Pittsburg

Jan. 11—The finished-steel trade shows pronounced dullness, but mills profess to be well content with the condition, and indeed state that it is favorable. Evidently the rapid advance in prices and the heavy buying had given rise to fears that a serious reaction would follow. It is commonly said that the mills are well sold and need not book any additional tonnage. This is fairly true of many lines, but in wire and pipe, on the other hand, the business actually on books is not heavy.

Pig Iron—There is considerable quiet inquiry and it is not improbable that a number of sales have been put through, particularly in foundry iron, on private terms, which, of course, means at concessions from open prices. On the surface the market is very quiet, with foundry iron unchanged at $17@17.25, Valley, and bessemer unchanged at $19, Valley. In basic a decidedly stronger tone has existed for a fortnight, due to the absorption of several lots both of speculative and of furnace iron. Basic is roundly quotable at $17.25, Valley, for ordinary delivery. In December some sales were made at less than $17.

Steel—The supply of unfinished steel is better, the recent slight easing up in billets having been followed by a similar movement in sheet-bars. The market is quotable, depending on delivery, at $27@27.50 for bessemer and $27.50@28 for open-hearth billets, with sheet-bars at $28.50@29. Plates and shapes remain at 1.55@1.60c., and steel bars at 1.45@1.50c., the lower prices being practically for delivery at mills' convenience and the higher prices for prompt delivery or delivery over four to six months.

Ferromanganese—The market has been easier by about 50c. a ton, at $44@44.50 for prompt and $44.50@45 for forward delivery, f.o.b. Baltimore. Jan. 1 the freight, Baltimore to Pittsburg, on ferromanganese advanced from $1.95@2.30 per ton.

Sheets—Prices are strong and might possibly show an advancing tendency did not the trade remain so fully committed to the idea of the leading interest making the price. The building of independent mills has been so rapid that the "leading interest" is entitled to the designation only on the ground that it is the largest single producer. Prices are 2.40c. on black and 3.50c. on galvanized, 28 gage; $1.70 per square for painted and $3 for galvanized corrugated. Blue annealed sheets are 1.75@1.80c., the higher price being for early delivery.

St. Louis

Jan. 10—The market on pig iron this week shows a slight improvement. A number of inquiries were received and a little business closed. Prospects are that the market will be in normal condition very shortly. Furnaces need very little additional business to finish out the quarter's run and consequently no concession in price has been made. The prevailing quotation is $15 per ton f.o.b. Birmingham, or $18.75 per ton St. Louis for No. 2 foundry.

Iron Ore—Missouri iron ore, 50 per cent. iron, is being eagerly sought for at $3.75 per ton St. Louis.

Metal Markets

New York, Jan. 12—The metal markets have been generally steady. The copper report for December shows a considerable decrease in the unsold stocks of the metal.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1909..	$15,649,281	$ 3,863,637	Exp. $11,785,644
" 1908..	2,967,795	2,909,883	" 57,912
Year 1909..	122,301,517	42,003,194	" 80,298,323
" 1908..	73,857,749	45,123,561	" 28,732,188
Silver:			
Nov. 1909..	4,951,483	4,691,807	Exp. 259,676
" 1908..	3,951,987	3,275,609	" 676,378
Year 1909..	52,294,344	41,981,006	" 10,313,338
" 1908..	47,111,382	37,814,676	" 9,296,706

Exports from the port of New York, week ended Jan. 5: Gold, $1,064,000, to Argentina and Brazil; silver, $1,360,248, chiefly to London. Imports: Gold, $63,236; silver, $13,888, both from Central and South America.

Transvaal gold production in December reported by cable at 604,987 oz. fine. Total production for the year, 7,052,617 oz. in 1908 and 7,280,542 oz.—or $150,488,803—in 1909; an increase of 227,925 oz., or $4,711,122, last year.

Gold—No special demand arose for gold and the price on the open market in London continued at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. The Bank of England took most of the gold offered. In New York some gold continues to go to South America.

Platinum—The market is easing off a little, though business continues good.

Dealers ask this week 50c. less, $29 per oz. for refined platinum, and $34.50 for hard metal.

Silver—The price of 24¼d. seems to have been top for silver in the recent rise. From the best advices, the impression gains that the market fluctuations are likely for the present to be confined within a narrow range.

SILVER AND STERLING EXCHANGE

Jan.	6	7	8	10	11	12
New York....	52½	52¼	52⅜	52½	52½	52⅜
London......	24 3/16	24 1/16	24⅛	24 3/16	24 1/16	24⅛
Sterling Ex..	4.8700	4.8690	4.8685	4.8685	4.8675	4.8680

New oYrk quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Dec. 30, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India........	£ 9,247,390	£6,667,600	D. £2,579,790
China.......	741,400	1,950,000	I. 1,208,600
Straits......	164,885	114,600	D. 50,285
Total.. ...	£10,153,675	£8,732,200	D. £1,421,475

India Council bills in London sold at an average of 16.125d. per rupee.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Jan.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
6	13⅞ @14	13⅝ @13¾	61 3/16	33¼	4.70	4.60 @4.65	6.02½ @6.05
7	13⅞ @14	13⅝ @13¾	61⅛	33	4.70	4.60 @4.65	6.02½ @6.05
8	13⅞ @14	13⅝ @13¾	....	33	4.70	4.60 @4.65	6.02½ @6.05
10	13⅞ @14	13⅝ @13¾	61⅝	33	4.70	4.60 @4.65	6.00 @6.05
11	13⅞ @14	13⅝ @13¾	61⅜	32¾	4.70	4.60 @4 65	6.00 @6.05
12	13⅞ @14	13⅝ @13¾	61 7/16	32⅞	4.70	4.60 @4.65	6.00 @6.05

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The level which the market reached at the close of last week has been fully maintained. A good-sized business has been done with domestic manufacturers at current prices. Business with Europe is at a standstill because the price of standard copper is below parity and foreign buyers can do better by taking copper out of public warehouse to supply their wants. The close is steady and unchanged at 13⅞@14c. for Lake copper, and 13⅝@13¾c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13½@13⅝ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is fair.

The market in London for standard copper has fluctuated within narrow limits throughout the week, and the close is slightly lower at £61 8s. 9d. for spot and £62 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £65; best selected, £65@65 10s.; strong sheets, £75@76 per ton.

Copper Producers' Association—The report issued Jan. 10 gives the following statement for December and the year ended Dec. 31, in pounds of fine copper:

	December.	Year.
Stocks, Dec. 1 and Jan. 1..........	153,003,527	122,357,266
U. S. production...	117,828,655	1,405,403,056
Total supplies...	270,832,182	1,527,760,322
Deliveries, domestic	69,519,501	705,051,591
Deliveries, for export...........	59,546,570	680,942,620
Total deliveries..	129,066,071	1,385,994,211
Stocks, Dec. 31..	141,766,111	141,766,111
Increase or decrease in stocks......	D. 11,237,416	I. 19,408,845

United States production includes all copper refined and put in marketable form in this country, whether from domestic or foreign material.

Tin—The London market has quieted down considerably. Transactions which up to last week averaged over 1000 tons daily have, at this time, fallen off to about 300 tons. The tendency is for lower quotations, and the close is cabled as steady at £149 5s. for spot and £150 12s. 6d. for three months.

The middle of last week witnessed a little more activity in the domestic market, brought about by rumors of heavy purchases in the foreign market on the part of the largest consumers in this country. When the expected improvement on the London Exchange failed to materialize, business resumed its former dullness, and at the close tin is quoted at 32⅞ cents.

Lead—The market is somewhat quieter and prices are about the same at 4.60@4.65c. St. Louis, and 4.70c. New York.

The advance in London has made further progress, the close being cabled at £13 17s. 6d. for Spanish and £14 for English lead.

Spelter—In view of the more liberal supplies of ore, there has been a greater desire on the part of smelters to realize. As the consumptive demand is still up to the maximum, all offerings have been readily absorbed and prices have only suffered slightly. The close, however, is rather weak at 6.15@6.20c. New York, and 6@6.05c. St. Louis.

New York prices for spelter Jan. 6-8, inclusive, were 6.17½@6.20c.; Jan. 10-12, inclusive, 6.15@6.20 cents.

The London market closes somewhat higher at £23 7s. 6d. for good ordinaries, and £23 12s. 6d. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market has a stronger tone, but there is little change in prices yet. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7⅝@7⅞c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—Business remains good. New York quotations are unchanged at $52.50 per flask of 75 lb. Jobbers ask 72@75c. per lb. for small lots. San Francisco price is $50.50@51.50 for domestic orders; $2 less for export. The London official price is £9 15s. per flask, with the same figures asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. tor 200-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, 11 months ended Nov. 30, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	282,532	128,687	Exp. 153,845
Copper, 1908....	279,561	84,775	Exp. 194,786
Tin, long tons....,	396	38,929	Imp. 38,533
Tin, 1908........	206	33,105	Imp. 32,899
Lead, short tons.	82,852	104,205	Imp. 21,353
Lead, 1908......	68,424	99,874	Imp. 31,450
Spelter, sh. tons.	2,438	9,402	Imp. 6,964
Spelter, 1908....	2,471	842	Exp. 1,629
Nickel, lb........	10,712,669	19,282,172	Imp. 8,569,503
Nickel, 1908....	9,057,506	15,780,499	Imp. 6,722,993
Antimony, lb.....	6,648	6,272,943	Imp. 6,266,295
Antimony, 1908.	....	7,542,997	Imp. 7,542,997
Platinum, oz.....	... .	105,340	Imp. 105,340
Platinum, 1908.	....	38,857	Imp. 38,857
Quicksilver, lb	502,326	....	Exp. 502,326
Quicksilver, '08	224,494	....	Exp. 224,494
Aluminum, value	$513,398	....	Exp. $513,398
Aluminum, 1908	309,738	....	Exp. 309,738
Ores, etc.:			
Zinc oxide, lb. ..	26,475,398	....	Exp. 26,475,398
Zinc oxide, '08..	22,056,313	....	Exp. 22,056,313
Zinc dross, lb....	14,011,622	....	Exp. 14,011,622
Zinc dross, '08..	15,966,311	....	Exp. 15,966,311
Zinc ores, lg. tons	11,121	95,726	Imp. 84,605
Zinc ores, 1908.	23,311	44,734	Imp. 21,423
Antim'y ores, lb.	504	3,386,708	Imp. 3,386,204
Ant. ores, 1908.	5,586	3,033,196	Imp. 3,027,610
Chrome ore, tons	....	38,863	Imp. 38,863
Chrome ore, '08	....	....	....

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Chrome ore was not reported separately last year. Zinc contents of ore imported, August-November, 1909, were 12,876,814 lb.; not reported prior to date of new tariff.

Zinc and Lead Ore Markets

Platteville, Wis., Jan. 1—Zinc ore ses at $48@49 base; lead ore, $58@ per ton. Shipments were interrupted snow. Stock of zinc ore in bins at l of year was about 6000 tons.

SHIPMENTS, WEEK ENDED JAN. 1.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
ıeral Point	360,000	....	....
ɔa City	236,750	....	139,200
·ker	206,300	....	....
7s Siding	163,100	....	....
ıton	158,800	....	....
ıllsburg	150,000	....	....
tteville	88,000	....	120,000
ena	88,000	....	....
ıtfort	80,000	....	....
;hiand	51,600	....	....
vey	....	63,000	....
otal	1,582,550	63,000	259,200
.r	136,443,180	9,754,528	15,939,566

In addition to the above there was pped to the separating plants 1,162,- 5 lb. zinc concentrates for the week.

Joplin, Mo., Jan. 8—The highest price id for zinc sulphide ore was $52 per , the base being $47@49.50 per ton 60 per cent. zinc. Zinc silicate sold a base of $26@27 per ton of 40 per nt. zinc, selling as high as $30 per ton. e average price, all grades, was $45.26 r ton. Lead ore generally sold at $58 r ton in the bin, with a few sales at $58.50 f.o.b. Some of the large bins of this mineral are being sold on these offerings. The average price, all grades, was $57.76 per ton.

SHIPMENTS, WEEK ENDED JAN. 8.

	Zinc, lb.	Lead, lb.	Value.
bb City	2,567,870	796,110	$ 84,715
ɔlin	1,280,230	128,900	35,104
ısperity	275,790	380,590	17,654
ınl	296,990	207,010	12,187
a-Neck	483,530	......	12,090
ena	343,440	25,280	8,975
ınby	450,000	5,300	7,445
ɔnogo	236,620	35,930	6,075
enweg	190,190	43,440	5,823
lger	178,130	7,510	4,663
7e Springs	194,210	......	4,661
·thage	168,820	......	4,220
rora	207,370	......	4,085
ıpaw	129,270	......	2,972
;inaw	107,530	12,740	2,525
·l Junction	74,240	......	1,893
ırgeon	50,280	37,100	1,760
ıeca	......	53,700	1,450
·coxie	43,870	......	1,051
'otals	7,478,380	1,733,610	$219,348
eeks	17,708,640	3,664,380	$510,683

c value, the week, $169,275; 2 weeks, $404,692
ıd value, the week, 50,073; 2 weeks, 105,991

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
ıuary	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
bruary	36.63	36.94	34.92	34.37	49.72	50.50
ırch	36.19	37.40	34.19	34.71	49.90	50.82
ril	35.40	38.63	34.08	37.01	52.47	55.63
ıy	34.19	40.06	33.39	37.42	56.05	56.59
ne	33.06	44.15	32.07	40.35	60.48	57.52
ly	34.55	43.06	31.67	41.11	59.90	53.74
gust	36.53	48.25	33.42	44.54	60.34	57.60
ptember	37.63	47.70	34.44	44.87	54.59	56.11
tober	35.95	49.50	33.28	45.75	52.63	55.02
vember	39.13	51.31	35.02	48.29	54.53	53.94
cember	42.75	49.45	39.63	47.57	49.68	55.26
Year	$36.63	43.98	$34.31	41.20	$53.93	54.60

NOTE—Under zinc ore the first two colıns give base prices for 60 per cent. zinc ᵉ: the second two the average for all ores ld. Lead ore prices are the average for ores sold.

Petroleum

The Standard Oil purchasing agency on Jan. 7 reduced the price of Pennsylvania crude oil 3c., to $1.40 per bbl. This is the result of increased production and smaller exports, and a further drop is expected.

Chemicals

New York, Jan. 12—The new year has brought no special change to the market; sales are moderate and there is little change in prices.

Copper Sulphate—Business is fair only, but prices are firm at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller parcels.

Arsenic—The market is flat, consuming demand being light. There is some pressure to sell, chiefly from Mexican producers, who have been holding stocks for almost a year. White arsenic is quoted at $2.70@2.75 per 100 lb., for both spot and futures.

Nitrate of Soda—There is only a moderate interest in this article. Spot sells at 2.10c. per lb., and futures are held at the same price.

Statistics of nitrate of soda in the United States on Jan. 1, reported by Messrs. Mortimer & Wisner, New York, in long tons:

	1908.	1909.	Changes.
Stocks, Jan. 1	5,900	9,140	I. 3,240
Imports 12 months	278,650	364,158	I. 85,508
Total supplies	284,550	373,298	I. 88,748
Deliveries 12 months	275,410	359,298	I. 83,888
Stocks, Dec. 31	9,140	14,000	I. 4,860
Afloat for U. S.	83,200	100,000	I. 16,800

Quantities afloat include all cargoes due to arive at United States ports before April 15 next.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, 11 months ended Nov. 30.

	Imports.	Exports.	Excess.
Copper sulph. lb.	....	2,226,840	E. 2,226,840
Copper sul., '08	....	7,360,870	E. 7,360,870
Bleach, lb.	82,838,721	13,964	I. 82,824,757
Bleach, 1908	66,622,981	121,511	I. 66,501,470
Potash salts, lb.	378,038,947	2,301,710	I. 375,737,237
Potash salts, '08	245,455,927	993,072	I. 244,462,855
Soda salts, lb.	14 417,295	670,784	I. 13,776,511
Soda salts, 1908	10,388,752	772,147	I. 9,616,605
Acetate lime, lb.	....	65,718,107	E. 65,718,107
Acetate, 1908	....	52,666,154	E. 52,666,154
Nit. of soda, tons	373,414	7,544	I. 365,870
Nitrate, 1908	293,424	9,526	I. 273,898
Phosphates, tons	11,379	1,003,504	E. 992,125
Phosphates, '08	24,255	1,174,987	E. 1,150,732
Sulphur, tons	25,014	31,921	E. 6,907
Sulphur, 1908	18,884	23,073	E. 4,189
Pyrites, tons	630,438	....	I. 630,468
Pyrites, 1908	621,315	....	I. 621,315
Magnesite, lb.	68,791,144	794,295	I. 67,996,849
Magnesite, 1908	....	....	....

Exports include reëxports of foreign material. Figures for magnesite are for five months, July-November; not reported separately prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1909 were 277,189 tons.

Mining Stocks

New York, Jan. 12—The general stock market has again been uncertain with spells of weakness and an occasional rally. The market shows no definite tendency and nothing is seen yet of the bull movement which was prophesied for the new year.

Some sales of Homestake of South Dakota are reported, 500 shares changing hands at $81 per share.

On the Curb there was likewise some uncertainty and varying movements. In the copper stocks Miami and one or two others was strong throughout the week, but there was depression in several of the issues dealt in. The Cobalt stocks are attracting more attention but do not appear to gain much. The Nevada gold stocks were rather neglected.

In Philadelphia there was a strong upward movement in Cambria Steel. There was heavy buying of the stock, the origin of which is uncertain.

Boston, Jan. 11—The copper-share market has been somewhat disappointing, as the January rise has failed to make its appearance. Lake Copper and North Butte have been the two market features. The former rose almost $20 gross for the week and touched $90 today. Word was received Monday that diamond-drill operations had encountered the vein at the sixth level, which caused a $6 advance during that day's Stock Exchange session. In today's market Lake opened at $80 per share and finished the day at $90. In the last 10 minutes of the market the price jumped from $86 to $90. Trading has been fast and furious and prices have been wide apart at times. The truth of the situation is that inside interests have sold their stock and control is held by other interests. The stock is scarce and as there are but 85,000 shares outstanding the bulls have a comparatively easy matter in marking the price up.

North Butte pursued a downward course the greater part of the week and had a $7 break to $41.25. Recovery to $45.50 followed this break, but the market is very uncertain.

Other strong stocks have been in the properties contiguous to the Lake mine. North Lake, Ojibway, Hancock and New Arcadian have been the conspicuous ones. New Arcadian rose $10.50 today.

The capitalizing of the Cliff lands belonging to the Tamarack mining company has given Tamarack stockholders a right which sold as high as $4 last week.

Curb trading has been active and prices generally strong. Inspiration, South

Lake and a few others have been active and strong features. A better market is also noted for Calaveras. Oneco took a sharp jump upward. Rhode Island Coal is likely to go on the Stock Exchange at no remote day, as is Cactus Mining.

STATISTICS OF COPPER

Month.	United States Production.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,140	61,163,325	70,542,753
VI	116,567,495	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Totals	1,405,403,056	705,051,591	680,942,620

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I	141,766,111	244,204,800	385,970,911

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	52.226	22.493	24.030
Total	52.864	51.503	24.402	23.726

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	[illegible]	[illegible]	[illegible]	13.295	58.786	61.198
March	[illegible]	[illegible]	12.875	12.826	58.761	56.231
April	[illegible]	[illegible]	[illegible]	12.93	58.331	57.363
May	[illegible]	[illegible]	[illegible]	13.238	57.387	59.338
June	[illegible]	13.214	12.777	13.548	57.842	59.627
July	[illegible]	[illegible]	[illegible]	[illegible]	57.989	58.556
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.393
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.021
October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	57.551
November	[illegible]	[illegible]	[illegible]	[illegible]	63.417	58.917
December	[illegible]	[illegible]	14.411	[illegible]	62.943	59.906
Year	[illegible]	[illegible]	[illegible]	[illegible]	59.902	58.732

New York, cents per pound. Electrolytic is [illegible] London, pounds [illegible]

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	32.913
			Av. year	29.465	29.725

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	4.560	4.459	13.166	13.125
Year	4.200	4.273	4.153	13.439	13.049

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	6.249	4.987	6.099	20.625	23.094
Year	4.726	5.503	4.578	5.352	20.163	22.185

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

COLO. SPRINGS Jan. 11

Name of Comp.	Clg.
Acacia	.05⅞
C. C. Con	.03
Dante	.07½
Doctor Jack Pot	.08
Elkton	.70
El Paso	.65
Findlay	.10½
Gold Dollar	.11
Gold Sovereign	.04⅛
Isabella	.17½
Jennie Sample	‡.08
Jerry Johnson	.09⅛
Lexington	‡.48½
Mary McKinney	.47
Old Gold	‡.04
Pharmacist	.04⅜
Portland	.87
U. G. M.	.10
Vindicator	.75
Work	.06¼

S. LAKE CITY Jan. 11

Name of Comp.	Clg.
Carisa	.50
Colorado Mining	.74
Columbus Con	1.20
Daly Judge	4.85
Grand Central	2.20
Iron Blossom	.72
Little Bell	1.60
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	‡.90
Maj. Mines	2.32½
May Day	‡.19½
Nevada Hills	.65
New York	‡.13
Prince Con	.70
Red Warrior	‡6.00
Silver King Coal'n	3.65
Sioux Con	.29
Uncle Sam	.42½
Victoria	1.50

SAN FRANCISCO Jan. 11

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	‡ 11	Belmont	.90
Belcher	1 30	Jim Butler	.09
Best & Belcher	90	MacNamara	.26
Caledonia	.65	Midway	.17
Challenge Con	37	North Star	.01
Chollar	34	West End Con	23
Confidence	1 45	Atlanta	.10
Con. Cal. & Va.	1 80	Booth	‡ 09
Crown Point	‡1 20	C.O.D. Con	‡ 06
Exchequer	‡ 37	Columbia Mt	‡ 05
Gould & Curry	46	Comb. Frac.	40
Hale & Norcross	64	Goldfield Belmont	.90
Mexican	1 92	Goldfield Daisy	98
Ophir	2 17	Jumbo Extension	.12
Overman	72	Oro	03
Potosi	70	Red Hill	02
Savage	58	Sandstorm	‡ 05
Sierra Nevada	84	Silver Pick	08
Union	99	St. Ives	07
Yellow Jacket	1 12		

N. Y. EXCH. Jan. 12

Name of Comp.	Clg.
Amalgamated	87⅜
Am. Agri. Chem.	47½
Am.Sm.&Ref.,com	100
Am. Sm. & Ref., pf.	111¼
Anaconda	52½
Bethlehem Steel	63¼
Col. & Hock. I. & S.	91¾
Colo. Fuel & Iron.	47⅝
Du Pont P'd'r, pf.	87
Federal M. & S.	70
Great Nor., ore ctf.	78½
Nat'nalLead,com.	87¼
National Lead, pf.	110
Pittsburg Coal	26⅛
RepublicI&S,com.	43¾
Republic I & S, pf.	103¼
SlossSheffi'd,com.	85
Sloss Sheffield, pf.	118½
Tennessee Copper	38¾
Utah Copper	58
U. S. Steel, com.	87
U. S. Steel, pf.	123¼
Va. Car. Chem.	56½

N. Y. CURB Jan. 12

Name of Comp.	Clg.
Big Vein Copper	8⅞
Bonanza Creek	3
Boston Copper	21
Braden Copper	4¾
B. C. Copper	8⅛
Buffalo Mines	3½
Butte Coalition	27¼
Cobalt Central	.21½
Combination Fra.	.38
Con. Ariz. Sm.	3⅛
Cumberland Ely	9
Davis-Daly	4
Dominion Cop.	7
Ely Con	.85
Ely Central	2¼
El Rayo	$2\frac{13}{16}$
Florence	2⅝
Giroux	12
Gold Hill	1⅝
Goldfield Con	$7\frac{13}{16}$
Greene Cananea	11
Guanajuato	2
Guggen. Exp.	241½
Kerr Lake	$10\frac{5}{16}$
La Rose	5
McKinley-Dar-Sa.	.79
Miami Copper	27⅜
Mines Co. of Am.	50
Montezu. of C. R.	6
Mont. Shoshone	1⅜
Mont.-Tonopah	.70
Nev. Utah M. & S.	$1\frac{13}{16}$
Newhouse M. & S.	3½
Nipissing Mines	10¼
Ohio Copper	$5\frac{5}{16}$
Pacific Sm. & M.	1½
Silver Queen	.20
Standard Oil	660
Stewart	$\frac{11}{16}$
Tintic	2⅛
Tonopah	6¾
Tonopah Ex.	.71
Tri-Bullion	1
Utah Apex	5⅛
Yukon Gold	$4\frac{15}{16}$

LONDON Jan 12

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	9	0
Esperanza	3	0	0
Tomboy	0	18	6
El Oro	1	9	0
Oroville	0	10	6

BOSTON EX. Jan. 12

Name of Comp.	Clg.
Adventure	6¼
Allouez	55
Am. Zinc	38½
Arcadian	10¼
Arizona Com	48
Atlantic	11
Boston Con	22
Calumet & Ariz.	100¼
Calumet & Hecla.	670
Centennial	36½
Con. Mercur	.11
Copper Range	84
Daly-West	8⅞
East Butte	12
Franklin	17⅝
Greene—Can.	11
Hancock	33
Isle Royal	27½
Keweenaw	5½
La Salle	17
Mass	6¾
Michigan	7
Mohawk	67
Nevada	26¾
North Butte	43½
Ojibway	11½
Old Dominion	52½
Osceola	163
Parrot	20½
Quincy	89
Shannon	17
Superior	64
Superior & Bost.	16⅛
Superior & Pitts.	16
Tamarack	70½
Trinity	11¼
U. S. Smg. & Ref.	53¼
U.S.Sm. & Re., pd.	51⅞
Utah Con	44
Victoria	4½
Winona	12
Wolverine	148
Wyandotte	2½

BOSTON CURB

Name of Comp.	Clg.
Ariz. Mich.	.37½
Ahmeek	225
Bingham Mines	..
Boston Ely	$4\frac{5}{16}$
Calaveras	$5\frac{8}{16}$
Champion	.13
Chemung	14
Chino	12⅝
Corbin	8⅜
Cactus	6⅜
Crown Reserve	$5\frac{15}{16}$
First Nat. Cop.	$5\frac{15}{16}$
Gila Copper	10¼
Indiana	9½
Majestic	.96
Ray Central	4
Ray Con	26¼
Rawhide Coal	.19
Rhode Island Coal	11⅞
San Antonio	8½
South Lake	9½
Trethewey	..
Vulture	$8\frac{3}{16}$
Yuma	1¾

ST. LOUIS Jan. 8

N. of Com.	High.	Low.
Adams	.40	.3
Am. Nettie.	.08	.07
Center Cr'k	2.00	1.75
Cent.C.&C.	86.00	84.0
C.C. & C. pf.	85.00	84.0
Cent. Oil	110.00	100.0
Columbia	9.00	7.0
Con. Coal	19.00	17.0
Doe Run	110.00	105.0
Gra. Bimet.	.33	.30
St. Joe.	12.50	11.0

‡Last quotation.

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.	....	Feb. 1	$1.00
Arcadian Copper, Mich	....	Mar. 1	0.50
Con. Imperial, Nev.	Jan. 11	Feb. 3	0.01
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Gordon M. & M., Utah	Jan. 15	Feb. 4	0.00
Hancock Min., Mich.	....	Feb. 1	1.00
Maxfield, Utah	Jan. 31	Feb. 19	0 00
Mountain Dell Con., Utah	Dec. 21	Jan. 10	0.01
Palmyra G. & C., Utah	Dec. 29	Jan. 19	0.002
Precious Metals M. & M., Cal.	Dec. 27	Jan. 31	0.01
Reindeer C. & G., Ida.	Dec. 31	Jan. 19	0.00
Seven Bros.-Pioche, Nev.	Jan. 15	Feb. 4	0.002
Sheba Gold & Silver, Utah	Jan. 19	Feb. 23	0.05
Sierra Nevada, Nev.	Jan. 11	Feb. 3	0.10
Silver Hill, Nev.	Dec. 23	Jan. 14	0.05
Silver King Con., Utah	Jan. 17	Feb. 5	0 10
Union Con., Nev.	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah.	Feb. 1	Feb. 20	0.00
Western Monitor, Utah	Feb. 1	Mar. 1	0.00
Winona Mich.	Dec. 1	Jan. 1	1.00

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The Conservation of Resources

The propaganda for the conservation of our national resources, inaugurated by President Roosevelt, is now assuming a tangible and practicable form. In its early days it was seized upon as a peg on which to hang a good deal of nonsensical talk, especially by the bureaucracy at Washington, which in its desire to plant more jobs to flourish like the bay tree was ready to undertake to show the miners, smelters and all other industrialists how little they knew about their own business. This was to be expected. Fortunately there has been a disappearance of this kind of promotion and a concentration of attention upon something that can be done, and moreover ought to be done, viz., the proper management of the Government's own resources and the prevention of their passage into the hands of monopolists to be loaded with interest charges that posterity will be required to pay. In his message to Congress on Jan. 14, Mr. Taft goes right to this point.

"All the principal land statutes," he says, "were enacted more than a quarter of a century ago. The homestead act, the preëmption and timber culture act, the coal land, and the mining acts were among these. The rapid disposition of the public lands under the early statutes, and the lax methods of distribution prevailing, due, I think, to the belief that these lands should rapidly pass into private ownership, give rise to the impression that the public domain was legitimate prey for the unscrupulous, and that it was not contrary to good morals to circumvent the land laws. This prodigal manner of disposition resulted in the passing of large areas of valuable land and many of our national resources into the hands of persons who felt little or no responsibility for promoting the national welfare through their development. The truth is that title to millions of acres of public lands was fraudulently obtained and that the right to recover a large part of such lands for the Government long since ceased by reason of statutes of limitation."

"Among the most noteworthy reforms initiated by my distinguished predecessor were the vigorous prosecution of land frauds and the bringing to public attention of the necessity for preserving the remaining public domain from further spoliation, for the maintenance and extension of our forest resources, and for the enactment of laws amending the obsolete statutes so as to retain governmental control over that part of the public domain in which there are valuable deposits of coal, of oil, and of phosphate."

"The present statutes, except so far as they dispose of the precious metals and the purely agricultural lands, are not adapted to carry out the modern view of the best disposition of public lands to private ownership, under conditions offering on the one hand sufficient inducement to private capital to take them over for proper development, with restrictive conditions on the other which shall secure to the public that character of control which will prevent a monopoly or misuse of the lands or their products."

"It is now proposed to dispose of agricultural lands as such, and at the same time to reserve for other disposition the treasure of coal, oil, asphaltum, natural gas and phosphate contained therein. This may be best accomplished by separating the right to mine from the title to the surface, giving the necessary use of so much of the latter as may be required for the extraction of the deposits. The surface might be disposed of as agricultural statutes, while the coal or other mineral could be disposed of by lease on a royalty basis, with provisions requiring a certain amount of development each year; and in order to prevent the use and cession of such lands with others of similar character so as to constitute a monopoly forbidden by law, the lease should contain suitable provision subjecting to forfeiture the interest of persons participating in such monopoly. Such law should apply to Alaska as well as to the United States.

All of this meets with our approval except the suggestion that the existing laws as to the disposal of lands containing the previous metals do not require change. In fact they are inadequate, antiquated and in as much need of revision as are any of the other laws.

We have already, in commenting upon one of Mr. Roosevelt's messages, expressed our approval of leasing the Government's remaining coal lands. This would be no innovation in governmental policy. The first important mineral resources that came into the possession of the Nation were the lead lands acquired by the Louisiana purchase. By Act of Congress in 1907 a lease system for the exploitation of these lands was inaugurated, the Government collecting a royalty, and this continued to be the law until 1847. The retention of their coal lands and their exploitation under lease is even now the policy of several States. There is no better method of preventing the monopolization of such resources and the preservation to the people of the unearned increment.

Anton Eilers

At the end of 1909 Anton Eilers retired from the American Smelting and Refining Company, with which he had been connected, as director and member of the executive committee, since its organization. It is appropriate at this time to review the important work that he has done in the art of silver-lead smelting in which he has been engaged for nearly 40 years, covering the major portion of his professional career. Indeed it would not be far out of the way to call Mr. Eilers the father of the modern practice of silver-lead smelting.

In his early days, a young graduate of Clausthal, Mr. Eilers became assistant to Dr. R. W. Raymond, then U. S. Commissioner of mining statistics, and in the course of that work, which extended from 1869 to 1876, was delegated to report upon the districts like Eureka and Cerro Gordo where the silver-lead-smelting practice of America was inaugurated. His earliest contributions to technical literature are to be found in those admirable volumes upon the mineral resources west of the Rocky Mountains; they were good and may still be read with interest and profit after these many years. We are bound to admire the insight and thoroughness of some of the pioneer investigators, among whom Mr. Eilers was preëminent.

It was natural that Mr. Eilers himself should become interested in smelting enterprises and also that this should first be at Salt Lake City, whose destiny of becoming an important metallurgical center was early indicated. Smelting at that place was particularly interesting to an engineer of Mr. Eilers' quality because of the problems, from which Eureka was happily free, that were baffling the less expert metallurgists. Smelting at that time was chiefly a rule of thumb affair. Ore was shoveled into the furnace with the hope that it would make its own slag. Sometimes it would and sometimes it wouldn't. Freeze-ups and the digging out of sows were matters of everyday expectation, and at the best the ratio of ore to fluxes was such as to be destructive of profits.

In 1876 Mr. Eilers became associated with the late Gustav Billing in leasing the old Germania works at Salt Lake City, which was idle after a rather dismal career as a lead refinery. With characteristic thoroughness he followed up the causes of the furnace irregularities that were then the rule rather than the exception, and found that when slags of certain definite types were made the irregularities largely ceased. He found, moreover, that these types were characterized by a tendency to form definite crystalline forms, which while not invariable, were strongly indicative, and that they corresponded to certain chemical formulas. The realization of this principle permitted a long step to be taken in the art, and the utilization gave the firm foundation upon which the success of this and many subsequent enterprises was based. Other contemporaneous metallurgists coöperated with him in the practical experimentation and determination of successful slag types, among whom may be mentioned Hahn, Raht and Schneider.

The final result of this study was to make American lead-smelting practice preëminent in the world, and give a degree of scientific and economic certainty to such enterprises, which have fostered the growth of a gigantic industry. The enormous waste of valuable metals that characterized the old haphazard practice was done away with, and even allowing generously for the natural improvement in skill and efficiency which would undoubtedly have taken place under any circumstances, it must be recognized that the prompt discovery of this fundamental principle was responsible for the saving to the country and the utilization of almost incalculable quantities of lead, copper, silver and gold, which would otherwise have been thrown away in the mountains of smelter slag that lie scattered over the western country.

With the better understanding of the theory, improvements in furnace design and smelter construction kept pace, and in this field also Mr. Eilers was a leader. He designed the sectional water jacket of cast iron with the flaring lip, at one time called the "Eilers jacket," but now so almost universally used that the identity of the original designer has been forgotten. He first adapted to the lead-smelting furnace the water-cooled tap-jacket, previously used by Lürman in iron smelting, and by thus replacing the clay breast of the furnace, greatly increased the length of a continuous campaign. He was one of the first if not indeed the first in our western practice to adopt the Raschette rectangular blast furnace, which permitted of increasing the smelting capacity without increasing the furnace width at the tuyere level. In brief, he was preëminent among those who pointed out the lines of permanently successful growth of this branch of metallurgy, and the modern lead and copper blast furnace of today is to a great extent a monument to his skill and thoroughness.

In 1879 when Leadville was just coming into prominence as a producer of silver-lead ores, the Billing & Eilers smeltery was built. It was afterward known as the Arkansas Valley works, and is still in operation, after 31 years of practically continuous operation under many changing conditions of ownership and ore supplies. It is the sole survivor in Leadville of the great smelting industry of the early '80s, though few signs of the old regime remain except the old log-cabin residence which Mr. Eilers built, and which is still used as the office of the works.

Early in 1882, Mr. Eilers organized the Colorado Smelting Company in conjunction with the owners of the Madonna mine at Monarch, Colo., and recognizing that thenceforth custom smelters must establish themselves at railroad centers, he built his smelting works at Pueblo, Colo. With his Madonna ore furnishing an ideal supply of lead carbonate and oxidized iron in large tonnage, he was able to buy silicious ores at his own figures, and the enterprise was phenomenally successful, both metallurgically and commercially, and was conceded to be the model works of its day.

When the great lead deposits in Idaho were opened up, Mr. Eilers began to be interested in the northwest, and in 1888 he organized the Montana Smelting Company, and built a large plant at Great Falls, Mont. This soon after was merged with the smeltery at East Helena, Mont., and the National refinery at Chicago, under the name of the United Smelting and Refining Company. All of these plants went into the American Smelting and Refining Company upon its organization in 1899, and the Helena and Chicago works are still in operation.

The smeltery at Pueblo, which remained in operation until a few years ago, was under Mr. Eilers a great training school for young metallurgists. The staff lived at the works and met daily at the mess with the superintendent at the head of the table and the juniors in their order. When the chief retired to go to a larger field the others moved up a place. Thus passed through these works such men as Hahn, Sticht, Dwight, Aldridge, Karl Eilers and Smith who have made great names in the art of metallurgy. Mr. Eilers himself, amid his multifold cares of business, maintained ever the keenest interest in purely technical affairs and bestowed upon them the largest part of his attention. We do not think that his retirement from some of the more active phases of his work will mean cessation of interest in the art to which his life has been devoted, but are rather inclined to think that in his relief from routine cares science will be the gainer.

The Relation of Dividends to Stock Value

When a mining company like the North Butte reduces its quarterly dividend from $1 per share to 50c., we wonder how many investors know really what it means, i.e., as to the actual value of the shares in the market. What this may be depends primarily upon the rate of interest that a mining investment ought to pay. As to this, opinions naturally differ to some extent. However, there is no question in any mind that the best mining investments ought to yield more than good railway stocks, from which about 5 per cent. is expected, and more than good industrial stocks, from which about 6 per cent. is expected, since mines—even those which are optimistically classed as "manufacturing propositions"—are subject to unfavorable, unforeseen contingencies for which allowance must be made in a larger rate of interest.

Mr. Hammond in the address recently published in the JOURNAL expressed the opinion that the best mining investments ought to yield 8 per cent. We are inclined to be a little more optimistic and say 7 per cent., but we should limit that rate strictly to the highest class of mining enterprises.

Now, a mine besides paying interest on the money invested in it must return the principal itself before the investment becomes a sound one, or must pay enough in addition to real interest to redeem the principal in a period of years. Upon an investment of $1000, there must be set aside annually the sum of $30 in order by reinvestment at 5 per cent. interest to regain the sum of $1000 in 20 years. Consequently, a mine that is going to produce for 20 years must yield annually 10 per cent. upon the investment in order to pay 7 per cent. net. If the life of the mine is to be shorter than 20 years, the payment required annually goes up with leaps and bounds.

When, therefore, the North Butte company pays $2 per annum, the shares would be worth only $20, on the basis of present price for copper (a reasonably safe assumption) and the expectation that the mine will continue producing at the present rate for 20 years to come, which is a long look ahead for a mine like North Butte, wherein the amount of ore in sight is never very great, when it is at its best, and quite unsafe as a basis for reckoning when it has come into *borrasca* in its lower levels as now appears to be the case.

The average investor, or perhaps we should better say speculator, does not figure in this way. He buys stocks because he thinks they are going up and sells them when he thinks they are going down. This is equivalent to playing faro and betting on horse races. It is not investment at all. Investment exists only when it is based to the chief extent upon visible value. The theory of the speculator is "the devil take the hindmost." He expects to get in and out nimbly, and let the lambs eventually have the empty shells. This is often practised successfully for a long time, but some day the speculator finds that he himself has got a shell and in one big slump beholds the disappearance of the proceeds of many scalping operations.

Daniel Guggenheim on Conservation

Daniel Guggenheim is the latest exponent of the idea that prices can and ought to be regulated. His own word is "stableized." Having had some unsuccessful experience, antedating that of the U. S. Steel Corporation, as to the ability of a great industrial combination to do this, he goes a step further and holds up the cartels and conventions of Germany, some of which have the aid and abettal of the government, as examples that are worthy of emulation, showing how the producers of commodities may by combination restrict production and obtain in the markets of the world the very highest price for their product. As a new argument in favor of this policy, Mr. Guggenheim blows the trumpet of conservation of resources. Thus do our captains of industry hike on toward paternalism. This is the logical outcome, although for the moment the *entrepreneurs* think only how lovely a thing it would be to have the world working to pay interest on their watered investments in the natural resources that they have gobbled.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS
AND THE EXPERIENCES OF READERS

Mining Investments

James Douglas' advice to investors to "never invest in any mining enterprise what you cannot conveniently afford to lose," can only be prompted by his extreme modesty. Surely a man who has achieved such technical and commercial success in mining, both for himself and for Phelps, Dodge & Co., a man who is responsible for the magnificent mines and plants of the Copper Queen, the Detroit and the Moctezuma companies, cannot think that this trinity of successes is due to mere fortuitous circumstances.

J. Parke Channing.

New York, Jan. 17, 1910.

Stamp Drop Sequence

In the Journal of Nov. 20, 1909, I notice a paragraph on stamp-drop sequence which mentions trouble experienced on changing to the so-called standard drop. Many others, including myself, have gone through this experience. About 15 years ago I had 10 stamps running on gold quartz, using inside plate amalgamation and what I call the California order of drop, 1, 4, 2, 3, 5, and by way of experiment changed them to what I call the Homestake order of drop, 1, 3, 5, 2, 4. Trouble began at once, the feed being piled up at one end of the mortar while the stamps pounded at the other end. The remedy was soon found to be to run the stamps as fast as possible without camming and to keep the feed low. Under these conditions the stamps worked well enough, but were never so satisfactory as with the old order of drop. On considering the matter closely I saw that the cause of the trouble lay in what I call the secondary drop of the stamps, which in this case is a regular succession of drop, at intervals of one (i.e., omitting every alternate drop), from stamp No. 5 to No. 1.

To make my point clear, let us consider the order 1, 3, 5, 2, 4. The stamps are numbered from left to right, 1, 2, 3, 4, 5. The first to drop is No. 1, second No. 3 third No. 5, fourth No. 2, fifth No 4, or this may also be expressed thus:

Stamp No.	1,	2,	3,	4,	5,
Sequence	1st,	4th,	2d,	5th,	3d.

Now begin with any stamp, but, for convenience, say No. 5, omit one, then take the next and so on. By this method we get: Stamp No. 5 drops third; omitting one, the fifth to drop is No. 4; again omitting one, the second to drop is No. 3; the fourth is No. 2, and the first is No. 1; the secondary drop is thus seen to be 5, 4, 3, 2, 1, from which it is evident that once in every two revolutions of the cam shaft there is a succession of drop 5, 0, 4, 0, 3, 0, 2, 0, 1 from one end of the battery to the other, and it is this secondary drop which works the feed up to one end of the mortar. This is not a theory; it is a condition which anyone can observe by looking at a battery running on this drop and watching the steady run of the stamps from one end to the other.

Note also that the intervening primary drop is so placed as to be of little effect in stopping the progress of the feed toward No. 1 stamp. After No. 5 drops and before No. 4, the one to drop is No. 2; between Nos. 4 and 3 comes No. 1; between Nos. 3 and 2 comes No. 5; between Nos. 2 and 1 comes No. 4. That is, the first two intermediate primaries are separated by two stamps from the one they follow, and the second two occur behind the secondary sequence and actually help it to transfer the feed toward No. 1 stamp.

By way of comparison, consider the California drop in the same manner, the order being 1, 4, 2, 3, 5. We have as secondary drop 1, 2, 5, 4, 3, or, beginning with No. 5 again, 5, 4, 3, 1, 2, in which, although the first three drop as in the Homestake, the last two are reversed, giving a drop which tends to work toward the center of the mortar, and which indeed would be quite workable as a primary drop.

While it is generally claimed that the Homestake drop crushes more than the other, it has the disadvantage of being very sensitive to changes of feed and of stamp speed, any slowing being at once followed by a piling up at one end of the mortar, and this is more noticeable with soft ores than with hard, with which the feed can be kept low. Moreover, the California drop gives a better amalgamating wash in the mortar, this being plainly visible on the screen, where the wave is seen to travel clear from one end of the mortar to the other, which in the other case it does not. Also the stamps sound better with the old drop.

In large plants where there is little likelihood of any departure from the proper speed, and where the stamps are regarded merely as a crushing machine, this is perhaps not of sufficient importance to offset an increased output, if there is any, but for a smaller mill, practising inside amalgamation and where the battery is valued as an amalgamating machine, and where the load is variable on account of the intermittent use of a rock breaker, etc., and the engine government not of the best, I consider the California drop far preferable. Several subsequent experiences with both orders of drop confirmed me in this opinion.

It seems to be impossible to get a perfectly even feed distribution in a five-stamp battery. With the California drop there is a slight tendency to pile up under No. 5, and I always used to give this stamp about an inch more drop than the others on that account. In fact, a two-stamp battery seems to be the only one containing more than one stamp in which a perfectly symmetrical drop can be arranged (unless we drop two at a time as they are said to do somewhere in the wilds of Australia!).

The Homestake drop is, however, the only one in which the secondary drop runs completely from one end of the battery to the other, and this curious result is the consequence of that feature which is generally considered its greatest recommendation; that is, that no two adjacent stamps drop in succession, it being indeed the only possible arrangement of five stamps in which that is the case.

I have never seen this point raised by anyone else, although I have mentioned it occasionally to mill men; and I offer it now as the correct explanation of the difficulty.

Ralston Bell.

Edinburgh, Scotland, Dec. 1, 1909.

Sweeping Coal Dust from Mines

I would like to offer a suggestion as to a possible method of abating the dust nuisance in dry coal mines. In mines equipped for electric haulage, I believe it might be feasible to rig up a dust-collector train, consisting of a light gathering locomotive and a string of five or six pit cars. The locomotive should carry a 5- or 10-kw. motor and a powerful suction fan capable of pulling 5 in. of mercury. One of the pit cars is to have a couple of small "cyclones" in parallel separate the coarse dust, the rest of ie cars to be lined with blankets and a ght cover of two or three layers of bur- ip and cotton cloth. These cars, con- ected by sections of cotton hose in eries with the cyclones would entrain ll but a small quantity of the finest dust.

The suction fan would have a number f flat nozzles similar to the ones used y vacuum cleaners. By running the ust train about four times over the aulageways and alternately sweeping ie roof ribs and floor, it seems the roads iould be thoroughly cleaned, not only f the fine dust, but also of the coarser articles that, if left on the roads, would iter be ground up into potentially ex- losive dust. The dust cars could be ent to the surface to have the accumu- ited dust removed, or the fan could be oupled to a discharge pipe running up ie shaft and the collected dust sucked it of the cars. In mines piped up for r machines the piping system could be sed on nights and Sundays for suction ipes by cutting in a vacuum fan, and ie partings, where most of the fine dust sually settles, could be swept with a ozzle and suction hose.

GEORGE C. MCFARLANE.

Omaha, Neb., Dec. 27, 1909.

A Bureau of Mines?

I believe many mining engineers will oice my sentiments when I say that it both a surprise and a disappointment see the stand, or perhaps I had better y lack of stand, the JOURNAL, the most fluential mining paper in this country, is taken in regard to the establishment a mining bureau. A paper that is ipposed to represent the best interests the mining and engineering profession iould have something more to say in s editorial columns in regard to this ry serious matter than I have been le to detect there lately.

The craze which has been raging vio- ntly now for the last five or six years establish government bureaus for the vestigation of every conceivable thing, ems at last about to fasten itself per- anently upon the mining-engineering ofession. The provisions of the bill w before Congress in regard to the ireau of Mines are familiar. There is be a commissioner at $6000 per an- im; the bureau is to "foster, promote d develop the mining industries of the nited States; to investigate diligently e methods of mining, safety of miners, . . . the treatment of ores and other ineral substances, ... and other chnologic investigations and inquiries rtinent to said industries, and from ne to time make such reports of the ork, investigations and information ob- ined as the secretary of said depart- ent may direct with the recommenda- n of said bureau."

INDIVIDUAL RESEARCH IS BEST

If this isn't invading the field of an honorable and self-sustaining profession with the worst species of government paternalism, I would like to know what it is. Every single purpose named above is properly the subject for private and individual effort, and is no more to be made the basis for a government bureau than would be the inauguration of government bureaus for medicine, dentistry, law, or any other profession. Certainly medicine, dentistry, etc., concern every one of us some time or other; they are desirable and useful; then why not let a generous Government establish suitable bureaus where we may get the benefits of government-paid professional advice?

Because we have recently had some appalling coal-mine disasters, this is no sound reason why the Government should begin forthwith the establishment of a mining bureau. The mining engineer has back of him many years of fruitful endeavor, experimenting and experience, and there are at the present day multitudes of keen and trained workers in the field. The results of new discoveries, investigations and practice are eagerly sought by our best professional journals, and the best find their way into print.

Again, it is a notable fact that in many of our coal mines especially, the salaries attached to the positions of managers and mine superintendents are not sufficient to attract and retain men of the highest qualifications.

OUR METAL-MINING PRACTICE

It is unfortunate for the mining industry, particularly coal mining, that so many comparisons with practice in European countries to the detriment of America have been made. But comparisons are always odious, and if we are to compare the higher death rate among American miners with those in other countries then why not investigate why the American must pay more for what he wears and eats, why our army and navy cost more per man in the service, why efficiencies in all our government agencies are lower than in commercial interprises doing much the same work, and a hundred other things?

As contrasted with the coal-mining industry of our country, which has always been hedged about by more laws, regulations, inspectors and inspection, etc., than any other branch of the mining industry, let us examine the practice in our metal mines. In the mining and reduction of copper, gold, silver and lead ores, which has hitherto been reasonably free from Government intervention and interference, we have attained the highest efficiencies and our practice is abreast of or leads the world. This is because private capital, initiative and brains have been free to work out their own salvation. What better refutation to the insinuating appeal of the bureaucrat for the pressing need of government aid and intervention can there be than the maintenance of a practically fixed price for our common metals during a period of 20 years or more in spite of an unprecedented consumption and without the discovery of any new bonanza deposits? It may be said, on the whole, that the increased demand has been met by an improvement in mining and metallurgy in known producing districts. In other words, when it has been put squarely to the American mining engineer to solve a complex mining and metallurgical question, he has never failed; and that, too, without any aid from a government bureau. The steady pursuit of this policy has resulted in making the practice in our metal mines and reduction plants the standard of the world, and the American engineer the leader of his profession.

BUREAU WILL NOT ADVANCE MINING

It seems a pity that in America we have no unified body of mining engineers whose voice would carry weight to oppose this proposed mining-bureau scheme. It is true we have the venerable Institute of Mining Engineers that might well serve as a center around which to crystallize professional and public opinion, but it seems highly improbable that it will ever take to itself this task.

The establishment of a mining bureau means not the advancement of the mining industry, but its slow strangulation. Let the mining industry, particularly the metalliferous end of it, remain free from government bureaucracy; let our young mining engineers receive a thorough training in the well known principles that are at the foundation of his profession; train him in the use of at least one other foreign language, that he may be able to follow his colaborers in other countries; stimulate in him the desire to investigate, observe and experiment on his own initiative; do not cheapen his profession by turning it over to the politician; and, above all, pay him according to his deserts and give him the facilities and authority to carry out those measures that he knows to be essential to the safety and well being of those under him; and the last shadowy reason ever assigned for the establishment of the mining bureau must disappear.

ROYAL P. JARVIS.

Knoxville, Tenn., Jan. 8, 1910.

[Instead of the JOURNAL having failed to take any stand on the question referred to in the above communication, it has repeatedly, strongly and at length expressed its opinion. That opinion, as most of our readers are aware, has been to a large extent on the same lines as discussed by our correspondent, who has evidently failed to see our previous editorials upon this subject.—EDITOR.]

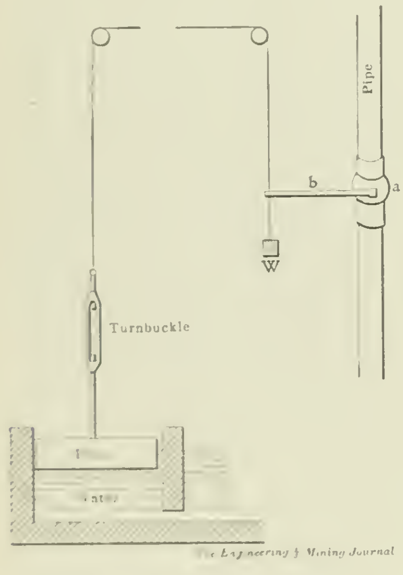
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES ☙ THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Automatic Water Cut-off

In many milling operations it is necessary to keep a constant head of water. This may be accomplished by means of the apparatus shown in the accompanying illustration. The one here described is used in connection with a Hancock jig. The valve *a* in the water pipe is operated by an arm *b* about 20 in. long. To this lever is attached a cord which runs over pulleys to a float where the water is to be kept at a constant head. The rope is adjusted to the proper length as nearly as possible, and the final adjustment is made by means of a turnbuckle near the float. Also attached to the arm *b* is a weight *w*. As the water lifts the float the weight *w* pulls the arm down and this closes the valve. When the flow of water is too small the float sinks and the arm *b* opens the valve. The control of the flow of the water is entirely automatic.

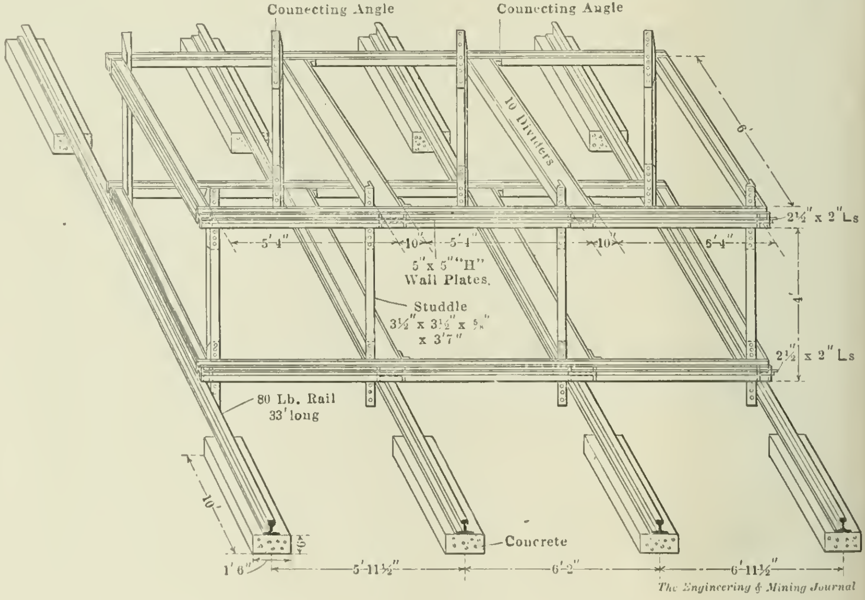


AUTOMATIC WATER CUT-OFF

Steel Shaft Sets on the Mesabi Range

By F. A. KENNEDY*

The accompanying sketch shows the steel sets used by the Shenango Furnace Company in its Whiteside mine near Buhl, Minnesota. The inside measurements are 6 ft. x 18 ft., 8 in. The wall plates and end pieces are 5-in. H's weighing 18.7 lb. per ft., with 10-in. I-beams for dividers. The sets are spaced 4 ft. center to center and held together with eight 3½-in. angle studdles. All angles are shop riveted to the end pieces and dividers so that little time is lost in putting a set in place. Machine bolts were used with nut locks for bolting the steel together. The shaft was wet and it took but 2 hours' labor at the most to put a set in place. Norway plank were used as slats and are held in place by means of small 2x½x2-in. angles shop riveted to the back of all wall plates and end pieces. Later on it is proposed to replace the slats by concrete.



STEEL SHAFT SETS AT WHITESIDE MINE

The sketch shows how the first bearing set was placed under the second set. The rails are 33 ft. long, resting on concrete foundations each 10 ft. in length. Another bearing set of 12-in. x 14-ft. I-beams was put in when the rock formation was encountered. Bearers like the last named were put in every 60 ft. down the shaft. This is found to be a satisfactory method of sinking.

Tube Mill Linings

Rand tube-mill operators have not as yet settled on the best type of lining, and some curious theories have been advanced in discussions of the several types. It is generally admitted elsewhere that the object should be to prevent the slipping of the pebbles on the lining as much as possible. Yet some operators in Africa advocate the silex because "by far the greater bulk of the grinding done in a tube mill is done on the liner of the tube," a statement which might meet with vigorous denial from operators in Mexico. Based on the quoted statement, the ribbed lining is not so effective, and the fact that more power is required to run a mill with ribbed lining is considered a disadvantage. The average life of the silex lining which is used on the Rand is given as 85 days, and the time required for replacing a lining as 24 hours. The ribbed lining lasts from 20 to 24 months. The "peg" lining, made by embedding short lengths of drill steel or round iron in a shell lining of cement, is being experimented with, though few mines could provide the necessary quantity of short drill steel without buying it specially.

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*Chief engineer, the Shenango Furnace Company, Chisholm, Minn.

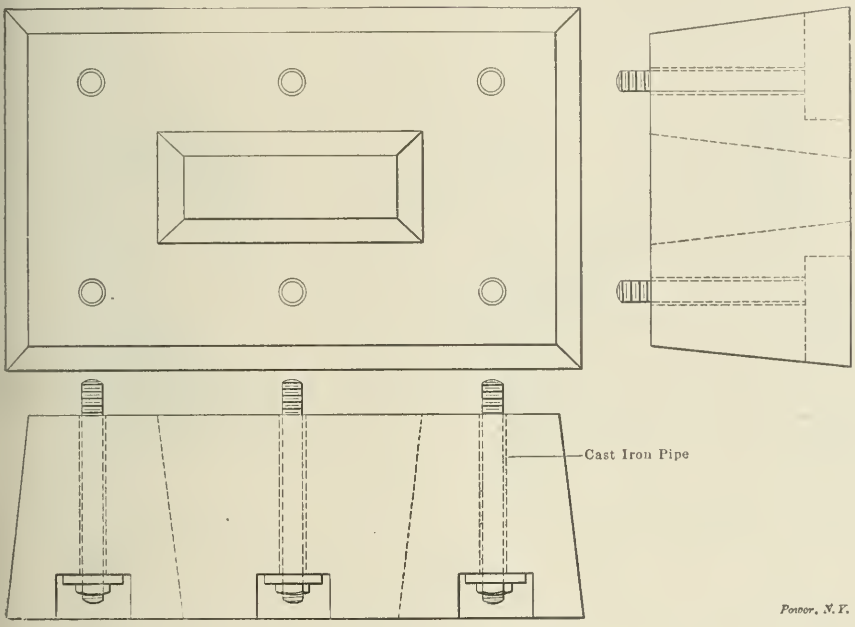
Furnace Charging Car

At the Fundicion smeltery of the Pacific Smelting and Mining Company in southern Sonora, Mex., a device in connection with a furnace-charging car is used, which is of interest and of utility under some conditions. Instead of having a car into which the charge was weighed from the various scales, a side-door, gable-bottom car is used, which is divided vertically into four or five compartments. Each compartment is numbered to correspond with a number on the bins containing respectively the ore, flux, lime and fuel. The metallurgist makes up the charge by calculation and places a mark by means of a peg in a series of holes on the side of each one of the respective compartments, corresponding to the amount of load from each bin which must be taken to make up the calculated charge. The native workman pushes the car, which in this case is on the surface level, under the bins and takes a load up to the respective pegs. The whole car is then moved over a discharge way in the track and is dumped into the elevator boot by opening the side door. It is claimed that this device is fool-proof, an item of some importance in connection with the use of Mexican labor, and also that the arrangement of having the charge delivered in a succession of streams from the side doors results in a desirable and suitable mixture of the charge in the boot of the elevator, from which it is elevated to the charging floor. The device was tried and found to work successfully at the plant above mentioned.

Removable Foundation Bolts

Foundation bolts are usually built permanently into the concrete or masonry, but this is bad practice especially in large and expensive foundations, for if the thread on a bolt happens to get stripped or the bolt is injured in any other way, it is an expensive and tedious job to tear out the foundation around the bolt sufficiently to allow of putting in a new one. The accompanying sketch shows a method of putting in the bolts, so that they can be removed at any time without disturbing the foundation at all.

Howard M. Nichols describes this method in *Power* Nov. 23, 1909, as follows: A cast-iron pipe is built into the foundation where each bolt goes through, and this pipe terminates in a square pocket near the bottom of the foundation. At the top of this pocket a cast-iron plate is built into the concrete. The bolts are held in place by large cast-iron washers and nuts.



Removable Foundation Bolts

When putting a bolt in place, the nut and washer are laid on a plank and pushed into the pocket, so that they come directly under the iron pipe. The washer should be considerably larger in diameter than the bolt so that it can be easily centered. The nut and washer are pressed up hard against the top of the pocket and held there with the plank while the bolt is screwed in from above. A short piece of plank is left permanently in the pocket to keep the bolt from dropping to the bottom of the pocket while placing the bed of the machine on the foundation. This method of building a foundation is applicable only where it is possible to dig the dirt away from the bottom of the foundation and thus obtain sufficient room for the work.

Use of High Explosives in Mining

At a great many mines and quarries a prejudice exists among the miners against the use of dynamite of a higher grade than 40 per cent., this regardless of the hardness of the rock mined. In mining a moderately hard and easily fractured material 40 per cent. explosive gives good results, and has the advantage of being comparatively safe. However, even 40 per cent. dynamite is not a material with which one can afford to be careless. If a man is careful and uses ordinary intelligence in handing dynamite, 60, 80 or even 95 per cent. blasting gelatin can be handled with a reasonable degree of security. In many of the mines of the West where ore with a hard, tough quartz gangue is encountered, 60 and even 80 per cent. dynamite has proven far more satisfactory than the lower grade material, giving a broken product which can be easily shoveled in the cars without previous cobbing or popping. In several instances, nitro-glycerin and even guncotton have been used with success.

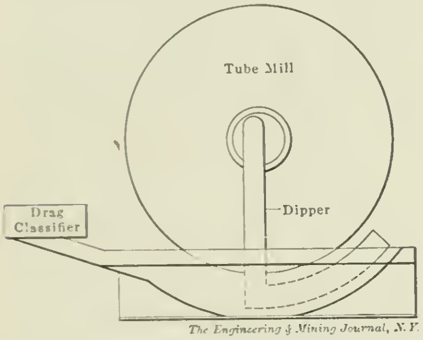
The pyrrhotite ore encountered in the mines of the Tennessee Copper Company is extremely hard and tough in many places. In the Eureka open-cut mine, where the ore is very tough and cemented with a blue quartz gangue, the company is experimenting with 95 per cent. blasting gelatin manufactured by the Du Pont Powder Company. As far as can be seen from the work already done, this explosive is giving excellent results. Owing to the prejudice of the miners against high explosives, it was introduced at first without telling the miners of its grade. Now, however, after the men have become accustomed to using it, they feel no more fear of it, seemingly, than they do of the ordinary 40 or 60 per cent. grade dynamite. It has been found to shatter the rock much more than a lower grade powder, and about eight or nine sticks of the gelatin will do as much work or break down as much rock as nearly double that many sticks of 40 per cent. dynamite.

In the underground workings, objection is made to the use of gelatin even where the men are not afraid of it, as they find it will not stay in upcast holes. In tamping it acts like so much rubber and unless some paper is stuffed in the mouth of the hole is very liable to roll out, this of course being a source of danger.

The decision as to the grade of dynamite to be used should depend upon the results obtained. In a locality where labor is expensive it may be more economic to use high-grade explosive on account of the labor saved from blocking or sledging the ore shot down, whereas, with similar ore, in another region where cheap labor is available it may prove cheaper to use a lower grade of dynamite and cob the large blocks of ore by hand. Each superintendent must determine the grade of explosive best adapted to his conditions. However, with the present tendency toward labor saving, the usefulness of the higher explosives is bound to become more and more recognized.

Tube Mill Dipper

A tube-mill dipper can be easily and inexpensively made of pipe and attached to the mill where it is desired to elevate the feed only a few feet, as in returning oversize. As will be seen from the accompanying sketch, there are no wearing parts, the dipper being flanged rigidly to the tube-mill trunnion. Where a drag classifier is used, this dipper will replace plunger or spiral pumps with their possible leaks and delays. This attachment is particularly serviceable with short tube mills, for which the dipper can be made short. With this attachment the classifier can be set to receive both the original pulp stream from stamps or Chile mills and the tube-mill discharge, returning the total sand content to the tube mill. By making the dipper of sufficient diameter the regular addition of pebbles can be made through it, with the supposed advantage of having the larger pebbles at the head end of the mill.



The Engineering & Mining Journal, N. Y.

TUBE-MILL DIPPER

Inclined Shafts at Joplin

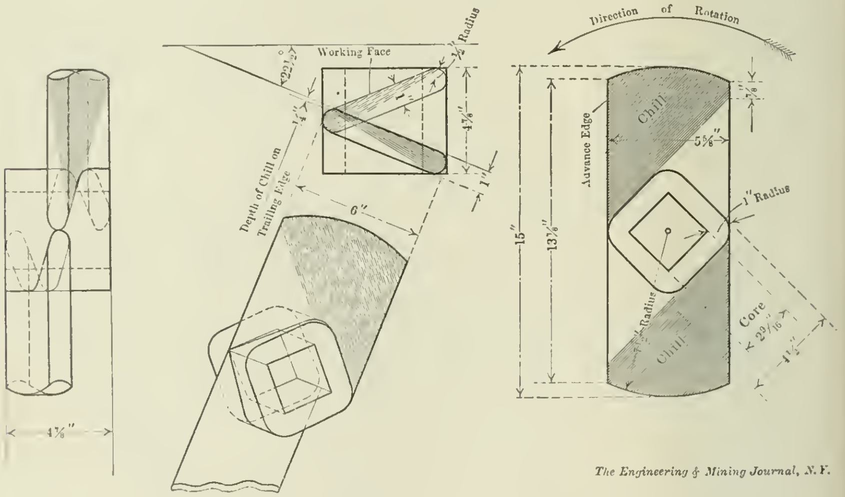
The inclined shaft is something of an innovation in the Joplin district and at present there are not more than one-half dozen in operation. The Yellow Dog mine has three, the Herald one, and the Temagami one. All are operated on a 45-deg. slope to a vertical depth of 175 to 250 ft. At the Temagami mine the 45-deg. slope is 300 ft. long with an additional inclined surface haul of 350 ft. A 7x7 hoisting engine is used for the mine slope. The ore is brought to the surface in 1-ton self-dumping skips, which dump into a car of like capacity, the latter being drawn to the mill by a small hoisting engine. The surface car makes a round trip in the same time as does the skip in the shaft.

The Herald mine hoists in 2-ton self-dumping skips which are run by a 50-h.p. electric hoist. The loading arrangement is rather unusual in the Joplin district. The inclined shaft extends beneath the orebody. From the working level a winze was sunk to the inclined shaft. The bottom of this winze is timbered so as to form a bin, with a gate which delivers the ore direct to the skip. The winze being 40 ft. deep forms a bin which will hold a supply of ore so that the hoist can be run to its full capacity when in use. The top of the winze is covered with railroad rails which form a grating and upon which all the coarse ore is broken by hand to about 6-in. size.

At the Yellow Dog mine are two inclined shafts in which link-belt bucket conveyers were installed, one of which, however, was taken out recently. The one in use is fed by an automatic feeder at the bottom of the shaft. This conveyer has been in use a number of years. A new inclined shaft has been opened recently, and this will be equipped with 2-ton skips run in balance. A 75-h.p. electric hoisting engine has been installed which, by the way, is one of the largest hoists in the district. The total haul is 600 ft., 250 ft. of which is 45-deg. slope, and the remainder on the surface is 7 per cent. At this mine a large acreage has been taken out in the sheet-ground deposits 6 to 10 ft. thick. There yet remains a floor to be taken up which is about 15 ft. thick. Most of this will be handled in the new inclined shaft. The shaft extends deep enough to provide for a loading bin below the working level so that the cars will be dumped into the bin, and from here the ore will be delivered by gravity to the skip, the same as at the Herald mine.

Pug Mill for Mixing Furnace Charge

A pug mill is used with very satisfactory results for mixing the charge for the oxide furnaces of the Bertha Mineral Company, at Austinville, Va. The pug mill is fed by a 16-in. screw conveyer and delivers its product upon a 12-in. conveyer belt carrying the mixed charge to a bin. Formerly, much trouble was experienced from the excessive wear of the teeth of the screw conveyer. Soft iron and angle iron were tried, but lasted only about six weeks. Finally, it was decided to try chilled-iron teeth constructed as shown in the accompanying drawing. The shaded areas in the drawing indicate the depth of chilling required. These teeth give very satisfactory results, and after nine months' continuous usage, are still in fair condition. The teeth are twisted through an angle of 22 degrees, so that each tooth in one revolution carries the material to a point where the next tooth will pass it forward.



The Engineering & Mining Journal, N. Y.

SKETCH OF CHILLED FEEDER TOOTH

On the pug mill, cast-iron holders are used with $2\frac{1}{4}x\frac{1}{2}$-in. tool-steel blades, these having been found to give good service for this purpose. The mill used at Austinville will handle about 70 tons of material (pulverized coal, Bertha mud ore and flux) in 24 hours, and it is in great measure due to the homogeneous mixture obtained through using the pug mill that excellent results are obtained with the oxide furnaces.

The usual small mill in Rhodesia consists of 3, 5 or 10 gravity stamps, or a Tremain steam stamp or a Huntington mill, and is usually "designed," built and operated by the two or three men owning the mine. No attempt is made to treat the slime produced in milling beyond what can be leached with the sand.

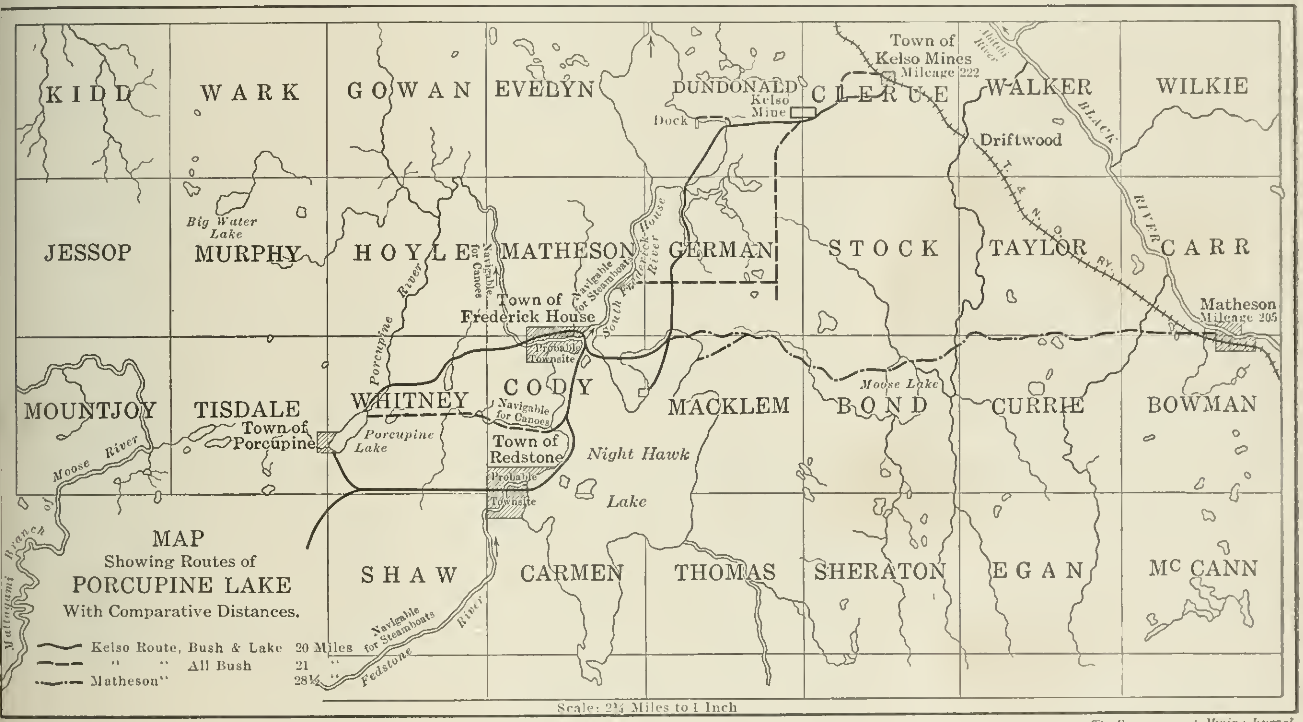
Porcupine Lake Region, Ontario

The Porcupine gold fever continues unbated, and judging from present indiations it is safe to assume that the first art of this year will witness a rush into is district. Daily between 50 and 100 en are going in and this number will ortly be largely increased. The Temisaming & North Ontario Railway Commison, recognizing the importance of the iscoveries, sent its engineer to make a report. The report was exceedingly faorable and the engineer believes the disict to be one of great promise. Free old occurs in the townships of Tisdale, Vhitney, Shaw and Carmen, and daily iscoveries are being made that are widning the mineral-bearing areas. The eins vary in width from a few inches to 0 ft. and several have been traced for 00 ft. and over.

The new roads into the district are apidly being put in shape and regular tages will soon be running. Arrangenents have already been made to put teamers on the lakes next spring, and he necessary capital to carry out this ork has been obtained. Some of the laims are held at a high figure and opions have been given, ranging in price p to $350,000. Bilsky & Jacobs, of Montreal, recently purchased three laims, and it is said that about $100,000 vas paid for them.

J. F. Whitson, assistant chief of the Provincial Surveys Branch of Ontario, has returned to Toronto after ten days' inspection of the Porcupine lake gold area, and states that there are 2000 claims staked out. The entire townships of Whitney and Tisdale, excepting lots reserved for location by veterans, have been staked, as well as two-thirds of Shaw township, south of Whitney, and two-thirds of a township as yet unnamed, south of Tisdale. Several hundred prospectors are doing development work on claims staked during the last two months.

The road from Mileage 222 (Kelso mines) on the Temiskaming & Northern Ontario was finished recently and road houses along the way have been built. The O'Brien Mining Company and the New York Syndicate have each 25 men at work developing properties near the southwest corner of Tisdale. One of these properties, which is being managed by Mr. Timmins, of the La Rose, has a quartz dike passing through it, which has been stripped for 1300 ft. and in many places shows a width of 20 ft. Free-milling gold appears across the whole dike in many places. There are about 50 people starting to build stores and stopping places at the northeast end of Porcupine lake. People are coming in at the rate of about 50 per day. Mr. Whitson strongly favors the route from Mileage No. 222 as an all-land road, level and in good condition, in addition to being shorter than the road from Matheson. He states that there are fine water powers easily accessible for the development of the mines. The accompanying map, from one compiled by G. W. Dixon, of Cobalt, show the three routes to the district most used at present.



Map Showing Routes to Porcupine Lake Region, Ontario

Some Opinions

Henry Timmins, part owner of the Hollinger property where gold was first discovered in large quantities, states that surface indications are wonderful, but much development must be done before it can be predicted that it will be a great gold-mining region. On the Hollinger, where 35 men are at work, a depth of 15 ft. has been reached, at which indications are equally good as those at the surface.

A. M. Hay, president of the Trethewey, says that while recent discoveries of free gold on some large quartz dikes are remarkable, it must not be forgotten that the occurrence of these dikes has been known for several years and claims staked four or five years ago in the district; and that a large number of the dikes under previous examinations failed to show a gold content of importance.

The present rush is largely a stampede, not of prospectors so much as claim-stakers, who are tieing up the really valuable locations without reference to *bona fide* discoveries in the hope of selling out at high figures. Ninety per cent. of the staking now being done in low-lying country without rock-outcropping, cannot show any indications to warrant location under the Mining Act.

Frank Cochrane, Ontario Minister of Lands, Mines and Forests, sounds a note of warning to investors. He states that information has reached the department that "snow-shoe staking" is going on extensively in the district, and that it is only fair to warn the public against buying claims staked out when the whole country is covered deeply with snow, as there can be no certainty of the *bona fide* discovery of minerals under such circumstances. Under the Mining Act the department has power to appoint inspectors to inspect claims for discovery, and it may possibly be necessary to consider whether inspectors should not be appointed for the purpose of stopping this claim staking if it is persisted in. The best safeguard for investors is to examine the claims offered them or have them examined by competent and trustworthy engineers.

W. J. Loring, of the British firm of Bewick Moreing & Co., who do an extensive mining business in various countries, has returned from an examination of the Porcupine district. While favorably impressed with its possibilities, he stated that he had made no investments for his firm because of the unreasonable prices asked by the holders of undeveloped properties. He thought that, while with careful handling profitable mines would be opened up, it was doubtful whether any English firm would care to make investments until more development work had been done or more reasonable terms could be obtained.

North Butte Copper Company

SPECIAL CORRESPONDENCE

As I have previously reported to the JOURNAL, the North Butte company is mining on a number of levels including the 1000, 1200, 1600, 1800, 2000 and 2200. On the 1000, 1200 and 1600 the orebodies have not changed very much in the last year, so far as I am able to learn, but the ore on these levels is nearly worked out.

On the 1800 level the ore was a distinct disappointment, both in the Edith May and the Jessie veins and was considerably inferior to what was found in these veins at the 1600. The 2000 and 2200 levels are the most recent developments, and at these depths the showing appears to be still poorer.

Although the output of the company has been kept up pretty well, having averaged 1500 tons per day, I understand that a large part of this has been second-class ore, whereas some three years ago, the major part of the tonnage was first-class. By first-class ore is understood that which runs 6 per cent. copper, or over.

On the 2200 level of the Edith May vein, which is the vein nearest the company's main shaft, there has been nothing but barren ground opened for over a month, to the best of my knowledge. On the 2000 level of the Edith May vein the ore is all second-class, i.e., under 6 per cent. copper.

On the 2200 level of the Jessie vein drifts are being run both east and west from the crosscut. In the East drift the ground is barren; in the west drift second-class ore is being mined. On the 2000-ft. level the Jessie vein has not been cut at all as yet. Just why this has not been done I do not know, but it is possible that the company wishes to open the 2200-ft. level first, to determine to what depth the richness of the vein extends.

It is the general impression in Butte that the company has been in no position to pay the dividends which it has recently done, since the amount of ore now in sight or blocked out has not justified them. It is extremely difficult to get any authentic information in regard to the company. The management refuses to make any statement whatever, except as to the amount of the production which it can't very well keep secret.

The Guggenheim Coppers

James Phillips, Jr., president of the Nevada Consolidated, last week issued to the stockholders of that company a letter advising them to refuse to go into the proposed consolidation with the Utah Copper Company. He states that the action of the Utah directors was taken only a few days after a meeting at which strong protests were made against any merger upon the proposed terms, and at which meeting Messrs. Smith, Kuhn and himself secured the unconditional promise of the Messrs. Guggenheim that no steps would be taken toward any merger until the figures submitted by the Guggenheim engineers had first been verified by metallurgical experts, and the accounts of the Utah company had been submitted to the examination of auditors. All agreed that there was not any mining necessity nor any economic reason for a union of the two properties at this time. Messrs. Smith, Kuhn and Phillips urged that the Utah company should pay for its own necessities, and that the Nevada company should not be called upon to pay more than the real value of Boston Consolidated, which the Utah company was forced to buy owing to the physical conditions at the Utah mine.

According to Mr. Phillips, the chief engineer for Messrs. Guggenheim refused to certify to the correctness of the estimates as to quantity of ore and extraction until he had a week's time or more to go over the data. Assurance was given that sufficient time would be allowed for examination and certification before any further action would be taken and also that auditors would examine the financial conditions of both the Utah and Boston companies. The said engineer stated at this time that it would take from 2½ to three years to put the Utah company in a position to increase its production. The Guggenheims declared definitely that unless their statements as to dividend earnings could be substantiated, the deal would fall through and no further attempt would be made to combine the Nevada with the Bingham properties. Without the fulfilment of any one of these promises, the Utah offer was forced through the Utah board on the following Friday on the terms presented.

Mr. Phillips follows with a great deal of data to show that the Nevada stockholders would be unfairly treated in the proposed trade.

Replying to the above letter, Daniel Guggenheim issued a statement to the effect that when negotiations looking toward an exchange of the stock of these companies was begun, the whole matter was referred to eminent engineers for a thorough examination. These gentlemen finally united in a recommendation that an exchange on the basis of one share of Utah for 2¼ of Nevada was just and fair. The same conclusion was reached by the Guggenheims themselves, who also were of the opinion that the exchange would result in benefit to both companies. They insisted that all the stockholders of the Nevada company should have exactly the same terms and rights as was given to them (the Guggenheims) and that they should have ample time to make up their minds about the exchange.

Mr. Guggenheim's reply does not throw any great illumination upon the matter. On the street it has been compared to Doctor Cook's promises to tell "later on" how he discovered the north pole.

In the meanwhile, new trouble in the consolidation project has arisen through injunction proceedings against the directors of the Utah Copper Company, inaugurated by Col. E. A. Wall, which prevented that company from increasing its capital stock as contemplated on Jan. 17. Curiously, Colonel Wall objects to the proposed plans on the ground that the Utah Copper Company will suffer by taking in Nevada Consolidated. The claims of Colonel Wall in this action, however, do not harmonize very well with those that he has previously made respecting the Utah Copper Company in his suit for damages against it for illegal extraction of ore from a piece of his own property.

The Safety of Judicious Mining Investments

Good Mining Stocks Yield Better Returns Than Industrials; Methods of Valuing; Information Company Reports Should Contain

BY J. PARKE CHANNING*

If we omit the comparatively insignificant industry of fishing, one can say without contradiction that the wealth of the world is derived from the two industries of agriculture and mining. Raw material, combined with man's labor and brains, produces wealth. Even in its final analysis the wealth produced by the farmer is really mineral wealth, because the growing crops absorb the potash and phosphorus from the ground and combine them with the carbon of the air to make those products which enter into our daily life and existence. Still, the broad division of agriculture and mining can with propriety be established.

Unfortunately, the general idea of mining among most of the public is confined to glowing prospectuses with requests to purchase stock at from 1c. to $1 per share with the promise that these shares will be advanced after three o'clock on next Thursday to double the price at which they are offered to the investor. Few realize, for example, that the mineral production of the United States for he year 1907 was valued at over $2,000,000,000; that of this, pig iron was valued at $530,000,000, silver at $37,000,000, gold at $90,000,000, copper $177,000,000, he total of the metallic products being $900,000,000; the other $1,000,000,000 being the nonmetallic products, that is, fuel, structural material, abrasives, chemcal materials, pigments, and miscellaneous items, such as asphalt and sand for glass manufacture. The total of these products has grown from $1,000,000,000 n 1899 to more than $2,000,000,000 in 910.

If one takes into consideration how much wealth mining adds to the world he can realize the importance of the industry. A mining operation if properly onducted adds to the world all its wealth, and takes nothing from the pockets of either the producer or the consumer. A egitimate mining venture properly financed does not produce the paper dolar which so often represents supposed good will in an industrial concern. I say properly conducted because, unforunately, so many mining investments have been conceived in iniquity and born n sin. One cannot expect, however, that mining investments can ever be as proaic as other investments because of the act that there is forever present the great chance of unexpectedly uncovering a large or a rich body of ore in the particular mine under consideration. John Hays Hammond, in his lecture a few weeks ago, gave some good advice as to what to beware of in a mining investment; follow his advice, but remember that there is no type of investment which one can so successfully make as a mine, if he takes the proper precautions.

Returns on Mining Investments

The return on mining investments, as on everything else, depends upon the risk which one runs. The greater the risk the larger the returns. The risks which one undertakes in mining are the same to a certain extent that one undertakes in agriculture. The first is the varying price of the product, that is, the varying price at which coal, iron, copper, silver, lead or spelter sells, and to this one may even add gold because, although gold is considered as a standard of value, there is no doubt that an overproduction of gold tends toward increasing prices, hence an increased cost for its production. The second risk that one runs is the sudden end of the particular ore deposit which is being exploited by the property under consideration. The chance of a coal seam being terminated underground is, of course, a minimum, the main thing being to secure sufficient acreage at the time of starting out. The price of coal does not vary much because it is really the cost of production that determines its selling value. Roughly, one may state that the profit on the production of soft coal is 10 to 15c. per ton, and on anthracite coal it is probably 50c. per ton. It would be easy for a moderately careful student of the annual reports of coal companies to determine from the figures given what his probable rate of interest would be upon his investment.

In iron mining the risk is somewhat greater, and was markedly so until the discovery of the Mesabi iron range in Minnesota, with its enormous deposits of ore now largely controlled by the United States Steel Corporation. It is quite likely that there is on the Mesabi range 1,250,000,000 tons of ore actually developed by shafts and drill holes, while on the older ranges, which have been operated for the last 40 years, it is doubtful if there is actually visible more than 250,000,000 tons of ore. It is the ownership of these large tonnages of iron ore, and of the large acreage of coking coal that puts the United States Steel Corporation in such a strong basic position. I doubt even if the corporation itself in its early day recognized the extreme value of this raw material.

J. R. Finlay, in his admirable book,[1] has estimated the cost of laying a ton of pig iron down in New York at about $12.50 per ton. If we can assume the selling price of pig iron to be $16.50 per ton, this would mean a profit of $4 per ton, or upon the ordinary run of a Lake Superior iron ore a profit of from $1.50 to $2 per ton.

The next group in which the risk is greater, and consequently the returns are greater, are copper mines. The average cost of producing copper is probably 10c. per lb., the lower minimum being 7½c. and the upper maximum being 12½c. The price of copper has fluctuated all the way from 11 to 25c., but one may figure the average price at from 14 to 15c. per lb. For a great number of years, with the possible exception of such regular deposits as those of Lake Superior, there was a great deal of risk in copper mining, and there were violent fluctuations in the price of copper stocks. The geology of the deposits was not understood, the particular phenomenon of what is known as secondary enrichment of the ores in the upper levels having been unrecognized. It frequently happened that when a mine got below this level, large sums of money were expended in looking for the downward extension of this rich zone, which existed only in the imagination of the manager. Within the last six or seven years attention has been turned toward the so-called disseminated orebodies, and there are now half a dozen mines in this country, the proved tonnages of which are calculated in the millions. This type of property requires a large initial investment and considerable time for development and equipment, but when in proper shape is one of the best mining investments which is known.

Gold mining is always in a category by itself, and, as you know, from the addresses of Mr. Hammond and Mr. Paish, is a favorite source of investment by the English public. The tendency now in gold mining is toward the development and exploitation of low-grade deposits in which a relatively large tonnage is exposed and available for treatment.

Silver mining at present is rather more speculative than any other, not only on account of the tremendous fall in the value of the product in the last 20 years and the fact that a large proportion of the world's consumption is produced as a byproduct in the production of other metals, but also from the fact that the strictly silver mines themselves are always more or less irregular. As showing this, last week there was a certain silver-mining stock selling at $9 per share, which was paying a dividend of $2 per year, and a certain copper stock selling at $90 per share, which was paying a similar $2 annual dividend. In each case the question of security and probable life were the governing factors in determining the price, though I think that, as often happens, the public had gone to the extreme in each case, and that one mine was selling at too low a valuation, and the other too high. However, one can say that without doubt a stock paying $2 per year and selling at $9 was doing so for the reason that it was a question as to how long it would last. In this connection it is probably not improper for me to say that the mineral reserves of the world and of this country are not unlimited, and that I strongly believe in the conservation of our metal resources as much as I do in conserving our timber resources. In fact, even more so, for a forest, if cut over, can by intelligent management be made to produce another crop in from 50 to 100 years, but a mine from which all the ore is extracted is valueless, and, as we know, it takes countless ages to produce merchantable mineral.

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*Consulting engineer, 42 Broadway, New York.

NOTE—An address delivered before the Fiance Forum of New York, Jan. 19, 1910.

[1] "Cost of Mining," McGraw-Hill Book Company.

Development of Mines

I presume that in an address to a body of this kind it is unnecessary to explain the steps that take place in the development of a mine. In a country like the United States, where the natural resources are not all known, there is a class of man who devotes himself to tramping over the western country looking at the various outcrops of rocks. As a rule, good ore does not stick up above the surface, but on the contrary it is never so deep seated as the ordinary promoter would have one believe. The prospector in scouring the country finds on some hill a red, iron-stained showing, and he sinks a small pit on it, and at one or two feet from the surface he finds some mineral. He then stakes this out and records a claim in the nearest land office, and to some people he now has a mine. Such, however, is far from the case; it requires time and money to determine actually whether the vein or deposit has value. Either he or the person to whom he sells his claim for a small consideration spends money upon it, and it may or may not turn out to contain a deposit of ore sufficiently valuable to be exploited. If the showing turns out well, the property finally increases in value until there is enough ore in sight to warrant the erection of a plant. This money is furnished, and the property is now in a development stage. When this is completed it then comes to a productive stage, and from now on its actual intrinsic value starts to decrease, for it is but a logical deduction from the statement that ore reserves do not grow in a mine. It would be wrong, though, to assume that the possibilities of the mine decrease, because during the time of extraction of ore, development work may be continually opening up new bodies, and it is the possibility of discovering new and larger tonnages of ore that make for the speculative end of the property. However, in all mining investments the fact of this ultimate extraction of the ore should be taken into consideration. Roughly speaking, in a property that can show it has 30 years' ore ahead, the question of ultimate extraction need not be of great importance at the moment.

Valuation of Mines

In determining the value of a mine we have two main points to consider. First, the net profit in the amount of ore which the mine has developed; second, the possibilities of finding other orebodies. If the successful mining investor will study mining conditions and mining reports in the same way that Mr. Harriman and Mr. Hawley in their early days studied railroad reports, and will get an idea of values and disregard prices, he will find that a mining investment gives him one of the best returns for his money that he can find. As Mr. Hammond has pointed out, unless you are actually in the mining business yourself, or unless you make a thorough investigation of it, it is not for you to invest your money in prospects. The investment of money in prospects must be left to those people who are distinctly in the mining business, or to development companies who can afford to have nine failures out of ten. It is for them to weed out those properties which in their early stages appear upon the surface as good as the successful one, but will not stand the test of the shaft or the drill. If you do wish to go into a prospect, it is better for you to do it by owning stock in one of the companies which does development work. Do not, if you are a merchant, be led away by the alluring tale of your friend who has gone West, and met in the hotel the prospector coming in with his burros and his samples of ore from his new strike. The chances are 10 to 1, yes, 100 to 1, that neither he, nor your friend, nor yourself, will ever get anything out of it.

Valuing Mining Stocks

When you come to study a mining investment look first to the question of the amount of ore which the property has developed, and the profit per year which it can make. Take into consideration the fact that if no ore were found during the five, 10 or 20 years that the mine will exist, that not only has it got to pay you back interest on your money, but it also has to return to you your capital. In this connection I call your attention to the two tables which are published by Herbert C. Hoover in his book[2] on mining, published last year. In this book the first table shows the present value of an annual dividend over....years at....per cent., and replacing capital by reinvestment of an anual sum at 4 per cent. If, for example, you have a mine which can pay $1 per share per year for 20 years, and you feel that you will be satisfied with 6 per cent. interest on your money, then you can afford to pay $10.68 for each share of stock, and out of the $1 which you receive you may consider 64c. as interest on your investment, and 36c. as return of capital, the idea being that if this 36c. were invested at 4 per cent. and each year you compounded your interest, at the end of 20 years it would produce for you your $10.68 original investment. I say to you that when you buy your mining stock take this into consideration, but do not let it be the whole point governing your investment. You must, from the reports of the engineers or the manager, take into consideration the possibilities of finding further ore. If these possibilities are good, and if at the same time you consider that the price of the metal which this mine produces is going to advance, then you certainly have a good investment. One can get into few businesses and get 6 per cent. return on his money, have absolute security, and at the same time a chance of having the business and the profits double or treble as is often the case with good mining investments.

If you wish to look at it from the other point of view, the third table in Mr. Hoover's book will give you some idea of the means of determining value.

J. H. Curle, of London, who is considered one of the best valuers of gold mines, considered that any gold mine that looked good in the bottom, and that had 60 per cent. of its selling value in sight, was a good investment. However, I do not wish you to be carried away by the idea that ore in sight is of necessity the most important thing in a mine. Four or five years ago, when the question of ore in sight was receiving a great deal of attention by engineers, I wrote an article asking the question, if it might not be possible for a mine to have too much ore in sight. I advanced reasons for this which I think were correct, the principal thing being that often the cost of development is wasted inasmuch as the ground caves in, or, as has happened in some of the Lake Superior mines, the interest on the money, where development has been done for 20 years ahead, has added a large factor to the cost of operating. Tonnage of ore is the main thing to be considered, if it is actually developed or simply prospective.

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[2] "Principles of Mining," McGraw Hill Book Company.

Amortization

Referring to the question of return of capital in mining industries, there are those who advocate that the companies themselves should start a fund to repay the capital to the stockholders. I do not approve of this for two reasons: First, the selling price of the stock may vary greatly at different periods in the mine's history, and hence the sum to be returned may vary accordingly; and, second, I believe that as this capital belongs to the stockholders it is for them to decide how and when they shall reinvest it. I believe that after accumulating a sufficient cash surplus to allow for the purchase of adjoining properties or radical changes in the reduction works, that all money should be repaid to the stockholders from year to year. In this connection it is unnecessary for me or you to look too closely into the par value of a mining stock. You should know the total number of shares and the selling price.

For the reasons as given above, the value of the shares at different periods may be a fraction of or a multiple of the original par value. The par value of the 100,000 shares of Calumet & Hecla, for example, is $25, of which, if my memory serves me right, only $10 was ever paid in, and still this stock is today selling on the Exchange at over $600 a share, and the laws of the State of Massachusetts permit trust funds of widows and orphans to be invested in it. The question might naturally arise, if one followed the theory of the mining company establishing its own amortization fund, as to whether this fund should be on a basis of the $10 paid in, the $25 par value, the $600 present selling price or the $1000 price at which the stock sold some time prior to 1907.

What Company Reports Should Contain

The Mining and Metallurgical Society of America, of which I have the honor of being a member, last year discussed the question of what information a mining company should give its stockholders each year, and it was finally decided that such a report should embody the following things:

(1) Details as to capitalization of the company; the number and classes of shares outstanding at date of the report; the respective rights of these shares; the number of shares remaining in the treasury; any options or contracts on such shares; any bonded indebtedness.

(2) A brief review of the past history of the property, the work accomplished and the results obtained, with tabulated statement of expenditures and receipts from the beginning, marketable products made each year, and the sums received from the sale of same, the annual net earnings and the disposition made of such earnings.

(3) A similar review, but in more detail, of the work of the year, with statements of the assets and liabilities, receipts and disbursements, cost sheet and other information as to work accomplished and results obtained.

(4) A statement of ore reserves at the date of the report, compared with the reserves of the previous year, with an estimate, by competent authority, of the probable life of the mine.

When mining companies give this information then one will be able to get a good idea of the value of a property, and you, who are studying finance, can by a little training be able to as carefully analyze mining reports as you can railroad reports. It is, of course, necessary that you know the men connected with the particular mining company under discussion, and the reputation of the engineer who makes the statement contained in the last paragraph, and I take it that his reputation in this case would be subject to perhaps the same scrutiny you might give to the statements of the chairman of the board of directors of a railroad company, who was predicting the growth of traffic on his line. In both cases the personal equation has largely to do with the matter. The day has long since gone by when, because a man was a noble duke, a merchant prince, a triumphant admiral or a well-known general, that his name as president or director in a mining company had any weight with the public. The question is, is the engineer who makes the annual report of such standing in his profession that his statements may be relied upon.

The capacity to be a successful mining man is one born and innate and cannot of necessity be derived simply by a course in a mining school. Great engineers, like great inventors, are born, and are not made, though no one will be less ready to decry technical training for an engineer, or a lawyer, or a physician than myself. This, however, is not everything, as former President Eliot, of Harvard, said: "Many a $2000 education has been wasted on a $2 boy."

Suppose that the millenium arrives, and that every mining company makes full and complete reports, you yourself in your investigation of these reports must ever be on the lookout for fallacious bookkeeping. Mr. Finlay in his book previously referred to has made two cost figures, one of which he calls "dividend cost" and the other "selling cost." The dividend cost is the one which subtracted from the annual profit gives the balance which is left for dividends. The selling cost is the one which takes into consideration the total ultimate investment including capital. By this I mean to warn you that in a mine, which is a business in a constant state of liquidation, it must at the time of the extinction of the mine have made enough money to have paid its regular running expenses, and also returned its capital, in addition to paying dividends. This is often neglected in mining companies, and you will find every year a certain amount is charged to construction and from that into the capital account, which, in reality, should have gone into the operating expense account. Keep this clearly before you, and remember that nothing should go against capital account but that which increases the productivity of the property, or I might even go still further and say, which tends toward shortening the time of extraction of the ore. See that everything that is spent for replacement goes into operating costs.

Orebodies Have Real Value

In conclusion, I wish to reiterate that if one uses the same care in investing in mining stocks that one does in investing in railroad stocks, that his return will in the long run be greater. I would, from my point of view, put mining stocks far above industrials for the reason that industrials, to a large extent, depend upon processes that may over night be rendered worthless. Who does not recall the fact that in the early days aluminum was made by what is known as the sodium process, and the minimum price at which the then new metal could be sold at a profit was 60c. per lb. The discovery of the Cowles electrolytic method made it possible to sell aluminum at a profit at 30c. per lb., and over night the property of the Hall company, which produced aluminum by the sodium process, fell from several million pounds sterling to nothing. Here was a purely industrial concern whose property was rendered worthless by a new discovery. Had the dominant factor in the production of aluminum been the ore from which it was produced, and had the Hall company control of the supply, or even part of it, this change in the process would not have affected them.

Today the value of the South African mines and our mines in the Black Hills is the gold in them; the value of our mines in Montana, Michigan, Utah, Nevada and Arizona is the copper within enormous orebodies; the value of the United States Steel Corporation is its iron ore and its coal; the value of the deposits in Leadville, Colo., and Missouri is the lead and silver that they contain, and no change in process can in any way affect their intrinsic basal values. Nothing can destroy the value of the anthracite lands in Pennsylvania, and nothing can destroy the value of the soft-coal lands near Pittsburg. If you take this into consideration you can realize that a good mine, like 640 acres in the valley of the Red River of the North, has a value that cannot be destroyed.

The Santa Gertrudis Mine, Pachuca, Mexico

Sold to Camp Bird, Ltd., for £922,000. Ore Reserves 526,283 Tons.
Estimated Net Profit £2 per Ton. Action of London Meeting

EXCERPTS OF ENGINEERS' REPORTS

The completion of the negotiations for the purchase of the Santa Gertrudis mine at Pachuca, Hidalgo, Mexico, is announced by the Camp Bird, Ltd., of London. In connection with the announcement are three interesting and important engineering documents, excerpts of which are presented herewith. The maps show in detail the vein widths and the estimated contents throughout, but owing to the necessary reduction it was not possible to reproduce these. The three reports are noteworthy for their directness and simplicity and for their unmistakable definiteness. In all the reports the money values are in United States currency, unless otherwise indicated, and the weights are in metric tons of 2204.6 pounds.

Report of Edwin E. Chase

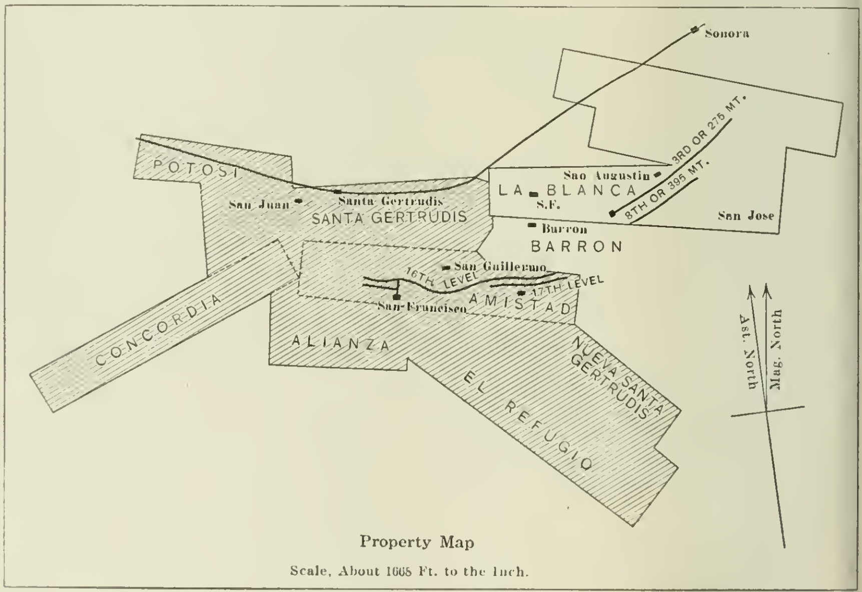
An excerpt of the report of Edwin E. Chase, of Denver, under date of Sept. 7, 1909, follows:

"The property embraces over 600 acres, and is situated at an altitude of 8000 ft., the distance from Mexico City being but 62 miles by rail so that all kinds of supplies are readily obtainable; water shipments can be made via Veracruz, the mine having therefore the advantage of both rail and water connections.

Geology

"The Santa Gertrudis vein is a large persistent fissure in andesite (eruptive) rock. Its course is generally east and west, with a dip of about 65 deg. to the south. The dip of the vein, combined with the irregular shaped surface holdings, results in a peculiar underground boundary line, which, however, is to the advantage of the Santa Gertrudis as compared to the Barron and the La Blanca. The vein filling is a friable, easily broken quartz, carrying clean argentite (silver sulphide) as the precious metal, with some gold. There are practically no base metals whatever, such as iron, copper, lead or zinc, with the ore, and for this reason the ordinary cyanide treatment results in a high percentage of recovery. The vein varies from 10 to 30 ft. in width, and has been developed, more or less, for over a mile in length. The main oreshoot averages about 2500 ft. in length, extending from Santa Gertrudis through the well known properties of the Barron and La Blanca to the east.

"Within the Santa Gertrudis territory and to the west of the main oreshoot is a smaller orebody, separated from the main shoot by from 300 to 600 ft. of ground which is either barren or in some places, carrying low-grade ore. The indications are that these two shoots are approaching each other in depth, and doubtless will, at several hundred feet greater depth, merge into one continuous orebody. The main vein is characterized by having various branches and spurs from the hanging-wall side of the vein and these are all more or less productive. Two branches especially are very marked, and are designated on the various maps as south branch Nos. 1 and 2 The ore carries 5 grams gold to each 1000 grams silver to the ton, and this percentage is almost invariably constant.



The Engineering & Mining Journal

Map of Santa Gertrudis Property, Pachuca, Hidalgo, Mexico

Sampling

"In the course of my investigations I took 1300 samples averaging 75 lb. each, or 44 tons in all. The sampling of this property was greatly facilitated by having the use of a power sampling mill for reducing crude ore samples to assay pulp. Wherever the vein was of great width, as for example 25 ft., then five samples of 5 ft. each were separately taken and assayed. On the 17th, or bottom level, the vein was sampled in this way at 10-ft. intervals along its course. As so much depends on the reliability of this 17th level sampling, I will further state that the following checks were had on its accuracy. The level was first sampled by another engineer under my general observation, with one of my own men as party to the work. The results as taken by him gave an average of 1560 grams or $29.58 per metric ton, this sampling being also in continuous 10-ft. sections. My own sampling followed, selecting cuts half-way between the first line of sampling, so that the vein has now been sampled on the 17th level at every 5-ft. interval and practically all samples covering 5 ft. or less in length. My sampling gave $28.62 per ton. As near as I can ascertain the ore actually mined from this 17th level gave $29.10 or an exact mean between the two samplings.

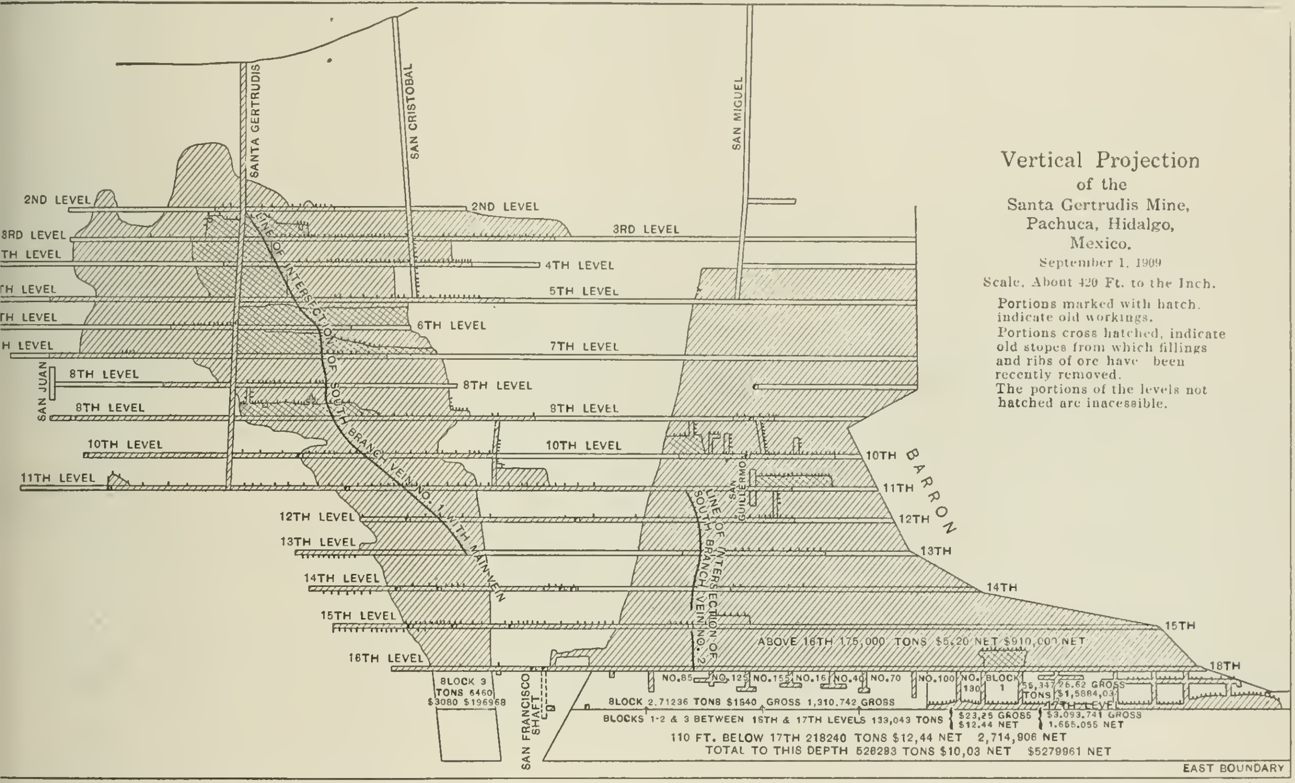
"The figures I shall use will be the lowest results, or my own sampling of $28.62, figuring silver at 50c. per oz., and allowing 15 cu.ft. of ore in place per ton or 20 cu.ft. in case of old fillings. I might add that every conceivable precaution was taken to avoid any possible salting of the ore, and the assaying itself has been checked up by two other assayers.

"The sampling of the territory above the 16th level was somewhat difficult owing to the ground being inaccessible and to the mine custom of using stone-masonry arch work in the levels, so that samples could only be taken in many cases by cutting holes through the masonry. Then again the levels are not always driven on the vein so that in many cases negative results marked on the map means simply that country rock was really the material sampled, rather than vein matter or old fillings.

ORE RESERVES

“The Santa Gertrudis main oreshoot s extended from its highest point at e 4th level down to the 17th level, a stance of over 1000 ft., with about the me width and grade of ore all the way, near as can be ascertained, for which ason, figuring ore downward is not as eculative as pertains to figuring more oroughly blocked out ore in some mines more erratic mineralization.

“Without going into full details of how arrive at mining, milling, and other sts, I will state that I have used figures little in excess of what I believe will entually prevail after the mine is in ll swing. In arriving at the net value the ore I have made the following deictions from the gross value, to wit: ost of mining, development, pumping, insportation to mill, milling, metallurcal losses, Mexican taxes of every deription amounting to seven per cent. of e recovery value, general expenses, royies, English income tax, and in general ery expense except amortization of the lling plant and any new equipment iich may be required. Using the data ven on the various maps and keeping in nd that measurements as to the length ould be made on the irregular courses the plan map, rather than on the concted projection of a section map, I are at my estimate of ore reserves. All e above the 17th level I will designate ‘positive ore,’ while that below the th I will class as ‘probable ore,’ alough the first 100 ft. of the latter I rerd as practically certain, for reasons forth later.



Vertical Projection
of the
Santa Gertrudis Mine,
Pachuca, Hidalgo,
Mexico.
September 1, 1909
Scale. About 420 Ft. to the Inch.

Portions marked with hatch. indicate old workings.
Portions cross hatched, indicate old stopes from which fillings and ribs of ore have been recently removed.
The portions of the levels not hatched are inacessible.

The Engineering & Mining Journal

VERTICAL PROJECTION—SANTA GERTRUDIS MINE, PACHUCA, MEXICO

“I have divided the ground longitudinally into three sections marked Blocks 1, 2 and 3, No. 1 being over the 17th level proper, No. 2 in the region of the winzes, and No. 3 embracing the west stope.

“The estimation of ore above the 16th level is based on whatever sampling was possible but takes into account, also, the general impressions which one gets in a two months’ study of this property and the constancy with which valuable ribs of ore and fillings are encountered whenever the old workings are opened up. Also from the fact that since Jan. 1, 1908, the Santa Gertrudis Company has mined 30,000 tons of these old ribs and fills, keeping the grade up to 1100 gram or $21 ore.

ORE RESERVES.

	Gross Contents.		
	Tons.	Gross.	Total.
Positive Ore.			
Block 1..........	55,347	28.62	$1,584,031
Block 2..........	71,236	18.40	1,310,742
Block 3..........	6,460	30.80	198,968
Blocks 1, 2 and 3.	133,043	23.25	$3,093,741
Positive Ore:	Net Contents.		
Between 16th and 17th levels.....	133,043	12.44	$1,655,055
Above 16th level..	175,000	5.20	910,000
Total above 17th level.........	308,043	8.33	$2,565,055
Probable Ore (practically assured):			
For a distance of 110 feet below 17th level......	218,240	12.44	$2,714,906
Total..........	526,283	10.03	$5,279,961

“For each succeeding 100 ft. in depth on the same basis as 17th level, there would be an additional return of 198,400 tons; $12.44 net; $2,468,096 total net.”

SUMMARY AND CONCLUSIONS

“My conclusions then are that the ground between the 16th level down to a depth of 110 ft. below the 17th, together with what may be expected from the old workings, will yield a net profit of $5,279,961 from 526,283 tons of ore and that each 100 ft. additional depth will yield 198,400 tons of $2,468,096 net value, for a reasonable depth impossible to predict exactly.

“The remarkable length, width and value of this oreshoot combined with the fact that there are no faults or breaks whatever in the vein, that the pay shoot has already extended to over 1000 ft. depth from its starting point at the 4th level with no change in size or value as far as known; that the ore reserves counted upon are away below the line of water level which is the danger point in many mines; that there is nothing in the character of the inclosing country rock to indicate any probable change in the ore deposition and that no indications exist of any base metals appearing in the ore as greater depth is attained, all of these facts make me feel confident that the present grade and size of ore prevailing at the 17th level will extend many hundreds of feet below that level and I certainly think that the first 110 ft. estimated, can well be classed as ‘positive ore.’

“I should have stated that my estimation of costs is based on an output of

160,000 tons per year, or about 530 tons per day for say 300 working days in the year. I have not gone into the matter of mine or mill equipment as that has been investigated by special engineers."

REPORT OF WILLIAM J. COX

Under date of Sept. 8, William J. Cox, of Ouray, Colo., in a supplemental report directed to the chairman of the Camp Bird, Ltd., transmits Mr. Chase's report with his own comment and indorsement. The following is an excerpt of his report:

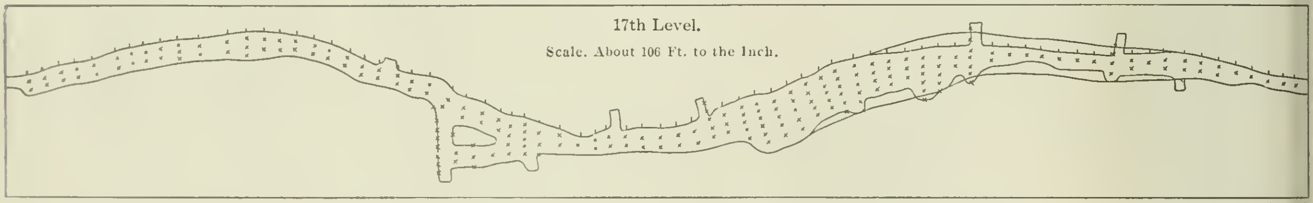
"Enclosed herewith I hand you the report of Edwin E. Chase, of Denver, Colo., the engineer, whom, after mature deliberation, I considered to be the most suitable person to put in charge of the sampling and measuring of orebodies in the mine. This gentleman was assisted by a staff of expert samplers from the Camp Bird mine. The work involved a re-survey of the mine workings.

"The methods adopted for sampling, as set forth in the report by Mr. Chase, are in every respect most thorough, and are the result of a careful study of the conditions and character of the ore deposits. These methods included a system of check sampling which I instituted with the object of protection against possible errors, or te tampering with samples.

"It will be observed that in casting the estimates on probable ore, the vein is assumed to maintain its size and value for an undeveloped depth of 110 ft. below the bottom level, and in view of the fact that the main orebody has been continuous in depth for approximately 1000 ft., has maintained its length and average width with apparently no falling off in values, and no change in the country rock inclosing the vein, I consider this assumption unquestionably justified, and am of opinion that the ore will continue for considerably greater depth than the distance assumed. I am further strengthened in this view by the opinion of Fred J. Pope, an economic geologist who has not only made an examination of the geology of the Santa Gertrudis vein, but quite recently finished an examination of other prominent veins in the district.

"In order to fully confirm the estimate of mine working costs the services of E. E. McIntyre, superintendent of mine operations of the Guanajuato Development Company, were employed. As to the cost of milling and extraction of metals, I was ably assisted by Godfrey D. Doveton, of Spurr & Cox (Inc.), of New York. Exhaustive tests extending over a period of several weeks on bulk samples of ore were conducted by Mr. Doveton, and from the results of these were deduced the percentage saving of values, and the cost of treatment. These results are fully confirmed in cyanide practice on similar ores within both this district and the republic.

"In conclusion, based on my investigations, the money that it is proposed to invest in this business should be returned in a period of between three and four years from the starting of the cyanide mill, say one year hence, and until a point is reached where there is diminution of the size and value of the vein, each additional 100 ft. of depth should yield a net profit of nearly $2,500,000."


17th Level.
Scale. About 106 Ft. to the Inch.
The Engineering & Mining Journal

SANTA GERTRUDIS, 17TH LEVEL—790 FT. LONG: VEIN, 15.5 FT. THICK; ESTIMATED VALUE, $26.62 PER METRIC TON

RECENT DEVELOPMENTS

Under date of Dec. 20, 1909, R. J. Frecheville made a supplemental report to the chairman, treating of the new conditions developed since the other reports were made and giving his own definite, specific conclusions and figures. An excerpt of Mr. Frecheville's report is as follows:

"In your interests I was present during the examination made of the above company's property in July and August last by your manager, William J. Cox, and the staff of engineers that he selected to assist him, and can testify to the great care and thoroughness with which the investigations were conducted. Since the date of the reports of Messrs. Cox and Chase a great deal of development work has been done on the 17th level east of the San Francisco shaft, and this work has opened up the western fringe of the main oreshoot and enabled its western limit to be more accurately defined.

"Last month I sent my own engineers to the mines to investigate and sample the new development work, and having now received their reports find that it is necessary to recast the previous estimates and make a reduction of 23,115 tons of positive ore in the western portion of pay shoot above the 17th level, and 17,470 tons of probable ore in the corresponding ground below the 17th level, making together a reduction in the reserves of positive and probable ore of 40,585 tons of an estimated net amount of $401,200. This makes the corrected figures for the ore reserves at date of Messrs. Cox and Chase's reports to be as follows: Positive and probable ore down to 110 ft. below 17th level, 485,698 tons; net value, $4,878,761.

The mines should be worked at the rate of from 150,000 to 160,000 tons of ore yearly, and an uptodate mill with cyanide plant erected for treating this output. On this basis the net profit should be in round figures £300,000 per annum. For the installation of the mill and other plant, and the development of the mine to a greater depth, a working capital of £150,000 should be provided."

CAMP BIRD LONDON MEETING

An extraordinary general meeting of the shareholders of Camp Bird, Ltd. was held at Salisbury house, for the purpose of considering the following resolutions: "(1) That the company hereby authorizes the formation of a separate company to acquire the option over the Santa Gertrudis mine and the subscription of the whole or any part of the capital of such company. (2) That the capital of the company be increased to £1,350,000 by the creation of 250,000 additional shares of £1 each. A. M. Grenfell, chairman of the company, presided and said in part:

"The purchase price of the mine, excluding all commissions, is £922,000. The actual profits in sight, as certified by R. J. Frecheville amount to £924,000. The mine is bought as a going concern, and, in addition to the profit in sight, has a plant in operation; but this is not a new and up-to-date plant, and we are therefore arranging to provide £150,000 for working capital, which will be sufficient to equip a thoroughly uptodate mill and cyanide plant to treat 160,000 tons a year. Besides this there are two *haciendas* and other assets. Under the terms of purchase we have to complete the organization of a subsidiary company by Jan. 26, 1910.

"This company will be called the Santa Gertrudis Mine, Ltd., or some such name. It will have a capital of £1,275,000. As I have already told you, the purchase price of the mine is, approximately, £922,000 in cash, in addition to which we have to find a further £150,000 for working capital, making £1,072,000 which we have to subscribe in cash

Cyaniding at the Montgomery-Shoshone Mill

Sands, Slimes and Concentrates Cyanided Separately; Crushing by Rolls and Chilean Mills; No Amalgamation at This Nevada Mill

BY P. EDWIN VAN SAUN*

The mill of the Montgomery-Shoshone Mines Company is situated at Rhyolite, Nev., and has been in operation since the summer of 1907. It is treating about 6000 tons per month of that company's ores, which average $10 to $12 per ton and carry silver and gold in a ratio of about 12:1. The milling costs average about $2.25 per ton. The ores occur both as oxides and sulphides in quartz stringers in the matrix of rhyolite.

The treatment is based in general on crushing to pass through 30-mesh screens and separating the sand and slime products, which are concentrated on tables and vanners respectively, the ratio of concentration being about 200:1. The crushed product is thus divided about equally into what is here termed, for convenience of reference, sands and slimes. These two products are then cyanided separately. The concentrates are ground in tube mills and separately cyanided by agitating, settling and decanting.

Since building, the mill has been modified to suit variations in the ores. The tests previous to designing the plant indicated that crushing to pass a 16-mesh screen would give most economical results in extraction and produce the proper balance between sands and slimes. Subsequent development of the mines, however, resulted in finding that the gold and silver were more finely divided than was evidenced at first, and that finer crushing was needed to effect quicker and closer extraction. For accomplishing this two 6-ft. chilean mills were installed to follow the 42x14-in. rolls previously in use. By this means, as well as through corresponding changes in the slime department to meet the conditions, the saving has been maintained, under the management of John G. Kirchen and superintendence of E. M. Kirchen, at a combined average of about 90 per cent. for the sand and slime treatment, and from 97 to 99 per cent. in the treatment of the concentrates. It is therefore interesting to note the present mode of operation which has been evolved to treat successfully this class of ore.

Crushing and Concentration

The ore is hoisted by cage from a vertical shaft and trammed to the mine-run bin. Referring to the accompanying flow diagram, it is then broken in a Blake crusher to pass a 2-in. ring and elevated to the mill-feed bin, from which a plunger feeder uniformly delivers it to the No. 1 roughing roll, set to effect a reduction of about 4 : 1. From this roll it is elevated to revolving screen No. 1 with ½-in. perforations. The oversize returns to the same roll and the undersize passes to roll No. 2. From this roll it is elevated to two revolving screens, Nos. 3 and 4, fitted with 6-mesh cloth, water being added. The oversize product is returned to roll No. 2, and the through product flows to the dewatering screen. This screen is fitted with 30-mesh cloth and takes out that portion of the product already crushed sufficiently fine, and removes the surplus water.

From the dewatering screen the oversize is fed to roll No. 3, and elevated to two revolving screens, Nos. 4 and 5, fitted with 30-mesh cloth. The crushing is thus evenly divided between the rolls so as to effect the maximum reduction commensurate with their capacity at each stage. The oversize from screens Nos. 4 and 5 is delivered to two chilean mills. The through product and that crushed to pass 30 mesh in the chilean mills and the undersize from the dewatering screen, are delivered to two mechanical classifiers which separate the sands from the slime product.

The sands are fed to seven concentrating tables. The slime product is delivered to six 8-ft. cone settling tanks, from which the thickened pulp is concentrated on ten 6-ft. smooth-belt vanners. The treatment of the sand tailings, slime tailings and concentrates is carried out separately and will be referred to in sequence.

Treatment of Sand Tailings

The tailings flow by gravity launder from the concentrating tables, and after being partially dewatered are discharged into either of two sand-collecting tanks, each of these tanks being provided with three roller-blind decanting gates, arranged so that the water will flow over continuously as the tanks are filled. The surplus water is elevated by centrifugal pump to two cone-bottom clarifying tanks, the clear overflow water from which is pumped to the main storage tank.

Montgomery-Shoshone Mill, Rhyolite, Nevada

When either of the two collecting tanks is filled with sand the central plug gate is drawn and the contents discharged by means of the excavator to belt conveyer No. 1, running beneath the tanks. This is run in such direction as to discharge to the incline-belt conveyer, No. 2, which raises and delivers the sand to conveyer No. 3, placed alongside and above the tanks and discharging by use of a tripper to any of the five leaching tanks. The product is spread uniformly over the area of the tank by a distributor.

The intervals of treatment of the sand product are as follows: Time of filling each collecting tank, 2 days; time of treatment with strong solution in the five leaching tanks, per tank, 4 to 5 days; time of treatment with weak solution, per tank, 6 days; total time of treatment, per tank, 10 to 11 days. No water wash is

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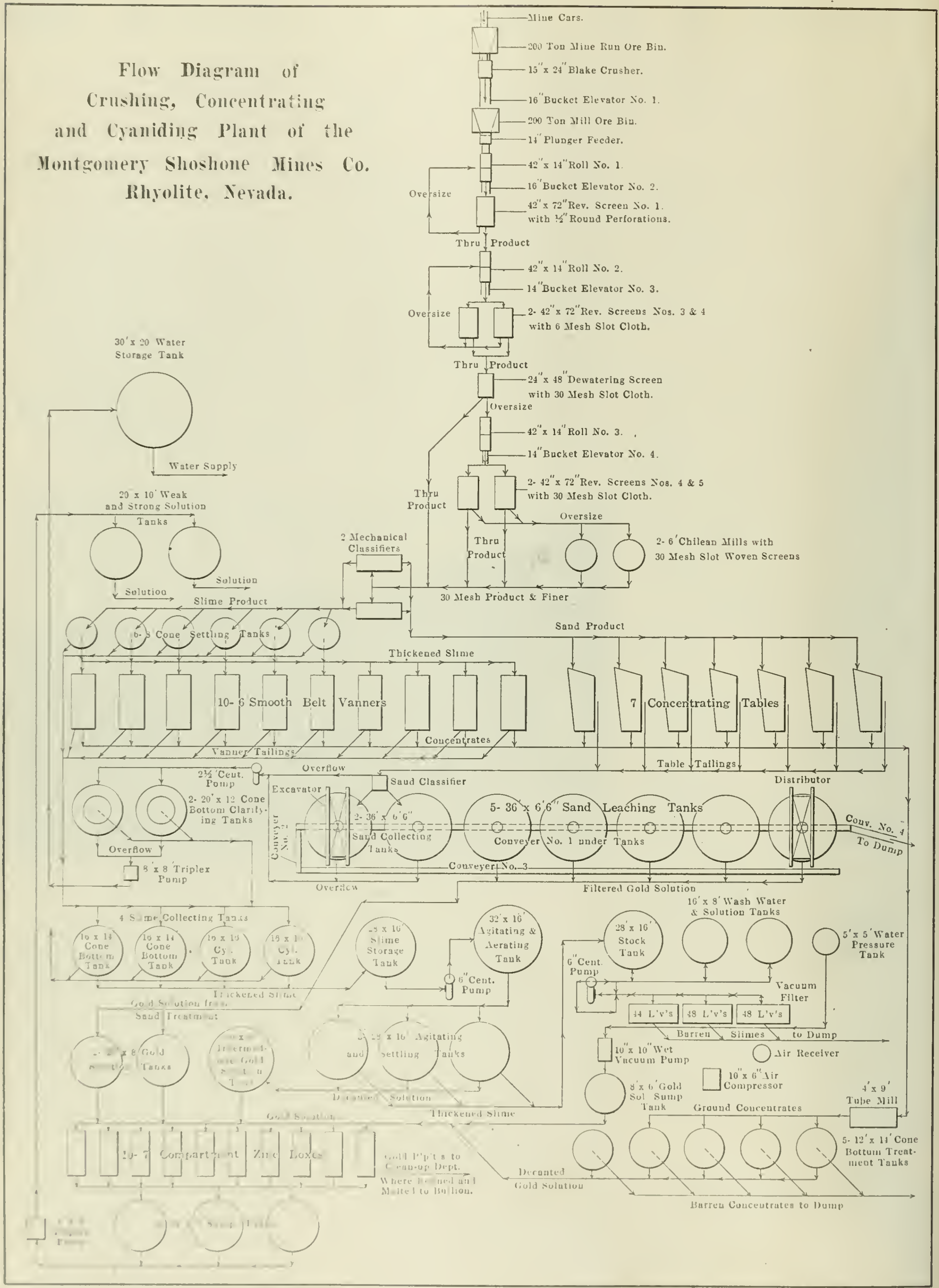
*Chief engineer, Mill and Smelter Engineering Company, 118 Liberty street, New York.


Flow Diagram of Crushing, Concentrating and Cyaniding Plant of the Montgomery Shoshone Mines Co. Rhyolite, Nevada.
Mine Cars.
200 Ton Mine Run Ore Bin.
15"x 24" Blake Crusher.
16" Bucket Elevator No. 1.
200 Ton Mill Ore Bin.
14" Plunger Feeder.
42"x 14" Roll No. 1.
16" Bucket Elevator No. 2.
Oversize
42"x 72" Rev. Screen No. 1. with ½" Round Perforations.
Thru Product
42"x 14" Roll No. 2.
14" Bucket Elevator No. 3.
Oversize
2- 42"x 72" Rev. Screens Nos. 3 & 4 with 6 Mesh Slot Cloth.
Thru Product
24"x 48" Dewatering Screen with 30 Mesh Slot Cloth.
Oversize
42"x 14" Roll No. 3.
14" Bucket Elevator No. 4.
2- 42"x 72" Rev. Screens Nos. 4 & 5 with 30 Mesh Slot Cloth.
Oversize
Thru Product
Thru Product
2- 6' Chilean Mills with 30 Mesh Slot Woven Screens
30'x 20 Water Storage Tank
Water Supply
20 x 10' Weak and Strong Solution Tanks
Solution
Solution
2 Mechanical Classifiers
30 Mesh Product & Finer
Slime Product
Sand Product
6- 5 Cone Settling Tanks
Thickened Slime
10- 6 Smooth Belt Vanners
7 Concentrating Tables
Concentrates
Vanner Tailings
Table Tailings
2½ Cent. Pump
Overflow
Sand Classifier
Distributor
Excavator
2- 20'x 12 Cone Bottom Clarifying Tanks
Conveyer No. 2
2- 36' x 6'6" Sand Collecting Tanks
5- 36'x 6'6" Sand Leaching Tanks
Conveyer No. 1 under Tanks
Conv. No. 4
To Dump
Overflow
8'x 8 Triplex Pump
Conveyer No. 3
Overflow
Filtered Gold Solution
4 Slime Collecting Tanks
16 x 14 Cone Bottom Tank
16 x 14 Cone Bottom Tank
16 x 16 Cyl. Tank
16 x 16 Cyl. Tank
25 x 16' Slime Storage Tank
32'x 16' Agitating & Aerating Tank
6" Cent. Pump
Thickened Slime
Gold Solution from Sand Treatment
28'x 16' Stock Tank
16'x 8' Wash Water & Solution Tanks
5'x 5' Water Pressure Tank
6" Cent. Pump
Vacuum Filter
44 L'v's
48 L'v's
48 L'v's
Barren Slimes to Dump
2- 24'x 8 Gold Solution Tanks
Intermediate Gold Solution Tank
3- 28 x 16' Agitating and Settling Tanks
Decanted Solution
Thickened Slime
Gold Solution
10- 7 Compartment Zinc Boxes
Gold Pp't s to Clean-up Dept. Where Refined and Melted to Bullion.
Sump Tanks
Pump
10"x 10" Wet Vacuum Pump
Air Receiver
10"x 6" Air Compressor
8'x 6' Gold Sol. Sump Tank
Ground Concentrates
4'x 9' Tube Mill
5- 12'x 14' Cone Bottom Treatment Tanks
Decanted Gold Solution
Barren Concentrates to Dump
The Engineering & Mining Journal

FLOW SHEET, MONTGOMERY-SHOSHONE MILL, RHYOLITE, NEVADA used. The five leaching tanks are fitted with the usual construction of filter bottom, consisting of canvas and cocoa-matting laid over a false bottom of wooden grilling. The filtered solutions flow by gravity to the two gold-solution tanks.

When the treatment in any of the leaching tanks is completed the central plug gate is withdrawn and the excavator discharges the contents on belt conveyer No. 1. This conveyer is now run in the opposite direction from that in the previously described operation of filling, so that in this case it delivers the leached sand to conveyer No. 4 and thence to the dump.

Slime Treatment

The slimes from the vanner tailings overflow from the six cone settling tanks, and the settled products from the two clarifying tanks are together delivered to four slime-collecting tanks from which the thickened product is delivered to the slime-storage tank. From this it is transferred by a 6-in. centrifugal pump to the agitating and aërating tank where it is agitated for four hours with solution consisting of 1.2 to 1.4 lb. sodium cyanide. 0.2 lb. lead acetate and 6 lb. lime per ton of ore. After agitation the product is transferred to the three agitating and settling tanks where it is settled for 15 hours and decanted to the gold-solution tank as indicated. The slime is then diluted with weak solution, agitated and transferred to the filter-stock tank.

The vacuum-filter plant consists of 140 filter leaves, each 5x10 ft., in three tanks. It is operated in the usual manner by the return system with solution and water washes. The intervals of operation are as given in an accompanying table.

TIME REQUIRED IN FILTER PLANT.

Filling	15 min.
Forming 1⅛-in. cake	40 min.
Pumping slime product back into stock tank	30 min.
Filling and washing with solution	115 min.
Returning solution	30 min.
Filling with wash water	10 min.
Washing and dropping cake	25 min.
Total time per cycle of operation	4 hrs. 25 min.

The gold solution withdrawn by the vacuum pump is delivered to the sump tank provided for it.

Treatment of Concentrates

The table and vanner concentrates resulting from a 24-hour run are charged together into the 4x9-ft. closed-type tube mill, where they are ground continuously for about 20 hours in cyanide solution. The ground product is then run into any one of the five cone-bottom treatment tanks. In each of these tanks the product is given about 28 days' treatment by agitating with compressed air, settling and decanting, and replacement with fresh solution. That is to say, the material is agitated for about four hours and allowed to settle; the clear solution is then decanted; other solution is again added and agitated for about six hours, when the slime is allowed to settle and the clear solution again decanted. This is done continuously until the tank is needed for a fresh charge of concentrates. After final washing and decanting the barren product is run to dump without further treatment.

The extraction by this method of treatment of the concentrates is stated to be close to 99 per cent. The consumption of cyanide does not seem to be excessive—in fact, since this method has been employed the total consumption is not noticeably greater than before the concentrates were cyanided.

The decanted gold solution resulting from the treatment of concentrates, and those from the vacuum filter, decantation of slime-settling tanks and sand treatment are run through ten 7-compartment zinc-shaving precipitating boxes from which the solution is delivered to any of three sump tanks. From the latter it is pumped to either of the two weak and strong solution tanks, and is there re-standardized.

The cleanup is made by the usual method, employing an acid tank for dissolving fine zinc, washing, filtering in gravity sand filter and drying in cast-iron muffles. The precipitate is mechanically mixed with the necessary fluxes and melted to bullion in an oil-fired tilting furnace. An ozone generator has been installed to facilitate extraction, but as yet insufficient data have been obtained to afford trustworthy conclusions.

Buena Fe Mining Company

The Buena Fe Mining Company has acquired a number of *antiguas* situated on what is known as the Cerro del Torro, about midway between the cities of San Luis Potosi and Aguascalientes, Mexico. The distance by wagon road to San Luis Potosi, the shipping point, is about 65 miles. Running across the mountain is a series of parallel veins. striking approximately east and west. The country rocks are shale and slate, capped by rhyolite, a flow subsequent to the formation of the veins.

Mining was going on here before the earliest time recalled by the oldest inhabitants. The ore was sorted and shipped on burros to Guanajuato. a distance of about 100 miles. where it was treated by the patio process. About 20 years ago the Salvador mine was operated by a Mexican company. When water level was reached a tunnel 500 m. long was driven past the vein. and from that a vertical shaft was sunk by means of a *malacate* and by that means the water level was lowered about 60 ft., but then an increased flow checked further progress, though 120 horses were at one time in use, in 30-min. shifts, four at a time. After all the available high-grade ore had been shipped, operations ceased.

The present company has completed a 2-compartment incline shaft on the vein and has installed a 40-h.p. gasolene hoist (Fairbanks Morse) driving an Ingersoll Rand compressor on the surface. The shaft is now timbered to a depth of 300 ft., and still has 50 ft. to go to reach water level. Work was started in August, 1909, and the hoist was installed Nov. 1. A 60-h.p., 3-cylinder, Westinghouse producer-gas engine is now being installed to drive an electric generator, the current to drive electric track pumps (Goulds); with these, in connection with bailing skip, no trouble in handling water is anticipated.

The vein matter is quartz. the silver occurring in the form of *plata verde* or horn silver. The shale on either side of the quartz often contains silver for a distance of several feet. According to F. B. Irvine, the general manager. the ore left by the ancients carries 20 to 150 oz. silver per ton and $1 to $5 gold. The extraction by cyanide process should approach 90 per cent. A 25-ton cyanide plant is to be installed.

Two other of the old mines are now in process of development; the Concepcion, about one mile distant from the Salvador, is a larger and more promising vein, but has not been developed to a depth of more than 150 ft. A 25-h.p. gasolene hoist (Western) will operate the compressor. The Providencia mine, midway between the Salvador and Concepcion, outcrops higher up the mountain, and was profitably mined for many years through a series of irregular shafts and winzes along the vein, the ore being packed up "pigeon ladders" on the backs of peons. A Mexican company drove a tunnel a kilometer long to tap the vein at a depth of only 350 ft. and left some milling ore above tunnel level. A small gasolene hoist has just arrived here to sink from tunnel level.

The scanty supply and high price of wood and the prohibitive cost of coal hauled 65 miles from the railroad has prevented the use of steam for power or hoists, and the necessity of economy in fuel led to the selection of producer-gas engines for power purposes, to run on native charcoal laid down here at $25 per metric ton. The fact that the hoists were scattered over a large area led to the selection of gasolene hoists, which are proving very economical. They are quite a rarity in this region where electric power is so widely available. Freighting costs are low, the minimum rates being $5 and $5.50 per ton respectively for hauls of 60 and 65 miles.

A 1500-h.p. producer-gas plant is to be installed here by Thomas R. Bremner, who installed the power plant at San Luis Potosi.

Exhaustive tests will be made to determine the relative economy and consumption of various kinds of fuels.

Le Roi Mine at Rossland, British Columbia

No Ore Now Being Mined; Three Veins Came Together at 900-ft. Level; Developing at 1650-ft. Level by Drives and Diamond Drills

BY ROY HUTCHINS ALLEN*

Less than two years ago the Le Roi mine was the largest and most important of the Rossland mines, and within the year it ranked only second among the large producers, being surpassed by the Center Star group, but in March the shipments of ore were stopped and all attention was directed toward prospecting and development work. By reason of its past importance and the chance that it may again attain its prestige, an account of the methods which were employed there are of interest.

Mine Equipment

The Le Roi property lies between the Center Star and Josie mines, and contains several of the veins found in those two properties. The ground was first opened by a shaft near the eastern edge of the property, but this has been abandoned for several years. The Le Roi shaft, which is near the center of the property, is a five-compartment shaft, 29x8 ft. in the clear, and 1650 ft. deep, and one manway 4½x6 ft. in the clear. The shaft was sunk on the Le Roi vein and has an inclination of 68 deg. 12½ min. toward the north. The wall plates are made of 10x10-in. timbers in two sections, one 16 ft. 9 in., the other 12 ft. 3 in., with plain butt joints. The end plates and one divider are 10x10 in. in section, the other three dividers are each of 8x10-in. timbers. Each hoisting compartment is fitted with heavy rails, the track being of 48-in. gage, and with guide timbers. Two of the compartments have 5-ton skips, while the other two have cages for handling men and supplies. The skips, as well as the cages, are provided with guide shoes and safety appliances.

The skips are operated in balance by an Allis-Chalmers first-motion corliss hoisting engine of 800 indicated horsepower, having cylinders each 24x60-in. stroke. The two cylindrical drums are 10 ft. in diameter and have a 5-ft. face, taking a 1¼-in. hoisting rope. The speed of hoisting is 2000 ft. per min. with an unbalanced load of five tons. A Vulcan Iron Works first-motion hoisting engine, set at an angle to the shaft, operates the two cages in balance. This hoist has cylinders 18x30 in., and two cylindrical drums 6 ft. in diameter with a 3-ft. face. The power used is compressed air at a pressure of 100 lb. All brakes, clutches and reversing gear are actuated by compressed air. The mine ore was crushed in the headframe and dropped into one of three bins, each of which was discharged on a pan conveyer leading to the sorting house. The sorted ore was conveyed by an aërial tramway, 900 ft. long, to the railroad bins over 250 ft. below, and shipped to the company's smeltery at Northport.

Stopes Timbered and Filled

Three veins were worked by the company: the Le Roi, which was the principal vein, and the North and South veins. These were approximately parallel in srtike, the strike being a little north of east, but they converged in depth and came together at the 900-ft. level. Below this point the vein was less regular, and though the value of the ore in gold still persisted a relatively larger amount of dead work was required to obtain the ore.

Le Roi Mine, Rossland, B. C.

The stopes varied from 3 ft. to over 100 ft. in width, the widest stope being next the Josie dike. Where the vein was less than 15 ft. in width stulls were used in timbering. The ore was drawn off as fast as it was broken, and rows of stulls placed about 20 ft. apart. In only a few cases, and that where the vein was very narrow, was the ore allowed to accumulate in the stope.

Where the vein was over 15 ft. in width the stopes were timbered with heavy square sets, 10x10-in. and 12x12-in. timbers being used. The sets were kept right up to the roof when working, and a set was placed and filled as much as possible as soon as there was room for it. Even with the heavy sets and filling the weight of the roof was often sufficient to crush the timbers before the stope could be exhausted. All stoping was carried on by the overhand method, Rand 3⅝-in. and Sullivan 2½-in. drills being used. The veins were worked out right up to the shaft, no pillars being left, and both sides of the shaft and also the stations at the levels are lined with cribs and bulkheading.

The mine chutes are 2 ft. 6 in. in width, and are for the most part provided with arc gates. End-dumping cars holding about one ton of ore were trammed by hand and the ore dumped into pockets at the shaft. These pockets each hold 150 to 250 tons of ore and are provided with a single gate raised and lowered by compressed air.

Diamond Drills Now Working

Development work is done by contract, the company furnishing all of the supplies. The drifts are run 6x8 ft. in the clear, and cost from $15 to $16 per foot. Such a drift has been advanced 100 ft. in ten days. The men work three 8-hour shifts, and usually blast a round of ten 5- to 6-ft. holes every 14 or 15 hours. Diamond drills are extensively used for prospecting, two being in use constantly, and four much of the time. The present method of prospecting the ground below the present mine workings is to drive crosscuts from the drift on the 1650-ft. level for 200 ft. into the hanging-wall. At the end of the crosscuts a chamber is cut sufficiently large for the convenient working of the diamond drills. The holes are put down diagonally so as to cut the planes of the veins at nearly right angles.

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*Mining engineer, Lunenburg, Mass.

The mine workings are also connected with the surface by the Black Bear adit, at the third level. At the mouth of this adit are the power plant, shops and mill belonging to the company. The adit contains the air, steam and water pipes, and the electric cables. All supplies are received through it, and when the mill was running it was used as a transportation tunnel for the low-grade ore. The power plant has nine tubular boilers of 100 h.p. each, made by the Jenkes Machine Company, and two 150-h.p. Heine safety boilers. Four 6x4x7-in. duplex boiler-feed pumps supply water to them.

There are two Canadian Rand, cross-compound, corliss air compressors, one with steam cylinders 22 and 40x48 in. and air cylinders 36 and 22x48 in.; the other having steam cylinders 22 and 40x48 in., and air cylinders 34 and 22x48 in. The capacities are respectively about 3000 and 2800 cu.ft. of free air per min. compressed to 100 lb. per sq.in. The last mentioned compressor is not used at the present time and the other is run at about half its capacity, the steam being furnished by the two Heine boilers at 120 lb. pressure. Condensers are attached to the low-pressure cylinders and a normal vacuum of 21 in. is obtained.

The various shops of the company are exceptionally well equipped and are fitted to do all ordinary repair work, as well as to make new cars, skips, cages, etc. The machine shop contains a power shears, a power punch, three lathes, a planer, a slotter, two drill-presses, a hack saw, and a large and small pipe threader and cutter. The blacksmith shop has six forges, and in addition to a full equipment of the ordinary tools has a large power hammer and two Word Brothers No. 10 drill sharpeners. The carpenter shop contains circular saws, both cross-cut and rip saws, and a Denver Engineering Works Company timber-framing machine.

The company formerly employed from 400 to 800 men and shipped 500 to 700 tons of ore daily, 1000 tons frequently having been hoisted in a day. During the first few months of the present year, before work was stopped, the shipments had been cut down to less than 200 tons daily. In common with most of the other large operators of the district, the Le Roi company spent large sums of money in vain attempts to adapt theoretic processes to the treatment of its low-grade ores, and it is to be hoped that when shipments are resumed the resulting profits will be expended under more practical advice, or returned to the stockholders as dividends.

Stage Crushing

BY H. W. HARDINGE *

Referring to the excellent paper by W. A. Caldecott, entitled "The Development of Heavy Gravitation Stamps," read before the Institute of Mining and Metallurgy, of South Africa, I must say that it is full of material for consideration by metallurgists, for, if studied carefully by the experienced, unprejudiced millman, it will, I think, prove that the stamp should be "scrapped" rather than continued in its present waste of energy, even though it does perform some of the work desired. I have read and re-read the facts and figures stated, and am reminded of the conclusion I reached 15 years ago, that the stamp, as both a preliminary and final reduction medium, is economically wrong. This conclusion owing to press of professional work was relegated to my experimental scrap heap for a period of 10 years, after which time it again received consideration.

At the time mentioned, experiments were made in crushing by stamps through a ¼-in. mesh battery screen with a low issue, the product being passed to a Huntington mill for final grinding. The tonnage per h.p. was greatly increased, but when the repairs on the Huntington mill had been charged against this increased tonnage, it was ascertained that but little had been attained from an economic standpoint. From that time to the present, I have realized the great waste of energy, when endeavoring to crush a springy mass of sand and gravel by pounding it between the shoe and die of a stamp.

Stamps Not Economical

Mr. Caldecott by his thorough experiments has proved the truth of the fact that the efficiency of the stamp passes beyond the economic range when used for fine crushing. He also proves that the efficiency of the stamp is greater on the run-of-mine ore (as received from the crusher) than upon material after passing rolls set at ½ in., for from the latter size the division is rather through abrasion than by impact crushing. The energy of the stamp is wasted by springing, compression and readjustment of the particles among each other.

The stamp is a most efficient crusher of solid rock, a single drop of an ordinary 1000-lb. stamp being sufficient to crush a 2-in. cube, three-fourths of a pound, into a mass of pieces finer than ½-in. cubes, provided the die is clear at the time of the drop. The effect of subsequent drops upon this mass depends upon the thickness of the fine material between the shoe and the die. If the material is allowed to remain on the die the amount of divisional work performed from this point seems to be inverse to the amount of the fine cushioning material present. Mr. Caldecott explains that with a heavy stamp of 1337 lb., the capacity to finality, or through 30 mesh (about 90 per cent. through 60 mesh) is a little over 5 tons per day of 24 hours, or possibly 2 horsepower-tons per day.

In the case of the 2-in. cube crushed into a mass of coarse particles and sand, provided the die were cleared at each drop we would have at 100 drops per min., 100 × 0.75, or 75 lb. per min., equaling 54 tons per stamp per 24 hours, or something over 20 tons per horsepower-day, instead of a possible two tons per horsepower-day as at present. There is something radically wrong, either in mechanical construction or method, for the 2-in. cube would occupy less than 1/12 of the die area before crushing, and after crushing into a mass ½ in. in thickness, would still occupy less than ¼ of die area. If it is the intention of designers of machinery to utilize all of the area of a die, then we would have a possible capacity of something like 200 tons per stamp per 24 hours down to a ½-in. size. This capacity of 20 tons per horsepower-day on the coarse rock compares favorably with the capacity of a rock crusher for reducing material to ½-in. cubes and finer.

Both methods are effective, but not equally so, for the crusher ceases consumption of power, except bearing friction, when work is not performed, while in the case of the stamp, energy is consumed in lifting the stamp whether or not it does work upon material below its shoe. As the resistance to the crushing strain is dependent upon the condition of the mass, there is something radically wrong in using the same medium to crush the ½-in. cube, as was employed to crush the 2-in. cube (1:64). While we can perform effective work in driving a spike with a sledge-hammer, we would hardly consider this sledge-hammer for driving a tack! This, however, is exactly what we have done for years in using the stamp as both the initial and final crusher. In the instance of the

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*President, Hardinge Conical Mill Company, 37 Wall street, New York.

2-in. cube crushed to pass ½-in. mesh, we used our stamp on a single unit, reducing it so that its relation to the 2-in. cube is as 1:64. We have then gone on using the same power to carry it to the 60-mesh finality desired, where the relation of the original cube to the final reduction would be as 1:1,728,000.

Use of Coarse Stamp-Battery Screens

A late experiment made at my suggestion along this line, covering a period during which several hundred tons of hard quartz were crushed, showed results given in the accompanying mesh test. The battery of 1000-lb. stamps was equipped with ¼-in. mesh screens, and had a capacity of 10 tons per stamp, or about 4 tons per h.p. Formerly when crushing through 20-mesh screens, the capacity was 2½ tons per stamp, or 1 ton per horsepower.

SCREEN ANALYSIS AFTER PASSING A 4-MESH BATTERY SCREEN.

	Per Cent.
Product remaining on 10 mesh.....	13
Product remaining on 20 mesh.....	11
Product remaining on 40 mesh.....	17
Product remaining on 60 mesh.....	10
Product remaining on 100 mesh....	17
Product passing 100 mesh.........	32

Note that 20-mesh and finer crushing was desired for amalgamation and concentration. In the above, 76 per cent. filled the requirement, leaving 24 per cent. to be finished by an auxiliary grinder at the rate of 4 tons per h.p. In other words, for less than 25 h.p. for 10 stamps, and 5 h.p. to finish the 20-mesh oversize, a total of 100 tons per day was the result, or an increase in crushing duty of about 300 per cent. by "step reduction."

Deficiency between Power and Effect

To overcome this great deficiency between power and effect, many fine-crushing machines have been devised. In most cases the change has been one of method rather than effect, in fact most of these reducing devices have reversed the condition needed, have increased rather than decreased the weights, e.g., the chilean mill type (a larger sledgehammer on our tack—instead of using a number of smaller media). This latter idea is utilized in the pebble mill, where the multiplicity of grinding bodies is in proportion to the work desired. The transition, however, from the 1000-lb. stamp, to the 1-lb. pebble is out of all proportion, and should be supplemented by a "nail-hammer." The nail-hammer effect is possible of production through using a larger number of 10- to 15-lb. iron balls. In other words, the ordinary ball mill would be a reasonable solution were it not for screen interference. Balls of the size mentioned will readily reduce the 2-in. cube to 10 or 16 mesh, a pebble ("tack-hammer") reducing the particles to a finality if properly employed.

A well understood principle among metallurgical engineers is that the ideal step reduction would be 1:4, which ideal it is impossible to attain; but the present applied relation of 1 to 1,728,000 (the relation of the 60-mesh particle to a 2-in. cube), or even 1 to 216,000 (the relation to a 1-in. cube) is certainly subject to modification through critical investigation and exhaustive tests such as those made by Mr. Caldecott. Instead, however, of remedying the difference as above suggested, 2000-lb. stamps are being tried out in South Africa.

In further corroboration of my opinion and the drift of modern ideas and methods, I note in an article in the *South African Min. Journ.* under date of Aug. 21, 1909, the mention of a recent use of 8-mesh screens (64 meshes to the sq.in.) on stamp batteries. As stated above, I used 4-mesh screens many years ago. The same article says: "Such schemes as stage grinding in tube mills is likely to affect the use of coarse screens on battery mortars." It is this awakening to present necessities, and the innovation of new methods that justifies the opinion that the stamp is coming to be an obsolete crushing device and the time is not far distant when the stamp will find a noiseless resting place in the scrap heap. The latest advices from South Africa indicate decided progress along this line, in the adoption of 3-mesh screens on heavy stamp batteries with a duty of 15 to 20 tons per stamp per 24 hours.

Antimony in 1909

The market for antimony during 1909 was very quiet. The only occurrence of any importance was the imposition by the Government of an additional duty of ¾c. per lb., making a total duty of 1½c. per lb. This was done expressly to stimulate the production of American ores, but as this was not evidenced when antimony sold at 25c. per lb., it is not reasonable to suppose that the additional duty of ¾c. will stimulate the production of ore. As a matter of fact there is not a pound of domestic ore being used today for antimony smelting. The low prices are due as of old to the heavy production in Australia and southern Europe and also to the large supply being furnished by China. Price of Cookson's antimony in January was 8¼c. It declined to about 8c. in the early summer. On the prospect of an increase in duty it gradually advanced to 8⅞c., at which price it now stands.

The other brands closely followed the lead of Cookson's and U. S. is selling today at 8¼c. and the Hungarian brands at 7[illegible]@7[illegible]c. for delivery over the entire year 1910. Speculators are paying an advance of ¼@½c. per lb. on these prices. Without doubt the present low figures will decrease production and it would not be surprising to see a satisfactory advance in 1910 until prices reach a more remunerative level.

Antimony Oxide

A little over a year ago the Harshaw, Fuller & Goodwin Company, of Cleveland, O., works at Elyria, O., entered the field as a producer of antimony oxide. Heretofore all of that consumed in the United States was imported, chiefly from Germany and France. The Cleveland company after a long series of experiments succeeded in producing a commercial grade of oxide from the sulphide or needle antimony, using natural gas as fuel, and, during 1909, exploited the use of the oxide in the paint, ceramic, glass, and enameling trades to a great extent; especially in the first where its use is new in this country.

AVERAGE PRICES OF ANTIMONY.
(In Cents per Pound.)

	1908.			1909.		
	Cookson's.	Hallett's.	Ordinaries.	Cookson's.	U. S.	Ordinaries.
January....	9.344	9.031	8.344	8.202	8.075	7.675
February....	9.266	9.016	8.406	8.125	8.000	7.531
March......	9.000	8.650	7.988	8.047	7.843	7.500
April.......	8.969	8.672	8.297	8.250	8.031	7.718
May........	8.875	8.625	8.250	8.387	8.150	7.887
June........	8.734	8.531	8.094	8.312	8.062	7.893
July........	8.594	8.375	8.125	8.375	7.875	7.375
August.....	8.313	8.150	7.850	8.525	8.125	7.625
September...	8.234	7.922	7.609	8.687	8.125	7.506
October.....	8.284	7.922	7.625	8.537	8.012	7.500
November...	8.640	8.075	7.775	8.437	7.937	7.687
December...	8.200	8.063	7.688	8.437	7.937	7.687
Year.....	8.704	8.419	8.004	8.360	8.015	7.466

The position of domestic antimony oxide was further strengthened by the recent tariff revision by which the 25 per cent. *ad valorem* duty on imported material was increased by a specific duty of 1½c. per lb. The price quoted by the manufacturers of antimony oxide is 8c. per lb. in a large way, but it is understood that concessions are made when any danger from foreign competition is feared. The domestic product controls practically 90 per cent. of the United States market for this material.

Gas Engines in Rhodesia

Gas engines up to 300 h.p. are becoming quite common in Rhodesia. Coal is mined at Wankie but this is too far from the mines. Charcoal is substituted and is used in gas producers. It costs at the mine about $12 per ton, which makes the cost of a h.p.-day about 18c. If the price of coal is taken as $6 per ton the cost of steam power in the ordinary small milling plant would reach 50c. per h.p.-day.

Geological Notes on West Coast of Mexico

Ores Connected with the First Volcanic Period and Believed to Occur under the Rhyolite Capping; Classification of the Ore Deposits

BY C. W. BOTSFORD*

The following is a generalization made up from a great many notes taken along the West Coast in the states of Sonora (south of Guaymas), Sinaloa, western Chihuahua, Durango and Lower California, and is to some extent provisional and dependent on more detailed work.

Topographically, this section of Mexico may be divided into three general types of country; namely, the coastal plain, the foothills, and the sierra country, which areas except the sierras are wedge-shaped, getting narrower as they extend south.

The coastal plain from a maximum width of about 70 miles at Esperanza, narrows to 30 at Culiacan, 20 at Rosario, and finally disappears in the Territory of Tepic. This area is nearly level, few elevations of more than 200 ft. being noted. It was plainly the bottom of the Gulf of California until very recently. There are no rock exposures and no mining.

East of this coastal plain is the foothill country. Beginning with small, detached, rounded, isolated hills rising from the plain, the country becomes more and more broken as the sierras are neared. The width of this area at Guaymas is about 100 miles, at Alamos about 60 miles, and narrowing to 20 and 30 in the southern part of Sinaloa and Tepic. In general, these hills are more rounded in the southern part of the district, due to less volcanic and other disturbances and a greater recent erosion. The average elevation of this district is less than 2000 ft. with only occasional peaks rising to 5000 ft. or less. East of the foothills the country rises abruptly into the sierras with elevations of from 6000 to 9000 ft. This area is very rugged and greatly cut by erosion.

SUCCESSION OF THE FORMATION IN WEST COAST REGION.

Coastal Plain	Recent
Rhyolites and Dacites	Miocene (?)
Granites Diorites Andesites	Eocene
Shales and Limestones (mostly Cretaceous)	Mesozoic
Schists and Limestones Old Schists	(?)
Old Granites	Archean

Recent Earth Movements

It is clear from the extent and characteristics of the later rhyolites and dacites in Sonora and Lower California that these beds were originally continuous and even extended some distance out into the Pacific. The present valley of the Gulf of California is the result of erosion by the Colorado river since the (Miocene?) rhyolitic-dacitic eruptions. The country at that time had a greater general elevation (probably 2000 ft.) above the sea-level than at present. The maximum erosion of this ancient Colorado river has been in this section at least 6000 ft. Since then the country sank, bringing the sea level considerably above the present position, and lastly has gradually risen to its present elevation. This caused much gentle folding and a little minor recent faulting, but no breaks of any extent accompanied these movements. The fault system which has been mineralized is much older and much more extensive than any of those resulting from recent movements.

The general sequence of the various formations is as given below. The age of some of these is very uncertain as fossils are rare and it is only possible to place them from their relation and resemblance to determined formations in other parts of the country.

The Old Granites and Schists

The whole country has for a basement rock an extensive granite formation which is probably Archean. This granite shows evidences of having been eroded to an ancient peneplain before the later sedimentaries were deposited. It is usually rather a coarse-grained, hornblendic rock, easily weathered into the typical coarse, sandy, light-colored soil characteristic of this formation where exposed. This is possibly the same granite that occurs in Veracruz and the other Gulf states and is probably the basement rock of this section of the continent. The granite seldom appears above an elevation of 2000 ft. in Sonora and less in Sinaloa. This formation contains few orebodies and it is usually an unfavorable sign when veins pass from other formations into it.

There are a few isolated areas of schists remaining, these having been mainly removed by erosion. They are possibly the remains of a southern extension of the Cambrian rocks of Arizona. These old schists are highly metamorphosed and are of a different general character from the younger schist formations, being much harder, darker colored and higher in iron minerals and quartz.

Sedimentaries

Sedimentaries older than the Mesozoic were probably once present over most of this country, but have since been mainly removed by erosion. These rocks were limestones and lime-shales but have been metamorphosed to a great extent and subjected to a complicated folding resulting in the formation of a variety of schists and dolomitic limestones. The limestones comprise the bulk of these rocks. It is probable that there is a thinning out and a final disappearance of these beds to the south in Tepic, their places being taken by the Mesozoic rocks.

Following these older sedimentaries came very extensive Mesozoic beds consisting of many varieties of shales and limestones usually somewhat folded and metamorphosed but never to anywhere near the condition of the older sedimentaries. The great bulk of these rocks belongs in the Cretaceous period. This formation probably underlies the entire country to the east and south and will be found continuous with the shale formations of Guanajuato, El Oro, etc. In southern Sonora and Sinaloa there are few exposures of these rocks as they are usually covered by the later eruptives.

The Volcanic Periods

The first volcanic formations are of great extent and importance as they are connected in every case with the mineral deposits of the West Coast. The andesites follow unconformably the Cretaceous sedimentaries and are probably Eocene. They consist usually of both fragmental and massive beds of usually a normal andesitic composition. Some areas of this formation are still of great extent although erosion has removed many times the amount at present exposed. Toward the close of this period of andesitic eruptions there occurred many intrusions of andesites and porphyrites or trachytes which opened channels for the ore-bearing solutions.

Closely following the andesites and probably marking the close of this first period of volcanism were many intrusions of porphyries and quartz diorite porphyrites in dikes, sheets, intrusive masses, etc. Some of these dikes can be traced cutting the andesites. These intrusions also had favorable effects in opening channels for the primary ore solutions and it is quite certain that the strains arising from the intrusions of these igneous rocks caused the breaks which are followed by the usual vein systems. The faults, shear zones, and contacts in the neighborhood of these intrusives are generally mineralized. This was also a period marked by extensive erosion and necessarily a long period of time must have intervened before the volcanic activity again started.

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*Mining engineer and geologist, Springville, N. Y.

The second eruptive series was very general and extensive and covered at the time practically the entire country and was undoubtedly continuous with similar rocks in Lower California before the Colorado river eroded the valley of the Gulf of California. This formation consists of a bedded series of tuffs and breccias with some massive flows of a rhyolitic nature. In large areas these rocks tend to grade into the composition of dacites and trachytes. This eruptive series is later than most of the mineralization and it is usually little disturbed by folding and faulting. Its thickness is at least 5000 or 6000 feet.

Types of Deposits

In a general way the distribution of the various metals coincides with the topographical areas above described. The coastal plain shows nothing as the rocks are not exposed, but it is probable that under the sands is a continuation of the foothill area. The latter usually has base-metal ores with the silver contents in more complex sulphides of copper, lead and zinc, antimony, arsenic, etc. Many of the deposits show principally copper ores. This base-metal area wedges out to the south near the town of Sinaloa and below here are only scattered occurrences of the base ores until the state of Jalisco is reached. The ores of the sierras and of the foothills south of the town of Sinaloa are usually of gold and silver and free from any quantities of the base metals. There are many exceptions to the above generalization but in the majority of cases it will be found correct.

Copper

The copper deposits occur in several ways. Contact deposits occur usually along the contacts of the eruptives and the limestones or shales and generally carry some silver with the copper. Occurrences of this type are common in Sonora and northern Sinaloa but little work has as yet been done on any of them. The ores on surface are carbonates and oxides and in the deeper workings begin to show sulphides.

The Bachaca, Sonora, shows a common form of a combination of the vein and contact types of copper deposit. Here the ore occurs along faults and slips in the limestones on and near the granite contact. There is usually a great deal of garnet and epidote developed along these contacts. Specular hematite occurs with chalcopyrite in many of these orebodies. In the case of the Porfirio Diaz claims ore occurs for over two miles along one of these granite-lime contacts. Work on these deposits has been confined to working out a few of the richer, concentrated pockets and practically no systematic exploration or development has ever been done on any of them.

The vein deposits usually carry a higher silver content than any of the other forms of copper deposits and in most cases have their principal value in silver and would be classed as silver ores. These veins always occur in connection with the intrusive rocks.

The orebodies of the only developed mines in this part of Mexico, the San Antonio and Anita mines of the Douglas Copper company, now the Mexico, are concentrations along fracture zones in andesites. These ores, except in the San Antonio, usually carry silver and gold besides the copper and will average probably 5 per cent. copper and $5 combined silver and gold. There are other occurrences of this type farther south which have not been exploited as yet because of the lack of means of transportation and of smelting facilities.

Disseminated copper ores occur in several localities but as yet not enough work has been done at any of them to prove their value. They usually occur in schists of obscure origin, probably both sedimentaries and eruptives originally but now highly metamorphosed with a great deal of sericitization. The Piedras Verdes near Alamos, Sonora, is the largest and best known of these deposits.

Silver and Gold

The silver veins are the most common form of mineralization of this part of Mexico. In the foothill area and as far south as the town of Sinaloa these ores are usually base. The silver occurs below the oxidized zone largely in the antimonial ores and in tetrahedrite with copper and frequently some lead and zinc. In the Alamos district these ores will average about 2 per cent. copper with an appreciable silver content. The most common occurrence for these veins is in the andesites or on the contact of the andesites with other rocks, and also in the sedimentaries. The granites are usually unfavorable rocks in this section, the veins showing a tendency to narrow and tighten up when they run into them. In this class of deposit belong the large mines of this district as the Quintera, Promontorio, Zambona, etc.

In the sierra country and along the foothills south of the town of Sinaloa the silver ores are generally less refractory and are easily amenable to cyanide treatment. There has been very little modern work done in this section, largely due to the absence of transportation facilities, but this part of the district shows more activity than the other parts. The contact deposits are few in number and are likely to be of silver with lead and zinc.

There are a few veins in this section of the country which have their principal value in the gold contained. Of this nature are Sobia and many other camps farther south. At Sobia, it is probable that silver will be found at depth. The Lluvia de Oro seems a gold mine pure and simple. From Copalquin south is a belt of country with many gold occurrences. The general average of gold and silver shipments from the state of Sinaloa show a content made up of 15 per cent. gold and 85 per cent. silver. There are quite extensive placer deposits through all this section with the better ones in the northern part. Some of these are quite rich but are worked only by the Mexicans in a primitive manner.

Iron and Other Deposits

Iron, as specular hematite, occurs quite commonly along the limestone-eruptive contacts and sometimes in immense bodies. Most of these carry too much sulphur in pyrite and chalcopyrite to be commercially valuable for anything except fluxes. Two large deposits, one near Quiriego, Sonora, and the other near Las Tapias, Sinaloa, are of a good grade of iron ore apparently free from sulphur and phosphoric minerals. These are of present some distance from the railroad and hence not available. There are also occurrences of antimony, bismuth, mercury, nickel and cobalt, etc., of uncertain value. Practically no work has been done on any of these except the bismuth deposit and this I have not seen.

The above grouping of the ore deposits is not hard and fast as many of the types grade into each other, as for example, a common occurrence of ore is in a vein along a fault plane which because of the faulting is now a contact deposit, etc. No absolute line can be drawn.

Resumé

In general, the primary mineralization took place at the close of the first eruptive period (Eocene) and during the following long period of quiescence and erosion much secondary concentration must have taken place before the rhyolite eruptions, when the relative elevation of the country above sea level was without much doubt about 2000 ft. higher than at present. During the presence of the rhyolite capping the ore deposits must have been protected so that little, if any, secondary enrichment could have been at work. After the removal of the rhyolite capping by erosion, circulation must have been resumed in the orebodies and more secondary concentration with a higher water level must have resulted. What percentage of the concentration occurred before and what after the rhyolites it is impossible to ascertain.

The amount of erosion in the two periods seems to be about equal and it is possible that at least one-half of the secondary concentration took place in the older period. I therefore consider it quite probable that orebodies occur under the rhyolite capping in many sections where the older rocks are not exposed and that the mining camps of the sierra country are situated at points only accidentally exposed by erosion.

Third Annual Report of Goldfield Consolidated

Output 194,480 Tons of Ore Averaging $37.98 per Ton at Operating Cost of $6.77 and Total Cost of $8.08 per Ton; Ore Found at Depth

RESERVES 800,000 TONS

The third annual report of the Goldield Consolidated Mines Company, Goldield, Nev., for the fiscal year ended Oct. 1, 1909, states that during the calendar ear 1909 the company distributed greatr gross dividends than any gold proprty in the world distributed during the revious calendar year. Four dividends mounting to 30c. per share each, and ne extra dividend of 20c. per share nade a total of $1.40 per share, or about 5,000,000 on the 3,558,848 shares outtanding. Only the first three of these vere paid during the fiscal year. The omplete profit and loss account and balnce sheet are given herewith.

Summarized, the report shows that there vere produced 194,480 tons of ore of n average gross value of $37.98 per ton, rom which a recovery of 92.5 per cent. vas realized. The operating cost for the ear was $6.77 per ton mined. The osts for the last 10 months of the iscal year are given separately as epresenting the period in which the Conolidated 100-stamp mill was operating. The total operating cost per ton during his period is detailed in an accompanyng table and was $6.34, or 43c. per ton ess than the average for the year. However, only $1.56 was charged to developnent as compared with $1.94 for the enire year. The total cost per ton, includng the above, concentrate treatment, plant operation, taxes and all other expenses, would be $8.08 per ton.

During the year the outstanding stock was increased from 3,539,811 shares to 3,558,848 shares, in order to absorb the stock of the subsidiary companies. The Goldfield Consolidated Mines Company now owns in fee all the property (380 acres) of the Mohawk, Red Top, Jumbo, Laguna and Goldfield Mining, together with their assets, liabilities, etc.

The railroad, water and milling facilities were organized under the laws of Wyoming as the Goldfield Consolidated Milling and Transportation Company, all of which stock is owned by the Consolidated Mines company.

Grade of Ore Worked

Regarding the grade of ore worked, the management seems to be able to output almost any average desired. As before stated, the average for the year was $37.98 per ton and the manager, J. H. Mackenzie, says of this matter:

"With the commencement of operations in the new 100-stamp Consolidated mill, Dec. 26, 1908, the grade of ore was held at about $15 per ton for a few weeks while all details of operation were being perfected, and then raised to a point which would insure the accumulation of a cash surplus of sufficient magnitude in excess of dividend requirements to form an ample safeguard against any unforseen events which might occur. When this result was attained, the value of ore production was reduced to an average which would result in additional economies through the mining of a larger proportion of lower grade together with ore of higher grade, and continue to produce current profits in excess of dividend requirements of about $360,000 monthly. During the last month of the fiscal year, however, ore of such high grade was exposed on the 750 level from the Clermont shaft, that the small quantity extracted in the course of development work increased the net profit nearly $200,000 in one month."

Ore Reserves

Mr. Mackenzie estimates the profitable ore now exposed at least 800,000 tons, sufficient to supply the Consolidated mill at the rate of 850 tons per day for nearly three years. He bases this estimate on the present and past production of the property, and the conditions which have hitherto appeared to govern in general the distribution, value and size of the orebodies. It is safe to assume that Mr. Mackenzie's estimate has been made with great care and with the exercise of his best judgment, and that the figures are as nearly accurate as the acknowledged difficulties of such estimation in this district will permit. No attempt is made to give a value to this ore other than that covered by the word "profitable" as it is impossible to secure even approximate figures by sampling the exposed faces.

Construction

The Consolidated 100-stamp mill was completed in December, 1908, and the concentrate treatment plant two months later. That gave facilities for treating 700 tons of ore per day. In September, 1909, the Hampton stope caved and wrecked the 90-ton Combination mill. At that time it was decided to increase the capacity of the Consolidated mill so as to handle 850 tons daily, and this addition is expected to commence work in January, 1910.

The new installation includes six 6-ft. chilean mills as regrinders between stamps and tube mills, 24 Deister concentrators, two agitators and an air compressor. It is to cost about $60,000. Other installations include a 150-h.p. air hoist at the Clermont shaft together with buildings and bins for a 600-ton daily production, safety devices on the large hoists, and a 30,000-gal. tank for fire protection; also 1795 ft. of track.

Mining

A total of 40,668 ft. of development work was done, of which 13,199 ft. were driven by lessees. This work was generally successful in opening ore in the newly developed portions of the older levels and in the new deeper levels from the Clermont shaft. Development work only was done from the Clermont shaft but this yielded considerable ore.

The Clermont shaft was placed about equidistant from the Mohawk and Red Top shafts and 800 ft. further east, on account of the rather flat easterly dip of the Mohawk and Red Top veins. All levels below 330 ft. on the Red Top and 600 ft. on the Mohawk vein are being driven from the Clermont shaft, the present levels being approximately at 600, 750, 900 and 1000 feet.

Operations in the Combination mine indicate that this vein joins the Mohawk at about 300 ft. in depth and dips rapidly away from the Combination shaft. A crosscut tunnel is being driven from the Combination Fraction to prospect the extensions of the known orebodies in this vein at a depth of 600 ft. This tunnel had been driven 340 ft., Oct. 31, but had opened no ore. The Combination shaft will not be sunk further unless this tunnel warrants it.

At the Mohawk, mining in the caved portions of the upper levels was successfully carried on, large stopes of high-grade ore were opened and the existence

OPERATING COSTS FOR 10 MONTHS ENDED OCT. 31, 1909.

	Labor.	Supplies.	Power.	Department.	Construction.	General.	Total.
Stoping	$1.24	$0.66	$0.03	$0.25	$0.02	$0.18	$2.38
Development	0.80	0.36	0.02	0.20	0.08	0.10	1.56
Milling	0.71	1.10	0.36	0.09	.....	0.04	2.30
Transportation	0.063	0.029	.....	0.008	.....	.....	0.10
Total	$2.81	$2.15	$0.41	$0.55	$0.10	$0.32	$6.34

of a large tonnage of low-grade proved between the 450- and 600-ft. levels, and ore exposed in the foot-wall on the 600-ft. level.

At the Combination, a wholesale-milling plan of using high- and low-grade ores will extend the glory hole. A large body of high-grade was mined from the Hampton stope on the 230 and 280 levels, this stope reaching a width of 70 ft. Beside the regular production from this stope, 1193 tons of an average gross value of $684.38 per ton were shipped from it.

On the Red Top, developments proceeded on the 160, 260 and 330 levels. Continuous ore, except 250 ft., was exposed for a distance of 1700 ft. on the 260 level. The ore from this mine is of more even grade than that from the other claims of the company.

On the Jumbo, the Clermont shaft was sunk to 1090 ft. A crosscut on the 600 level was driven 600 ft. north to undercut the Red Top vein 230 ft. below the deepest level from the Red Top shaft, but had not reached commercial ore. On the 750 level, 100 ft. of the Mohawk vein averaged $450 per ton. The shoot was opened a length of 300 ft. in about $30 ore on the 750 and 900 levels. The width has not been determined, but is at least 9 ft. The 1000 level had not reached this oreshoot.

COMBINED PROFIT AND LOSS ACCOUNT.

(Year Ended Oct. 31, 1909.)

Earnings:			
Ore shipments, gross		$ 818,472	
Transportation, treatment and charges		83,978	$734,494
Concentrate shipments, gross		205,557	
Transportation, treatment and charges		32,837	
		172,720	
Concentrates on hand Oct. 31, 1908	$104,990		
Concentrates on hand Oct. 31, 1909	38,143	66,487	105,873
Concentrate residue shipments, gross		270,934	
Transportation, treatment and charges		137,283	133,651
Sales miscellaneous mill products, gross		38,889	
Transportation, treatment and charges		3,891	35,000
Sales bullion		5,232,987	
Mint charges and expressage		41,711	5,191,276
Mill products on hand and absorption			252,386
Cleanup combination 20-stamp mill			13,319
Royalties from leases			19,004
Damages Frances-Mohawk suit			75,000
Forfeit Consolidated Red Top lease			5,000
Interest and discount			7,285
Miscellaneous earnings			26,583
Total earnings			$ 6,598,871
Expenses:			
Mining		$ 839,178	
Transportation		18,158	
Milling		460,646	
Concentrate treatment plant operation		45,525	
Bullion tax		117,463	
General expenses		91,281	
Total expenses			1,572,251
Profit for year			5,026,620
Dividends paid during year			3,201,239
Undivided profit for year			1,825,381
Undivided profit to Oct. 31, 1908			2,442,016
			4,267,397
*Depreciation and accounts charged off			373,543
Undivided profit to date			$3,893,854

*This item covers a period of three years, no depreciation having been charged off heretofore.

ASSETS AND LIABILITIES,

Oct. 31, 1909.

The Goldfield Consolidated Mines Company.

Assets:		
Mine properties	$35,353,278	
Mine buildings, machinery and equipment	192,097	
Mine development	96,749	
Office building and furniture	28,868	
Compressor plant	60,460	
Power station and pole line	17,965	
Miscellaneous real estate, buildings and equipment	71,451	
Stocks owned	1,445,084	
Unexpired insurance	655	
Supplies on hand	92,144	
Ore settlements outstanding	476,983	
Accounts receivable	113,150	
Cash in bank and on hand	657,281	$38,606,165
Liabilities:		
Capital stock issued	$35,588,480	
Accounts payable	94,945	
Accrued bullion tax	34,472	
Undivided profit	2,888,268	$38,606,165

Goldfield Consolidated Milling and Transportation Company.

Assets:		
100-stamp mill and addition	$361,938	
Railroad and equipment	25,127	
Water plants, reservoirs and pipe lines	5,000	
Concentrates on hand	38,143	
By-products on hand and absorption	252,386	
Mill supplies on hand	55,700	
Bullion and concentrate settlements outstanding	479,311	
Accounts receivable	421	
Cash on hand and in bank	708,213	$1,926,299
Liabilities:		
Capital stock	$100,000	
[illegible]	476,983	
Accounts payable	43,730	
Undivided profits	1,005,586	$1,926,299

MILLING

The 100-stamp mill was operated steadily after Dec. 26, 1908, and a continued inprovement made in tonnage, extraction and costs. In October an average of 649 tons per day were milled at a cost of $1.915 per ton, with an extraction of 94.49 per cent.

The concentrate-treatment plant was successfully operated since March. Its extraction, added to the smelting recovery from residues carrying over $20 per ton, has equalled the extraction from untreated concentrates which would be paid for by the smelters, and the saving in cost has been $25 per ton of concentrates. Residues below $20 are stored on a dump for future treatment.

The primary and secondary amalgamation plates were abandoned, the free gold being allowed to go into the concentrates. Two plates were installed over which the concentrates pass before entering the concentrate-treatment plant, and all the gold which is too coarse to pass readily into solution is amalgamated. The 24 small classifiers below the batteries were replaced by two 8-ft. cones with good results.

FUTURE OUTLOOK

Developments have extended the productive area laterally and downward. Two new bonanzas, the Hampton and Clermont 750, are as rich as any of the older bonanzas. At no time was there difficulty in holding the grade of ore at the average planned; and in spite of the large production the ore reserves have been increased. Ore was discovered in the latite, where it was previously thought unlikely that orebodies existed, at a depth of 1500 ft. along the dip of the vein. The change from dacite to latite did not lessen the size, continuity or value of the orebodies.

The general manager further states that "all facts with regard to the Clermont oreshoots indicate that they may be expected to extend to a greater depth and it is confidently anticipated that the 1000 level will reach ore within a few months." Much virgin ground remains in the upper levels.

The London Spelter Market in 1909

More than usual interest was displayed the opening of 1909 in spelter, which gistered a substantial advance in lue while other metals were mostly epressed. There was some scarcity of ipplies due to interruption of traffic, hich coincided with improved demand om consumers—chiefly for extended livery—and considerable firmness disayed by producers. Transactions on e London market were relatively unimrtant, but there was a large volume business elsewhere at home and road. The galvanizing trade showed rly signs of expansion, and sheet zinc as in some cases advanced in price. rices opened at £21 5s. for ordinary ands, and £21 10s. for specials; closg at £21 12s. 6d.@£21 15s. for ordiries and £22@£22.50 for specials.

In February the market showed a eclining tendency during the first eight ys, due to forced realizations in exss of trade demand. Ordinary brands ifted down to £21, notwithstanding aprent improvement in the galvanizing ade. At this basis some speculative isiness developed, which was followed the announcement of the definite rmation of the long projected syndite, whereby the German, Belgian and utch producers—with one or two exptions—had combined to control proiction and, to some extent, prices also. ie announcement that the German sellg agency was holding for prices much ove those ruling in London was the gnal for brisk buying, both speculative id consumptive, which continued up to e end of the month and carried prices £22 15s. for ordinary brands, and £22)s. for specials; with a premium of seval shillings for extended time of devery.

March found the market steady in tone it with little business doing, consumers ing reluctant to cover more than their imediate requirements. Early in the onth the Producers' Convention reiced its price to £22 5s. for London devery. This was still considerably high- than the price actually ruling, but it dicated weakness and prompted holdrs of second-hand parcels to accept own to £21 10s. or less. About the iddle of the month markets generally ere depressed, and the price fell further £21 5s., which brought out some iniry for April and May delivery; but e demand was only transient. Thereter sellers became more reserved, and e market was steady for the remainder the month; ordinary brands being ostly held for £21 7s. 6d., with £21 15s. r specials.

In April, the prevailing depression was unrelieved during the first 10 days. By the middle of the month inquiry was stimulated by improved statistics of exports in galvanized iron. Consumers had held off in hope of further concessions in price, but producers remained firm and second-hand parcels were gradually absorbed; moreover, it was found that few consumers had covered requirements beyond May. Little business was transacted on the Exchange but a fair volume developed on private negotiation. Some attention was attracted to the American market where prices ruled at one time about £2 over those current in London, and orders were reported taken in Europe for shipment to America. Prices, however, moved within narrow limits throughout the month, starting at about £21 6s. 3d. for ordinary brands, and closing at £21 13s. 9d.; with £22 5s. for special brands.

May was an active month in the metal trade generally, and spelter was in decidedly better demand, particularly for the galvanizing industry. Fluctuations were narrow, but generally upward. Toward the middle of the month it became known that the leading German producers—who had hitherto remained outside the convention—had now joined it, thereby imparting additional strength to that combination. Another encouraging feature in the market was the purchase of an important quantity of the metal for shipment to America. Trade was fairly active throughout the month. Prices opened at £21 12s. 6d.@£21 17s. 6d. for ordinary brands, and £22@22.50 for specials; closing at £22@22 2s. 6d. for the former, and £22 7s. 6d.@£22 10s. for the latter.

June passed with scarcely any fluctuations in value, as was natural under the control exercised by the producers' syndicate. The galvanizing trade showed considerable expansion, prompting large purchases of spelter for July and August, and other consuming industries afforded normal support. By the middle of the month demand appeared to be satisfied, and business quieted in consequence. Second-hand holders were not overloaded, but the little they held was successfully employed to depress prices by a few shillings while the market lacked support. Opening prices were £22 2s. 6d.@£22 5s. for ordinary brands; £22 7s. 6d.@£22 12s. 6d. for specials; and the closing prices were in each case 2s. 6d. less.

July was uneventful on the whole, prices remaining steady throughout at £22 for ordinary brands, and £22 5s.@£22 10s. for specials. Home trade was quiet at the outset, but the market was strengthened by large sales made to America, where consumptive demand was strong. Toward the middle of the month the Galvanized Iron Association was dissolved in consequence of keen competition by outside firms.

In August, spelter was supported by good inquiry for export, but prices were uniform at £22 for ordinary brands, and £22 7s. 6d. for specials, until Aug. 27 when the Producers' Convention raised the price. This, with improved demand for galvanizing, was quickly reflected on the London market where prices rose to £22 8s. 9d. and £22 17s. 6d., respectively, and so remained for the rest of the month.

In September, opening at £22 7s. 6d.@£22 10s. for ordinary brands, values gradually improved throughout the month. Sheet zinc was in good request, and spelter was largely sold to Continental consumers, the demand extending some months ahead. The Producers' Syndicate early advanced prices by 5s. per ton, and met with little outside competition; and these prices were further advanced toward the close of the month. The American demand was correspondingly good. Closing prices were £23 2s. 6d.@£23 5s. for ordinary brands, and £23 7s. 6d.@£23 12s. 6d. for specials, and with sustained demand from all the consuming industries.

October was remarkably free from fluctuations in value, ordinary brands being uniformily held for £23 2s. 6d.@£23 5s. per ton, with good volume of business with consumers, and producers remaining firm and with reduced stocks. Only during the last two days of the month was any variation apparent, final values being £23 1s. 3d.@£23 3s. 9d. for ordinary brands, and £23 10s. for specials.

On Nov. 19 ordinary brands were quoted £23 2s. 6d.@£23 5s. per ton, from which point demand slackened, and the month finished as it had begun, with ordinaries at £23@£23 2s. 6d. and £23 7s. 6d.@£23 12s. 6d. for specials.

In December, consuming industries continued well employed, particularly galvanized iron which was increasingly active and with orders booked well into the new year. Consumers bought spelter cautiously, but the market was none the less firm in view of large sales already made. Prices were practically uniform throughout, at £23@£23 2s. 6d. for ordinary brands, and £23 7s. 6d.@£23 12s. 6d. for specials. Consumers bought more freely just before the Christmas holidays when business usually slackens, showing thereby their confidence in the underlying conditions of trade.

Firing Shots in Mines by Electricity

A Discussion of the Causes Leading to Misfires, and Suggestions with Respect to the Selection of High- and Low-Tension Fuses

BY SYDNEY F. WALKER*

I was much interested in reading the article by Mr. Payne in the JOURNAL of Oct. 30, on "Safety Precautions in Shot Firing," and for two reasons: I have known the Roundwood colliery and C. E. Rhodes, the mining engineer who was responsible for the sinking of Silverwood colliery, for something like 30 years, and I have had many opportunities of observing the great care, in the thoroughly practical sense, that he has shown in all his work.

My first acquaintance with Mr. Rhodes was characteristic. I had been doing some work in the neighborhood, and a friend told me that Mr. Rhodes was thinking of going in for some electrical appliances, and that I might get the order if I saw him. My friend told me also, that the only time to see him was about 8 o'clock in the morning. The colliery joined a small station on what was then the Manchester, Sheffield & Lincolnshire Railway, and I took the only available train next morning, and arrived on the pit bank, just as Mr. Rhodes was going down the pit. He was just stepping on the cage as I got there. I explained my business in a few words, and told him where I had done work. "Very well, send a price in," he replied, and down he went. About a fortnight after, not having heard anything about the matter, I appeared again at the colliery, by the same train, and caught Mr. Rhodes again, just on the point of descending. "Will you maintain the apparatus for so much per annum?" "Yes," I replied. "Very well, go on, put it in," and down he went again. That was the commencement of an acquaintance that has lasted up to the present day, with satisfaction, certainly on my side, and I have reason to believe also on his side.

The contract I had accepted to maintain, however, led to a result that I have been very thankful for ever since. I had to do the work of maintenance myself, and I necessarily acquired such an intimate knowledge of the details of the apparatus, as I could not have obtained in any other way. Incidentally I cleared nearly the whole of the maintenance money, though the price allowed me was low. I used to go into the district, see to the maintenance, and hunt up other business. When the usual result followed, and the development of business prevented my attending to the maintenance myself, the workman I put on to attend to it swallowed up a year's maintenance in the first quarter. Mr. Rhodes' confidence, however, was so far established in electrical appliances that he had more apparatus put in, and his own man, whom I had personally instructed on my visits, was able to take the whole thing in hand.

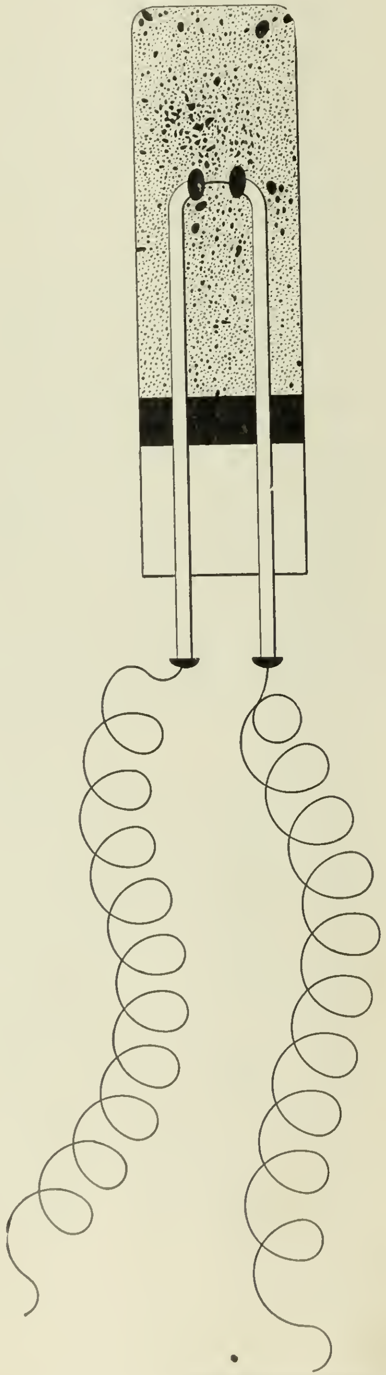

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FIG. 1. THE LOW-TENSION FUSE

PRECAUTIONS AGAINST MISFIRES

The other point of interest in connection with the article is, I should like to make some suggestions that I believe would lessen the chances of misfires with electrically-fired shots. When electrical firing was first introduced, it was claimed by the makers of fuses, and by electrical men generally, that the great advantage of electrical firing over the fuse it superseded, known generally on this side as Bickford's fuse, and over the old damp squib used by miners, was the fact that with either the damp squib, or the gutta-percha fuse, it was necessary to leave the firing place severely alone for some considerable time after the shots had been put off, while with electrical firing it was possible to go immediately to the face where the shots had been fired. Later experience has shown that this is not so. In one inspector's district alone there were over 4000 electrically-fired shots that missed in one year, so that it is evident electrical firing is not infallible.

It is certainly more reliable, however, than fuse or damp-squib firing, and the general consensus of opinion of mining engineers, royal commissions, and everyone who has studied the question is that the general adoption of electrical firing makes for increased safety. In the latest instructions issued from the Home Office in the United Kingdom, shot firers are instructed to wait 30 min. before going to a shot fired with old-time fuses, and 10 min. after firing electrically. Several sources of trouble have arisen in connection with electrically-fired shots, that have led to disastrous results when the shot firers have gone to the shots immediately after putting them off. The point that I wish to refer to now is the possibility of reducing the chance of shots missing.

TWO KINDS OF FUSES

Electrical fuses are of two kinds, sections of which are shown in Figs. 1 and 2.

In Fig. 1 what is called the low-tension fuse is shown, and in Fig. 2 the high-tension fuse. In both fuses there is a copper cap, something on the lines of the old caps that were used with muzzle-loading guns in days gone by, though larger. The cap is filled with fulminate of mercury, for a portion of its length, and two copper wires are embedded in the fulminate, the wires being insulated from each other, usually by gutta percha, or india rubber, and connected to wires side of the cap, to which the wires m the firing battery can be attached en the fuses are to be exploded. In low-tension fuse, the two copper es have a small bridge of very fine tinum wire between them, as shown in . 1. In the high-tension fuses, the per wires are not connected inside the , except by the fulminate of mercury. the low-tension fuse, a current of a nparatively large quantity is employed, heat the platinum wire, the wire in n igniting the detonating composition. current employed is of the same ngth as that of a carbon-filament c.-p. 200-volt lamp, but the pressure oss the wire bridge, and the energy ended in the fuse, is only a fractional t of that expended in a 16 c.-p. lamp. he small platinum wire, when heated ir with the current named, assumes a ht red color. When heated in the fined space of the cap, and sur- nded by the detonating composition, temperature assumed will be higher. any rate it is sufficient to start the nator. In the high-tension fuse, the t necessary to start the detonator is duced by a spark passing between the s of the copper wires. In the early s of fuses, both kinds gave consider- e trouble from the usual difficulties of nufacture. The high-tension fuses in ticular were exceedingly troublesome, n the fact that the pressure required ire them was so varied.

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*Bloomfield Crescent, Bath, England.

made a number of experiments a d many years ago, in the early days shot firing, and I found a range of n 2 volts to 100 volts, in the same ch of fuses. The development of nufacture has overcome this difficulty, fuses can now be relied upon to fire n a certain definite pressure. The ssure required is higher than that ded for some of the fuses in the early s, but it is uniform. In those days, the magnetic exploders were unre- le, and they were made to furnish a ssure much less than might be re- red by some of the fuses. Magneto loders of the present day are uni- nly made to furnish about 200 volts, n designed for firing high-tension es.

he low-tension fuses, in the early s, were thought more reliable, be- se it was possible to test a fuse, to out whether the platinum-wire bridge intact, before going down the pit, le there was no possible test for a n-tension fuse. It appears to me that e are still possible sources of danger misfires, with both high-tension and -tension fuses, but more particularly n low tension. With low tension there he danger of the small platinum wire ng broken, even after it has been ed on the bank, before it is actually d. In the rough and tumble of a mine, ever careful a man may be in carry- his fuses, there is always the danger of a low-tension fuse being jerked, and the wire bridge breaking away from the copper connecting wire in the process. I would suggest, as a precaution against this possibility, that a small battery and galvanometer be taken down the pit, and to the immediate neighborhood of the place where the shot is to be fired, and the fuse be tested with it at the very last minute, after it is actually in place. Testing galvanometers, suitable for the purpose, with small batteries attached, are now made sufficiently light to be easily carried with the other apparatus, and without adding much to the burden of the shot firer.

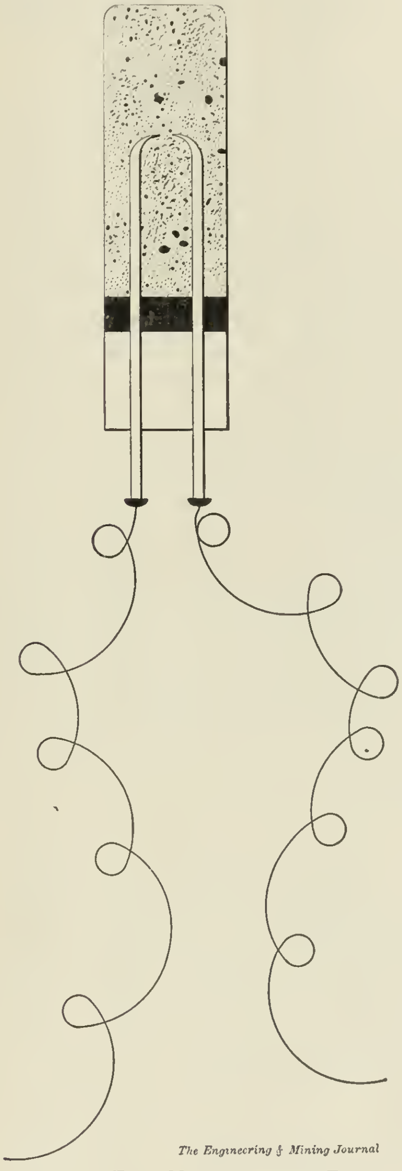
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FIG. 2. THE HIGH-TENSION FUSE

In the case of the high-tension fuse, there is the possibility of the copper wires between which the spark is to pass, being jerked slightly apart, and therefore out of the range of the firing apparatus, by one of the same accidents that may have broken the wire bridge of the low-tension fuse. This is not so likely to occur as the breakage of the wire bridge of the low-tension fuse, but it is possible, and unfortunately there is no means of testing whether the fuse is in order or not, short of actually firing it.

THE FAILURE OF SHOTS ELECTRICALLY FIRED

Another frequent cause for the failure of shots electrically fired, both high and low tension, and particularly high tension, is the failure of the insulation of the connecting wires. For high-tension fuses, the current required is small indeed, and therefore a small wire will carry it from the exploder to the fuse and back again. But there is the question of the ability to spark of the high-tension current, and there is also the question of damage to the covering of the wire.

The exploders employed for firing high-tension fuses all furnish alternating currents, and the difference in pressure of an alternating current of 200 volts is really 560 volts. The alternating current, it will be remembered, rises to a maximum beyond the average, or effective pressure as it is called, falls to zero, and rises to a similar maximum in the opposite direction. So that the actual pressure which the insulation of any wire exposed to alternating currents has to withstand is the difference between these two maxima.

In too many cases the insulation of the wire connecting the exploder with the fuses is poor in quality. I have seen plain cotton-covered wire employed; and the wire that is used for house bells, in which pure rubber, with cotton outside, forms the insulation, is also largely used.

A GOOD INSULATOR

Cotton is a good insulator, if it is dry, and if there is plenty of it to withstand sparking, but the atmosphere of a mine is rarely dry, and consequently a cotton covering quickly loses its insulation. This applies also to a considerable extent to the covering consisting of pure lapped rubber, with a cotton wrapping outside. But what is of far more importance is, in the somewhat rough and tumble conditions at the face, and where the coil or drum of wire has to be carried, and more, in running the wire out from the exploder to the shots, the insulating covering is liable to be damaged. The weaker it is, the more liable it is to damage.

It may easily happen that the insulating covering is stripped off two portions of the wire, in close proximity, or if it is not actually stripped off, it may be seriously damaged, so that when the exploder is operated, a spark passes across between these damaged places, taking the current that ought to go to the fuses, with the result that some or all of them misfire. It may also happen that the damaged insulation merely weakens the current sufficiently to prevent the firing of a part of the fuses.

There is a tendency to use too small

wires for connecting the exploder with the fuses, with the result that when the wire has been pulled about a bit, after firing one or two shots, or occasionally even when the first shot is fired, one of the wires may be parted inside its covering, and either no current passes when the exploder is operated, or the current is much weakened.

The remedy for both of these troubles is, to use substantial wires, certainly not less than No. 20, and I prefer No. 18, or even No. 16; also to insulate them as well as for electric light wires in easy situations; and further, to carefully examine the wire after each batch of shots has been fired, and before firing another set. The tendency to employ cheap wires, thin wires and badly insulated wires, has been accentuated by the fact, that a portion of the wire is lost every time shots are put off. The more expensive the wire, the greater is the amount that must be debited to this cost. On the other hand, the amount saved by using inferior wire, or to put it in the other way, the extra amount required to be spent by using the superior wire, is only a small fraction of the possible loss that may occur from shots missing fire.

Coal and Coke in British Columbia

BY E. JACOBS

The production of coal and coke in the province in 1909, it seems quite safe to assert, was the largest of any year since coal mining was commenced in British Columbia. Owing to non-receipt of the production figures of one of the larger companies this may not be stated positively, but it appears reasonable to estimate the gross output at nearly 2,500,000 long tons, and the net at nearly 2,000,000 tons. However, to be on the safe side, I estimate the net production, that is after deducting the quantity of coal made into coke and valued as such, at 1,940,000 long tons. Of the gross tonnage about 1,450,000 tons were produced in what is officially known as the Coast coal-mining district (Vancouver island about 1,380,000 and Nicola 70,000 tons) and the remaining 1,050,000 tons came from the Crow's Nest district in southeast Kootenay. About 450,000 tons were made into approximately 277,000 tons of coke. The figures representing the coal and coke production are incorporated in the tables of mineral production of British Columbia in the JOURNAL of Jan. 8, 1910. The nearest approach to this tonnage of coal was that of 1907, when a net production of 1,800,067 tons was officially recorded. The highest previous tonnage of coke was in 1905, when it was 271,785 tons. The older and larger collieries increased their output, and three or four new collieries produced steadily.

The older collieries in the Coast district are those of the Western Fuel Company, at and near Nanaimo, Vancouver island, and of the Wellington Colliery Company (Dunsmuir), at Cumberland and Extension, respectively. The production of the Western Fuel Company's No. 1. Protection island, and Brechin mines reached to higher figures than in any other recent year. The manager of this company states that about 51 per cent. of this coal was disposed of in British Columbia, while 49 per cent. was exported to foreign countries in the proportion of 32 per cent. to California and 17 per cent. to other parts.. The Dunsmuir collieries are likewise believed to have increased their output.

The Pacific Coast Coal Mines, Ltd., has coal properties at South Wellington and Suquash, both on Vancouver island, and at Malcolm island, off the northeast coast of Vancouver island. Its more important operations were at South Wellington, in the Nanaimo district, where about three miles of slopes, levels, and roadways were driven in the coal. The power plant installed at the South Wellington colliery included an air compressor and large slope hoist; a tipple having a capacity of 1000 tons a day was built and equipped; seven miles of railway were constructed between the mine and tidewater at Boat harbor; and 6000-ton bunkers, a 400-ton coal washery, shipping wharf and loading plant were put in at Boat harbor. The year's production of coal was about 45,000 tons, of which 11,500 tons were exported, most of it to Mexico. Latterly production was increased to about 600 tons per day. A ready sale was found for all coal produced.

NEW COAL DEPOSITS DISCOVERED

Men from Tacoma, Wash., purchased in August 4800 acres of coal lands in the vicinity of the Dunsmuir Extension colliery. Coal has been found in various parts of the northern country through which the Grand Trunk Pacific railway is being built west of the Rocky mountains to Prince Rupert; the limits of one area discovered on the Morice river in 1908 by W. W. Leach, of the Geological Survey of Canada, were largely determined by that official during the fieldwork season of 1909; another area, near the headwaters of Skeena river, was examined by Chas. Fergie.

In the Nicola country, the Nicola Valley Coal and Coke Company did much development work in its Nos. 1 and 5 mines, Middlesboro collieries, and also gave attention to Nos. 2, 3 and 4. The coal opened in No. 5 is exceptionally clean and hard and of excellent quality. The additions to mine equipment included the extension of No. 1 tipple for the handling of all coal from Nos. 1, 4, and 5 mines, and the erection of a boiler and compressor house and the installation therein of two 72-in. by 18-ft. steam boilers and a Rand compound-condensing steam, compound-air compressor having a capacity of 2215 cu.ft. of free air per min., complete with air receivers and necessary connections. This engine is used chiefly for driving hoisting engines coal-cutting machines, ventilating fans etc. The company's output of coal in 1909 was about 70,000 short tons. Labor difficulties restricted production during three or four months, but as the year closed production was between 9000 and 10,000 tons per month. Developmen work was done at the property of the Diamond Vale Collieries, Ltd., also in Nicola valley, but the production of coa was small.

The extension of the railway to Princeton, Similkameen, enabled the Vermilion Forks Mining and Development Company to commence shipping coal. The company's colliery at Princeton is only developed sufficiently to admit of an output of about 100 tons per day, but transportation difficulties having been overcome, additional plant will be installed and production facilities increased.

The Crow's Nest Pass Coal Company is the largest coal producer in the Crow's Nest country. It has three collieries—a Carbonado, Coal Creek, and Michel, respectively. Its output was from Coa Creek and Michel. About 900,000 tons gross, of coal were mined, and abou 250,000 tons of coke made in 1909 Additions to the power plant in 1909 were the installation of three Rand corliss ai compressors, one at Coal Creek and two at Michel. At the former colliery the machine put in is a compound-condensing steam, four-stage air compressor, having a capacity of 1300 cu.ft. per min. compressed to 1200 lb. A similar machin was installed at Michel, and also a low pressure, compound, condensing steam and compound air compressor having a capacity of 4523 cu.ft. per min. The latter, which is equipped with aftercooler condensing apparatus, etc., supplies ai for operating pumps, hoisting engine and coal cutters.

Circular vs. Rectangular Shaft Sinking

It Is Claimed that the Cost of Lining Circular Shafts Is Less, and that Besides Being Safer, the Circular Form Is More Permanent

BY HENRY M. PAYNE*

It may be said in general, that Amer- an and Scotch coal mines have rec- ngular shafts, while English, French, elgian and German collieries are pro- ded with circular shafts. During the ıst summer, I made a detailed study of is subject in these various fields, sup- ementing my observations by persis- nt inquiries, to determine whether this stinction in method is based on sound asoning, or solely on habit and custom.

The majority of the mines in England ıd Wales are deep, and much difficulty encountered with quicksand and ater-bearing strata. The shafts in the ıff and Rhonddha valleys are from 17 21 ft. in diameter and the total cost sinking and lining varies from $90

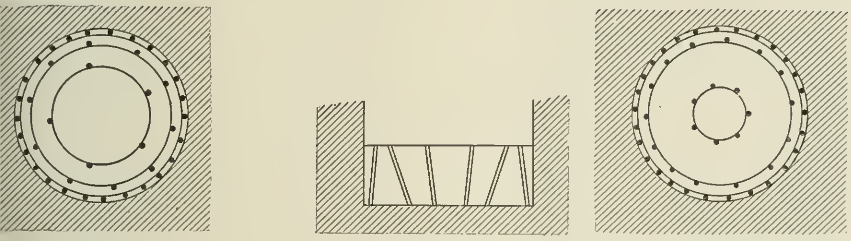

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FIG. 1. THE ENGLISH AND WELSH METHOD OF PLACING SHOT HOLES FOR CIRCULAR SHAFTS

$150 per yard. Locked-coil rope ıides for the cages are almost exclu- vely used, under a tension of 3½ to 14 ns each, depending on the depth of the aft and the speed of hoisting.

In the North of England, the shafts e slightly larger, varying from 20 to ft. in diameter, and are lined with eel tubbing. During the sinking pro- ss, 4-in. steel rings, 1 in. thick, are spended 3 ft. 9 in. apart, and packed th poling boards 4 ft. long and 1⅛ in. ick. These are removed as the per- anent lining is placed. This permanent bbing is 6 to 8 in. wide and 1 to 1½ in. ick, with inside flanges secured by ⅞- . bolts. Twelve segments form one mplete ring. Some very excellent eed records in sinking have been made this method, notably at Sherwood col- ry, where the last 858 ft. of a 1300-ft. aft were excavated and lined in 21 eeks, an average of 40.8 ft. per week.

A circular scaffold is used to carry on e lining, while the excavation is going ı below, a 7½-ft. square hole in the nter of the platform, providing hoist- g space. The method of excluding water, is to line first with an outer ring of brickwork from 4 to 6 in. thick, carefully packed at the back. Next a 2-in. space is left and the balance of the brick lining is laid, to the finished diameter of the shaft. Sheet-iron lining is then placed in the cavity, in circular segments, and cement grouting poured in until the space is filled. This gives a total lining of from 14 to 16 in. thickness.

The general English and Welsh method of placing shot holes for circular shafts is shown in Fig. 1.

In Belgium, brick lining is almost exclusively employed. In some of the newer shafts, reinforced concrete has been used in addition, but sparingly. The average cost of excavation runs from $60 to $75 per meter (3¼ ft.) and of lining from $5.00 to $6.00 for the same distance. Cage guides are usually of timber, fastened to cross buntons set in hitches in the masonry. The Belgians are extremely skillful in keeping their shafts in alinement during the sinking process; many of their shafts exceed 3000 ft. in depth, and are perfectly plumb, notwithstanding their age, and the enormous side pressure from steeply inclined strata and shifting quicksands.

The Kind-Chaudron method is used with greater success in Belgium than in any other country. One of the chief difficulties encountered in this method, is the tendency of the trepan to glance to one side when boring through hard rock on a steep dip. This is largely overcome by increasing the weight of the trepan to 25 or 28 tons.

THE GERMANS DISLIKE SQUARE SHAFTS

The only square shaft found in the Rhenish coal district of Germany, was sunk by a Scotch engineer, true to the customs of his native land. All early attempts to maintain rectangular shafts in Germany have failed, on account of pressure. The circular shafts are lined with steel tubbing, brick, or reinforced concrete, or occasionally with brick facing and concrete backing. The German engineers claim that removing the corners in rectangular excavation is very expensive, and that there is also more danger to the workmen, from the pressure.

At Rhein-Elbe No. 5, Alma mine, of the Gelsenkirchen Bergwerks Actien Gesellschaft, a new shaft is now being sunk, under the direction of Herr Lindenberg. This shaft is to be 2600 ft. deep,

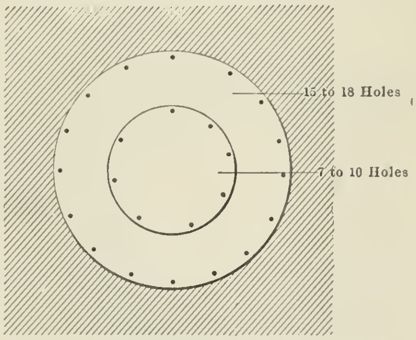

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FIG. 2. METHOD OF SINKING USED AT FRENCH COLLIERY

and on August 20 last, when I visited it, the excavation had reached a depth of 810 ft. The temporary lining is made of steel rings suspended about 3 ft. 9 in. apart, with sheet-iron lagging in sections 4 ft. long, 5 in. wide and ⅜ in. thick, suspended by hooks passing through a hole in the end of each piece, and passing over the ring above. When the excavation has proceeded 30 ft., the permanent lining is begun.

This lining is of concrete, 5 parts clean, washed Rhine river sand, 1 part gravel and 1 part portland cement. The inside diameter of the shaft is 19 ft. 6 in., and the lining will be 3 ft. thick, making the total excavation 25 ft. 6 in. in diameter. The lining is reinforced with iron rods 2/5 of an inch in diameter, so placed as to make a cylindrical network of 8-in. squares. The horizontal rods are curved to fit the shaft, and cut in lengths of 9 ft. 9 in. The vertical rods are 16 ft. 3 in. long, the ties at each intersection being made with wire. This cylindrical network is built in position 1 ft. from the inside surface of the shaft, and 2 ft. from the outside, or line of excavation. The excavation and lining are progressing at the rate of 81 ft. per month, and gelatin dynamite is used for the explosive.

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*Mining engineer, Morgantown, W. Va.

The French collieries do not differ materially in the method of sinking, but their permanent lining is almost exclusively of brick, the temporary iron rings and backing being used during excavation, in advance of the lining platform, the same as in Germany.

On August 25, last, I visited the Puit 13 bis, of the Societe des Mines de Lens, which is being sunk under the direction of Monsieur Dolliger. It requires only one week here to line two weeks' excavation. The holes are placed as shown in Fig. 2.

The center holes are drilled 7 ft. deep, and the outer ones 5 ft. deep. The drills are reduced in diameter as the depth of the drill hole increases, as follows:

From the surface to 19 in., 1.6 in. diameter.
From 19 in. to 38 in., 1.5 in. diameter.
From 38 in. to 59 in., 1.4 in. diameter.
From 59 in. to 84 in., 1.3 in. diameter.

The method of bricking the lining is shown in Fig. 3.

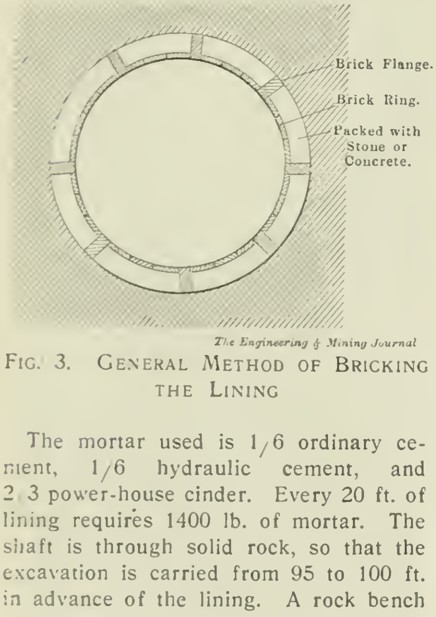

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FIG. 3. GENERAL METHOD OF BRICKING THE LINING

The mortar used is 1/6 ordinary cement, 1/6 hydraulic cement, and 2/3 power-house cinder. Every 20 ft. of lining requires 1400 lb. of mortar. The shaft is through solid rock, so that the excavation is carried from 95 to 100 ft. in advance of the lining. A rock bench is left in the usual manner, and a wooden templet of 12x12-in. timber, cut in 3½-ft. segments, to fit, dowel-pinned all around and a key section set, is then leveled and wedged up, and the lining carried up to the preceding templet, whose rock bench is then removed in sections. The shaft is kept in line by heavy plumb bobs suspended at intervals of 3 ft. all around the circumference from the last templet.

In the center, the shaft is divided during construction by a double partition whose sides are 3 ft. apart, and between which are carried the pipes for compressed air, water, etc., and a series of zigzag ladders for a manway. This division serves also for the purpose of ventilation, one side of the shaft being used for a downcast and the other for an upcast.

CIRCULAR SHAFTS ARE MORE PERMANENT

It is evident, that assuming the same hoisting capacity in either form of shaft, the excess area, which makes ventilation possible, should be the same in either a circular or a rectangular shaft. A circular shaft of 20 ft. net diameter would be roughly equivalent to a rectangular shaft 12x20 ft. English mining engineers claim that the cost of lining is as 5:9 in favor of circular shafts, and it is generally conceded that where great pressure is encountered the circular form is the only safe one. A circular shaft, when once properly lined with iron or masonry, is a permanent affair, while timber lining under the best conditions cannot be expected to last more than 18 or 20 years and rarely more than 15 years. It is also well known that for a given area, a circular shaft presents less rubbing surface, or resistance to the passage of the ventilating current, and the segments at the side of the cages furnish space for this air current without additional enlargement of the shaft.

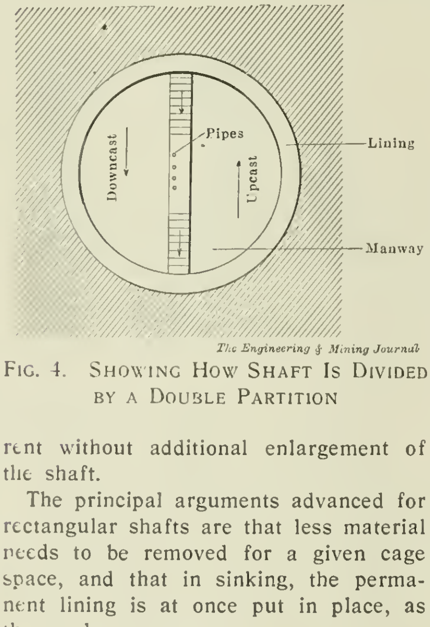

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FIG. 4. SHOWING HOW SHAFT IS DIVIDED BY A DOUBLE PARTITION

The principal arguments advanced for rectangular shafts are that less material needs to be removed for a given cage space, and that in sinking, the permanent lining is at once put in place, as the work progresses.

It is probable that the matter of keeping a shaft in alinement during construction, by either method, is largely a matter of experience and character of labor employed.

While engineers have claimed cheapness of construction as an argument for both forms of shaft, the data at hand would indicate that the circular shaft may be excavated fully as cheaply as the rectangular, but costs more to line; while on the other hand the upkeep and repairs on a circular shaft properly constructed, are very much less than on a rectangular shaft of same capacity, and the danger, especially in deep mines or in quicksand, is very materially reduced, and water much more easily kept out, effecting a saving in pumping.

Review of the Coal Industry in Ohio in 1909

From advance information received from the various large coal-producing districts of the State at this time, it is believed that the coal tonnage for the year 1909 will vary little from that of 1908. Reports from the Hocking Valley indicate that the tonnage will not equal that of the previous year. The Cambridge district will compare favorably with that of 1908, while eastern Ohio will in all probability show an increase over that of the previous year.

There was no shortage of labor in evidence, and no strikes of any importance, the Inter-State wage agreement being still in force during the year, and only minor local troubles of small importance disturbed the status of the coal trade and were quickly disposed of. General activity in the coal trade did not manifest itself until about six months after the beginning of the year, as mills and other industries had not sufficiently recovered from the financial and industrial depression felt all over the country the two preceding years, to warrant a large consumption of the coal products.

PRICES WERE DEMORALIZED

Prices were very much demoralized during the year on account of rivalry between the large companies and independent ones, and from competition from other States. Climatic conditions were also not conducive to a large disposal of the output. A shortage of cars was noticeable during the latter part of October, and through November. No floods or other appalling disasters marred the year in the coal industry. From present indications, the death rate will be somewhat higher than in 1908, especially if the tonnage shows any material loss. The business prospects for 1910, at present, are encouraging, and it is confidently expected that, with anything like normal conditions, the coal trade will once again assume the proportions it attained during the unprecedented prosperity of 1906 and 1907.

What is Ore ?

After an unsuccessful search for a satisfactory definition of the word "ore," J. F. Kemp suggests the following: "In the scientific sense an ore is a metalliferous mineral belonging to the group of those which have profitably yielded the metals to the miner or metallurgist. In its technical sense an ore is a metalliferous mineral or an aggregate of metalliferous minerals, more or less mixed with gangue and capable of being, from the standpoint of the miner, won at a profit; or from the standpoint of the metallurgist, treated at a profit."

The Pyrites Industry in the United States

The pyrites-mining industry thrived during 1909, and although few new companies reached the producing stage, the established ones almost without exception showed a tendency toward improving their methods and equipments; a sure sign of a healthy condition of the business. Prices exhibited little range throughout the year, being practically stationary at 11¼c. per unit per long ton for non-arsenical furnace, f.o.b. mines; and 10@10¼c. for the domestic fines. The imported pyrites brought 12@12½c. per unit for the non-arsenical furnace, ex-ship, New York, 12@11¾c. for the arsenical furnace, 10¾c. for the non-arsenical fines and 8¾@9c. for arsenical fines. These are practically the prices which prevailed during 1908, but early in 1909 prices were shaded to quite an extent, foreign fines being reported as offered at Atlantic and Gulf ports as low as 8c. ex-ship. Producers are generally optimistic in looking for better prices in 1910.

The scare over the Ducktown acid production about subsided, for although the Tennessee Copper Company operated one 400-ton unit of its acid plant throughout the year, and is now constructing another unit of equal or greater capacity, and the Ducktown Sulphur, Copper and Iron Company operated its 180-ton plant after the latter part of June, no noticeable curtailment in the market for pyrites resulted. The reported failure of the attempt to organize the new fertilizer combine possibly accounted in part for this.

The Government trade returns show that during the first 10 months of 1909, 585,319 tons of pyrites were imported into the United States, as against 557,418 tons imported during the corresponding period of the previous year. This increased importation of 27,901 tons is a pretty good indication that the American pyrites market was not damaged by competition with acid makers or producers of brimstone. From indications at the principal mines, the home production of pyrites in 1909 will not be materially different from that for 1908. If slightly less, this will be due to the fact that stocks were generally carried over from 1908, rather than to any lack of demand in 1909. As will be noted, a number of the large American companies took advantage of the slackness of trade resulting from stocks carried over and spent a great deal of time during the year in developing fresh ore reserves and refitting their mills.

Important Operations

The larger mines in the mineral belt of Virginia, with the exception of the Boyd-Smith at Mineral, Louisa county, were regular producers in 1909, but the total production was somewhat curtailed by reason of improvements instituted. Both the Armenius and Sulphur mines at Mineral were engaged in sinking new shafts to further develop their properties, and the latter is expected to enlarge its mill capacity during the ensuing year. As usual these mines produced mostly fines. The Cabin Branch mine, at Dumfries, Prince William county, began operating its new mill in September. Early in the year this company moved its 40-ton smeltery from the mine to Barrows Siding, about six miles distant on the main line of the Washington Southern Railway. The furnace was run on selected chalcopyrite ore for a short while. In southwestern Virninia near Chestnut Yard, Carroll county, the Pulaski Mining Company was engaged in developing an immense pyrrhotite orebody by open cut, and also in prospecting with churn drills. The company's acid plant at Pulaski operated throughout the year on this ore.

Farther south at Villa Rica, Ga., the Sulphur Mining and Railroad Company worked its pyrites mine regularly during 1909. Here too improvements were instituted in the mill. At several other points in Georgia, notably in Cherokee county promising prospects were opened up. The southern properties showed a general tendency to better mill operations, but the lack of engineering methods in underground work was still to be criticized.

Northern Mines

The Davis mine near Charlemont, Mass., showed a restricted output on account of a rather disastrous cave-in which occurred in the early part of 1909. At the north end of the property a new shaft, No. 4, was sunk about 90 ft. but neither the main nor No. 3 shafts were in commission. The difficulties are now reported to be overcome and the normal output is looked for in 1910. The company recently experimented with motor trucks and expects in the near future to substitute these for the wagon teams which are now used to haul the output of the mine to the railroad. At Charlemont station on the Boston & Maine Railroad, the Mount Peake mine was actively operated and produced some ore. Most of the work carried on was, however, of a development character. This mine still yielded some chalcopyrite ore associated with the pyrite. The Milan Mining and Milling Company's property, situated about 12 miles from Berlin, N. H., was a regular producer throughout the year. In New York, the St. Lawrence Pyrites Company produced as usual large tonnages of low-grade ore from its Stella and Anna mines.

Conditions about the Great Lakes were practically unchanged in 1909. The Northern Pyrites Company which was expected to become an important factor in this trade, did not actively enter the field. The production in 1909 only amounted to 5000 tons or so, but the company is reported to be in a position to produce a large tonnage during 1910, and expects to compete for the American market. This property, known as the Vermilion pyrites mine, is situated on Vermilion lake, in Western Ontario, about 2½ miles by aërial tram from the branch line of the Grand Trunk-Pacific Railway from Fort William, Ont. The orebody is large and the pyrites of almost a theoretically pure composition.

The Northland mine, formerly known as the Harris or Rib Lake, shipped lump ore to the markets of eastern Canada and the United States in 1909. The main shaft on the property (situated near Rib lake in the Temagami forest reserve about one-half mile from the Temiskaming & Northern Ontario Railroad) was sunk about 300 feet.

Improvement of Milling Methods

The tendency toward improved milling methods was marked in 1909, much attention having been paid to this technical feature of the industry. At Milan picking was installed on two 24-in. Jeffrey belts. Shaking screens, a Richards classifier and Wilfley and Bartlett tables were used. No changes were introduced in the concentrating method, at Davis, jigging still being conducted in a four-compartment Harz jig. The plant, however, was somewhat enlarged. At the St. Lawrence Company's mill Hancock jigs replaced the Harz formerly used. The Cabin Branch mine at Dumfries, Va., as noted, built a new mill comprising crushers, picking tables, Sturtevant rolls and Harz jigs.

At the Mineral, Va., mine of the Sulphur Mining and Railroad Company an interesting development in pyrites concentration was instituted in the removal of iron impurities by magnetic concentration. The jigged material is run over a Cranberry magnet which removes particles of iron oxide and pyrrhotite, thus raising the sulphur contents of the finished product 4 or 5 per cent. Balancing the increased loss of sulphur against the saving effected in freight charges, shows that the operation gives a commercial saving. This company also put in Harz jigs and made other changes at its mill at Villa Rica, Ga., during 1909. All of these improvements indicate that the producers of pyrites realized that improved methods were necessary to the success of their business.

The Corporation Tax Law

The Treasury Department at Washington has issued a circular relating to the new corporation tax law, giving the interpretation placed upon its provisions. We give below some parts of this circular which seem to be applicable to mining and smelting corporations especially.

INTENT OF THE LAW

A study of the act discloses clearly that the intent of the law is as follows:

1. That the law is a revenue measure and should be construed liberally for the purpose of producing revenue for the Government.

2. That the real intent of the law is to collect a tax of 1 per cent. on the net income, less $5000, of the individual corporation, joint-stock company, or association liable to the tax.

In order to understand clearly the intent of the law a few primary definitions are essential:

NET INCOME

The term "net income" as used in this law means not only net profits arising from the operation of the principal business of the corporation, but all items of income received from other sources, such as investments, holdings in other companies, and businesses, etc. The expression "net income" is used because there can be no question as to its embracing amounts of income received from these outside sources, whereas there might be some question as to whether or not such items would be included in the expressions "net profits" or "net earnings."

GROSS INCOME

In the same manner the term "gross income" includes gross profits, the expression being used because there can be no question but what it embraces all items of income received by any corporation from any source, while there might be some question as to whether "gross profits" or "gross earnings" would embrace such items.

A great amount of adverse criticism of this law is due to misapprehension of the proper definitions of these terms. The opinion was advanced that because "gross income" was not "gross profits" it must be "gross receipts," and that, in the same way, because "net income" was not "net profits" it meant "net receipts." An examination of the law, however, will show that if gross income meant gross receipts the statutory deductions therefrom would not leave net receipts, but would leave merely an arbitrary sum. It also appeared from calculations that if these interpretations were given to the law from mercantile and manufacturing companies alone the amount of tax received would be many times the sum which was estimated to be collected from all corporations, joint-stock companies and associations of whatever nature.

It is clear, therefore, that the purpose of the law was not to put a tax on receipts, but a tax on profits; and that the terms "gross income" and "net income" are used because, while they are practically identical with "gross profits" and "net profits," they are yet more embrasive and consequently permit a more comprehensive administration of the law.

The law requires that the return from every corporation, joint-stock company, and association liable to the tax shall show the "gross amount of the income . . . . received during the year from all sources," and authorizes certain deductions such as " ordinary and necessary expenses actually paid out of earnings in the business and property of such corporations . . . . within the year; all losses sustained during the year; amount of interest actually paid within the year; amount paid by it within the year for taxes; amount received within the year as dividends upon stock of other corporations liable to this tax, etc."

Very careful consideration has been given to these expressions in order to determine what evidence shall be required in order to determine what items are to be considered as "income" in calculating "gross income," and what items should be allowed as deductions under the language of the law. An impression has obtained in some quarters that no item should be considered in making up the account of the corporation, either as income or a deduction, unless its receipt or disbursement was evidenced by an actual cash transaction. It was owing to this interpretation placed on the law that a great number of accountants throughout the country declared that the law was impossible of administration, and if their interpretation of the law had been correct, there would indeed have been the most serious difficulty.

MEANING OF "ACTUALLY PAID"

Upon first reading the law and studying the authorities relating to the language used, it would appear that the words admit of no interpretation other than that an item must have been evidenced by the actual disbursement of cash, or something of equal value, before it could be considered in making up the account of a corporation. It is interesting to note, however, that all definitions and decisions regarding the expression "actually paid," consider the matter from the standpoint of debtor and creditor, and not from the standpoint of the individual himself, or in this case, from within a corporation concerned solely with its own accounts from which alone the law requires this return for taxation to be made, and not taking into consideration the standpoint of the debtor.

DIRECTIONS TO COMPANIES

Gross income consists of the gross revenue derived from the operation and management of the business and property of the corporation making the return, together with all amounts of income (including dividends received on stock of other corporations, joint-stock companies, and associations subject to this tax) derived from all other sources, as shown by the entries on its books from Jan. 1 to Dec. 31 of the year for which return is made.

Relating to statutory deductions, the regulation is to the effect that the deductions authorized shall include all expense items under the various heads acknowledged as liabilities by the corporation making the return and entered as such on its books from Jan. 1 to Dec. 31 of the year for which return is made. It will appear, therefore, that the return is to be made up from the ledger and not the cashbook, and that entry on the ledger from Jan. 1 to Dec. 31 of the year for which return is made is the evidence which will determine whether or not an item is to be taken account of in making the return.

It is believed that this interpretation furnishes a practical working method by which the amount of income subject to the tax can be fairly and justly determined in every case.

The regulations do not call for specific methods of keeping accounts or any particular method of bookkeeping; the requirement is simply that the transaction be so recorded that accurate returns can be made therefrom and verified when necessary.

In many corporations, mercantile and manufacturing particularly, an inventory, or its equivalent, is essential at the close of each calendar year. The law specifically states that the tax shall be collected for the calendar year and no return for any other period can be accepted. Provision is however made for preparing returns for the present year, when no inventory or equivalent was taken at close of last calendar year.

Provision is made for a method of fairly determining amount of loss and depreciation claimed; also for a fair adjustment of profit or loss in case of sale of capital assets acquired prior to Jan. 1, 1909; also for properly accounting for materials and supplies, etc.

Ottokar Hofmann

Ottokar Hofmann, the eminent metal- rgist, whose death on Dec. 24 was riefly noted in our last issue, was born 1843 at Ruskberg, a mining town in ustria Hungary. He came of a family hich had been for generations engaged mining and metallurgical work, in hich some of its members had secured minent positions. He was educated in e technical schools at Vienna and in e *Bergakademie* at Freiberg in Saxony, raduating there in 1866. In the fol- wing year be came to the United States nd settled in San Francisco, where he ormed a partnership with the late Guido üstel, at first as assayers and later in perating metallurgical testing works, the rst to be established on the Pacific oast. At that time pan amalgamation and arrel amalgamation were practically the nly processes used in treating the silver res of the coast. Küstel and Hofmann ommenced experiments with the Patera rocess, and found it well adapted for eir purpose. Late in 1868 Mr. Hof- ann received a commission to erect lixi- iating works at La Dura in Sonora, Mex- o, in which he succeeded after many ifficulties. The works there attracted uch attention and he was soon called n to build other plants of the same kind La Trinidad and at San Marcial, also Sonora, both of which were success- lly operated for a number of years.

Returning from Mexico to California, found it difficult to induce mine oper- tors to take up the lixiviation process nd for several years he filled positions metallurgist in amalgamating mills and lorination works in Nevada and Cali- rnia. In 1878 he was engaged to work e rich concentrates of the Advance and e Colorado No. 2 mines at Monitor, al. He was very successful in this ork, roasting the ore with salt, using e Plattner chlorination process for the old and leaching for the silver contents. is success at Monitor led to his en- agement to erect works at the Silver ing mine at Pinal, Arizona, and there- fter his services were much in demand r the erection and management of lixi- iation plants. These included experi- ental works at St. Louis for the Mary urphy Mining Company, and several lants in Mexico. In 1888 he was en- aged by an English company to ex- eriment with the ores of the San Fran- isco del Oro near Parral, Mexico. The sult of his work was described by him a series of papers which appeared in e ENGINEERING AND MINING JOURNAL in 889, and which constituted an extremely portant contribution to metallurgical terature. In 1890 he was appointed anaging director of the North Mexican ining and Milling Company, a position hich he held until 1894. In that year he as engaged by the Hidalgo Mining Company to rebuild and remodel its lixiviation works at Parral.

In 1895 Mr. Hofmann was called to Argentine, Kansas, by the Kansas City Smelting and Refining Company, which was having trouble with the Hunt & Douglas process for copper extraction. Concluding that this process was impracticable from a business standpoint, he invented a method of his own, which proved more successful and which enabled him to produce copper sulphate of unusual purity. This process was adopted by the Kansas City company and the works were enlarged from time to time. The Hofmann process was fully described in Vols. VIII and X of THE MINERAL INDUSTRY. In 1899 he was appointed chemical director for the United Zinc and Chemical Company, and built for that company a large plant at Argentine where he remained until 1905. He then resigned, intending to devote his time to experimental work and writing. He was engaged in this work for two years, during which time he discovered a new method of making red oxide pigments of unusual brilliancy. He also wrote a number of articles and completed his well-known treatise on "The Hydrometallurgy of Silver."

OTTOKAR HOFMANN

A sedentary life, however, did not suit his active temperament, and in 1907 he decided to go back to Mexico, accepting an offer from the Topia Mining Company of New York. Topia is a small mining camp in the precipitious mountains of Durango, more than 100 miles from a railroad. The place is remote, being reached only by difficult trails, and it was almost impossible to secure proper food and accommodations. Though he accomplished what he undertook to do—to remodel a rundown lixiviation plant and make it pay—he was too old a man at that time to undergo such hardships and his health gave way. He returned to his home in Kansas City, but last summer his health broke down completely.

Besides the articles mentioned above, Mr. Hofmann wrote many papers for scientific publication and societies. His articles were never compiled; they were all descriptive of his own experiences, investigations and discoveries. His last article was "Notes on the Hydro-metallurgy of Copper" which appeared in THE MINERAL INDUSTRY for 1908. He has the distinction of having introduced in the United States a branch of metallurgy and a number of processes which were practically entirely new in this country. Much of his early work was done in the face of strong opposition—partly ignorant and partly interested—but his persistence and energy and his thorough mastery of his work made him successful in the end.

Misrepresentation by Curb Market Promoters

Our attention has been called to the circulars of two "brokerage" firms doing business on the New York curb, who in their "market letters" refer to J. Parke Channing in connection with the Ray Central and the Tularosa copper companies. One of these concerns says that J. Parke Channing estimates that every month's development work now being done upon the Ray Central property blocks out and exposes over 1,000,000 tons of copper ore. The other concern says that J. Parke Channing has nailed his flag on Tularosa, thus implying an indorsement of that concern.

Mr. Channing authorizes us to inform the public that he has never made any statement as to tonnage on Ray Central and has steadfastly refused to make any estimates on this property until such time as work is sufficiently advanced to enable him to do so intelligently. His original statement was that probably the whole of the Globe-Isabella group was entirely underlain by ore.

Respecting the implication that Mr. Channing indorses the Tularosa Copper Company, he states that he has never seen the property and does not even know where it is.

The JOURNAL takes this opportunity to reiterate to the public its warning against these so-called "market letters." Their references to prominent engineers are generally unqualifiedly untrue. Their statements as to other matters are apt also to be untrue.

The stock of the Amalgamated Copper Company is held by 15,000 shareholders, which means an average holding of a little less than 100 shares.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Frank H. Probert, of Los Angeles, Cal., is visiting New York.

J. V. N. Dorr, of Denver, Colorado, is now located in larger offices at 728 Equitable building.

P. Chester Thompson has resigned his position as president of the Calaveras Copper Company.

Carl F. Dietz has returned from North Carolina where he has been engaged on professional work.

Frederick G. Clapp, of Pittsburg, has recently been examining petroleum and natural-gas territory in Indiana.

Dyke V. Keedy, who has been in New York for some time, is on the way to Utah and Nevada, on professional business.

B. L. Farrar has resigned his position as mine manager for the Chihuahua and El Potosi companies, of Santa Eulalia, Mexico.

J. B. Tyrrell, of Toronto, Ont., has been spending some time looking over the new gold finds near Porcupine lake in northern Ontario.

R. J. Howard, of Spokane, Wash., has been appointed general manager of the New Republic Mining Company in Ferry county, Washington.

Patrick J. Lavelle, general manager of the Johnstown plant, of the Lorain Steel Company, for the past nine years, has tendered his resignation.

P. R. Alsdorf, of the Aurora Gold and Copper Company operating in Gilpin county, Colo., is making a visit to Pittsburg, on mining business.

J. E. Spurr left New York Jan. 17 for Mapimi, Durango, Mexico, where the Spurr & Cox staff are conducting an extensive geological survey.

E. E. Ellis, of Birmingham, Ala., geologist in the Land Department of the Tennessee Coal, Iron and Railroad Company has been promoted to the position of assistant manager of the department.

Dr. William Berryman Scott, professor of geology at Princeton University, has been awarded the Wollaston medal by the Geological Society of London, in recognition of his research work in geology.

J. L. McClelland has resigned his professorship at Leland Stanford University in California, and has been appointed professor of mining engineering at the Sheffield Scientific School of Yale University.

The Governor of Iowa has appointed J. J. Jeffrys, of Albia, Edward Sweeny, of Des Moines, and R. T. Rhys, of Ottumwa, State mine inspectors. Mr. Jeffrys is the only new inspector; the others are reappointed.

M. F. Godfrey, who has been in charge of the Canisteo district of the Oliver Iron Mining Company for a short time, has returned to Chisholm, Minn., and will remain in charge of the Chisholm district as general superintendent.

The firm of Grady & Shorkley, consulting engineers and mining geologists, has been formed, with offices in the Empire building, Knoxville, Tenn. The members are William H. Grady, recently mechanical engineer for the Lehigh Coal and Navigation Company at Lansford, Penn., and Charles C. Shorkley, lately with the Bethlehem Steel Company at the iron mines in Cuba.

Philip Argall announces that in order to give prompt attention to his rapidly increasing business, he entered on Jan. 1 into partnership with Philip Henry Argall, late of the Selby Smelter, and George Oates Argall, general manager Iron Silver Mining Company, Leadville, Colo., with the object of conducting a general business as consulting, mining and metallurgical engineers, under the name of Philip Argall & Sons. The offices are in the Majestic building, Denver.

G. H. Dowell, who for a number of years has been employed by the Phelps-Dodge interests at the smeltery at Douglas, Ariz., has been appointed general superintendent of the Old Dominion. George Kingdon, who has been acting superintendent since the resignation of R. B. Hegardt a few weeks ago, will henceforth be superintendent of mines and also general superintendent of the United Globe property controlled by the Old Dominion Copper Mining and Smelting Company.

Frederic H. Keyes, formerly general manager of the Robb-Mumford Boiler Company, has associated himself with Timothy W. Sprague, Henry Docker Jackson, and others, to carry on a general consulting engineering business under the name of Timothy W. Sprague, Frederic H. Keyes, Henry D. Jackson and Associates, 88 Broad street, Boston, Mass. They propose to make complete reports, investigations, and furnish designs and supervision for all sorts of power plants; also mining reports, investigations and power plants.

Obituary

Stephen Warner Baldwin died at Brookline, Mass., Jan. 4, aged 76 years. He was for many years connected with the Pennsylvania Steel Company and was thoroughly acquainted with steel manufacture and trade. He was an active member of the American Society of Mechanical Engineers, having served as a manager and as vice-president. He took a strong interest in industrial education and trade schools.

N. E. Whitaker, former member and president of the West Virginia Stat Senate, president of the West Virgini Commission to the Louisiana Purchas Exposition, president of the Whitaker Glessner Company, the second larges independent iron and steel company i the Wheeling district, and largely inte ested in other corporations, died a Wheeling, W. Va., on Dec. 28. He wa a native of Maryland and was 71 years old

John H. Lidgerwood, vice-presiden and treasurer of the Lidgerwood Manufacturing Company, died at his home i Morristown, N. J., on Jan. 1. Mr. Lidgerwood's connection with the firm date back to its inception. He entered th employ of the historic Speedwell Iro Works, Morristown, N. J., in 1858, an later, upon the organization of the Lidgerwood Manufacturing Company, h became associated in its managemen and so continued until the time of hi death. Mr. Lidgerwood was 80 years old

Societs and Technical Schools

National Association of Cement User—The sixth annual convention will b held at Chicago, Feb. 21-25, headquarters at the Auditorium hotel. A larg attendance is expected. A number o important committee reports will b made, and some valuable papers o cement and concrete construction ar expected.

Montana Society of Engineers—Thi society held its annual meeting in Butt last week and elected the followin officers: President, Frank M. Smith manager of the American Smelting an Refining Company, East Helena plant first vice-president, F. W. C. Whyte, general superintendent of the Amalgamate coal mines; second vice-president, Rober A. McArthur, chief engineer Parrot Mining Company; secretary, Clinton H Moore. Several papers on engineerin and mining features in the State wer read.

American Institute of Chemical Engineers—At the recent annual meeting i Philadelphia the following officers wer elected for the coming year: President Dr. Charles F. McKenna, New York first vice-president, Dr. F. W. Frerichs St. Louis; second vice-president, Dr Edward G. Acheson, Niagara Falls N. Y.; third vice-president, Dr. Eugen Haanel, Ottawa, Can.; secretary, Dr John C. Olsen, Brooklyn, N. Y.; treasurer, William M. Booth, Syracuse, N. Y. auditor, Henry S. Renaud, New York directors, George E. Adamson, Easton Penn.; David Wasson, Montclair, N. J. Dr. Edward Gudeman, Chicago; Ludwi Reuter, Berkeley, Cal.; Thorn Smith Portland, Mich.; H. F. Brown, Wilmington, Del.; Dr. William M. Grosvenor New York; Richard K. Meade, Nazareth Penn., and Dr. S. P. Sadtler, Philadelphia.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Jan. 16—Under the California corpora-
n laws, the president of a mining com-
ny is required to give any stockholder
he so requests, an order on the super-
endent to allow the stockholder to in-
ect any mine owned by the corpora-
n. An expert may accompany the
ockholder in this inspection. For re-
sing to permit a stockholder of the Soc-
es Consolidated Mining Company to
spect the Socrates (quicksilver) mine,
court has ordered the president to pay
the stockholder $1000 and to pay costs
the suit. This is perhaps the first time
t this State law has been appealed to
the courts.

The eight-hour law passed by the last
gislature has been declared valid and
nstitutional by the Supreme Court of
lifornia. The law was attacked in the
esent case on the ground that it was
ss legislation directed solely against
ne owners. Fred J. Martin, superin-
dent of the Utica mine at Angels,
reed to have a test case made in behalf
the mine owners of the State, and,
June last, was placed under arrest on
ee charges of violating the eight-hour
. One charge was that of forcing a
n to work in a mine for a longer
riod than eight hours; another was
t of working a man in a quartz mill
ger than the specified time; and the
rd was that of compelling a man to
rk eight hours in a mine and making
n take the trip to and from his place
derground on his own time, instead of
t of the company. On the two counts
ich charged that Martin kept men at
rk in both mine and mill over eight
urs, the writ of habeas corpus was
nied by the court. On the third charge
ere the miner was forced to go to the
e of the drift on his own time, he was
charged from custody. Thus, while
olding the law, the court construed
act to mean eight hours' actual work,
miner to go to and from the place of
rk on his own time. The court in ren-
ing its decision maintained that the
tter came under the police power of
State, holding that there are a num-
of operations detrimental to health of
ployees, such occupations demanding
cial precautions for the well being
l protection of employees. While this
soning may apply to underground
ners, the mine operators do not think
applies to surface men or men em-
yed in quartz mills or reduction works, though the decision covers all these as well as underground miners. If the operators feel now as they did when the law was passed, and before it had been declared unconstitutional, some of them may close down their properties in which low-grade ore is being mined, or will at least curtail operations materially and mine only the better class of ore with fewer men. The decision will also make quite a difference in the running of quartz mills, for another shift will now have to be added, thus making more cost for ore reduction.

The Western Steel Corporation, with a capitalization of $20,000,000, has been organized under the leadership of J. A. Moore, of Seattle, and H. E. Law, of San Francisco, to make iron and steel on the Pacific coast. The company own the plant at Irondale, Wash., where charcoal iron was formerly made from ore from Texada island. The company is said to have extensive deposits of bog ore on Vancouver island and other important deposits along the coast. They also are reported to own valuable coalfields on Graham island, one of the Queen Charlotte group, and at Ashford, in Pierce county, Wash. The present assets of the company are estimated to have a value of $42,000,000.

Denver

Jan. 15—The Cleveland shaft, in Big Evans gulch, Leadville, has developed a fissure vein well into the granite, and is making a highly profitable production of gold ore. There are other instances on Breece hill of ore-bearing fissures.

Prospecting work in the South Evans section, however, is active, and promises much in the way of discoveries of new orebodies in the gold belt, and the tonnage going out from the above section is larger than at any former time. The names of properties working are the Valley, Cleveland, Ollie Reed, Silent Friend, Gold Basin, Louise, Little Bob, Little Ella, Blanche, Alps-Aztec, St. Louis, Boulder, etc., and nearly all shipping.

The history of the Little Jonny is in keeping with that of nearly all mines, inasmuch as they are free of litigation and counterclaims and work along comfortably, often for many years, until rich ore is discovered, when suddenly up jump a dozen, more or less, litigious adventurers, who seek through the courts to establish a claim to a portion of the prize. The Van Cise suit, involving a $500,000 interest in the above mine of the Ibex company, has just been dismissed by the Supreme Court of the United States, and is the last of 12 suits filed against the company as soon as the rich gold ore was discovered in 1892, and all of which have been dismissed from time to time during the past 15 years, not a single plaintiff having secured final judgment. The Little Jonny is the biggest gold mine in Leadville. It is owned by John F. Campion, of Denver.

Cripple Creek, whose mines are at elevations of from 9400 to 11,200 ft., has suffered severely from the long protracted cold weather experienced lately. All surface and dump work has to be stopped, pipe lines are out of commission, and little team work is being done, except in hauling fuel.

The Mine Owners' and Operators' association held its annual meeting in Colorado Springs on Jan. 10., and reelected the executive board, all Cripple Creek men. Most of the leading mine managers of the district were present, but nothing was made public as to the policy for this year. However, it is said that one of the principal subjects of discussion was as to ways and means of putting a stop to what is politely termed "high grading." Why on earth it is not called "ore stealing," and why the perpetrators are not called "thieves," passeth all understanding. Is it prompted by a sense of delicacy about hurting the feelings of these predatory rascals that their operations have been in this way almost classed as a trade by the press, rather than as a crime, and a remarkably sneaking one at that? The burglar who breaks into a house takes the chances which need a considerable amount of ill-directed courage, and if caught, he alone suffers; but the ore thief steals from his employer what he is paid good wages to produce, and not only without risk to his person, but casts suspicion probably on a hundred honest miners working in the same mine. According to reports it was stated that 20 to 30 "high-grade fences" (meaning receivers of stolen ore, and practically partners of the thieves) are in operation in the district, and that upward of $250,000 had been stolen during the year. If true, it would seem to be incredibly silly, as one-fifth of that amount paid to a good detective agency would probably stamp it out. Only four men have been convicted during the year and are now serving terms in the penitentiary.

In 1909 the mines of Leadville, Colo., produced 29,811 tons of carbonate ore, 81,360 tons of argentiferous iron ore, 308,604 tons of sulphide ore, 32,192 tons of silicious ore, and 88,545 tons of zinc ore. The metallic contents of these ores were 66,652 oz. of gold, 3,593,108 oz. of silver, 6,693,625 lb. of copper, 9050 tons of lead, and 18,500 tons of zinc. These statistics are reported by the Leadville *Herald Democrat*.

Butte

Jan. 15—The Boston & Montana smeltery at Great Falls, started up Monday after a shutdown lasting from the beginning of the switchman's strike. The Great Northern railway has imported strike-breaking switchmen for use at Great Falls and freight is being handled as usual. At the smeltery yard and about the plant 100 special deputy sheriffs are on guard and 40 more are in the railway yards. At the smeltery 600 men have been put to work and more will be taken in as the plant resumes its full capacity. A recent large shipment of coal from the Sand Coulee mines has relieved the fuel famine in Great Falls. The mines of the Boston & Montana company started shipping to the Great Falls smeltery on Saturday. The threatened shutdown of all the Amalgamated properties has thus been averted.

At the annual meeting of stockholders of the Idaho Smelting and Refining Company, the following were elected directors: J. Herbert Anderson, Arthur B. Lee, E. K. Erwin, Thomas L. Greenough, W. J. C. Wakefield, W. W. Hidman and J. L. Drumheller. Mr. Anderson was reelected president and his policy was approved. President Anderson has issued a statement in which he says that a $500,000 operating fund has been arranged for and also an additional fund of from $50,000 to $100,000 for improvements. Those furnishing the $500,000 for the operating fund will be secured by a lien on all ores treated at the plant, while the fund for improvements will be secured by a lien on the improvements themselves. From the foregoing it would appear that the differences existing among stockholders had been fixed up and that complete harmony now prevailed. The resumption of operations at the smeltery will mean much to many of the small producers in Idaho and Montana and it is to be hoped that work will be renewed soon.

The annual report of the assay office at Helena shows that its total receipts for 1909 were $2,037,436 against $1,754,265 for 1908. The receipts from Montana alone amounted to $1,992,276 and Fergus county leads with $664,173, Chouteau second with $658,961.

There has been doubt as to who were the interests behind the Gilmore & Pittsburg railway now being built from Armstead, Mont., to Salmon City, Idaho, and the latest theory advanced is that the road is being built jointly by the Great Northern, Northern Pacific and Chicago, Burlington & Quincy. Such backing would indicate that the road may be extended much farther than its present terminals.

In the case of St. Louis Mining and Milling Company vs. Montana Mining Company a writ of error has been granted the defendant by Federal Judge Hunt. Notice was also given by the defendant that it would move the court for an order directing the United States marshal and William Mayger of the St. Louis Company to return to defendant certain cipher codes, assay sheets and other papers which came into their hands at the recent sale of defendant's personal property under execution. It is contended that the articles mentioned are not properly within the meaning of the statute and thus not the subject of levy under execution. These moves disprove the rumors that the Montana Company has abandoned the fight.

Indianapolis

Jan. 17—A large number of delegates to the annual convention of the United Mine Workers of America, which will be opened in this city, Jan. 19, have arrived.

Leaders of the delegates believe that a general increase of 20 per cent. in the wage scale applicable throughout the country will certainly be asked at the coming conference. The miners point to the fact that there has been no general increase since 1902. This point will be decided by the scales committee.

On the same day the Indiana Bituminous Operators' Association will have a meeting to form a union between the bituminous operators' associations of America. A National constitution will be considered. It is pointed out that the operators are not banded together in one organization as the mine workers are, but such amalgamation is now deemed advisable.

Scranton, Penn.

Jan. 17—Since the new child-labor act went into force in this State at the beginning of the year, the attendance of boys at the public schools in the anthracite regions of Pennsylvania has largely increased. In fact, in some of the schools the influx has been so great that there is no room for the numbers who have applied for admission. It is admitted on all sides, and by none more readily that by the operators, that if the law had no other effect than to bring the children of foreign miners to the public schools, it will be a great blessing. The children of foreign parentage are bilingual; the majority of them can read and write two or more Slavonic languages, say Polish and Russian, Littish and Magyar, according to the part of Europe from which they came. They learn English rapidly.

Toronto

Jan. 15—Directors' meetings of the Dominion Iron and Steel Company and the Dominion Coal Company were held at Montreal, Dec. 12, at which concurrent action as regards organization was taken. Matthew J. Butler, Canadian deputy minister of railways and chairman of the Intercolonial Railway Commission, was appointed second vice-president and general manager of both companies, with headquarters at Sydney, N. S. It is understood that he is to receive $25,000, his salary in the government service being $8000. Mr. Butler has been prominently connected with several railway and industrial enterprises, including the Rathbun company, of Deseronto, and the Montreal Locomotive Works, joining the government railway staff in 1902. The production of the company in 1909, with the figures for 1908 in parentheses, follows: Coke, 401,182 tons (411,086); Pig iron, 256,496 (262,839); steel ingots, 296,950 (279,513); blooms, 262,052 (248,621); rails, 140,738 (152,440); wire rods, 73,004 (40,420).

Ore from Wabana was received during 1909 to the amount of 530,682 tons and 14,765 tons from other sources, as against 556,255 tons from Wabana and 44,212 tons from elsewhere in 1908. The new coke ovens are well under way and contracts have been let for the new blast furnace, the additions to the open-hearth and other extensions.

The Amalgamated Asbestos Corporation is making extensive preparations to greatly increase the output from some of the principal properties.

Cobalt

Jan. 15—Cobalt in 1909 surpassed all previous records, both in regard to tonnages shipped, value of the output and dividends paid. It is interesting to note that the total dividends paid by Cobalt companies up to the end of 1909 represent a total of $15,777,257. Included in this total are the profits of the privately owned companies, the La Rose properties before they went into the consolidation, the O'Brien and the Drummond, while the profits paid by these companies amounting to $3,304,826 were not actually distributed as dividends, they form part of the profits won.

During 1909 the total dividends paid by 16 companies, amounts to $6,301,316. It is estimated that the total silver production for that period will approximate 24,000,000 oz., representing about 10 per cent. of the world's silver production. It will be seen from this that the diviends paid represent about 50 per cent. f the value of the year's production. hen it is considered that the Right-of-ay and O'Brien pay 25 per cent. the udson Bay 15 per cent. and the Crown eserve 10 per cent. of the gross value f their outputs, in royalties to the On-ario Government, these figures take on deeper significance. Until within the ast few months the dividends for 1909 romised to be even greater than they re, but unexpected reverses among some f the dividend payers led to the cutting r suspension of the regular dividends. n almost every case, however, the pros-ects are good for their being resumed ater.

During 1909 work was started on sev-ral new concentrators and additions have lso been made to four of the existing mills nd it is estimated that when these and he others in the course of construction re running to their full capacity, the onnage of the mills will be over 1000 ons a day. One new smeltery for the reatment of the high-grade ores, the oniagas Reduction Company's plant, has lso been completed. So far this plant as been treating mainly Coniagas ore ut when the imprevements now being ade are finished it will be in a posi-ion to handle outside ores as well.

The prospects for the coming year are right and the production should show a substantial increase over the present year. This will be partly accomplished by the greater tonnage that will be handled in the concentrating mills and partly on account of the fact that when the power companies are in a position to distribute cheap air and electricity, many of the mining companies will carry on operations on a much larger scale and many claims now lying idle for lack of power will be developed.

The outlying districts, South Lorraine, Elk Lake and Gowganda, are also commanding more attention and 1910 should show a big improvement. The rush into the Porcupine goldfields should be productive of encouraging results, and judging from the reports that are coming from that section it is possible that at last Ontario is to have a profitable gold camp. Many large interests have already taken up claims.

Victoria, Tamaulipas, Mexico

Jan. 12—Owing to the general stagnation of business throughout this section of the Republic, brought about by the financial crisis, one or two years of drought and finally the unprecedented storm of September, 1909, mining was very seriously set back in this state.

Active work, however, has continued in the Dulces Nombres, Rampahuala and Llera districts. In the former, Rafael Salinas Cantre has been shipping zinc ores steadily, and under the impulses of better prices is now erecting at his mines a large calcining plant for the purpose of utilizing a large quantity of 30 to 40 per cent. ore which, owing to the long mule pack, has been unavailable for transport to the railway. The Guadalupe & Virginia lead-silver mine in the same district, under the management of F. E. Sandys Simpson, has been pushing development steadily, and is asking bids for an 11-km. cableway. The mine has a large amount of ore blocked out now. South of the Guadalupe & Virginia property is the Tamaulipeca group, 165 pert. with seven workings. These properties have been idle for three years, the company having been in financial difficulties. L. Vogelstein & Co., of New York, through their Monterey representative, have recently taken over the Tamaulipeca group upon a two-year lease for extracting the zinc and lead-silver ores, and a large force is at work. The San Antonio lead-silver mine owned by the Conductors' company, and under the administration of Joseph Van Stone, is working and has developed a large tonnage of lead-carbonate and sulphide. This company has completed arrangements for the installing of a Patridge hot-blast furnace of 10 tons capacity, and expects to have it in operation in April. La Lolita mine, owned by the Alta Rampahuala Mining Company, largely owned in San Antonio, Tex., with H. C. Dennin manager, has been doing development work for the last two years, and has a large tonnage of lead-carbonate and sulphide ore blocked out. Development will be pushed to a point where sufficient ore will be in sight to warrant the erecting of a cableway to the railway at Santa Engracia station. R. S. Willey, who owns a large number of claims in the Chinge cañon, south of the La Lolita, has completed the organization of a company in Texas. If development is successful, another cableway will follow.

In the vicinity of Victoria, the only property being actively exploited is the Barnita, a locally owned copper mine. Work upon this property lagged considerably during the past year. Shipments of copper ore are made at rate of one car of 31 tons each two months. The ore contains 10 per cent. copper and from 500 to 800 grams silver. While there are a number of mining claims held in the territory surrounding Victoria and to the south of it in the Llera district, the Guadalupe de Tamaulipas near Llera is the only property being developed. This property is owned by La Gloria Copper Mining Company, of Terre Haute, Ind., and is in charge of Manuel Ruiz. The property yields lead and silver, and has much low-grade carbonate ore developed. Owing to the distance, 30 miles, from the railway, the company has decided to treat its ore on the ground, and is now investigating suitable processes.

Interest is being shown in the coalfields west of Cruz station on the Monterey & Gulf division of the National Railways. A French company is prospecting with drills a property near Ascencion, across the Tamaulipas and Nuevo Leon line. So far results have been satisfactory. There is reported to be a large area in that section, showing many indications of coal. At one small mine known as La Caballda several carloads of semi-anthracite have been taken out, which were high in carbon and low in ash.

In the southern part of the State, at Tampico, the boring for petroleum is being pushed with vigor and a number of "pumpers" have been brought in within six months.

London

Jan. 9—American mines have been very prominent this week. The flotation of the Santa Gertrudis Mining Company by the Camp Bird has been accomplished. The debenture stock and new shares of the Camp Bird offered for subscription appear to have been well applied for by the shareholders and the underwriters will not, it is believed, be called on to any large extent. The purchase of the Santa Gertrudis mine involved the finding of a million sterling in round figures.

From these reports it appears that the Camp Bird Company has made a promising purchase. It is one of the largest mining deals that has been carried through in London for some time, and it is to be hoped that the valuations so conscientiously undertaken will be borne out by results.

At an extraordinary meeting of the Boston Consolidated Copper and Gold Mining Company held during the week the shareholders agreed to ratify a provisional agreement for the sale of the company's property to the Utah Copper Company. The scheme of amalgamation is approved of by Sydney Jennings, the company's consulting engineer, who estimated that the two properties could be worked more advantageously together than separately. The cost of producing copper on the enlarged Utah ought not, he thought, to exceed 8.5c. per lb. It was announced that the property of the Nevada Consolidated might later also be included, at a rate not more favorable to the Nevada company than 2¼ Nevada shares for one Utah. The terms of purchase of the Boston property are 310,000 shares in the Utah, the capital of which is to be increased from 734,500 shares of $10 each to 2,500,000 shares.

The proposals met with some opposition, but were eventually carried. The chairman informed the meeting that a large majority of the shares were held in America and that he held proxies representing 327,438 shares in favor of the sale.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY· INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

Chicagoff—The company has been sold to a Seattle syndicate. Judge deGroff retains his interest in the property and will act as manager. Mining operations will be increased in the near future.

Bear's Nest—An air compressor is to be installed on the property, at Juneau, and it is planned to carry on active operations. W. Jewett is in charge of the work.

Arizona

The Development Company of America has taken over the Henderson concessions for the railroad in Sonora to a port on the Gulf of California and proposes to connect with a line from the Imperial smeltery at Sasco. The railroad will be important, affording an outlet for a richly mineralized section of Arizona and for a copper district in Sonora which is said to have great possibilities. Also the road will serve as a port of entry for coal from Australia for the use of the Imperial and other smelteries in Arizona.

COCHISE COUNTY

Arizona United—The company controlled by Philadelphia capital is operating a smeltery at Johnson, making a carload of matte per week, worth about $5000. The mines are down to a depth of 750 ft., with ore in the bottom. I. Wayne Von Leer is in charge.

GILA COUNTY

Miami—Churn drilling is to be inaugurated to explore the ground toward the Inspiration property in which direction the mineralized schist is known by a geological survey to trend. The Miami orebody undoubtedly extends in this direction, the underground developments not yet having reached its limit, but how far it goes remains to be proved. The drilling, which will shortly be commenced, will throw light upon this. Recent developments by drifting in the mine have shown ore of materially higher copper content than the average of the orebody. Good progress is being made in the mill construction.

GRAHAM COUNTY

Arizona Copper Company—Production in December was 1300 tons.

Shannon—The December output was 1,498,000 lb. of copper.

Red River Copper Company—The new shaft has reached 235 ft. and sinking continues. On the 200 level a drift has been driven 180 ft. in ore.

Donald—On the property in the Cave Creek mining district a 175-ft. shaft has been sunk. A crosscut of 110 ft. in ore fails to disclose either wall. The ore contains copper, gold and silver and is self fluxing. W. F. Donald is manager.

MARICOPA COUNTY

Arizona—The double compartment shaft at the Minneapolis, one of the 10 claims owned by the company in the Winnifred district, has reached 200 ft. and is in good average ore. L. L. Plank, Phœnix, is manager.

Rogers-Arizona—Thirty miles north of Phœnix is the property of this company. Development is being pushed on a vein of copper glance. J. D. Marlar, of Phœnix, superintendent, says a 100-ton hydrocarbon smelting plant is to be erected during 1910.

PIMA COUNTY

Twin Buttes—E. T. Davis has resigned as president. The annual meeting was held Jan. 18 at Tucson.

YUMA COUNTY

Clara—Representatives of the French stockholders have been visiting the properties near Bouse. Work on the smelting plant is being pushed and the railroad will soon be completed. Oscar Fanyan, representing the foreign stockholders, has been elected vice-president.

California

PLUMAS COUNTY

Plumas - Eureka—Turner Brothers, who have been operating a lease on this mine near Johnsville, have done well during the season.

SHASTA COUNTY

The chromite mine between Castella and Dunsmuir, owned by L. H. Brown, of Dunsmuir, is shipping chrome ore for furnace lining to smelteries at Kennett, Coram, Martinez, as well as Salt Lake City. The crude ore brings between $12 and $15 per ton.

Silver Falls—This company, near Igo, formerly the South fork, is being rapidly opened under management of Harold Rogers. They have started a new ore-shipping station at Girvan to send the ore to Kennett.

SIERRA COUNTY

Irelan—The three old claims owned by ex-State Mineralogist William Irelan and his sister have been bonded to Fred Clark, of San Francisco. The claims are in a very favorable location at Alleghany and will now be fully developed. Over 30 years ago they were profitably worked. George Hegarty is superintendent.

Queen Radigunde—This property at Alleghany has been placed under a five-year lease to Tonopah men. Frank B. Smith is the representative. The mine has not been bonded, but only leased.

Eldorado—The latest strike at Alleghany is in this mine where ore of phenomenal richness is being taken out. This is a very old mine and is under management of H. L. Johnson of the Tightner.

SISKIYOU COUNTY

Clarence Smith and John Haley have found a small vein of free gold ore in this district, the first vein discovered, though there is plenty of auriferous gravel.

Machinery is being installed on the new dredge on McAdams creek and it will soon be started up.

Elk Creek—This company, operating the Coburn mine, has been making profitable clean-ups.

Forest—This mining property, on Nigger creek, adjoining the Osgood & Co. claims, will be operated this winter by W. S. Duprey.

Bennett & Co.—This firm has started work on the four hydraulic claims at Forks of Salmon with an abundance of water.

Black Bear—Ben Daggett has returned from Mexico, bringing men with him who expect to purchase and work the mine.

TRINITY COUNTY

Headlight—This property, near Carrville, will be developed extensively. Three miles of flume are to be put in and a 40-stamp mill built.

TUOLUMNE COUNTY

Moffitt—This mine on the Tuolumne river, formerly a producer, is about to be worked again.

Banner—This mine at Big Oak Flat has been started up by George C. Richards, owner.

Little Gap—This gravel mine on the Big Channel, seven miles from Groveland, has been bonded to Holtsburg & Lane of Modesto.

Horseshoe Bend—This company is about to resume operations on its property at Tuttletown.

urprise—Very good ore is being taken n a wide shoot in this mine at Saw l flat.

pp—Ore of high grade is being taken n this mine near Jamestown, owned W. A. Nevills. The shoot is a con- ation of that found before water ped operations in that part of the e.

ay—This mine, formerly the Ful- Pocket claim, is being opened by a el to strike the shoot some distance w the old workings.

rma—The new hoisting machinery of mine has been placed in position and ing will be resumed.

Colorado

Boulder County

rimos—This company will shortly ar- ge for the building of a power plant North Boulder creek to generate 2500 , about 500 h.p. of which will be used he operation of the company's mines, s and tramway, the balance to be sold perators in the Nederland and sur- nding districts.

ip Van Dow—W. Brown and associ- are sacking rich tellurium ores from property near Jamestown.

lear Creek and Gilpin Counties

everal carloads of machinery for the m plant at Georgetown have been eived, and it is expected that the mill be running inside of 60 days.

. Sternberger, of Philadelphia, Penn., L. Sternberger, of Denver, are in- ling a power plant which will cost at t $75,000 for furnishing electricity their own and neighboring property the Fall River section. Fred G. od, Russell Gulch, is in charge.

erman—A strike of high-grade uran- ore has been made. A compressor nt will be installed. R. W. Miller, d Mountain, is superintendent.

lice—Work has been resumed at the dings of this company, and plans are erway for a 300-ton mill to handle low-grade deposits. A. H. Roller, ho Springs, is manager.

ontinental—Arrangements are being de to install a large compressor plant the Seemann tunnel and additional acity at the power plant.

old Collar—A new orebody has been nd in the third west level. Heavier chinery has been installed. A. Skeels, tral City, is manager.

amsdell—Arrangements are made for financing of this property and the pleting of the mill near Georgetown. Teagarden is manager.

ennedy—This Georgetown company figuring on the installation of a 50- milling plant.

lein-German—Wisconsin people have en a lease and bond on this and adjoining property in Gregory district and are installing machinery and compressor. J. W. Stoughton, Black Hawk, is manager.

Hurricane—Denver people have purchased this mine, close to the War Dance, Russell gulch, and will install machinery. J. H. Le Shar, of Denver, is manager.

Newhouse Tunnel—Work on the heading has been discontinued for the present as it is reported that the ventilation was inadequate. It is expected that work will be resumed inside of 60 days and during the interval several laterals are being run to cut veins under Quartz hill, which nave been partially explored through the big tunnel. During 1909 the tunnel was extended 3332 ft., making its total length 20,978 feet.

Cumberland—High-grade gold ore has been found in this property near Yankee hill. Denver people have recently purchased the property and they will install machinery including compressor. J. D. Montgomery, Yankee, is manager.

Gilpin Independence—This company has recently opened up large orebodies in its Golden Flint mine, Perigo, and intends to install an additional 10 stamps and other machinery at its mill. The company has an office at 202 Exchange building, Denver.

Princess Alice—Developments are being carried on at the holdings in the Alice district and it is reported that a mill is to be built near the property. J. F. Kaminky, Alice, Colo., is superintendent.

Lake County—Leadville

Cleveland—This mine is installing a 1200-h.p. hoist and will sink another 200 ft. During the sinking, the company will ship about 2000 tons of ore per month, as usual. The New Monarch shaft is to be unwatered preparatory to sinking deeper and exploiting orebodies.

Gold Basin—The lessees on this mine are shipping seven carloads of high-grade ore per month.

Robert E. Lee—W. T. Jones and associates, leasers, are shipping high-grade zinc ore.

Ibex—From the lease on No. 2 shaft, high-grade ore has been produced for over a year, and a carload of exceptionally rich stuff has just been sacked and sent to the local smeltery.

Teller County—Cripple Creek

News comes from Cripple Creek that four old-time shippers that have not been producing for a considerable period, have again begun to ship, sending out a carload each this week. They are the Peggy, under lease to Seaver & Henry, this mine being on Gold hill, and worked through the Ophelia mining and transportation tunnel; the John A. Logan, on Bull hill, under lease to Charles Ridpath; the Jennie Sample, on Beacon hill, under lease to W. L. Shockey; and the Mitchell shaft of the Pinnacle claim, on Bull hill, which is said now to have ore yielding from 1 to 3 oz. gold per ton.

Golden Cycle—It is reported that the mine and mill have been sold to an English syndicate for $7,000,000 or $4.50 a share. Verner Z. Reed, who sold Stratton's Independence, is said to have negotiated the deal. It is admitted that the mine has been examined but the completion of the deal is not admitted by the company officials at Colorado Springs.

Gold Sovereign—This mine, which was closed down for 10 months on account of the destruction by fire of the mine plant and buildings, is shipping steadily, and is credited with a total production of 2964 tons of a gold value of $23,294. O. H. Hinds is president.

W. P. H.—This mine on Ironclad hill is shipping about 600 tons per month from 450 ft. deep, the ore running about 2 oz. gold to the ton.

Idaho

Cœur d'Alene District

Bunker Hill & Sullivan—A new milling plant has been installed with a capacity of 700 tons daily. The old mill will be remodeled and when this is done it is expected that the mine will produce between 1500 and 2000 tons daily.

Copper King—The continued heavy flow of water from the face of the tunnel has necessitated the closing of the mine and it will in all probability remain closed for three months.

Nipsic—It is thought that the property may change hands in the near future and that only the issuance of patents is being awaited before the transfer.

Snowstorm—Ore rates have been reduced $1 and $2 per ton on shipments from Larson. This was done after the directors threatened to shut down the property unless rates were reduced. This will enable the mine to ship low-grade ore which it was formerly unable to do.

Surprise—A fine body of lead-silver ore has been opened up, creating interest in Pine Creek district.

Josephine—This mine will ship ore which lies on dump and will continue monthly shipments.

Ambergris—The raise 300 ft. long has made connections between levels after months of work.

Hercules—The Tiger mill is treating 200 tons daily on one shift.

Kentucky

The mine of the Interstate Coal Company at Barbourville caught fire two weeks ago. At first it was thought that the fire could be handled easily, but it spread rapidly and the mine is now completely closed. As a last resort the main entry has been sealed and water is being pumped into the mine. The mine is the largest in eastern Kentucky, and was recently equipped with electric haulage and other machinery.

Michigan

Copper

The Lake Superior copper properties produced in December 19,920,458 lb. of refined copper, or 279,230 lb. less than November.

Winona—This property continues opening up reserve ground and at the present time has enough blocked out to maintain regular shipments to the mill for a number of years. The ground is of a consistent nature and will in all probability yield about 15 lb. copper to the ton.

South Lake—The mine has its drill in the lode after passing through 240 ft. of overburden.

Tamarack—The rock from the conglomerate lode of this property is being shipped to the Calumet & Hecla mills, while the rock from the Osceola amygdaloid lode of the Calumet & Hecla is going to the Tamarack mill. This arrangement went into effect Jan. 1 and to the benefit of both companies as the respective mills are more economical on these different kinds of rock.

Franklin—The company is about to start drill operations upon the approximated strike of the No. 3 lode which is showing such good results at the Hancock property. Operations are centered on the Pewabic lode with most encouraging results.

Oneco—This company has encountered a copper-bearing amygdaloid formation in its No. 5 drill hole at 350 ft. The core taken out shows the formation 12 ft. wide and charged with copper throughout. This unidentified lode is 1200 ft. west of the lode exposed in the shaft. No. 5 hole is sinking to cut the Oneco lode at depth and also the hypothetical Tomahawk conglomerate lode, which Edwin J. Hulbert, discoverer of the Calumet conglomerate, maintained traversed this tract. A second drilling outfit is working in proximity to this strike and will expose this lode at another point in a short time.

Lake—A diamond drill operating from the face of the crosscut at the sixth level has cut the Lake lode at 120 ft. from the shaft. This work was done to determine the distance necessary to drive before striking the lode, and crosscutting will not be resumed. The crosscut has been extended 70 ft. from the shaft. Drifting on the new formation cut by the shaft at the sixth level continues showing good copper ground.

Indiana—This property has disclosed in its diamond-drill operations a conglomerate lode of exceptional richness. The core shows the lode to be 41 ft. thick and impregnated with heavy copper throughout and as rich as any sample ever taken from the district. The drill is operating at the northeast corner of section 28 and cut the lode at 1400 ft., but in all probability the outcropping will be found on these lands.

Ojibway—The north drift from the 500-ft. level of No. 1 shaft is encountering a good run of copper ground, as is also the south drift from the 650-ft. level of No. 2 shaft. A diamond drill operating at the 800-ft. level drift of No. 1 shaft has cut the formation and shows 10 ft. of it carrying commercial copper. This drift passed out of the copper-bearing portion of the lode some time ago, owing to a fault in the formation and this drill was recently started to relocate the lode.

Missouri

Frank T. Creller has purchased 320 acres in Newton county near the Mattes brothers mine from Victor L. Young and others and is opening the tract.

Continental—This company has taken over the Temagami mine and mill, Joplin tract, and is operating in sheet ground.

John Jackson—This tract of land consisting of 400 acres near Joplin has been sold to the St. Louis-Joplin Lead and Zinc Company for $250,000. T. J. Franks, of St. Louis, is president and R. F. Campbell Joplin, manager.

Montana

Butte District

Amalgamated—The Mountain View mine has kept in operation throughout the recent troubles, but with a reduced number of men. Its normal output is between 1500 and 1700 tons but during the railway strike it has been shipping about 1000 tons daily, for a while to Anaconda, but since Jan. 9 to Great Falls. The Pennsylvania was closed for some time, but opened again with about two-thirds its full force, and is shipping about 500 tons daily to Great Falls. The Leonard and East and West Colusa are producing at a much reduced rate. A crosscut driven north from the Badger State shaft has recently connected with a drift on the 1200-ft. level of the Speculator.

Butte & Superior—The first shipment of zinc ore to the Basin concentrator has been made. Work has been begun in the Black Rock shaft.

Davis-Daly—A new vein varying in width from 18 to 30 in. has been cut on the 1800-ft. level, 50 ft. from the shaft. The main vein has not been cut, on this level, and is in about 600 ft. further. The company's petition to build a tramway from the Colorado to the Hesperus shaft in the city has not as yet been acted upon by the council and shipments are being hel pending such action.

Butte-Ballaklava—P. H. Nelson, Duluth, president, is in Butte, and will r main in this city several months to d rect operations. The third compartme of the shaft has been raised to the su face and the new steel headframe is u The new hoisting engine has not yet a rived.

North Butte—A wreck in the shaft w caused by the engine escaping contr and one cage went to the sump while t other was pulled into the sheaves.

Nevada

Unprecedented floods have destroye nearly 100 miles of the Salt Lake rai road in Nevada. The road will rebuil the line through Meadow Valley was in a new location to avoid the recurrenc of such disasters.

Elko County

The new Contact camp on the Twi Falls-Cobre line is attracting attentio The Ivy Wilson group has been bonde and other negotiations are underwa The ore is copper and low grade but th deposits are extensive.

Esmeralda County

Goldfield Consolidated—The annu meeting of the company was at Evansto Wyo., Jan. 10., and the following boar of directors was elected: George Wing field, J. B. Hubbard, J. H. MacKenzi J. H. Carstair, W. C. Ralston, A. Howe and W. G. Roelker. The officer for the ensuing year are: George Wing field, president; J. B. Hubbard, vice-presi dent; J. R. Finlay, general manager; H. Howe, secretary and treasurer.

Humboldt County

Laurel—This gold property eight mile west of Winnemucca is now shipping. C F. Siebert is manager.

Lincoln County

At Goodsprings, the Ninety Nine an the Sultana are developing satisfactoril J. B. Jenson is manager.

Storey County

C. & C.—The water stands at 151 ft. below the 2350 station.

Ward—This shaft is working on th 2100 pump station and retimbering of th shaft below the 2300 level.

Comstock Tunnel—The wood stav pipe to carry hot water from the War and C. & C. shafts has been complete to the mouth of the tunnel.

Butters—The mill has discontinue working tailings for the winter, and i running on ore from the Ophir and uppe levels of the Chollar and Potosi.

Mexican—The two-compartment winz is down 72 ft. below the 2300 level.

Hale & Norcross—The station at th top of the incline raise, from the tunne vel, has been completed. The reopenig of the No. 2 east crosscut from the orth lateral drift is in progress.

Yellow Jacket—The incline shaft has een reopened and repaired for a disince of 325 ft. below the 1100 level.

WHITE PINE COUNTY

Steptoe Lead and Copper Company—/ork has been started on this lead proprty in the Duck Creek district.

New Mexico

The Orogrande Smelting Company has ad engineers in the field for the past x months searching throughout the outhwest for available properties proucing copper-sulphide ores. The comany is now negotiating for two properes, one in the Globe district, Ariz., the ther in New Mexico. This company as a smeltery at Orogrande, on the main ne of the El Paso & Southwestern raiload, 50 miles north of El Paso. The daily apacity is 500 tons. The company owns, ear the smeltery, large amounts of oxide nd silicious ores, but owing to the lack f sulphides the plant has been idle for bout two years. J. J. Murray, formerly f the Mountain Copper Company, California, and the Iron King, Arizona, is anager.

Polar Star—This group, in the northn part of the Black Range district, orked under lease and bond by Park ommissioner Harris, of El Paso and asociates, has just been sold to the Black ange Reduction Company, formed by olorado men. The company is planning e construction of a 50-ton milling plant treat the Polar Star ore and also to do ustom work.

Stephenson-Bennett—The company with roperties at Organ, at the present time receiver's hands, is having its financial oubles adjusted and will soon resume. his lead-silver mine has ore blocked ut, and a concentrating plant on the roperty.

Pennsylvania

ANTHRACITE COAL

Delaware & Hudson—Five brothers amed Hull have sued this company in e Lackawanna county court to recover yalties on a tract of,coal land in Blake- township, near Scranton, containing me 400 acres, which, it is estimated, orinally contained over 25,000,000 tons of oal, of which about 5,000,000 tons have een mined. The Hulls, according to eir complaint; made contracts in 1860, hich reduced the annual minimum quanty to be mined to 120,000 tons. As a sult of this contract, the company, it is aimed by the defendants, has been enbled to conserve the coal in the Hull act, while it has mined out coal from her tracts, where the minimum was eater. The plantiffs claim that the mpany fails to pay its royalties to them; they also claim that the coal has been mined negligently and that no proper accounting has been made of the output during the past 50 years.

Monongahela Consolidated—An order has been placed for 400 steel mine cars with the Ohio Ceramic Engineering Company, Cleveland, the equipment being for the Monongahela company's large mine at California.

South Dakota

With the declaration that they intend to establish permanently in the Black Hills non-union labor conditions and to install the card system, the managements of 13 large mining properties in the Black Hills district have issued notice to their employees that they could sign under the new conditions before any outsiders were imported. More than 800 men are affected, exclusive of the 2500 at the Homestake, now closed. The Homestake employees opposed to the policy of the union have formed the Homestake Loyal Legion unaffiliated with any union and are in negotiation with Superintendent Grier looking to a resumption of operations.

Homestake—The company has started part of plant using non-union men only and expects soon to be in full operation. Over 1000 men are ready to work and it is not expected that any outside labor will be needed.

Utah

A company headed by George F. Timmons, of Washington, D. C., is making investigations of special process for treating the copper ore from the deposits in Green river section. The ore is expected to run 5 per cent. and can be steam shoveled.

BEAVER COUNTY

Nevada Ready Pay—Development will be resumed on the Santa Anna and Mollie Reed claims. H. A. Moore succeeds W. L. Bachtell as superintendent.

JUAB COUNTY

Tintic Central—Conditions in the property are reported improved by manager O. U. Holdaway. The limestone formation has not been cut. Electric power will be installed.

Scranton—This mine, Tintic district, has opened new ore in the Magazine tunnel, the deepest working. The product is zinc and lead. Henry Jones is superintendent.

SALT LAKE COUNTY

Utah Copper Company—The meeting of the stockholders of the company which was to have been held at Jersey City, Jan. 18, was adjourned until Jan. 25 next by an injunction granted by Judge Scott of the United States Circuit Court at Trenton, on the application of E. A. Wall. The injunction is to be argued at Trenton on Jan. 24. The meeting was called for the purpose of ratifying the merger with the Boston Consolidated and Nevada Consolidated Copper companies, for the stock of which Utah shares have been offered in exchange at the rate of 1 for 2½ and 1 for 2¼, respectively, and to vote an increase in Utah stock from 750,000 to 2,500,000 shares for the purposes of exchange.

Utah Consolidated—The local management has received no information concerning the probability of a shutdown of the mine until International smeltery is finished. The new smeltery is getting more material now, and the improvement in weather conditions is permitting increased activity in completing the plant. The exact date for blowing cannot be given, but the plant, it is said, cannot possibly be commissioned by April 1, the time set for receiving the Utah Consolidated ores.

SUMMIT COUNTY

California—This old property, Thaynes cañon, Park City, has been leased to George Morse and M. H. Wynn. Other work is planned for the adjoining Comstock property owned by the same interests.

Washington

Capt. John McA. Webster, superintendent of the Spokane Indian reservation in eastern Washington, announces in a statement that no mining claims can be located on the reserve until President Taft issues a proclamation opening the mineral lands to location and entry. This order is looked for early next spring.

KLICKITAT COUNTY

Lucky Five—The owners of this property are making extensive preparations for early spring work. The ore is freemilling gold. P. G. Peterson, White Salmon, has charge.

WHITMAN COUNTY

Commonwealth—This coal mine at Wilkeson has been sold. The mine outputs 250 tons daily, which the new management will double. Robert L. McCormick, of Tacoma, is president.

Canada

ONTARIO

The Cobalt shipments for the week ended Jan. 7, are as follows: Drummond 170,000, Kerr Lake 120,213, Cobalt-Central 40,000, Coniagas 59,597, McKinley-Darragh 48,041, La Rose 65,000, Nipissing 62,301, total 565,152 pounds.

City of Cobalt—This company has arranged with the Northern Customs Concentrator to mill the dump, estimated at 10,000 tons.

Union Pacific—This property, Cobalt, has suspended mining operations pending the arrival of the hydraulic air.

Silver Alliance—A diamond drill has been installed to test the underlying diabase at this property, Elk Lake.

Lucky Godfrey—It is expected that the first car of high-grade ore from this mine, Elk Lake, will be shipped Feb. 15.

Mexico

Baja California

Boleo—Production in December was 1378 metric tons, the average yield of the ore having been 3.784 per cent. copper.

Chihuahua

Negotiations are reported for the Chihuahua Mining Company property and the Potosi mine in Santa Eulalia district for 7,000,000 pesos to an American company. The London Exploration Company also has some pending deals in this district.

Dolores—Fire at Madera, Jan. 8, destroyed the storehouse of the company. Loss $100,000.

Inauguration—This property near Ojo Caliente is being operated by a company in which G. W. Vanderslice, G. L. Williams, M. D. Murphy and G. L. Vaughan are interested. The ore contains silver and lead.

Parral Consolidated—This Parral company's new concentrating plant is to be in operation in January. D. H. Bradley, Jr., is in charge.

Cordero—The company is making regular shipments of silver ore which nets about $1500 to the car. It is announced that dividends will be distributed shortly.

American Zinc Extraction Company—At Parral the experimental Elmore oil-process plant lately installed at Parral is proving sufficiently satisfactory to warrant the early erection of a large working plant.

Minas Veta Grande—Heavy shipments of silicious ores are in progress from this Mines Nuevas property.

Lluvia de Oro—Milling operations have been suspended until early spring when the new hydroelectric power plant will be in readiness. Mine work is being continued under the direction of H. R. Conklin.

Guerrero

Maine & Nebraska—The smeltery of this company at Rio Balsas is at present shut down, awaiting repairs necessitated by an explosion. The plant has a capacity of 160 tons per 24 hours.

Jalisco

San Vincente—At this mine, owned by the Philadelphia Gold Mining, Milling and Smelting Company, an experimental cyanide plant, using Pachuca tanks, is being installed. The company is having trouble with the treatment of the ore, due to some undetermined element in it. M. J. Slattery is manager.

Matarañа—A tunnel 950 ft. long has cut 21 ft. of ore in the old Matarana mine near Mascota. The tunnel is several hundred feet below the old workings. The mine is owned by the Matarana Mining Company, of Spokane, Wash.

Magistral—A wagon road has been completed from Ameca, the railroad terminus, to the copper mines, a distance of 8 miles. Machinery for the 100-ton concentrating plant is being brought in.

Santa Maria—The old workings of this copper mine in southwestern Jalisco, near the Colima line, are being cleaned out preparatory to sampling by the De Lamar interests. The mine is owned by S. S. Gates, of Guadalajara.

Virginia & Mexico—Fuel difficulties have been overcome, and the new 150-ton plant is now handling from 75 to 90 tons daily. Electric power will be used soon.

El Favor—It is estimated that the ore now in sight is sufficient to keep the recently completed 100-ton mill in steady operation for 10 years. The mill will not be placed in commission until electric power reaches the district.

Mexico

El Oro—Returns for December are as follows: mill No. 1 ran 16 days; mill No. 2 ran 30 days; crushed 25,383 tons; yielding bullion, $224,980; working expenses, $119,230; expenditure on developments, $31,000; total expenditure, $150,230; profit, $74,750; profit on railway, $4000; total profit, $78,750; expenditure on permanent improvements, $7000.

Mexico Mines—Returns for December are as follows: mill ran 31 days, crushed 11,500 tons; yielding bullion, $115,410; working expenses, $42,270; expenditure on developments, $12,300; total expenditure, $54,570; profit, $60,840. net value of 23 tons shipped during month not included in the above profit, $3000. Expenditure on permanent improvements, $1000.

Cucharra—The new mill is now running and the separation of the lead and zinc is satisfactory.

Santa Ana-Esperanza—The mine is shipping regularly and exploration work is being carried on. A crosscut has been started in order to get under the old workings.

San Fernando—Development is being pushed. Sr. Francisco Conejos is in charge.

Imparcial—This company, L. N. Shaw in charge, is doing development and a 5-ft. vein of milling ore has been discovered.

Oaxaca

San Juan—The American company contesting the title of this property has won in a suit in the Federal Court of Mexico City.

Sonora

Santa Rosalia—One thousand pounds of first-grade ore was brought to Cananea from this mine last week as an experimental shipment.

Greene-Cananea—The Sierra de Cobre mine was put on the producing list in December and is yielding regularly. The ore does not require concentration.

Mexican Northern Mines Company—This concern has recently added to its working force and is in good shape. Its properties are situated near Tucabe.

Black Mountain—This is a Cole-Ryan holding near Magdalena. A retrenchment and reduction in number of employees are reported.

Zacatecas

Santa Rosa—This property, in the Concepcion del Oro district, owned by V. D. Williamson and the estate of V. M. Clement, is under negotiation to the Exploration Company of London.

Zaragoza—This mine has been shipping to Aguascalientes for three months. One shaft yields copper, silver and lead ore. The other iron sulphide containing gold and silver. The company is refitting the mill. The main shaft is down 130 m. and is being sunk to the 225-meter level.

Asia

India—Mysore

Kolar Goldfield—Gold production in December was 53,099 oz. bullion. For the year ended Dec. 31 the total was 534,415 oz. bullion in 1908, and 544,007 oz. in 1909; an increase of 9592 oz. The bullion reported in 1909 was equal to $10,120,032, or 489,600 oz. fine gold.

South America

British Guiana

Exports of gold from the colony, 11 months ended Dec. 1, were 66,471 oz. bullion in 1908, and 60,390 oz. in 1909; a decrease of 6081 oz. The bullion reported in 1909 was equal to $1,050,162, or 50,806 oz. fine gold.

Exports of diamonds in 1909 were 5583 carats, valued at $35,589; a decrease of $3746 in value from the previous year.

Venezuela

The Venezuelan government has notified the Pan-American Company, in which Charles M. Schwab is believed to be interested, that it will not recognize the transfer of the Imataca iron mine to that company, on the ground that the title to the property is questioned. The protocol expressly prohibited any person taking possession of the mine until the title was cleared. It was the intention of the company to begin work at an early date.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Jan. 19—The coal trade in the West is in a generally confused state. The demand for coal at all the distributing centers is strong and mines are working hard to fill orders. The distribution of coal, however, has been badly disarranged by stormy weather and at many points coal has been scarce and premium prices have been paid. It is quite probable, however, that this condition will pass over in a short time and matters will work down to a normal basis. A good demand seems to be assured for some time to come.

The Eastern bituminous trade has its own troubles, some of them similar to those of the Western trade, though demand does not seem to be generally as strong. Transportation here too has considerable effect on the trade.

In the anthracite trade there is nothing specially new beyond the usual winter demand.

Preparations are already being made for the Lake trade of next season. The Northwest is reported short of coal and early shipments will be needed. No charters have been made for next season, but it is generally expected that coal rates from Lake Erie ports will be at least 5c. above the past season. Some coal has already been loaded, so local papers report, on vessels tied up for the winter; the boats charging 10c. per ton for the storage.

Car Distribution to Mines—The United States Supreme Court, on Jan. 10, rendered an important decision sustaining the order of the Interstate Commerce Commission in the case of the Illinois Central and other roads in Illinois. That order directed that no discrimination should be made in the case of companies owning their cars, but that all private cars should be counted in the general stock and distribution made to mines on an equitable basis. The court fully sustains the right of the commission to make the order, and to direct the allotment of cars.

COAL TRAFFIC NOTES

Corrected report of coal passing through Sault Ste. Marie canals for the full season of navigation, short tons:

	1908.	1909.	Changes.
Anthracite.....	1,384,743	1,412,387	I. 27,644
Bituminous....	8,517,717	8,527,639	I. 9,922
Total.........	9,902,460	9,940,026	I. 37,566

Increase in anthracite, 2 per cent.; in bituminous, 0.1; total increase, 0.4 per cent.

Coal and coke tonnage, Chesapeake & Ohio railway, five months of fiscal year July 1-Nov. 30, short tons:

	Coal.	Coke.	Total.
New River	3,395,134	151,375	3,546,509
Kanawha.............	2,622,974	17,182	2,640,156
Kentucky.............	178,955	228	179,183
Connecting lines.....	31,950	21,635	53,585
Total................	6,229,013	190,420	6,419,433
Total, 1908...........	5,143,022	128,334	5,271,356

Total increase in 1909 was 1,148,077 tons, or 21 8 per cent. Deliveries in 1909 were, to points west of mines, 3,289,044 tons coal and 85,299 coke; points east, 745,457 tons coal and 105,121 coke; tidewater, 2,191,491 tons coal; anthracite to line points, 3021 tons.

Coal receipts at Boston for the full year, reported by Chamber of Commerce:

	1908.	1909.	Changes.
Anthracite...........	1,776,401	1,706,659	D. 69,742
Bituminous	3,302,929	3,495,011	I. 192,082
Total domestic....	5,079,330	5,201,670	I. 122,340
Foreign.......... ...	370,709	228,297	D. 142,412
Total................	5,450,039	5,429,967	D. 20,072

The foreign coal received is mainly from Nova Scotia.

Coal and coke tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year ended Dec. 31, short tons:

	1908.	1909.	Changes.
Anthracite	11,294,598	11,190,176	D. 104,422
Bituminous	35,797,171	38,882,058	I. 3,084,887
Coke..............	7,463,498	12,028,791	I. 4,565,293
Total	54,555,267	62,101,025	I. 7,545,758

The total increase in 1909 over 1908 was 13.8 per cent. Nearly 60 per cent. of this gain was in coke.

New York

ANTHRACITE

Jan. 19—Local demand is good. The railroads are doing fairly well in handling coal, but local dealers have a great deal of trouble in making deliveries to customers, while ice in the harbor and rivers is delaying barge deliveries to city yards from the different harbor points.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are f.o.b. New York harbor points: Pea, $3.10@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. Some coal is reported sold higher where quick delivery is wanted.

BITUMINOUS

The bituminous trade is in bad shape. There is a demand for coal and yet buying is slow and is confined almost entirely to the cheaper grades. Higher-grade coals have few customers, and their deliveries are almost entirely on contract. Fair grades of steam coal bring $2.55@2.60 per ton, f.o.b. New York harbor. For the better grades there is no sale and no quotations can be given.

Transportation is about as bad as it can be. The Baltimore & Ohio is practically out of business, and many mines are almost shut down because they can get no cars. Motive power as well as cars is short. The Pennsylvania is doing somewhat better but has had a good deal of trouble from snow and stormy weather. How long this will continue it is impossible to say.

The coastwise trade is also in bad shape as a result of the weather. Many vessel owners are reluctant to take charters and are frightened by the number of vessels which have been lost in recent storms. Rates are higher and shippers have to pay 80@85c. for medium-sized vessels to points around Cape Cod. The loading and discharging clause is being insisted on in charters in view of the possibilities of demurrage at the delivery ports. Locally barges are charging as high as 25c. per ton for city and near-by deliveries, and are not always easy to get at that.

Birmingham

Jan. 17—Coal production in Alabama shows some improvement and still there is need for more. The output is back to the active state that prevailed two years ago. Coal prices are hardening a little. All classes of coal, steam and otherwise, are actively in demand. The coke demand is also most interesting, the entire make being easily sold right along.

There is quite an amount of coal being shipped from this State into the South and Southeast. A trade is being worked up that promises to be permanent.

Chicago

Jan. 17—Shortness of coal continues to maintain high prices, and despite milder weather there seems bound to be a continuance of this condition for several weeks. Receipts from western and eastern mines are hardly up to contract requirements and railroads are confiscating coal to such an extent as to keep down the open-market supply. Screenings from Illinois mines continue to bring $2.25@2.50, with lump selling at $2.75@3.50, most of it bringing over $3. Run-of-mine is nominally at $2.40@2.65—in fact, hardly any prices can be called other than nominal, properly, for individual conditions of consignments to the market and of the user's needs determine the price. But in any case the coal brings a high price, if it can be delivered.

Smokeless West Virginia coals continue strong and run-of-mine is hard to get at $3.40@3.50, with lump and egg in comparatively less demand at $3.75@4. Hocking likewise is in short supply but does not command any general premium over the list price of $3.15. Youghiogheny is also selling at list prices of $3.25 for steam and $3.30 for gas lump, and minor coals show no great advances. Anthracite is in good supply for the local market, but country dealers are having much difficulty in getting enough for their needs.

The local terminal situation has been greatly improved within the last two or three days, but railroads are very slow in getting forward delayed and inadequate shipments.

Cleveland

Jan. 17—While the demand continues active the deliveries are restricted. The railroads are in bad shape; cars are scarce and motive power is insufficient, owing to bad weather and the condition of tracks. Moreover, the snow and stormy weather have interfered with operations at mines.

Prices are nominally about the same, but premiums are being paid where deliveries are urgently needed, so that it is hard to give any real quotations.

Indianapolis.

Jan. 17—There has been no abatement in the demand for Indiana coal for four weeks and Brazil block has gone to a premium. The Block coal operators have been besieged with telegrams offering to buy block coal in cars at the mines for $2.25 and screenings for $1. This is the highest price screenings have ever been known to bring and even at this figure the operators are unable to supply the demand. Operators have let the jobbers do the boosting in prices, and have not raised the price at mines where it is still selling for $2@2.25. The trouble is to get enough men.

Pittsburg

Jan. 18—The national convention of the United Mine Workers opened this morning in Indianapolis. It is generally understood the men will formulate a scale based on a $1 mining rate which would be the highest ever paid and involve about 10 per cent. increase over the present scale. The conference with the operators will probably open in Toledo a week from today. The local coal market is strong, and slack shows an advance of 5 or 10c. a ton. The car supply is poorer than it was, but the movement is somewhat improved. Due to holidays, car shortage, poor movement, etc., coal production the past three weeks has been 15 to 25 per cent. below the former rate. We quote the market firm at $1.15 for mine-run and nut, $1.25 for ¾-in. and 90@95c. for slack.

Connellsville Coke—The market has been very quiet, and disappointingly so to both parties. There is no doubt that when business is done it will be at concessions from the recent nominal price of $2.75 for furnace coke on contract. Probably $2.60 or $2.65 could be done without much difficulty today on contract, but this does not interest consumers. Spot is quotable at the same range. Foundry-coke quotations are a shade easier at $3@3.15 for prompt and $3.15@3.25 on contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Jan. 8 at 454,007 tons, a gain of 5000 tons and the highest production ever reported. Shipments, 5145 cars to Pittsburg, 7690 cars to points west of Pittsburg and 911 cars to points east of Connellsville, a total of 13,746 cars.

St. Louis

Jan. 17—The local market is a trifle slower today than it has been for the past two weeks and prices are a little off. This is due to the weather which has been warm all week. The railroads are in much better shape locally for moving coal as all the ice and snow is off by this time. The car supply, however, shows no sign of improving, and it looks very much as if there would be no improvement this winter. The Illinois Central is in terrible shape, and two days a week run is about the average. The Iron Mountain is also only running about two days a week, and is taking practically all the coal for its owners. It is very hard on the operators to be forced to run railroad coal when the market is so high. The depression in coal is only local, as anything that will go out of town is being eagerly snatched up. Screenings and fine coal of all descriptions and even mine-run are being shipped to Chicago, Omaha and the Northwest are taking all the lump coal, consequently prices are high on any kind of coal that will move out of St. Louis. There is a difference of about 40c. per ton in price between coal that will go out of town and coal that will not.

Standard 2-in. lump is worth $1.50 mine, or $2.02 St. Louis; 6-in. lump is bringing $1.80 per ton mine, or $2.32 St. Louis. However, very little 6-in. lump is being made as 2-in. is moving so readily and cars are so scarce that operators prefer not to load 6-in. Mine-run is bringing $1.30 at mines, or $1.82 St. Louis; 3-in. nut is $1.25 at mines, or $1.77 St. Louis; 2-in. nut is worth $1 at mines, or $1.52 St. Louis. A premium of 30 or 40c. per ton is being offered above these prices for coal that will go out of town.

The market for hard coal is strong. Even egg and grate, which a short time ago were a drug on the market, are in strong demand now. It seems nearly impossible to get chestnut, and stove coal is being substituted. The circular price of $6.95 per ton for small egg and chestnut and $6.70 for grate is being rigidly maintained.

Foreign Coal Trade

Austrian Coal Production—Coal production in Austria-Hungary, 11 months ended Nov. 30, metric tons:

	1908.	1909.	Changes
Coal	13,035,023	12,702,374	D. 332,649
Brown coal......	24,580,506	23,650,512	D. 929,994
Total mined...	37,615,529	36,352,886	D. 1,262,643
Coke made.......	1,735,791	1,838,747	I. 102,956
Briquets made...	134,032	166,497	I. 32,465

The greater part of the briquets reported are made from brown coal, or lignite.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Jan. 8: Best Welsh steam, $4.08; seconds, $3.96; thirds, $3.84; dry coals, $3.96; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.28; seconds, $2.04. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount. Prices have hardened since the first of the year.

Iron Trade Review

New York, Jan. 19—The iron and steel markets continue rather quiet, although there is some revival in business shown principally in inquiries for second-quarter and third-quarter delivery of materials. Sellers, however, are inclined to be rather conservative and are holding back on any business beyond June.

In pig iron Southern companies report a good many inquiries of this sort, but are not anxious to take business. There is still some speculative iron on the market which is rather holding down prices for early deliveries; but the larger companies are declining offers of lower prices than they have been naming all along. There is more inquiry for basic and forge iron just at the moment than for foundry. On these classes of iron prices are generally pretty well held.

In finished material inquiries are coming forward for bars and plates. Structural steel is in somewhat better demand, and some large contracts are reported to be under negotiation. Small orders make up a fair aggregate of business. The small trade in nails and building material is reported very good.

'he *Railway Age Gazette* has made up ıres showing that the railroads placed ers in 1909 for 3362 locomotives, for ,596 freight cars, and 4514 passenger s. Of the freight cars 74,920 were all el and 77,667 were steel-frame cars. ıipment orders were much better than orders last year.

Baltimore

Jan. 18 — Exports from the port of timore during the week included 4501 s steel rails and 264 tons rail fastens to Vera Cruz, Mexico. Imports inded 5514 tons cupreous pyrites and 725 tons iron ore from Spain; 17,200 s iron ore from Cuba.

Birmingham

'an. 17—Some selling of pig iron is ng on in the Southern territory and ; is giving much encouragement, ugh the furnacemen do not claim that buying movement has started in yet. re has been a little stiffening of quoons, the prices being $14@14.50 per , No. 2 foundry. The furnace comıies hold their iron at $14.50. There some sales, early delivery, being de at $14, much of this still resale ı. Some inquiries are coming in covıg a period of three-fourths of the sent year, but none of the manufacers here are willing to quote figures 'ond the first half of the year. The ke continues a litle slow as compared the output in November and Decem- . There is no accumulation worthy mention.

Chicago

'an. 17—Recovery from the inactivity the holidays' begins to be evident in iron market. There is more activity buying pig iron and the market for ı and steel products is decidedly bet- The bottom of the market would m to have been reached, so far as iron is concerned, in some sales of ıthern No. 2 at $13.25@13.50 Birmingn, or $17.60@17.85 Chicago, with st sales in the neighborhood of the 3.50 mark and $14 asked on small lots. advance, however, is likely to be w, in the opinion of those most faiar with the market. Northern iron ıains firm at $19@19.50, with the rerements of melters gradually expand- and the furnaces well sold up into the ond quarter.

Sales of railroad materials, bars, plates l other forms of finished materials are od. Coke—more in demand and irreg- r in deliveries because of transportan difficulties—brings $5.50 as heretoe.

Cleveland

Jan. 17—Placing of contracts for iron continues, especially of nonbessemer s. It looks as if the business would practically completed this month.

Pig Iron—More inquiries are reported, most of them for second quarter, but some for third quarter. Bessemer is quoted $18.75@19; No. 2 foundry, $17.75@18; forge, $17.25@17.50; Lake Superior charcoal, $19.50@20; all Cleveland delivery.

Finished Material—Buyers are showing a lively interest, but mills are rather holding back on second-quarter and third-quarter contracts Some heavy business is pending for bars; 1.50c., Pittsburg base, is quoted.

Philadelphia

Jan. 19—The pig-iron market has fallen into a quiet condition. Basic pig is strong and would be active if there were available supplies. A reason for the present quiet is that most of the larger consumers in this territory bought heavily some time ago. Forge ironmakers have their output sold far ahead but they enjoy the vantage ground of being sought for. Pipe iron has been in good request and furnaces have been asked to name prices on large lots to be delivered later on. No. 2 X foundry is selling at $19; gray forge at $18; for basic $18.75 was asked.

Steel Billets—There are a few inquiries in the market. The customers have a fair supply on hand but would be glad to increase their engagements at suitable prices.

Bars—The mills are well sold up but demand has fallen off within a week at mills while the distribution through the stores has improved.

Sheets—Some large consumers who ordinarily place their orders in March, are now asking prices for iron to be delivered over the first half of the year. There has been less sold at the stores during the past week than for a long time, owing probably to the clogging of vehicular traffic.

Pipes and Tubes—This branch is slumbering so far as orders are concerned.

Structural Material—The market is quiet and there have been no sales of importance.

Scrap—The market is as dull as it well could be. Deliveries locally have been next to impossible. The scrap dealers are at a standstill but assure their regular customers that they will be taken care of.

Pittsburg

Jan. 18—Signs are multiplying that the market is just a trifle more quiet than is requisite for the maintenance of the full production rate recently attained. It is too early in the year to judge whether a definite trend has set in, but the indications begin to point in that direction. The year promises to be one of tonnage far beyond all previous records, but it is likely to show minor ups and downs.

Pig Iron—Considerable production of steel was lost by stoppages during the holidays while furnace production went on, so that mills are in an easy position and there is no pressure for deliveries of pig iron, which are being held up to a certain extent. Basic pig iron has shown weakness again, and can be had without difficulty at $17, Valley furnace, for first-quarter delivery, while $17.25 would probably be asked for second quarter. Bessemer remains firm at $19, Valley, but is very quiet. Foundry iron is dull and it is not improbable that concessions could be obtained on desirable orders, the asking range remaining at $17@17.25, Valley. Indications are that pig iron will sell off a trifle from present asking prices.

Steel—Steel is in still better supply and there is no difficulty in buying at formerly quoted prices, $27@27.50 for bessemer billets, $27.50@28 for openhearth billets and $28.50@29 for sheetbars, all f.o.b. Pittsburg or Youngstown mill. It is reported from the East that one or two rail mills will turn in and make billets, on account of slack demand for rails, as the Maryland Steel Company did last month, on orders for 45,000 tons of billets for western shipment.

Ferromanganese—The market is dull. A carload sale is noted at $44, Baltimore, and two others at $44.50, all being for prompt shipment, and the market is quotable at this range. For delivery to July 1 next, $45 is the quotable market, although this might be shaded 10 or 15c. The rate, Baltimore to Pittsburg, is $2.30 per ton.

Sheets—Mills are well sold up and do not care to accept much more business at the present range. Prices are firmly maintained at 2.40c. for black, 3.50c. for galvanized, $1.70 per square for painted and $3 for galvanized corrugated roofing and 1.75@80c. for blue annealed, 10 gage, the higher price for early delivery.

St. Louis

Jan. 17—The market for pig iron was slightly better this week and sales seem to be opening up a good deal. Inquiries are coming in at a good rate and some business is being closed. All the business transacted is confined practically to second quarter, while a few are filling in small shorts for the first quarter. A few inquiries have been received for shipments in the second half, though the average buyer is not venturing that far ahead. Prices remain unchanged at $15 Birmingham, or $18.72 St. Louis.

Iron Ore—Missouri ore is bringing $3.75 per ton St. Louis and the demand is considerably more than the supply, owing to the fact that the weather conditions have been so bad that the tonnage has been practically cut in two.

Metal Markets

New York, Jan. 19—The metal markets continue rather quiet on the whole, though consumptive demand is reported good in most lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1909..	$15,649,281	$ 3,863,637	Exp. $11,785,644
" 1908..	2,967,795	2,909,883	" 57,912
Year 1909..	122,301,517	42,003,194	" 80,298,323
" 1908..	73,857,749	45,123,561	" 28,732,188
Silver:			
Nov. 1909..	4,951,483	4,691,807	Exp. 259,676
" 1908..	3,951,987	3,275,609	" 676,378
Year 1909..	52,294,344	41,981,006	" 10,313,338
" 1908..	47,111,382	37,814,676	" 9,296,706

Exports from the port of New York, week ended Jan. 15: Gold, $806,500, chiefly to Argentina; silver, $727,711, chiefly to London. Imports: Gold, $100,441; silver, $211,293, both chiefly from Mexico and South America.

The preliminary figures of the director of the Mint, as made public today, show a total output of gold in the United States in 1909 of $99,232,200, an increase of $4,672,200 over 1908. The silver production for the year was 53,849,000 oz., an increase of 1,408,200 ounces.

Platinum—Business is quiet but dealers report prices unchanged at $29 per oz. for refined platinum and $34.50 per oz. for hard metal.

Our special correspondent writes from St. Petersburg, under date of Dec. 23, that there has been some decline in prices contrary to expectation. In Ekaterinburg business has been done at 5.50 rubles per zolotnik for crude metal, 83 per cent. platinum—equal to $20.68 per oz. In St. Petersburg 23,000@23,500 rubles per pood is asked—equal to an average of $22.79 per oz.

Silver—The market has been very steady. The demand keeps pace with output. There does not seem to be any congested spot where the metal appears to be a menace to the present situation.

SILVER AND STERLING EXCHANGE

Jan.	13	14	15	17	18	19
New York....	52½	52½	52½	52⅝	52⅝	52½
London.....	24[illegible]	24[illegible]	24[illegible]	24⅛	24[illegible]	24[illegible]
Sterling Ex..	4.8685	4.8690	4.8700	4.8695	4.8675	4.8650

New York quotations, cents per ounce troy, fine silver. London, pence per ounce sterling silver 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Jan. 6, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India...	£ 66,110	......	D. £ 66,110
China...	......	£ 57,000	I. 57,000
Straits....		....	....
Total....	£ 66,110	£ 57,000	D. £ 9,110

India Council bills in London averaged 16.094d. per rupee.

Copper, Tin, Lead and Zinc

Jan.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
13	13⅞ @14	13⅝ @13¾	60⅞	32¾	4.70	4.60 @4.62½	6.00 @6.02½
14	13⅞ @14	13⅝ @13¾	$60\frac{15}{16}$	32½	4.70	4.57½ @4.62½	5.97½ @6.02½
15	13⅞ @14	13⅝ @13¾	....	32⅜	4.70	4.57½ @4.62½	5.97½ @6.02½
17	13¾ @14	13½ @13¾	60⅝	32¼	4.70	4.57½ @4.62½	5.95 @6.00
18	13¾ @14	13½ @13¾	$60\frac{3}{16}$	32⅜	4.70	4.57½ @4 62½	5.95 @6.00
19	13¾ @14	13½ @13¾	60⅝	32¾	4.70	4.57½ @4.62½	5.92½ @5.97½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New oYrk, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—In consequence of the weak and unsettled condition of the stock market, there has been little demand for copper, either for domestic or European consumption. The manufacturers, both here and abroad, are very busy and in many cases are working overtime, and it is expected that when the stock market conditions here improve, a good demand for the metal will again make itself felt. Producers' books are well filled and there has been no pressure to sell, but some speculative lots have been offering at slightly lower prices. The market closes nominally at 13¾@14c. for Lake copper, and 13½@13¾c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13⅜@13½c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been advanced ¼c., and is now 15½c. base, carload lots at mill Business is very good.

The market in London for standard copper has been weak and declining, mainly due to the liquidation on the part of American holders who are influenced by the stock market conditions here. Standard copper declined on Tuesday to £60 3s. 9d. for spot and £61 2s. 6d. for three months. On Wednesday it improved and closes at £60 12s. 6d. for spot and £61 11s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £65; best selected, £65@65 10s.; strong sheets, £75@76 per ton.

A shipment of 1000 tons of copper matte and 3400 tons of ore was received from Africa last week, this being the first direct consignment to New York from that quarter so far as we are aware.

Exports of copper for the week fro New York and Philadelphia were 49 long tons. Our special corresponde gives the exports from Baltimore at 23 tons copper.

Tin—The decline in the London ma ket made further progress. The reaso given were the unfavorable statistic position and the decreasing consumpti of the metal in the United States. somewhat better feeling made itse manifest at the close, and quotations r covered from the low point of £146 7 6d. for spot and £148 for three mont reached on last Tuesday, closing at £1 15s. for spot and £149 5s. for thr months.

Dealers in this market were discoun ing the London situation by offerin future shipments at concessions, withou however, finding ready buyers. Bus ness is still confined to spot materia which at the close can be obtained 32¾ cents.

Lead—The market is quieter and lea at St. Louis is quoted at 4.57½@4.62½ and at New York 4.70 cents.

The London market is also somewh easier, Spanish lead being quoted £13 13s. 9d. and English at £13 16 3d. per ton.

Spelter—Consumption continues goo but there has been little demand. Price have declined somewhat and close 5.92½@5.97½ St. Louis, and 6.07½@ 6.12½ New York.

New York quotations for spelter Ja 13 were 6.15@6.17½c.; Jan. 14 and 1 6.12½@6.17½c.; Jan. 17 and 18, 6.1 @6.15c.; Jan. 19, 6.07½@6.12½ cents

Base price of sheet zinc is now 8c. pe lb., f.o.b. La Salle-Peru, Ill., less 8 pe cent. discount.

The London market closes slightl lower at £23 5s. for good ordinaries an £23 10s. for specials.

Other Metals

Antimony—The market has fallen into a quiet state again, and only a retail business has been done. Prices are nominally unchanged. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7⅝@7⅞c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—There is little change and business continues good. New York quotations are $52.50 per flask of 75 lb.; jobbers ask 72@75c. per lb. for small lots. The San Francisco price remains at $50.50@51.50 for domestic orders and $2 per flask less for export. The London rice is £9 15s. per flask, but jobbers are ow quoting 2s. 6d. per flask less.

Nickel—Large lots, contract business,)@45c. per lb. Retail spot, from 50c. or 200-lb. lots, up to 55c. for 500-lb. ts. The price for electrolytic is 5c. igher.

Magnesium—The price of pure metal $1.50 per lb. for 100-lb. lots f.o.b. ew York.

Cadmium—Current quotations are 65 70c. per lb. in 100-lb. lots at Clevend, Ohio. In Germany 450@475 marks er 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Joplin, Mo., Jan. 15—The highest price aid for zinc-sulphide ore was $52, the ase ranging from $47@49 per ton of) per cent. zinc. Zinc silicate sold as gh as $31, on a base of $24@26 per n of 40 per cent. zinc. Week-end prices all grades of zinc ore were weaker. ne average price was $46.06. Lead ore ld generally on a flat bid of $58, and e average price, all grades, was $57.74 r ton.

Conditions for outputting were improved by moderate weather, as shown increased sales of zinc-silicate ore, it heavy roads and light buying kept e sales well under the production, affording an increase in the stock in the bins.

SHIPMENTS, WEEK ENDED JAN. 15.

	Zinc, lb.	Lead, lb.	Value.
ebb City-Carterville	4,465,590	490,730	$119,171
plin	1,541,450	287,630	49,535
iami	538,150	215,940	17,555
ienweg	688,050	9,380	15,552
lena	300,290	62,770	8,876
ba-Neck	251,910	30,770	7,175
rora	351,010	......	6,939
urgeon	290,630	36,750	5,735
apaw	232,120	......	5,242
anby	314,470	10,710	4,870
onogo	237,490	1,380	4,135
dger	146,740	......	3,595
rthage	108,500	......	2,710
rl Junction	84,420	......	2,210
ott City	61,750	......	1,450
entworth	41,560	......	955
Totals	9,654,130	1,146,060	$255,705
veeks	27,362,770	4,810,440	$766,388

nc value, the week, $222,397; 3 weeks, $627,089
ad value, the week, 33,308; 3 weeks, 139,299

MONTHLY AVERAGE PRICES

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
nuary	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
ebruary	36.63	36.94	34.92	34.37	49.72	50.50
arch	36.19	37.40	34.19	34.71	49.90	50.82
ril	35.40	38.63	34.08	37.01	52.47	55.63
ay	34.19	40.06	33.39	37.42	56.05	56.59
ne	33.06	44.15	32.07	40.35	60.48	57.52
ly	34.55	43.06	31.67	41.11	59.90	53.74
gust	36.53	48.25	33.42	44.54	60.34	57.60
ptember	37.63	47.70	34.44	44.87	54.59	56.11
tober	35.95	49.50	33.28	45.75	52.63	55.02
vember	39.13	51.31	35.02	48.29	54.53	53.94
cember	42.75	49.45	39.63	47.57	49.68	55.26
Year	$36.63	43.98	$34.31	41.20	$53.93	54.60

NOTE—Under zinc ore the first two colmns give base prices for 60 per cent. zinc e; the second two the average for all ores ld. Lead ore prices are the average for l ores sold.

Platteville, Wis., Jan. 15—The highest price paid this week for zinc ore was $50; the base price, 50 per cent. zinc, was $48@49 per ton. The base price paid for lead ore was $56@58 per ton. Another severe snow storm Tuesday and Wednesday closed down nearly all operating mines and cut off shipments.

SHIPMENTS. WEEK ENDED JAN. 15.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	352,140	73,500	80,000
Mineral Point	278,000	....	.....
Benton	168,700	58,200	....
Cuba City	111,890	....	....
Galena	81,100	....	....
Highland	60,600	......	....
Total	1,052,430	131,700	80,000
Year to Jan. 15	2,221,530	224,659	278,200

In addition to the above there was shipped to the separating plants, Platteville and Mineral Point, 360,390 lb. zinc ore.

Petroleum

Southwestern petroleum production and shipments in December, as reported by *Oil Investors' Journal*, in barrels of 42 gal. each:

	Production.	Shipments.
Oklahoma	3,643,458	3,654,054
Southeast Texas	656,884	894,498
Louisiana	253,915	140,499

Oklahoma stocks on Jan. 1 were 56,543,630 bbl. New wells completed in December: Oklahoma, 144 oil and 6 gas; southern Texas, 18 oil and 3 gas; Louisiana, 5 oil and 1 gas producer.

Exports of mineral oils from the United States, year ended Dec. 31, in gallons:

	1908.	1909.
Crude petroleum	99,446,946	144,199,051
Naphthas	36,292,418	57,555,061
Illuminating	1,120,638,415	1,037,750,452
Lubricating and paraffin	144,612,947	157,087,254
Residuum	73,829,785	98,142,320
Total	1,474,820,511	1,494,734,138

The total increase in 1909 was 19,913,627 gal., or 1.35 per cent.

Chemicals

New York, Jan. 19—There is no special change from our last report, sales being moderate. Deliveries on contracts are fair.

Copper Sulphate—Business has been moderate but prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller orders.

Arsenic—The market continues flat and demand is light. Prices are a little lower, white arsenic being quoted at $2.62½@2.75 per 100 lb. for both spot and futures. From 50 to 75 tons changed hands this week at the lower figure.

Nitrate of Soda—Interest in this article continues moderate only. Spot sells at 2.10c. per lb.; futures are a shade lower and 2.07½c. is named on that class of business.

Mining Stocks

New York, Jan. 19—The general stock market has again been irregular and for the most part rather depressed. Nearly all the active stocks have declined in price and occasional rallies have not helped matters much. It has been a traders' market mainly and the close is rather weak all around.

On the Curb there has also been considerable weakness in the copper stocks, some sharp declines being noted. Miami, which held up well during the preceding week, was still active, but showed losses in quotations, closing considerably below last week's prices. Cobalt stocks were more active, but irregular in price. The Nevada gold stocks are attracting more attention, but are not showing much gain.

Boston, Jan. 18—The copper-share market has been broad and active, but the activity has been largely in the Lake Superior issues and particularly Lake Copper, North Lake and Indiana, the latter a Curb stock. The recent favorable developments at the Lake mine and the striking of rich ore by diamond-drill work at the Indiana brought a wild speculation for a spell. Although the Amalgamated, Cole-Ryan stocks have been inactive, the market has been the biggest for a long period, and reminded one of the boom of 10 years ago.

Lake stock made its high of $93 last week, but subsequently reacted to $83, with material recovery from the low. The stock is so held that it is easy to cause a $5 movement in almost as many moments. The advance in North Lake was in sympathy with developments at the Indiana property, as the North Lake is between Lake and Indiana. North Lake has been the most active feature and has more than doubled in price during the week. From a close at $8.62½ a week ago it touched $18.75. Indiana, in the meantime, has risen on the Curb from $9.50 a week ago to $34 per share. Sooner or later this stock will be taken over on the Exchange as the papers for such action have been filed.

North Butte continued to be depressed the greater part of the week and broke from $44.25 to $41. This pressure has apparently been removed for the stock was allowed to go up to $46.25 today on private reports that an improvement had occurred at the property. Mohawk has risen $6 to $73. This company has struck ore in crosscutting at No. 6 shaft. Dividend action will be taken shortly but no change is likely. St. Mary's Mineral Land has benefited to the extent of $14 during the week and rose to $71 today. Calumet & Arizona has been a weak feature, and is off $9 to $91. Other strong and active spots have been Franklin, La Salle, Superior Copper, Winona and Wyandotte.

Curb transactions have also been on a heavy scale, largely in Chino, Oneco, Inspiration, Corbin Copper and South Lake, which are all materially higher for the week.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,956,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Totals	1,405,403,056	705,051,591	680,942,620

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	52.226	22.493	24.030
Total	52.864	51.502	24.402	23.726

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	61.198
February	12.905	12.949	13.098	13.295	58.786	57.688
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.563	12.928	12.93	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	13.125	14.386	13.354	63.417	58.917
December	14.111	13.298	14.411	13.647	62.943	59.906
Year	13.208	12.982	13.424	13.335	59.902	58.732

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	32.913
			Av. year	29.465	29.725

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	4.560	4.459	13.166	13.125
Year	4.200	4.273	4.153	13.439	13.049

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.518	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	6.249	4.987	6.099	20.625	23.094
Year	4.726	5.503	4.578	5.352	20.163	22.201

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

COLO. SPRINGS Jan. 18		S. LAKE CITY Jan. 18	
Name of Comp.	Bid.	Name of Comp.	Clg.
Acacia	.05⅞	Carisa	.50
C. C. Con	.03	Colorado Mining	.74
Dante	...	Columbus Con	.99
Doctor Jack Pot	.08	Daly Judge	4.50
Elkton	.69¼	Grand Central	2.05
El Paso	.64	Iron Blossom	.77
Findlay	.11	Little Bell	1.60
Gold Dollar	.11	Little Chief	.45
Gold Sovereign	.04	Lower Mammoth	.50
Isabella	.17½	Mason Valley	2.30
Jennie Sample	...	Maj. Mines	‡2.32½
Jerry Johnson	...	May Day	.19½
Lexington	...	Nevada Hills	.62
Mary McKinney	.45½	New York	.13
Old Gold	...	Prince Con	.93
Pharmacist	.03¾	Red Warrior	6.00
Portland	.88¼	Silver King Coal'n	3.55
U. G. M.	.09¼	Sioux Con	.33½
Vindicator	.73	Uncle Sam	.44
Work	.06	Victoria	1.30

SAN FRANCISCO. Jan. 18.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	11	Belmont	.20
Belcher	1.20	Jim Butler	.09
Best & Belcher	85	MacNamara	.26
Caledonia	.58	Midway	.19
Challenge Con	.36	North Star	.01
Chollar	.32	West End Con	.21
Confidence	1.35	Atlanta	.08
Con. Cal. & Va.	1 75	Booth	.09
Crown Point	1 17	C.O.D. Con	.06
Exchequer	30	Columbia Mt	.05
Gould & Curry	40	Comb. Frac.	.40
Hale & Norcross	60	Goldfield Belmont	‡.90
Mexican	1 75	Goldfield Daisy	‡.98
Ophir	2 12	Jumbo Extension	.17
Overman	.63	Oro	‡.03
Potosi	60	Red Hill	.03
Savage	.60	Sandstorm	.02
Sierra Nevada	77	Silver Pick	.08
Union	91	St. Ives	‡ 07
Yellow Jacket	1 30		

N. Y. EXCH. Jan. 18

Name of Comp.	Clg.
Amalgamated	83⅛
Am. Agri. Chem.	45
Am.Sm.&Ref.,com	94
Am. Sm. & Ref., pf.	109¾
Anaconda	49¾
Bethlehem Steel	31
Col. & Hock. I. & S.	87¼
Colo. Fuel & Iron.	44½
Du Pont P'd'r, pf.	‡87
Federal M. & S.	84½
Great Nor., ore ctf.	73
Nat'nal Lead, com.	85⅝
National Lead, pf.	109
Pittsburg Coal	23
Republic I&S, com.	40
Republic I & S, pf.	101
Sloss Sheffi'd, com.	82⅝
Sloss Sheffield, pf.	‡118½
Tennessee Copper	37
Utah Copper	53¼
U. S. Steel, com.	83⅞
U. S. Steel, pf.	123
Va. Car. Chem.	54

N. Y. CURB Jan. 18

Name of Comp.	Clg.
Big Vein Copper	8⅞
Bonanza Creek	3
Boston Copper	20
Braden Copper	4¾
B. C. Copper	7⅝
Buffalo Mines	3½
Butte Coalition	26
Cobalt Central	.21½
Combination Fra.	.40
Con. Ariz. Sm.	3 1/16
Cumberland Ely	9
Davis-Daly	3⅜
Dominion Cop.	7
Ely Con	.82
Ely Central	.01⅞
El Rayo	2¾
Florence	2⅝
Giroux	11½
Gold Hill	1⅝
Goldfield Con	7¾
Greene Cananea	10¼
Guanajuato	2
Guggen. Exp.	241½
Kerr Lake	09 3/16
La Rose	4½
McKinley-Dar-Sa.	.80
Miami Copper	23¾
Mines Co. of Am.	50
Montezu. of C. R.	4½
Mont. Shoshone	1⅜
Mont.-Tonopah	.70
Nev. Utah M. & S.	1⅝
Newhouse M. & S.	3½
Nipissing Mines	9⅞
Ohio Copper	4¾
Pacific Sm. & M.	1½
Silver Queen	.22
Standard Oil	648
Stewart	¾
Tintic	2⅛
Tonopah	6⅝
Tonopah Ex.	.67
Tri-Bullion	1
Utah Apex	5⅛
Yukon Gold	4⅞

LONDON Jan 19

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	8	6
Esperanza	3	1	3
Tomboy	0	17	6
El Oro	1	7	0
Oroville	0	9	9

BOSTON EX. Jan. 18

Name of Comp.	Clg.
Adventure	7
Allouez	53
Am. Zinc	36¼
Arcadian	9
Arizona Com	45¾
Atlantic	11¾
Boston Con	20½
Calumet & Ariz.	91¾
Calumet & Hecla	665
Centennial	33
Con. Mercur	.12
Copper Range	82¾
Daly-West	9
East Butte	11½
Franklin	19½
Greene—Can.	10⅛
Hancock	31⅜
Isle Royal	26¼
Keweenaw	5⅛
La Salle	18
Mass	7
Michigan	7
Mohawk	72
Nevada	25¾
North Butte	44¼
Ojibway	11½
Old Dominion	50
Osceola	161
Parrot	20⅛
Quincy	88¼
Shannon	16¼
Superior	64
Superior & Bost.	16½
Superior & Pitts.	15
Tamarack	66
Trinity	9½
U. S. Smg. & Ref.	50½
U.S.Sm. & Re., pd.	51½
Utah Con	41⅛
Victoria	4½
Winona	12¾
Wolverine	149
Wyandotte	3⅛

BOSTON CURB

Name of Comp.	Clg.
Ariz. Mich	.95
Ahmeek	218
Bingham Mines	3½
Boston Ely	4 1/16
Calaveras	5⅞
Champion	.11
Chemung	11¾
Chino	14
Corbin	.11¼
Cactus	6⅛
Crown Reserve	‡5 13/16
First Nat. Cop.	5½
Gila Copper	9¾
Indiana	33
Majestic	.95
Ray Central	3¾
Ray Con	23¾
Rawhide Coal	.21
Rhode Island Coal	11½
San Antonio	8½
South Lake	13
Trethewey	..
Vulture	8 3/16
Yuma	1⅝

ST. LOUIS Jan. 15

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	.07
Center Cr'k	2.00	1.75
Cont. C. & C.	86.00	85.00
C. C. & C. pf.	85.00	84.00
Cont. Oil	110.00	100.00
Columbia	8.00	7.00
Con. Coal	19.00	17.00
Doe Run	115.00	100.00
Gra. Bimet.	.33	.30
St. Joe.	12.50	11.00

‡Last quotation.

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.	....	Feb. 1	$1 00
Arcadian Copper, Mich.	....	Mar. 1	0.50
Bullion, Nev.	Jan. 11	Mar. 1	0.05
Con. Imperial, Nev.	Jan. 11	Feb. 3	0.01
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Gordon M. & M., Utah	Jan. 15	Feb. 4	0.002
Hancock Min., Mich.	....	Feb. 1	1.00
Maxfield, Utah	Jan. 31	Feb. 19	0 00½
Palmyra G. & C., Utah	Dec. 29	Jan. 19	0.002
Precious Metals M. & M., Cal.	Dec. 27	Jan. 31	0.01
Reindeer C. & G., Ida.	Dec. 31	Jan. 19	0.003
Savage, Nev.	Feb. 10	Mar. 8	0.10
Seven Bros.-Pioche, Nev.	Jan. 16	Feb. 4	0.002
Sheba Gold & Silver, Utah	Jan. 19	Feb. 23	0.05
Sierra Nevada, Nev.	Jan. 11	Feb. 3	0.10
Silver Hill, Nev.	Dec. 23	Jan. 14	0.05
Silver King Con., Utah	Jan. 17	Feb. 5	0.10
Union Con., Nev.	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah.	Feb. 1	Feb. 20	0.00½
Western Monitor, Utah	Feb. 1	Mar. 1	0.00½

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The Outlook for Copper

The trouble with copper heretofore has been that although consumption was increasing, production has been growing faster for the very simple reason that even on a 13-cent basis there has been a handsome profit to the producers. In December there was a recession in the production, due to accidental causes that affected some of the refineries. We do not take any stock in the talk of a deliberate curtailment of production on the part of anybody, and do not see any evidence of such, but it appears as if some important producers are refraining from increasing any further. Now the smelteries have been subject to the same kind of accidents that affected the refineries in December. There was the switchmens' strike in Montana, troubles over freezing of ore elsewhere, and in general the difficulties that follow from the wintry season. This has naturally restricted the smelters' production and in a month or two this will appear in the refiners' returns. Consequently, there is good reason to anticipate favorable statistics for two or three months to come, inasmuch as consumption is undoubtedly still expanding. We are inclined to be more optimistic as to the copper market than we have been for a long time.

Since the first of January the market has been halting. This has been perfectly natural in view of the situation in Wall Street. The connection between the latter and the copper market is close. Our producers have to sell nearly 50 per cent. of their output for export. The London market is largely affected by speculative transactions emanating from this side. When liquidation is the order of the day in Wall Street, the same people may have to sell out their commitments in copper in London, the price in that market may fall below ours and sales for export may temporarily cease. At the same time domestic buyers are apt to hold aloof in a period of gloom and uncertainty such as has dominated the stock market recently.

We think that this was the result of overspeculation, rather than the anticipation of a check to industrial activity in this country. It is true that the iron and steel business has been halting, but we have not received any such reports from the other metal industries; rather the reverse. The railways and builders still have a lot of work to do that was put off in 1907-8. We cannot believe that they have yet filled the requirements and are rather inclined to look for a resumption of progress. Now that valuations on the stock markets have been reduced to a sounder basis, we may soon expect more optimism as to everything than has been the rule during January.

The Distribution of Coal Cars

The distribution of cars to coal mines is such an important factor in their business that general satisfaction was expressed some time ago when the Interstate Commerce Commission interfered and ordered that no discrimination should be used on account of the ownership of cars by coal companies. The order then made directed that all the company cars must be included in the general stock upon which the distribution was based, and that no company should receive more than its equitable allotment—based upon productive capacity—because it owned the cars. The original order given in the case of the Illinois Central and several other railroads in the Illinois district resulted in an appeal to the courts, and the case was carried up to the United States Supreme Court.

The Supreme Court has now rendered a sweeping decision, not only holding that the order in itself was correct, but upholding fully the authority of the Interstate Commerce Commission in the case. The court holds that in interstate commerce in coal the question of car distribution is an important factor and one which comes fully within the authority of the commission, although it is not specifically named in the law. A parallel case, in which suit was brought against the Baltimore & Ohio was remanded, but solely on technical grounds. In this case application was made by aggrieved coal companies to the district court, but the Supreme Court holds that the complaint should have been presented in the first case to the Interstate Commerce Commission as the proper authority in the case.

This decision apparently settles the car-distribution trouble, for the authority of the commission being fully established it would appear that it has necessarily the power to regulate and revise rules for such distribution, on proper complaints being made and proved.

Gold and Silver

The preliminary estimate of the director of the mint, made public a little later than usual, puts the gold production of the United States in 1909 at a total of $99,232,000, a figure considerably higher than the statistics heretofore available had led us to expect. This high value is due to a very large increase—$3,219,000—in Nevada, and to an unexpected gain of $1,941,600 in California, much of which was doubtless due to the extensive dredging operations in that State. Notwithstanding small losses in Colorado and Utah and a considerable one in South Dakota, the total for the United States shows an increase of $4,672,200 over that for 1908, and is, therefore, far the largest ever reported.

This increase over the earlier estimate makes the gold production of the world in 1909 a total of a little over $460,000,000, of which the United States supplied 21.5 per cent. Comparatively little of the new gold remained in the United States. The commercial returns for the full year show that the total exports were $132,880,821, and the net exports, after deducting all imports, were $88,793,855 for the year.

The silver production for the year, by the mint returns, was 53,849,000 oz., an increase of 1,408,200 oz. As was to be expected, the increase came from Montana, Utah and Arizona, all large copper producers.

The details of the mint estimate will be found on another page of this number. They show some interesting changes in the different States.

The Geology of Leadville

Probably the last word as to the geology of many important mining districts will never be said. In making their generally admirable reports, the scientists of the U. S. Geological Survey report the data that are available by careful study and summarize the data and draw their conclusions as best they may, but sometimes new discoveries quickly put things in a new light. This is not said in any spirit of criticism of the work of the geologists, but rather to indicate that the work of the U. S. Geological Survey will not be finished when it has examined all of the mining districts of the country; it never will be ended. Thus, in the work upon Leadville, respecting which the first report was made in the middle '80s, Dr. Emmons and his assistants have repeatedly visited that interesting camp and published supplementary reports. Doubtless he will continue to do so, at least we hope so, for many years to come.

The paper by George O. Argall, published in this issue of the JOURNAL, is an important new contribution to the geology of Leadville. It describes actual ore developments in the lower quartzite and fairly proves the close association of the ore shoots in the overlying limestone with the intrusions of gray porphyry, and fairly connects the small ore-bearing fissures in the Cambrian quartzite with the lower deposits in the white limestone. This may be sufficient to lead geologists in the future to correlate the ore deposits of Leadville with ascending solutions, intimately associated with the later eruptives, gray porphyry, rather than with descending solutions, although the latter were probably influential in creating the deposits at the first contact, between the white porphyry and the blue limestone. Possibly the verdict will finally be that no single theory is applicable to the entire Leadville district. We are sure that Mr. Argall's paper will be regarded as an important contribution and hope that our geological readers will contribute their views respecting his ideas.

The Steel Corporation Report

The report of the United States Steel Corporation for the last quarter of 1909 shows a recovery from depression almost as rapid as the decline in the closing months of 1907, and in 1908. The earnings of the quarter approached nearly the highest ever reported, and the total for the year is a gain of 43 per cent. over that of 1908. The accompanying table, giving the net earnings for two years by quarters, shows also how the business took a sharp upward turn from the time when the corporation reversed its previous policy of high prices and reduced output, and decided to meet conditions and deal with consumers on an open market.

The statement for the year compares with the previous year as follows:

	1908.	1909.
First quarter.....	$18,229,005	$22,921,268
Second quarter....	20,265,756	29,340,391
Third quarter.....	27,166,274	38,246,907
Fourth quarter....	26,225,485	40,971,309
Year...........	$91,886,520	$131,479,875

The largest net earnings reported in any previous quarter were $45,507,705 in the second quarter of 1907. The net earnings for 1909 show an increase of $39,593,355 over 1908. The appropriations for new construction, entirely suspended in 1908, were renewed last year, $18,200,000 being set aside for that purpose. The dividend policy of the corporation has been changed. In its most prosperous previous year only 2 per cent. was paid on the common stock, but that rate was continued through the year and a half of depression. In 1909, however, the quarterly dividend was increased, first from ½ to ¾ per cent., then from ¾ to 1 per cent.; while for the fourth quarter, in addition to 1 per cent. as in the third, an extra dividend of ¼ per cent. is to be paid, bringing the total for the year 1909 up to 4 per cent. and indicating an intention to put the stock on that basis.

The unfilled orders on the books Dec. 31 are reported at 5,927,031 tons, the largest quantity since Sept. 30, 1907. The increase during the quarter was 1,130,098 tons, which reflects the heavy buying of material for 1910 delivery which was noted in our market reports in October and November.

The United Mine Workers' Convention

The convention of the United Mine Workers in session at Indianapolis this week, has declared in favor of an increase in the coal-mining rate beginning April 1 to a general basis of $1 per ton. This will be an advance of from 10 to 15 per cent. on this year's rate. The operators' associations in Ohio, Indiana and Illinois, on the other hand, have resolved that a reduction of 10 or 15 per cent. in the wage rate is absolutely necessary in the existing condition of the coal trade. Both these declarations are part of the usual bluff, and it is probable that the conference to be held at Toledo next month will result, after prolonged discussion, in the adoption of rates not greatly differing from those now in force. The real trouble with the Western coal trade is not so much in the mining rate as in the capacity of the mines to produce coal to an extent far in excess of the demand.

The probabilities of a settlement of a compromise nature are based on the fact that both operators and miners realize that a general strike would give a great opportunity for expansion to the non-union mines of West Virginia and Kentucky. The competition of these mines is already severely felt, and a chance to increase their hold upon the trade would be a serious matter to their opponents.

One interesting point in the Indianapolis meeting was a strong declaration by President Lewis—whose reëlection had just been announced—against the policy of strikes. The strike, he said, was a harsh measure and a dangerous one, and should only be used as a last resort, when everything else had failed.

Another important incident was the appointment of a special committee to meet a circular committee from the Western Federation of Miners to consider the possibility of a union of the two bodies. The coal and metal miners' unions have always been distinct, and a federation of the two might have important results.

Columbus & Hocking

A scandal of the last week has been the collapse of the pool in the stock of the Columbus & Hocking Coal and Iron Company; or rather we should say the scandal has been of 10 months while the pool conducted its bald manipulation for the purpose of deceiving the public. The collapse was but the climax.

The Hocking company, capitalized at $7,500,000, owns some coal lands in Ohio. Organized in 1883, it became insolvent in 1896, was reorganized in 1898 and has never paid a dividend. In March, 1909, a pool of "financiers," comprising the president of the company, was organized to boost the stock of this moribund concern to fictitious values with the threadbare purpose of unloading upon investors, out of whom it would make something out of nothing.

By all the devices known to evil and loose-mouthed promoters, by the inspired stories of hired press agents, including reports of discovery of oil in the Hocking lands, by "inside tips" and wash sales, and the machinations of the arch manipulator the stock was raised from 21⅜ on Feb. 23, 1909, to 92½ on Jan. 4, 1910. Then one of the conspirators decided to betray his accomplices and the pool collapsed, the stock dropping in a few hours to about 25.

How long are the governors of the Stock Exchange going to permit such attempts at robbery? If they do not act promptly, the Legislature will surely act for them. The effrontery of the Rock Island and Hocking manipulators has been such that they have acted right under the nose of the Legislature with the report of the committee on speculation, indorsed by the Governor, before it.

We know that the authorities of the Stock Exchange have the checking of such evils prominently in mind. The unlisted department is to be abolished and the mining and industrial companies are to be required to make proper reports, just as the railways are. In this connection the listing committee of the Stock Exchange has wisely entered into conference with the Mining and Metallurgical Society of America, and may enact requirements such as were recommended last year by the latter. This will be a step in the right direction but it will not be enough. The Stock Exchange should investigate the Hocking transactions and mete out such punishment to the guilty as will effectively deter the tribe of thimbleriggers from inaugurating similar schemes in the future. The Stock Exchange must now do something drastic to compensate for sitting idly by while this flagrant manipulation was going on to the knowledge of almost everyone.

A New Coal Combination?

A despatch of somewhat doubtful origin comes this week from Charleston, W. Va., to the effect that options on 80 per cent. of the coal mines in the New River region have been taken, and that the parties concerned are seeking other options in the Pocahontas district. This, the despatch goes on to say, is in the interest of a great combination, which is to include not only the West Virginia mines mentioned, but also the Consolidation Coal Company, the Pittsburg Coal Company, the Berwind-White and other large interests in western Pennsylvania. There have been reports from time to time of great bituminous coal combination, but this somewhat mysterious despatch puts them for the first time on a definite basis.

The despatch goes further and mentions names. It appears that the holders of the West Virginia options and the general managers of the whole combination are the Guggenheims. Not satisfied with their smelting and mining interests, they are preparing to take up and manage the coal-mining business also. Whether their aspirations extend to the purchase of the anthracite mines also, we are not told. Perhaps it is best for us to remain in doubt for a while, at least.

It is pleasant to note from recent London advices that Stratton's Independence has once more paid a dividend. We hear from the mine that the dump ores are now being treated profitably. The material is of extremely low grade, but means have been developed for treating it at extremely low cost. The solution of this problem has been an uphill struggle, but it is the wrestling with difficult tasks that tends to develop the right class of men. Where there is little resistance, but little effort is necessary.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS AND THE EXPERIENCES OF READERS

The Corporation Tax on Mining Companies

I was especially interested in the editorial on the "Corporation Tax on Mining Companies" in the JOURNAL of Jan. 15, and hope for some discussion of a method for determining the depreciation, under the tax law, of the value of the property on account of the ore extracted during the year.

The JOURNAL seems to express the opinion that under the law no allowance can be made for depreciation of property on account of the ore removed. I do not think that the Treasury Department intends to interpret the law in that way, as the deputy commissioner replied as follows to a recent inquiry: "In reply to your query as to the manner in which the depreciation in the value of the mine should be determined, you are informed that in case of corporations whose capital investment represents the purchase of mines, oil wells, etc., in which there is a steady depreciation of the value of the property because of the depletion of the deposits and such depreciation is not ascertainable by an inventory, the shrinkage in the value of the capital investment account should be treated as depreciation in making the required return. The amount declared on this account must be a fair and just estimate of the actual amount of depreciation, and if such estimated amount be more than 5 per cent. of the amount actually invested in the property, a charge of capital investment account and detailed statement setting forth all the facts must be filed with and made a part of the required return."

From this I judge that it is the intention of the department to permit a depreciation charge on account of the extraction of mineral from the ground, but it seems to have a very vague idea of how the estimate should be made. Neither under the law nor in fact does 5 per cent. of the amount actually invested in the property seem to be a fair estimate of the amount of depreciation. I hope that before March 1, when returns under the law are to be made, someone will furnish us with a proper method of estimating the life of a mining property and the annual depreciation on account of the operation of the mine.

GORDON R. CAMPBELL.

Calumet, Mich., Jan. 20, 1910.

Copper Converter

Referring to a notation by Herbert Haas in the JOURNAL, Nov. 20, 1909, which in turn refers to an article of mine in the JOURNAL, Oct. 23, 1909, describing a modern type of barrel converter for copper matte, I wish to say that on account of my absence from Cananea this has only just been brought to my attention. It is not the purport of this letter to take up the question as to whether this converter is patented or not, and although Mr. Haas refers to this as having been covered, I will leave this question open for the time being. But I was particularly interested in his statement:

"An additional feature more valuable than the increased life of the lining is the arrangement of the tuyeres in such a manner as to generate a vortex in the fluid matte for the purpose of increasing the air efficiency in the copper converter, which at present is very low. This would result in more rapid oxidation of the charge, hence a reduction of the time required for blowing."

I would suggest that anyone is entitled to a generalized opinion, and to express it, but is Mr. Haas willing to commit himself to figures, and state what the difference would be in the efficiency of the air blown into the two types of converters illustrated? He says that it is very low in the present type, intimating that he has data bearing out this statement. Does his "low" mean a 20 per cent. efficiency, or 30, 60 or even a 99 per cent. utilization of the combining power of the oxygen contained in the blast? I do not mean the ultimate efficiency of the quantity of air supposed to be delivered by the blowing engines, but I mean the efficiency of the actual air that passes through the tuyeres and into and through the molten mass, for here is where he expects the improvement to be. The air which is lost previously is not seriously affected in a different manner by any type of converter (except that deep converters may offer more resistance, resulting in increased velocity of air through leak losses); this varies at different places, depending on the atention given the engine's pipe lines, safety valves, tuyere valves and other mechanical opportunities for leaks.

This is a subject that has been given considerable attention by managers and metallurgists at a number of large plants throughout the United States, Mexico and elsewhere. Large sums of money have been expended to increase this efficiency at various places where I am quite familiar with the improvements installed and also with the results therefrom; and I beg to advise that I have been well pleased with the results. And, good naturedly, I might say that it looks like treading on ones toes when accused in the public press of getting poor results, hence this reply. I have reasons to believe that Mr. Haas is mistaken, and if he is willing to take a definite stand and give a figure that will locate his "low," I will be pleased to show what I consider good.

CHAS. F. SHELBY.

Cananea, Mex., Jan. 12, 1910.

Patent versus Bone-Ash Cupels

In the abstract of the paper, "Comparison of the Thermal Properties of Cupels," by Bannister and Stanley, published in the JOURNAL of Dec. 11, 1909, there is one point not touched upon in the published abstract, and which is, possibly, the most important from the point of commercial results, and, therefore, of greatest moment to the assayer. I refer to their item (4), page 1167, "Cupellation losses are always lower on good patent than on bone-ash cupels."

It is a matter of experiment that the ordinary scorification and cupellation will show less silver than is actually present by 1 to 2 per cent., depending on the skill of the assayer, the weight of the button recovered and the elements present in the material to be assayed. The greater part of this silver difference can be recovered in the so-called "correction assay," i.e., by crushing the scorifier slag and the cupel bottom and assaying them.

When the weight of the silver thus recovered is added to that of the original assay button, the difference between the sum of their weights and the silver actually present is as a rule less than 0.2 per cent. the weight shown by the assays usually being less than the silver present. This small difference, however, is not the assayer's actual loss, which consists of the correction on the correction assay plus any volatilization losses, but is less than the actual loss of silver by about 0.3 to 0.4 per cent., which deficiency is compensated for by impurities in the silver beads recovered. These are mainly lead, bismuth and copper.

While it is thus demonstrable that the bone-ash cupel shows rather heavy losses originally, which are recoverable, in the main, by a correction assay, it is also equally demonstrable that care must be exercised with the patent cupel not to overrun the silver contents actually present. In certain experiments made on patent cupels with assays on known amounts of fine silver, from 98.55 to 100 per cent. of the silver actually present was recovered in the first assay button obtained, while after adding the correction buttons there was an apparent recovery of 100.8 per cent. of the silver actually present. This is doubtless due to the point upon which Bannister and Stanley lay so much stress, that the buttons both run and finish colder on the patent cupels than on the bone-ash. This colder finish evidently causes the retention of impurities in the silver bead.

It seems then that the assayer who is running corrected assays with patent cupels must either heat his cupels vigorously toward the end of the assay or run the risk of reporting more silver as present than actually exists.

DONALD M. LIDDELL.

Grasselli, Ind. Dec. 20, 1909.

The Ontario Bureau of Mines

In your issue of Jan. 15 there appears a letter from Thomas W. Gibson, deputy minister of mines for Ontario, stating that in a communication which appeared in the JOURNAL of Dec. 11, I made some reflections on the Ontario Department of Mines which were not warranted by the facts. If I remember rightly the extent of my offending was to suggest that the evidence adduced at a recent trial at North Bay called for an investigation into the affairs of the department. I remain of that opinion.

The source of my information was a report of the trial of an action brought by John Caley claiming a one-fifth interest in the Bartlett mine, which appeared in the Toronto *Globe* and several other Canadian journals. This report stated that Caley agreed to secure private information as to the location of the McIntosh and McLaughlin claims in the Gowganda district, and did so. In the final settlement, made out of court, Caley received $1600 cash and 5000 shares of stock for his claim.

The report of the trial obtained widespread circulation in Ontario. It was made the subject of editorial comments considerably more severe than anything contained in my letter at the time. Yet no official or semi-official contradiction of the statements of the report was published until the appearance of Mr. Gibson's letter in the JOURNAL. It seems rather singular that the department should allow such charges to go uncontradicted at home, and only attempt to meet them when they are published at a distance.

In conclusion I wish to say that I intended no reflection in any way upon Mr. Gibson whose reputation as a conscientious and zealous official is well known.

PHILLIPS THOMPSON.

Toronto, Jan. 18, 1910.

[Mr. Gibson's letter in the JOURNAL of Jan. 15 was a clear and straightforward statement of the facts, and it does not appear that Caley could obtain any information from the department of mines which was not equally accessible to any inquirer. As to the settlement it is quite possible that in the absence of accurate maps Caley, being on or near the ground, may have been able to give some information of value as to the actual location of the claims. Our correspondent seems to have relied too much upon local newspaper reports, which in Cobalt and Gowganda matters are apt to be colored by the reporter's interest or inclination. As to his other criticisms, it may well be that Mr. Gibson did not think it worth while to contradict statements made locally where the facts are well known, but did believe it necessary to make some protest when they were published where they would reach many who were not familiar with the affair.—EDITOR.]

The Big Vein Copper Company

A newspaper report in connection with the investigation by the authorities of the transactions of the People's Mutual Life Association and League, involving Lieutenant Governor White, of New York, says:

"John Tevis, a promoter whose specialty is the purchase of life-insurance companies, seems by the expenditure of only $2350 to have rented from Moran & Co., of New York, 25,000 shares of the capital stock of the Big Vein Copper Company, which he claims to be worth upward of $150,000, and with this rented stock to have secured what he claims to have been a loan to him from the Farmers' Bank of Canada of $150,000, with which sum, after taking out $10,000 for personal use, he paid certain of his obligations and by a disbursement of $110,000 acquired control of the Fraternal Beneficial Society with liquid assets of practically $3,000,000."

According to the official report of transactions on the New York curb in 1909 there were sales of 202,220 shares of the Big Vein Copper Company, as high as $11, closing at $9⅛.

It is the common gossip that this stock was manipulated to its high price by more or less scandalous operations. The condition came to the attention of Mr. Mendels, the agent for the curb, in December and action was taken to cancel the listing of the stock. At the same time the transfer agents who were involved in the disqute and litigation over the selling and hypothecating of pooled stock withdrew.

Apparently some persons have lately conducted a profitable operation in securing loans on this stock from country banks and financial institutions, using as a basis for the valuation of the collateral the quotations established on the curb market.

The Big Vein Copper Company, with a capital stock of 1,000,000 shares of $10 each, has William H. Sterling as president, and Joseph B. Moran & Co., as fiscal agents. It owns property near Tucson, Ariz., and Sherman, Colo. Its prospectus is a glorious affair. The Big Vein mine—in Arizona—is represented as having a mineralized dike, 300 to 800 ft. wide. A shaft is to be sunk 600 ft. deep, crosscuts the full width of the vein are to be driven, also drifts on the vein; and it is estimated that by July 1, 1910, although only a fraction of the vein will be opened, there will be blocked out 10,000,000 tons, which at 2 per cent. copper and 13c. per lb. will be $50,000,000 gross.

As if this were not enough, the Big Vein Copper Company owns a majority of the stock of the Mexamerican Company, which owns the Black Wonder and West End mines, near Sherman, Colo. These mines are stated to have *inexhaustible* orebodies (in the opinion of able authorities), and to have ore to the value of $82,500,000, *net*, developed. Moreover, the belief is expressed that this estimate is "exceedingly conservative," and that an increase of 20 per cent. would not be unwarranted.

Now should not the Rothschilds, the Count of Monte Cristo, and the proprietors of the Calumet & Hecla mine be envious? Oh, shade of Baron Munchausen!

The matter of the Big Vein Copper Company and some similar occurrences led to the issuance of the following edict by the curb committee:

"In all cases where stock is pooled under special contract, loan or otherwise, the certificates thereof used under such agreements as above stated shall be issued in the name of a trustee or trustees only, the trust to specify the particular purpose for which said stock was issued. Under no circumstances can this stock be utilized for delivery, and must in every case be issued in the name of a trustee or trustees. Certificates other than the above shall be considered a delivery, unless lost or actually stolen, in which case the numbers and denominations of same shall be furnished to the agency at once, for the protection of all. This resolution is effective absolutely on and after this date, Jan. 21, 1910."

The gravity tram of the Boston Consolidated, at Bingham, Utah, is said to be the longest of its kind in this country.

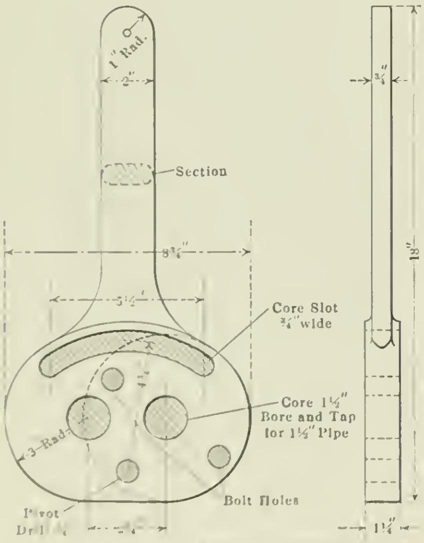
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES ☙ THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Cast Iron Spigot Holder for Settling Cone

To avoid the flooding usually experienced in changing spigots to cone settlers, W. O. Borcherdt, assistant superintendent for the Bertha Mineral Company, at Austinville, Va., devised the spigot holder shown in the acompanying drawing.



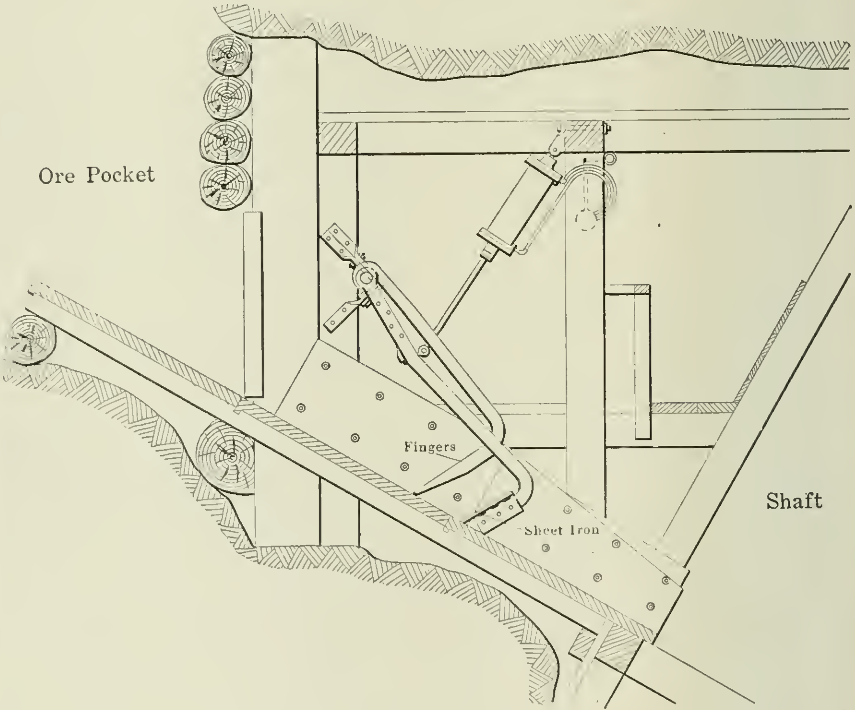
The Engineering & Mining Journal, N.Y.

CAST-IRON SPIGOT HOLDER

The holder is pivoted at the ¾-in. drilled hole, and spigots are screwed into both the 1½-in. holes. In case it becomes necessary to change or renew a spigot the bolts can be loosened and the other spigot simply swung into position while a new one is being put into the holder. Thus, instead of exposing a much larger aperture and probably disarranging the working of the entire mill, a spigot of the proper size is always at hand if the one in use becomes clogged or requires attention for any cause.

Skip Loading Chute

The accompanying drawing shows an ore chute for loading skips used at the mines of the Granby Consolidated company, Phœnix, B. C. It is an improved form of finger chute, combining fingers with a sheet-iron gate for holding the fines. In the operation the sheet-iron gate is raised first by the air lift, then, as the arm is raised still higher by the piston of the air cylinder, the fingers are raised and the coarse ore allowed to escape. When the air is released the fingers fall first, catching the coarse rock, and there is a sufficient interval of time for the chute to clear itself before the sheet-iron gate is closed. The operation is rapid and the skips are filled nearly as fast as the skip loader can operate the valves.



The Engineering & Mining Journal, N.Y.

GATE FOR SKIP-LOADING CHUTE

A company to be known as the Rand Tailings Brick Company has been formed to make bricks from tailings. The capital will be £7000. On the flotation of the company machinery capable of turning out 12,000 bricks per day will be ordered. It is the intention later to establish works on the East and West Rand.

Notes on the Pohle Air Lift*

By W. S. Anderson

The proportions of piping, submergence, etc., in the Pohle air lift may be arrived at mathematically, basing the calculations on the expansion of the air bubbles as they rise to the discharge where the head due to the sum of the water pistons above diminishes, and on the usual formulas covering capacities of air and water pipes; but for practical purposes in the case of small wells reliable results may be arrived at from the flollowing:

It is found in practice that the length of pipe submerged below the normal pumping level after the water has fallen should range from 30 to 60 per cent. of the total length of pipe from the bottom end to the top of discharge, the latter ratio of 60 per cent. generally giving the greatest efficiency. The air pressure should vary from three-quarters of the pressure due to the total lift for shallow wells to six-tenths for deep wells. It should be such that it will about equal atmospheric pressure at the point of dis-

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*Reprinted from *Power*, December, 1909.

harge, unless high velocity is desired at he expense of economy. That is, it should qual the head in feet multiplied by 0.434 lus a few pounds for friction, this latter lepending on the length of pipe and friction head. In this connection it should e remembered that where a central air ipe is used in drilled wells, on account of here not being room for the air pipe outide of the water pipe, the friction head s greater. If the compressor is close o the well, the reservoir should be proortioned to reduce all impulses, though n the case of a long air line this will to great extent take care of itself.

In the case of a large well casing, here the inflow into the well is small, or here the desired amount of water is mall in proportion to the capacity of the ipe, the air pipe, if central, should purosely be made large enough to prevent owing, the most desirable proportion, as dicated by practice, being about 1:2 for nall wells and 1:3 where the diameter water pipe is over 2½ in.; or the area the water pipe is about six times the ea of the air pipe for average cases. If air is taken from shop air mains, ere variable service causes a large riation in air pressure, and the air is t run through a reducing valve, the dden expansion of high-pressure air at discharge is likely to cause trouble, if discharge is into a covered or practic- y closed tank. This may be relieved putting a large-sized safety valve at y convenient bend.

Assuming 60 per cent. submergence, volume of free air for maximum onomy may be roughly taken from the lowing: For lifts of 25 ft., 13 cu.ft. of for 100 gal. of water; for lifts of 75 ft., 28 cu.ft. of air per 100 gal. of water; for lifts of 100 ft., 36 cu.ft. of air per 100 gal. of water; for lifts of 150 ft., 57 cu.ft. of air per 100 gal. of water; for lifts of 200 ft., 75 cu.ft. of air per 100 gal. of water.

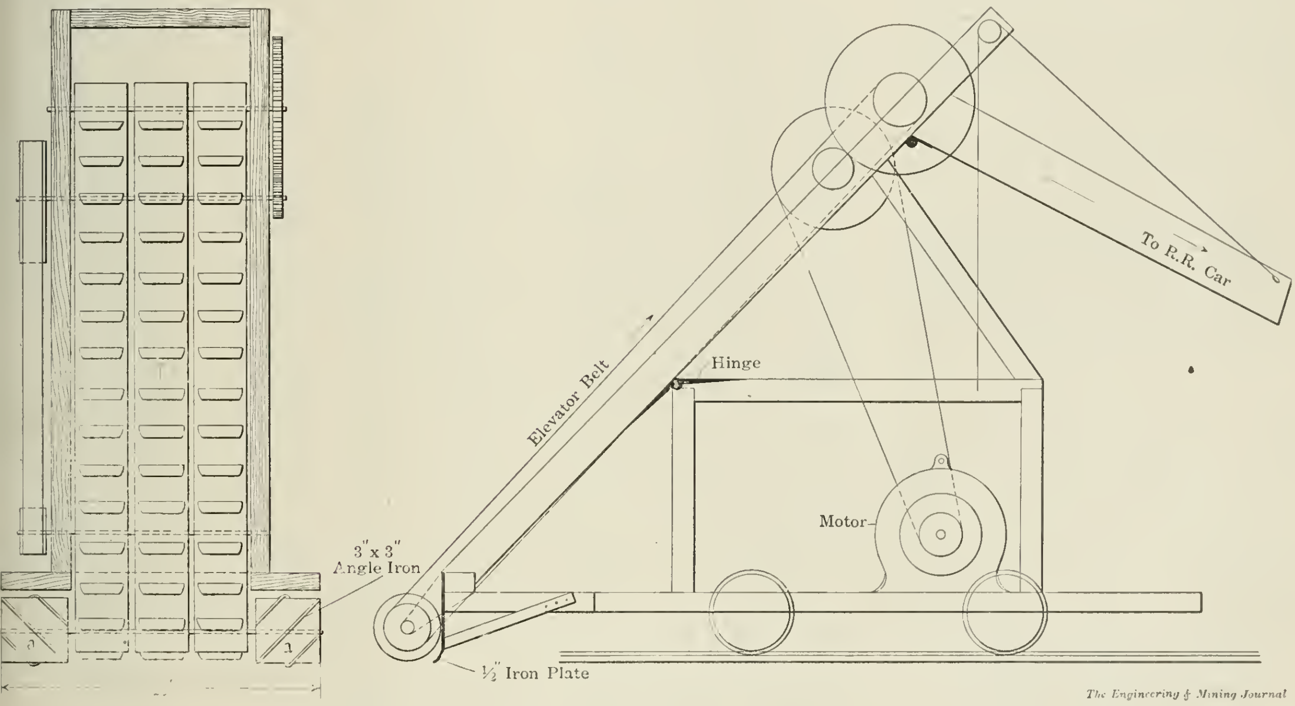
With side inlets and ¾-in. air pipes and 1½-in. water pipe, the ordinary capacity will be about 25 gal. per min., and for larger wells the capacity may be assumed as varying nearly but not quite with the square of the diameter of the water pipe. For example, a 6-in. water pipe will ordinarily give a flow at fair economy of from 400 to 425 gal. per min. In the case of central air pipe with 3½-in. casing, the output should be about 110 gal. per min., or 230 gal. with 5-in. pipe, and other sizes in proportion. Generally speaking, from 10 to 14 gal. per sq.in. of area of water pipe, after deducting the air-pipe area, will be about right, the smaller figure being used for short lifts and the larger figure for lifts of 100 ft. or over.

The matter of economy is generally misunderstood and most of the claims of high efficiency should be taken with rather a liberal allowance. While under favorable conditions it may be possible to approach 70 or 80 per cent. efficiency figured from the discharge back to the indicated horse-power of the compressor, most of the tests of ordinary wells where extreme submergence is not possible seem to indicate efficiencies between 20 and 35 per cent. It should also be understood and remembered that the air lift is not well adapted to forcing water horizontally, and horizontal discharges of over 40 or 50 ft. should be avoided, except by discharging into a tank with a gravity flow the rest of the distance.

Chat Elevator and Loader

A large amount of chats (tailings) in the Joplin district are sold to the railroad companies for ballast. The handling of a large tonnage of this material has evolved the construction of an elevator for loading railroad cars. The elevator is run by a 35-h.p. motor which takes its power from the trolley system. The elevator consists of three belt elevators, inclined at an angle of 45 deg. and having 14-in. buckets. These three elevator belts are operated on three sets of belt pulleys, attached to the same shaft. The accompanying drawing shows the general arrangement of the elevator. The entire outfit is mounted on two pairs of car wheels with 6-ft. wheel base. The lower shaft to which the pulleys are attached is 10 ft. long. At each end is a wheel *a*, 24x30 in. which was originally a belt pulley. To the rim of this wheel is bolted a curved piece of 3x3-in. angle iron, which forms a spiral, one wheel being right and the other left. These wheels assist in feeding the bucket elevator by throwing the chats to the center. As the material is elevated it falls into a chute, which in turn conveys it to the car.

The apparatus is operated on a standard-gage track. Short rails are placed in front of the machine when it is necessary to move the machine forward. This part of the work is the same as for steam shovels. The loader is moved forward or backward by means of the motor car that does the switching of the cars. Two men are employed to assist in feeding the elevator, and one man operates the motor. The elevator belt is 25 ft. long, center to center of pulley. Thirty buckets are at-

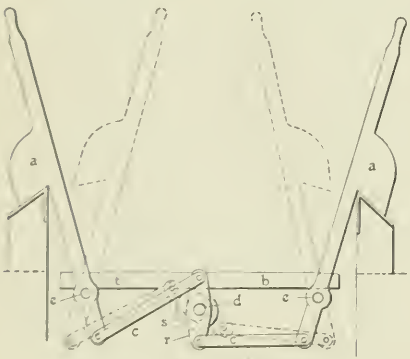


Front and Side View of Tailings Elevator in the Joplin District tached to each belt. It requires 5 minutes to load a 15-cu.yd. car. The loader used by the railroad company is constructed in such a way that the elevator portion may be lowered in order to transfer it where trolley wires would interfere. The hinged joint is shown in the illustration.

A similar but smaller machine is being used at the Yellow Dog mine for handling tailings that are being retreated. The loader at the Yellow Dog mine has a friction clutch which operates a chain belt connected to the wheels, so that it can be moved forward or backward by its own motive power as in the case of the steam shovel. There is also a double winding drum, which operates a car with a tailrope system. The car has a capacity of 2½ tons, and the haul is 250 ft. Forty trips per hour can be made; the car is self-dumping, and while the car is making its trip to the bin, a hopper is being filled by the elevator so that no time is lost in loading. Three men operate this machine. A 20-h.p. motor is used.

Chairs on the Cage

In the effort to do away with the chairs in a shaft, many devices have been tried. An apparatus similar to the one described here can be made in any mine shop and will give perfect satisfaction.



The Engineering & Mining Journal, N.Y.

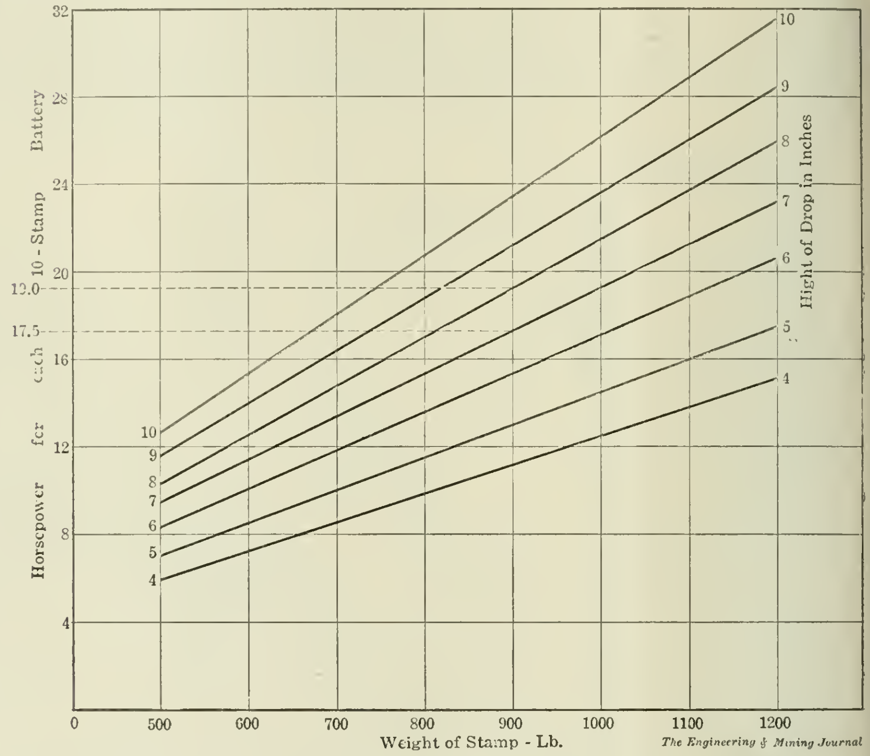
Cage Chairs

In the accompanying sketch the levers *a a* carrying the chairs are four in number and are set at each corner of the cage floor *b b*, just within the side rods. As shown, they are connected by the rods *c c* to rocker arm *r*, and are held clear of the shaft when the cage is in motion by the powerful spring *s*. The shaft *d* and bars *c c* extend across the cage and the arrangement is duplicated on the other side. Thus a movement of any lever actuates all

The chairs rest on blocks with sheet-iron caps placed at each corner of the shaft compartment. The hight of these blocks is, of course, such as will insure alinement of the cage rails with those on the station. The mechanism can be operated from the cage or station floor

Power Required for Stamp Batteries

The power necessary to drive stamp mills in units of 10 stamps is readily obtained from the accompanying diagram prepared (*Aust. Min. and Eng. Rev.*, Oct. 5, 1909) from the notes of E. H. W. Westwood, of Melbourne. The chart is figured on a basis of 90 drops per minute. The following example explains the method of using the diagram: Required: The horsepower necessary to drive a 10-head battery of 900-lb. stamps, 90 drops per min., hight of drop being 7 in. Take the figure 900 under the "weight of stamps," follow this line vertically until it intersects the 7-in. drop line, then proceed horizontally to the left of the diagram, where it will be found that the required power for each 10-stamp battery is 17.5 h.p. Another use of the diagram is in finding the change in horsepower, by varying the hight of drop without changing the weight of stamp; for example, with a 900-lb. stamp, in changing the drop from 7 to 8 in., the increase in horsepower for each 10-stamp battery is from 17.5 to 19 horsepower.



The Engineering & Mining Journal

Horsepower Diagram for Stamp Batteries (Includes All Friction)

A new form of license to be issued to oil prospectors in the island of Trinidad has been prepared. A recent consular report states that an essential condition of any concession will be that 'the receiver thereof shall be and remain a British registered company, and be prohibited from transferring rights to any other than a British registered company." When oil is found, the prospect or well must be worked; it can not be locked up and left idle or undeveloped.

Cyanide Tank Record

The accompanying form of tank card is in use at the cyanide plant of the El Tajo Mining Company, at San Sebastian, Jalisco, Mex. One of these cards is hung at each tank, thus enabling the operator to see at a glance the amount of treatment each tank has had. After a tank is discharged the card is taken to the office, and there filed for use in working up data sheets.

TANK RECORD BLANK.

El Tajo Mining Company

Slime Tank No....... Charge No......

Charging........M ....19..

Slime . .....inches Sp. Gr......Tons.....

	Inches Decanted	Net Hours Agitation
1st Agitation.... to..	. .	.....
Settling and Decanting	...	....
2nd Agitation.... to..	..	....
Settling and Decanting		.....
3rd Agitation .. to		....
Settling and Decanting		.....
4th Agitation. to.		....
Settling and Decanting		....
....		...
Cubic Feet Pulp		...
Per Cent. H_2O..		....
Tons Dry Slime		.
......		....
Agitation and Discharging to Burt Filter		..
from to		..
Sodium Cyanide kg		..
Lead Acetate "		.
Lime "		....

old and Silver Production of the United States

Dr. A. Platt Andrew, director of the int, has completed his preliminary esti- ate of the production of gold and silver / the mines of the United States for the ilendar year 1909. The estimate is ased upon deposits at the mints and ssay offices of the United States and re- orts received from private refineries and nelters in the United States.

The totals of this estimate for 1909 ompare with the corrected figures for 08 as follows:

	1908.	1909.
old, fine ounces......	4,574,340	4,800,359
Value...............	$94,560,000	$99,232,200
lver, fine ounces.....	52,440,800	53,849,000
Commercial value....	$28,050,000	$28,010,000

The increase in gold in 1909 was $4,- 72,200, or 4.9 per cent. The increase quantity of silver was 1,408,200 oz., r 2.7 per cent. Owing to the lower verage prices of the year, however, iere was a decrease of $39,900, or 0.14 er cent., in the commercial value.

I. GOLD PRODUCTION OF THE UNITED STATES.

IN DOLLARS.

	1908.	1909.		Changes.
la ..	$41,200	$28,000	D.	$13,200
las.....	19,858,800	20,947,600	I.	1,088,800
riz....	2,500,000	2,672,300	I.	172,300
al......	19,329,700	21,271,300	I.	1,941,600
olo.....	22,871,000	21,954,700	I,	83,700
a......	56,200	44,300	D.	11,900
aho....	1,443,500	1,389,300	D.	54,200
linois...	....	300	I.	300
o......	....	200	I.	200
ont....	3,160,000	3,599,400	I.	439,400
ev......	11,689,400	14,908,400	I.	3,219,000
. M.....	306,300	278,300	D.	28,000
. Car...	97,500	32,200	D.	65,300
re......	905,900	712,900	D.	193,000
C.....	53,700	3,500	D.	50,200
D.....	7,742,200	6,849,900	D.	892,300
enn.....	3,700	3,700		....
ex......	500	400	D.	100
tah.....	3,946,700	3,844,800	D.	101,900
a......	3,600	3,600		....
ash....	253,700	377,900	I.	124,200
yo.....	7,600	3,800	D.	3,800
ther States..	3,700	118,700	I.	115,000
Total U.S. .	$94,274,900	$99,045,900	I.	$4,770,600
orto Rico	600	600		....
hilip- pines...	284,500	186,100	D.	98,400
	$94,560,000	$99,232,200	I.	$4,672,200

Gold Production

In the first of the accompanying tables ie gold production. by States is given, ie figures being in dollars. The gain i the total was larger than was indicated y the earlier partial estimates, this being ue to the heavy increase in Nevada, and the unexpectedly large gain from Cali- ornia. In Alaska the increase was about hat had been expected. There were our States which reported over $10,000,- 00 each in 1909. Of these Colorado lone showed a decrease, but still re- iained the leading producer. California, owever, came near claiming the first ank owing to a gain of more than 10 er cent., a large part of which was due the dredge operations, which have be- ome such a prominent part of the min- ig industry in that State. Alaska was third in rank, coming very close to California. Nevada showed a heavy gain, due to the more thorough working of its mines and the extension of mill operations rather than to new discoveries. These four producers furnished altogether $79,081,000, or 79.7 per cent. of the total.

There were five producers of the second rank, which reported last year an aggregate of $18,355,700, or 18.5 per cent. of the total. These, in the order of their importance, were South Dakota, Utah, Montana, Arizona and Idaho. Of these Montana and Arizona had increases, while South Dakota reports a considerable loss, due chiefly to labor troubles at the great Homestake mines.

II. SILVER PRODUCTION IN THE UNITED STATES.

IN FINE OUNCES.

	1908.	1909.		Changes.
Ala.......	400	200	D.	200
Alas.......	204,600	158,100	D.	16,500
Ariz.......	2,900,000	3,632,200	I.	732,200
Cal........	1,703,700	1,705,200	I.	1,500
Colo.......	10,150,200	9,093,600	D.	1,056,60
Ga.........	200	200		....
Iad........	7,558,300	7,054,500	D.	503,800
Ill.........	2,000	3,600	I.	1,600
Mich.......	294,100	323,900	I.	29,800
Mo.........	49,400	15,200	D.	0 34,200
Mont......	10,356,200	12,000,000	I.	1,643,800
Nev.......	9,508,500	8,953,000	D.	555,500
N. M.........	400,900	329,200	D.	71,700
N. C.......	1,300	500	D.	800
Ore........	56,100	71,100	I.	15,000
S. C.......	200	200		....
S. D.......	197,300	205,600	I.	8,300
Tenn.......	60,900	58,500	D.	2,400
Tex........	447,000	358,300	D.	88,700
Utah.......	8,451,300	9,533,400	I.	1,082,100
Va.........	300	6,000	I.	5,700
Wash......	86,800	73,500	D.	13,300
Wyom.....	3,500	1,100	D.	2,400
Other states.	6,300	269,800	I.	263,500
Total U.S.	52,439,500	53,846,900	I.	1,407,400
Phiilppines..	1,300	2,100	I.	800
Total.....	52,440,800	73,849,000	I.	1,408,200

No other State produced as much as $1,000,000 in 1909, and only one—Oregon—over $500,000. The aggregate for the 13 lesser States in the table was only 1.8 per cent. of the total. The Philippines report a decrease, there having been more prospecting than actual working in the islands during the year.

Silver Production

The second table shows the silver production by States. Montana again held the first position; Utah took the second, Colorado dropping to third place. The other large producers in order were Nevada, Idaho, Arizona and California. No other States reported as much as 500,000 oz. Of the seven large producers Montana, Utah and Arizona reported large gains and California a small one. Colorado, Nevada and Idaho showed decreases of considerable proportion. The important increases were all in States having large copper production. In Idaho the silver is won chiefly in connection with lead; in California with gold, and to a smaller extent with copper. The comparatively large quantity credited to other States is probably silver reported by smelters, which could not be properly apportioned in the preliminary estimate.

Receipts of Gold at Seattle

The annual report of Calvin E. Vilas, assayer-in-charge, shows that the United States assay office in Seattle received 24.4 tons of gold valued at $12,864,268 during the calendar year of 1909. The total receipts of the Seattle office since the opening on July 15, 1898, to the close of 1909, amount to 376.2 tons, valued at $188,128,872. The receipts of gold for the year 1908 were $18,064,171. The gold for 1909 was sent from the following points:

Nome	$4,239,416
Tanana	6,204,573
Balance for Alaska...........	863.592
Total for Alaska............	$11,307.581
British Columbia, Canada.......	$1,319.237
Yukon Territory, Canada.......	161.771
All other sources..............	75,679
Total	$12,864,268

The foregoing is not the total output of the districts mentioned, as a portion is shipped each year to the United States mints and other United States assay offices. Of the $188,128,872 which has been received at the Seattle office since July 15, 1898, Nome has furnished $42,264,228; Tanana has furnished $37,329,157, and the remainder of Alaska $7,865,248, making the total of $87,458,633 for all Alaska.

Zinc Production of the World

A circular just issued by Henry R. Merton & Co., of London, gives their usual yearly estimate of the zinc production of the world. This estimate is generally very close to the actual output shown later by the official reports. The figures are given in the accompanying table, and are in long tons of 2240 lb. For the United States we have substituted the statements given in THE MINERAL INDUSTRY for 1908, and in the JOURNAL of Jan. 8 for 1909. for those of Merton & Co., but the difference is small.

ZINC PRODUCTION OF THE WORLD.

	1908.	1909.		Changes.
Belgium	162,420	164,470	I.	2,050
Rhine district.....	72,050	73,990	I.	1,940
Holland..........	16,985	19,240	I.	2,255
Great Britain....	53,615	58,415	I.	4,800
France and Spain...	54,940	55,235	I.	295
Silesia............	111,410	142,625	I.	1,215
Austria and Italy..	12,560	12,440	D.	120
Poland..........	8,700	9,000	I.	300
Total Europe...	522,680	535,415	I.	12,735
Australia......	1,070	...	D.	1,070
United States.....	187,956	238,455	I.	50,499
Total	711,706	773,870	I.	62,161

The total increase in 1909 was 8.7 per cent. Of this four-fifths came from the United States. All the European countries except Austria increased their production, but the gains were small in most cases, only Great Britain and Holland having any considerable changes.

The Bureau of Mines bill passed the House on Jan. 25.

The Guggenheim Coppers

The litigation between Col. E. A. Wall and the Utah Copper Company has brought out some interesting information respecting the ownership of the Guggenheim coppers.

Daniel Guggenheim in an affidavit said that he and his brothers own 437,011 shares of the Guggenheim Exploration Company. The Exploration company owns 232,805 shares of Utah Copper Company. Further than this, the only Guggenheim ownership of Utah Copper Company is 900 shares held by Solomon R. Guggenheim.

The Guggenheim Exploration Company owns 379,416 shares of Nevada Consolidated. In addition Daniel owns 52,067; Morris, 58,558; Solomon, 64,500 and Isaac, 2400, making the total holdings of the brothers, 199,125.

No stock of Nevada Consolidated was ever owned by the American Smelters' Securities Company. The American Smelting and Refining Company is not owned or controlled by M. Guggenheim's Sons, but has 10,000 shareholders, and widely distributed stock.

Charles M. McNeill, president of the Utah Copper Company, said in an affidavit that the directors of that company own 127,000 shares of its capital stock. The directors include Mr. McNeill, D. C. Jackling, R. A. F. Penrose, Jr., John Hays Hammond, J. D. Hawkins, Charles Hayden, William B. Thompson, S. W. Eccles and K. K. McLaren. There are 1500 shareholders in the Utah Copper Company, the stock owned and represented by members of the board other than Mr. Eccles and the Guggenheim interests exceeding 240,000 shares. The Guggenheims have never participated actively in the management of the company, or attempted to guide its policy.

Mr. McNeill in his affidavit explained the mutual benefit which the directors claim will result from consolidation of the Utah and Boston companies. Unless the consolidation be made, said Mr. McNeill, the present steam-shovel method of mining cannot be continued, and the Utah company will be compelled to resort to a more expensive scheme of underground mining.

S. J. Jennings, consulting engineer, made affidavit that without consolidation, the Utah company can continue to produce 62,000,000 lb. of copper per year at cost of 9c. per lb., yielding $3.92 per share with copper at 13c. With an enlarged company it can produce copper at 8½ cents.

On Jan. 25, the injunction was dissolved and the merger of the Utah Copper and Boston Consolidated companies was consummated before the close of the day on the basis of 2½ shares of the latter for one share of Utah Copper.

Stratton's Independence

The first report of the directors of Stratton's Independence, Ltd., since the reconstruction, has been issued. For the period Sept. 8, 1908, to June 30, 1909, the total amount of shipping ore obtained from the mine near Victor, Colo., was 21,162 tons, which realized £108,035. A large proportion of this ore was won by lessees who pay a graded royalty and a percentage of the profits to the company. The amount netted by the company from royalties and percentages of profit was £32,360, or an average of 35.958 per cent. The company's wet mill was operated with a profit of £1036. The net profit carried to the balance sheet was £7843, out of which the directors recommend the payment of a dividend of 5 per cent. on the present capitalization of 1,000,000 shares at 2s. 6d. per share. An interim dividend of like amount is also to be paid out of the profits earned during the last six months.

Philip Argall, the consulting engineer, reports that the new leasing system inaugurated has proved quite satisfactory in operation and that it is largely due to this system that the increased returns from lower grade ore and the large amount of development work have been obtained.

Milling Operations

As regards the dry mill which was designed to treat concentrates from the dump or wet mill and general mine ore, operations were started in January, but as sufficient ore could not be obtained the mill was shut down in March. The plant has a capacity of 80 to 100 tons per day, but only 30 to 35 tons could be obtained.

The production of high-grade ores was not nearly sufficient to warrant milling on the spot; furthermore, the reduction in the treatment cost by Cripple Creek custom mills between the time mill construction commenced and January last, did not justify milling the high-grade ores, said reduction varying from $1.25 per ton on ores under $10, to $2.50 per ton on ores exceeding $60 per ton in value. This cut in rates continues in force today. Should the old rates be again enforced the high-grade ores could be treated in the company's dry mill. Development in the mine is now proceeding so as to obtain an ore supply for treatment in the dry mill without roasting and therefore at a much less cost per ton treated, once the continuous-roasting process is eliminated.

The wet mill has been operated at a profit. Mr. Argall states that since the mill started last April the working profits have averaged $10,000 per month and that he hopes to maintain that average.

Erick Johnson, the mine superintendent, says in his report: "I could not venture a guess on the ultimate production of the Independence; the conditions are unique; we have been quite successful in reworking the caved ground, though we seldom had over a week's ore supply in sight at any one time.

"The mine, however, is in better condition today, looks better, and has more ore exposed than at any time since November, 1908. Therefore, I believe we will at least do as well in the way of output as we did during the previous year."

The Hocking Scandal

The *Wall Street Journal* says: Defenders of speculation in Columbus & Hocking Coal and Iron have failed to offer any excuse which does not amount to what the lawyers call a plea of confession and avoidance. The objectionable character of the speculation is admitted, but it is contended that it is in some way excused by some prospective value in the property which will ultimately justify the price at which it was selling.

This plea makes the whole matter only more suspicious. Here is the stock of a land company which has been through one bankruptcy, which has never paid any dividend, and has been kicking about the floor for over a quarter of a century, which is suddenly found to have great prospective value. This is conceivable, but when the discovery of oil, natural gas, brick-making clay and pitchblende is coincident with an advance of the stock by an expert manipulator, the intelligent investor will be hard to convince.

If stories of the increase in value contained any truth, it would have been to the interest of those who control the property to have kept the price as low as possible for as long as possible. There would have been no necessity for paying Mr. Keene a large sum to manipulate an advance in the stock.

Some investigation was made by the Stock Exchange last year, with the result that the pool seems to have been given a clean bill of health. The governing committee consists far too largely of the floor-trading and specialist element, with utterly inadequate representation of the commission houses who bring the legitimate business into the market. Plenty of floor specialists even now see nothing to excite public criticism in the movement of the stock. That element does not believe in reforming the methods of the Exchange, and may be said to have been responsible for the utter failure to act upon the recommendations of the Hughes commission.

It is simply a question of whether the Stock Exchange will deal with its members before and not after the offense. That is the only alternative to direct interference from Albany, the ultimate cost of which no man can estimate.

Recent Developments on Iron Hill, Leadville

Evidence that Ascending Solutions Permeating Cambrian Quartzite Played Important Part in Formation of Ore in Silurian Limestone

BY GEORGE O. ARGALL*

Iron hill, situated about two miles east the city of Leadville, was the scene of eat mining activity in the early history the camp. The most extensive leadrbonate ore deposits of the entire disct were mined here. It is still a region great interest, as the mining operations nducted during the last few years are particular economic importance in that ey have served to prove the existence extensive sulphide orebodies in the lurian limestone, and the presence of e-bearing fissures and bedded deposits the Cambrian quartzite. Mining delopments having thus penetrated the wer sedimentaries have established the ct that the important oreshoots are not strictly confined to the upper beds of e Carboniferous limestone as was orinally supposed.

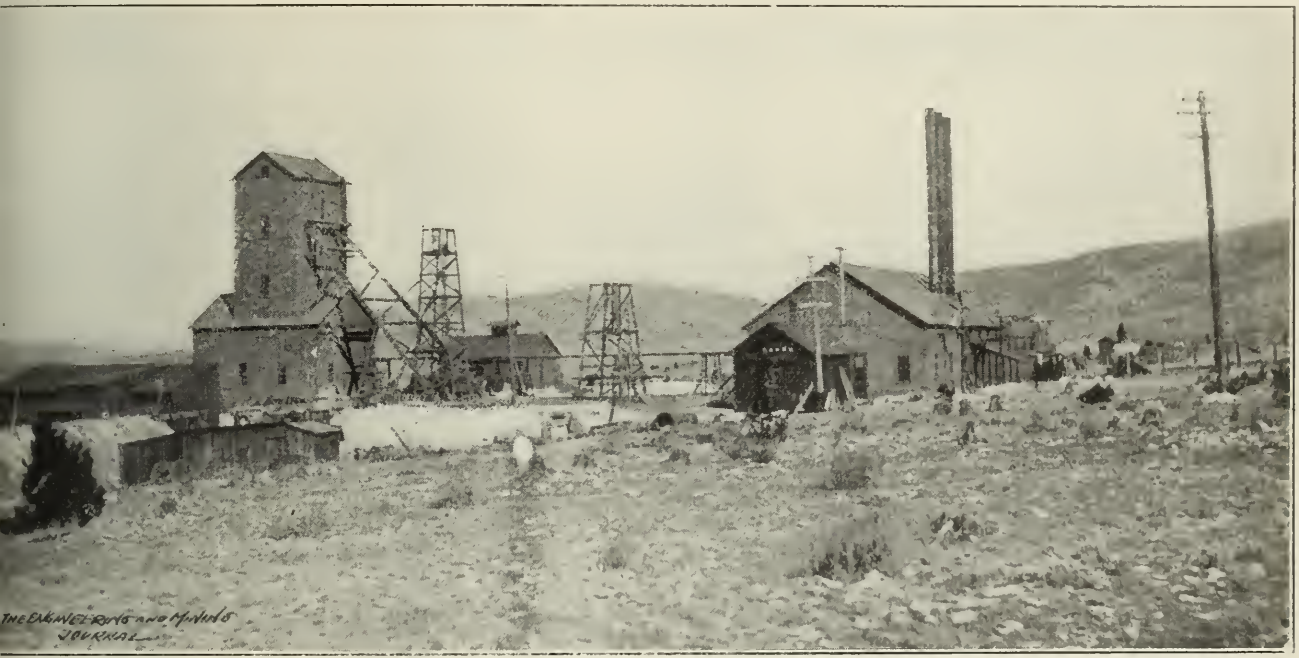


FIG. 1. TUCSON SHAFT OF THE IRON SILVER MINING COMPANY, LEADVILLE

GENERAL GEOLOGY

S. F. Emmons in his excellent monoaph on the "Geology and Mining Inistry of Leadville," so accurately deied the geological structure of Iron hill, at after more than 23 years of developent it stands the test in general and s proved of the highest possible utility those engaged in mining in this disct.

The general geological conditions of Iron hill, as first determined by Mr. Emmons, may be briefly summarized as follows: Commencing with the fundamental Archean granite, of unknown thickness, there rests directly upon it the Cambrian quartzite, showing an average thickness of 125 ft. Next in ascending order occurs 160 ft. of Silurian white limestone separated from the overlying Carboniferous blue limestone by a persistent stratum of quartzite from 15 to 20 ft. thick, known as the parting quartzite. The blue limestone has an average thickness of 200 ft. and has been the most prolific ore-bearing formation of the Leadville district. Immediately overlying the blue limestone is the white porphyry, of varying thickness up to 600 ft., capping the ore measures and forming the summit of Iron hill. Cutting through the sedimentaries in the form of dikes and spreading out along contact planes or between the bedding planes of the limestone, in sheets of varying thickness, are found the eruptive quartz-monzonite porphyries, locally termed gray porphyry, in the vicinity of which the most important orebodies are often found.

HISTORY

During the earlier years of lode mining in the Leadville district, from 1877 to 1890, Iron hill was a constant and heavy producer of carbonate ores. The ore occurred in extensive irregular shoots along the contact plane between the white porphyry and blue limestone, at various points pitching down into the body of the limestone to varying depths forming channels, which gradually pinched out in depth, or, as in some cases, spreading out into extensive bodies at a lower horizon. These deposits were found almost entirely within the oxidized zone and consisted mainly of argentiferous lead carbonate together with occasional unaltered nodules of galena, the gangue being composed of hydrated oxides of iron and manganese, with silica and clay. At times this gangue was so enriched by silver minerals as to form a valuable product. Sometimes the richest ores were of this nature and contained large amounts of silver chloride and native silver, particularly in depressions in the limestone, the "pot-holes" of the miners. The oreshoots outcropping on the western slope of Iron hill followed the limestone on its easterly dip at an angle of about 12 deg., the strike being north 40 deg. east. The underground workings of the Iron Silver Mining Company, known as the Iron mine, were the most extensive of any in the district during this period. This company opened its property and extracted its ores through inclined shafts, which, following the ore on its dip, developed shoots exceeding 1500 ft. in length. Subsequently the Tucson shaft, situated at the summit of Iron hill 1200 ft. east of the outcrop, cut the blue limestone at a depth of 350 ft. below the surface. The workings from this shaft developed some isolated bodies of carbonate ores on the first contact; these were soon worked out and as the known oreshoots in the carbonate horizon of the iron mine proper were practically exhausted, the company discontinued operations in 1889 and placed the mine on a leasing basis.

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*General manager, Iron Silver Mining mpany, Leadville, Colo.

RECENT DEVELOPMENTS

In 1903, the Iron Silver Mining Company decided to put down a series of diamond-drill holes from the carbonate workings of the Tucson mine in order to test the lower horizons, which it was thought might prove to be ore bearing. The result of this work disclosed the existence of bodies of mixed sulphide ores in the Silurian limestone, showing an average thickness of 30 ft. At a depth of 880 ft. below the surface, ore was cut in four drill holes separated by wide intervals. It is interesting to note that the samples taken from borings, while the drill was passing through the ore, gave low assay returns, in fact, none of the samples represented pay ore. Inasmuch as the holes before cutting the ore had passed through soft ground, which had given considerable trouble by caving around the rods, it was assumed that the samples had become vitiated by small particles of waste rock washed up from the sides of the hole, together with the cuttings from the bottom. Such subsequently proved correct, as the company decided it was warranted in further exploiting orebodies of the magnitude disclosed by the drill holes; consequently the old Tucson shaft, a two-compartment one reaching a total depth of 600 ft. from surface, was enlarged to a three-compartment shaft; a modern mine plant erected at the collar and sinking continued to a depth of 1060 ft., at which point the shaft had penetrated 50 ft. into the Cambrian quartzite. At a depth of 850 ft. from surface the shaft passed into pay ore and continued therein for a distance of 55 ft. As the ore pitched rapidly to the east, the shaft was carried down 100 ft. below the ore before stations were cut and levels extended to develop the pay shoot.

FAULTS

Iron hill is bounded on the western side by the Iron fault, striking a little east of north and having an average dip of 50 deg. to the west. This is a normal step fault with a downthrow of 800 ft. to the west, or hanging-wall side. The eastern slope of the hill is limited by the Mike fault which is likewise normal, with the upthrow to the east. Within the area between the Mike and Iron faults the deep workings from the Tucson shaft have recently disclosed a well defined fault which strikes north 40 deg. west, and at the lowest point developed has a dip of 45 deg. to the east. As it passes up through the formations, it rapidly flattens out to the westward and finally dissipates itself in the bedding planes of the upper sedimentaries. The eastern or hanging-wall side, has been thrust up along the fault a distance of 360 ft., equivalent to a vertical displacement of 200 ft. This fault is now known as the Tucson (Figs. 2 and 1), and is of particular importance as it cuts through the longitudinal ax of the main oreshoot displacing the eas ern edge of the orebody. The furth relation of this fault to the ore deposi will be described later.

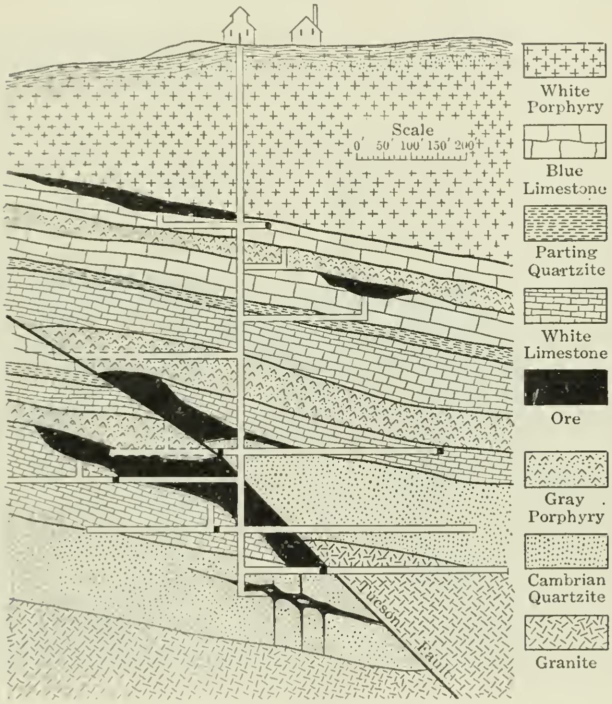
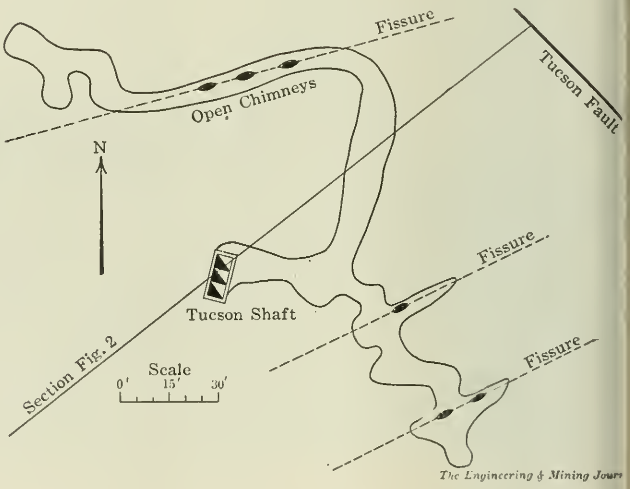


FIG. 2. SECTION THROUGH TUCSON SHAFT



The Engineering & Mining Jour

FIG. 3. ORESHOOT AND FISSURES IN CAMBRIAN QUARTZITE

PORPHYRY DIKES AND CONTIGUOUS O DEPOSITS

Numerous dikes and sheets of coarse-grained quartz-monzonite po phyry are found cutting through spreading out into the sedimentary fo mations of Iron hill. The porphyry w formed at great depth and has been i truded into the sedimentaries under i tense pressure, though these igneo masses have not succeeded anywhere breaking through to the surface of t hill. The porphyry is a greenish gr and is commonly referred to througho the district as gray porphyry. The dik vary greatly in width, showing a min mum of 18 in. and a maximum widt of 260 ft. as penetrated by the mi workings. They usually continue in con paratively straight directions but in few cases sharp angular bends have bee noted. As a general rule the dikes c sharply through the sedimentary strat Instances are seen where the strata ha been strongly tilted up along the edge the intrusion, and in some cases the a jacent limestone shows the effect shearing strains. The gray porphyr masses have undoubtedly been intrude previous to the formation of the ore, a in most cases before the movement whi produced the faults.

Some important orebodies have bee formed along the contact of these dik with the limestone, the ore having bee deposited in the limestone by a proce eplacement. The ore does not extend the mass of porphyry. The close ciation of the gray porphyry intrus with certain ore deposits points to evident conclusion that they were an ortant factor in determining the posi- of these orebodies. It may even be med that these intrusions have establd channels by means of which the bearing solutions gained access to the stone. The porphyry masses were ded into the sedimentary strata in a e of hydrothermal fusion, and in coolit may be assumed the porphyry conted and shrank away from the ining rock, leaving more or less open es now represented by decomposed hyry in and adjacent to the upper stone deposits. In the lower beds of white limestone, a thin but very pernt vein-like streak of sulphides on dike wall connects, in many cases, large overlying orebodies (Fig. 6). s it would appear that ore-bearing tions from some deep-seated source entered the shrinkage spaces along the sides of the porphyry dikes, and ascending along them finally reached the limestone in which they deposited their burdens.

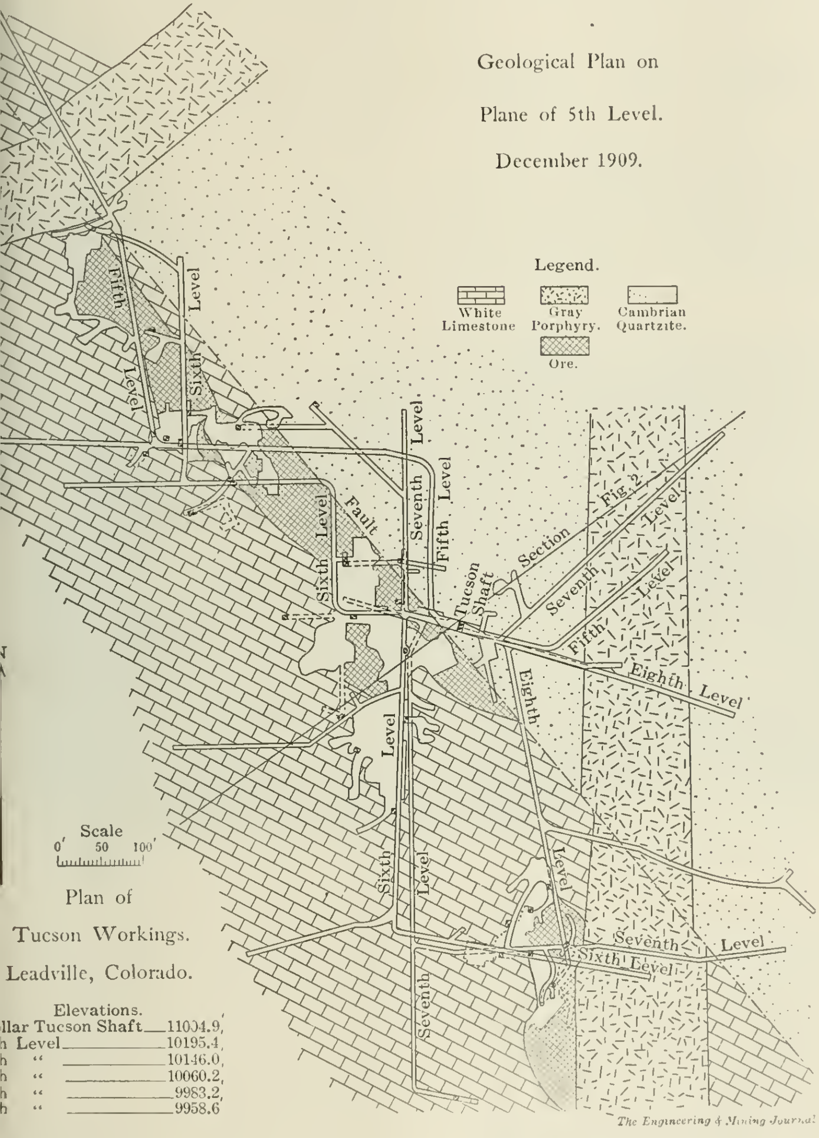


Fig. 4. Geological Plan of Fifth Level, and Workings from Tucson Shaft

The large deposits are sometimes contained in the limestone in localities where it was sheared and shattered by a porphyry intrusion affording cracks and joints through which the solutions were able to percolate and react on the limestone. Frequently the orebodies are immediately under a porphyry sheet or offshoot forced out along a bedding plane in the limestone from some neighboring eruptive dike. Solutions ascending along the dike would be halted by the comparatively impervious barrier presented by these sheets, and forced to spread out laterally in the opened bedding planes and might readily deposit their mineral contents in the underlying limestone. Fig. 6 shows in cross section a contact deposit disclosed in the mine workings of the Tucson shaft. The ore on the dike is a massive, dense, exceedingly fine-grained sphalerite with a steel-like fracture. It is evident from the thickness of the ore that many of the planes in the thin-bedded Silurian limestone are entirely obliterated while those that do exist are much altered. This dike deposit has sharp-cut boundaries in the limestone, the ore ending almost as abruptly as if it had filled an open cavity. This orebody differs so much from the main oreshoot in the Silurian limestone (hereinafter described) as almost to suggest a different paragenesis. Both deposits occur in the same thin-bedded limestone formation, the only other apparent physical difference being that adjoining the dike deposit the limestone is metamorphosed and in part strongly marbleized, indicating a possible hydatogenic origin for this particular deposit.

Ore Deposits

The ore deposits contained in the lower sedimentaries may be classified into two groups according to their mode of occurrence: Those which have been deposited as incrustations lining preëxisting cavities and fissures in the Cambrian quartzite, and those which occur as replacement deposits in the Silurian limestone. The largest orebodies, and so far the most important commercially, belong to the second class. The deposits of the first class are of great geological interest since they are found directly beneath the replacement orebodies with which they are apparently connected by means of chimneys or pipes.

Ore-bearing Fissures in Quartzite

The Cambrian quartzite in the vicinity of the Tucson shaft is shattered by a series of vertical fractures striking approximately northeast and southwest (Fig. 3). Along these fractures occur open cavities of varying dimensions from oval-shaped conduits a few inches wide to channels 10 ft. wide and 4 ft. high along the strike of the quartzite beds. Incrustations of ore, from a few inches up to 2 ft. in thickness completely line these openings, but where the large cavities occur, the roof ore is often found on the floor with fragments of the quartzite roof caved down upon it, see Fig. 8. This occurs on account of the inclosing quartzite being in part disintegrated through the removal of the cementing material, leaving a loose sand-like rock to which the ore is attached.

It would appear from the thickness of the mud deposited on this caved ore and quartzite, often 10 in. in depth, that the collapse of the roof is not by any means a recent occurrence. Furthermore, this brown mud deposit might indicate the downward circulation of meteoric waters from the Silurian-limestone ore deposits immediately above. The longest distance so far opened in a vertical fissure in the quartzite is 80 ft.; this fissure shows three chimneys, the largest 3 ft. by 1½ ft., standing vertical and lined with the same minerals. The openings in the fissures vary from a width of 18 in. down to a mere film or incipient fissure often difficult to follow. Cross fissures also occur carrying the same mineralization, while open joints in the rock are often coated with pyrite or blende.

The ore occurs in the fissures and cavities mainly as a crusted structure with a regular succession of mineralogically different layers, as follows: Argentiferous sphalerite, pyrite, galena and chalcopyrite. The sphalerite and galena are found throughout the entire length of the fissures, while the pyrite and chalcopyrite occur only at infrequent intervals. At points where these cavities take a sudden pitch downward and where "potholes" or other irregularities occur in the floor, pockets of a rich silver-sulphide mineral are found.

The quartzite often shows a honeycomb structure where the channels split up into numerous small cavities, usually along a bedding plane. The cavities are always lined with ore. Invariably a small seam of ore connects one cavity with another and on being followed, in the ordinary course of mining, these seams eventually lead into a large single cavity where the ore has been deposited in much thicker layers.

Fig. 5 is from a photograph of a thin section of the crusted ore structure, a close study of which shows that the cementing silica is removed in greater part near the zone of mineralization, leaving the quartzite quite porous, similar to a soft sandstone. Some fine galena and blende crystals have been deposited in the interstitial spaces in the altered quartzite. The order of mineral deposition is as follows:

(1) Fine galena with a little blende and pyrite on the quartzite about 1/16 in. thick.

(2) Blende and pyrite with occasional spangles of galena, a very distinct crust about ¼ in. thick with a rough crystalline outer surface on which the next layer was deposited, mostly in cavities between crystals.

(3) Chalcopyrite in irregular crystals, but not as a continuous layer.

(4) Massive crystals of galena about one inch thick, sometimes coated with a film of rich silver sulphide.

The high-grade ore from these fissures after being carefully sorted contains 14 oz. gold, 4000 oz. silver and 45 per cent. lead. This is sacked and shipped to the smeltery. The remaining ore contains 0.3 oz. gold; 140 oz. silver; 15 per cent. lead; 25 per cent. sulphur; 17 per cent. silica and 35 per cent. zinc. This is shipped to the zinc smelteries, where the zinc is recovered and the residue carrying the lead and precious metals receives final treatment in the blast furnaces. The last round of holes drilled in the sump of the Tucson shaft, 50 ft. down in the Cambrian quartzite, cut this ore, and so much water, that it was deemed advisable to plug the holes until the station was completed on the level above and the electric pump started up. As the drillings showed some ore, the holes were then blasted revealing a 10-in. seam of galena, blende and pyrite conforming to the dip of the quartzite. Further work opened up the complex of fissures, chimneys and caves above described from which over $30,000 worth of ore was taken out.

Replacement Deposits in Limestone

Immediately above the quartzite deposit just described, the overlying limestone contains a wide, flat oreshoot conforming to the stratification of the limestone and trending north 40 deg. west, in which direction it has been opened up for a length of 950 ft. showing an average width of 65 ft. and a thickness of 20 ft., see Fig. 6. This deposit was formed by metasomatic replacement of the limestone by circulating mineral solutions, which might well have ascended through the channels and cavities afforded by the quartzite fissures, finally depositing their contents in the more soluble limestone formation. The oreshoot is capped by a sheet of gray porphyry which probably served to arrest and hold back the ascending solutions, causing them to spread out laterally and deposit their contents in the underlying limestone.

The white limestone in which this orebody is contained is a compact thin-bedded formation. The beds are separated by layers of clay selvage often an inch or more in thickness. The original structure of the rock formation is distinctly preserved in the orebody, as the clay seams have not been replaced by the ore-bearing solutions. Owing to the impure nature of the lower limestone it has not been thoroughly replaced, and as a result "horses" of country rock are often encountered. The edges of the shoot are extremely ragged and irregular differing in this respect from the well defined orebodies occurring in the beds of the blue limestone above. There is no sharp line of demarcation between the ore and surrounding limestone.

Frequently a layer of ore, replacing the original limestone bed, will extend farther into the formation than the layers immediately above or below it. This depends upon the porosity of the rock and the strength of the circulating solutions which were prevented from percolating through the adjacent limestone beds by the impervious layers of clay between the bedding planes. At points where the limestone beds were broken by joint planes, the solutions often left the stratum in which they were circulating and passed up along the joint plane and finally spread out along a higher bed in the series and there continued their process of replacement, Fig. 7. The principal minerals are sphalerite, pyrite, galena and chacopyrite, carrying a small amount of silver; they occur in the order given. The gangue is composed chiefly of silica and clay.

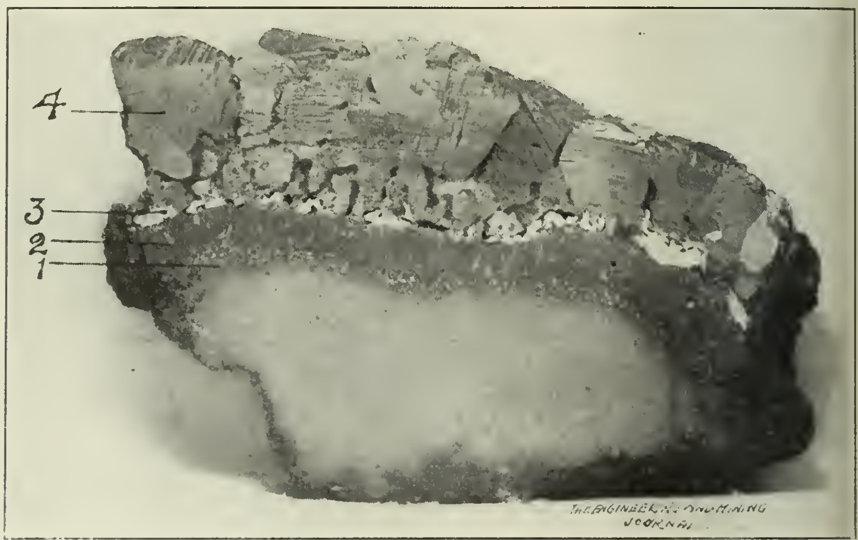


Fig. 5. Section Showing Crusted Ore Structure

The minerals vary greatly in different parts of the shoot and as a result, it is necessary to mine three different varieties of ore, viz: zinc-lead sulphides, zinc sulphides, and copper sulphides. As a general rule the zinc-lead sulphides predominate in the lower layers of the orebody. The lead content diminishes rapidly toward the top until the upper layers contain more zinc and iron pyrites. The top ore is mined solely for its zinc. Where the galena is present in the ore it does not form a homogeneous mixture with the other sulphides, but occurs in a series of thin, distinct layers parallel to the bedding which gives the ore a laminated structure. The miners call it "corduroy ore."

The copper sulphides form but a small roportion of the deposit, and are in the nmediate vicinity of the Tucson fault. 'he zinc ore is often impregnated with halcopyrite and chalcocite for a short istance surrounding water courses. This ondition would seem to point to a secndary origin for the copper ores, the upreous solution entering the orebody rom the Tucson fault. The eastern edge f this oreshoot was intersected and hrust upward on the Tucson fault as is videnced by the appearance of the ore nd limestone beds as they approach the ault plane and the further presence of he Cambrian quartzite on the eastern r hanging-wall side of the fault as preiously described and shown in Fig. 2.

Secondary Enrichment

Rich secondary ores have been found n the oreshoot, always in close proxnity to the Tucson fault and rarely exending far into the body of primary ies. These enriched ores consist of a oncentration of rich silver and copper ulphides formed by reactions between he primary ores and later circulating olutions. The fault plane has evidently een the medium along which solutions ave migrated leaching out minerals in ne portion of the orebody and carrying hem in solution to finally reprecipitate hem at the points where the zones of nrichment are found.

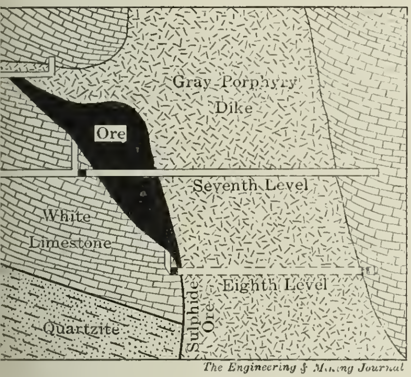


Fig. 6. Section Showing Contact Deposit

The largest body of enriched ore so ar encountered produced 1250 tons of opper-silver ore. The richest ore was ound close to the fault, but as the stopng operations receded from the fault and assed into the body of the main oreshoot, the silver and copper content iminished rapidly. The unaltered ore vas encountered at a distance of 30 ft. rom the fault and consisted of mixed inc and lead sulphides containing little ilver and no copper. The copper exists n the enriched zone in the form of black ulphides and chalcopyrite, while the ilver is present as sulphide.

The rich matte-like ore, a sort of steelgrained, argentiferous galena, rich in old and forming the last film deposited on the laminated ores in the Cambrian quartzite, is no doubt secondary and I believe of comparatively recent formation. I have found depressions in the floor of the ore channels, in the quartzite, filled with this rich ore. It also occurs as an impregnation of the sand underneath the ore, but everywhere shows up as the latest mineral. In places, the bottom of the caves underlying the crusted ore contain 3 to 6 in. of quartz sand resulting from the removal of the silicious cement from the quartzite, thus allowing that rock to pass back again to a sandstone, or loose sand. These sands are invariably enriched and are mined and shipped as silicious ores.

Genesis of the Ore

In Doctor Emmons' preliminary publication issued immediately after the close of the field work in 1887 he stated with regard to the origin of the deposits:

(1) That they have been derived from aqueous solution.

(2) That this solution came from above.

(3) That they derived their metallic contents from the neighboring eruptive rocks.

This summary of Doctor Emmons' views was made more explicit in his monograph[1] on the Leadville deposits, viz: "With regard to the immediate source from which the minerals forming these deposits were derived, the following conclusions have been arrived at;

(1) That they came from above.

(2) That they were derived, mainly, from the neighboring eruptive rocks.

"By these statements it is not intended to deny the possibility that the metals may have originally come from great depths, nor to maintain that they were necessarily derived entirely from eruptive rocks at present in immediate contact with the deposit."

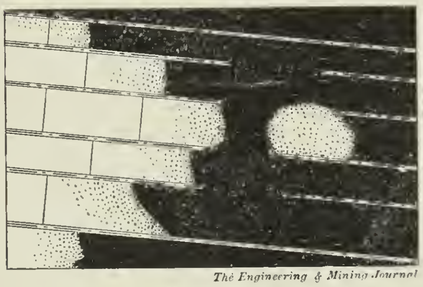


Fig. 7. Edge of Oreshoot in Silurian Limestone

That these views did not meet with unanimous acceptance by the mining engineers conversant with Leadville ore deposits, is well known. Furthermore the explanations, qualifications and apparent restrictions of the original views in later publications has not rendered them entirely acceptable to those engaged in present-day mining in Leadville; more particularly the statement, "the solutions came from above."

I will not discuss in this paper the various theories of ore genesis. My intention is merely to apply to some of them the facts gathered in four years' active experience on Iron hill, particularly in the development of the white limestone and Cambrian quartzite with diamond drill and mine workings. I wish it distinctly understood that the fissures in the quartzite have not been connected by mine workings with the granite below or the ore deposits in the Silurian limestone above. But the fact is that when the fissures were intersected at a depth of 50 ft. in the Cambrian quartzite, the overlying deposits were immediately drained and have been quite dry ever since. This fairly establishes a connection between the quartzite fissure complex and the ore in the Silurian limestone. The water now entering the workings in the quartzite rises in the fissure system. The Tucson fault, the main drainage channel of the mine, is only 50 ft. from the lowest working and is comparatively dry, proving that there is no water channel connecting the fissures in the quartzite with the Tucson fault, and establishing at this time an upward flow in the fissures.

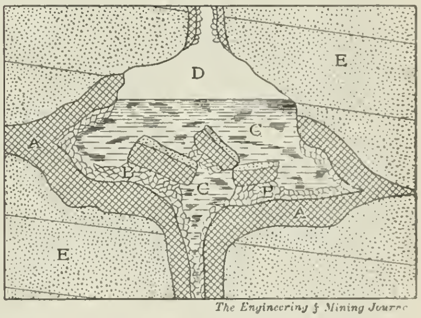


Fig. 8. Cavities in Cambrian Quartzite

A, pyrite and blende; B, galena; C, mud deposit; D, open cavity; E, quartzites.

I have previously shown what I take to be a secondary deposition of copper in the lower limestone ores introduced along the Tucson fault plane. There is no evidence, however, that this fault has either served to deposit or to enrich ores in the quartzite. The source of the encrusted ores in the quartzite is thus intimately connected with the Silurian-limestone ore deposits and is either primary or secondary. The rich gold, silver and lead ore in the circulating channels and in some of the "pot-holes" is I believe secondary, and comes from above together with the brown mud now partially filling the large cavities, as shown in Fig. 8. The crusted ores deposited in preexisting cavities, in the order previously shown has, I believe, a different origin. The cavities, caves and water courses in the quartzite could readily be formed by the action of hot alkaline waters ascending from the underlying granites and eruptives. Similar action is now in progress at the Hot springs in Gunnison county, Colo. If these crusted ores are wholly of secondary origin, it would not only be difficult to account for the formation of the cavities, but also the order of mineral deposition in the crusted deposits. I am, therefore, led to the conclusion that the crusted ores are primary, except as noted—and that the fissure complex served as feeders through which ore-bearing solutions ascended to form, wholly or in part, the ore deposits in at least the Silurian limestone, if not in the Carboniferous limestone itself. So far as I know these are the first ore-bearing fissures discovered in Leadville, carrying ore in vein-like form from some underlying source into the great deposits in the limestone. I have, however, to the best of my ability, given the facts as they appear to me, so that those of greater experience and wider knowledge in the genesis of ore deposits may have the data necessary to reach a correct conclusion on this very interesting occurrence.

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[1] "The Downtown District of Leadville, Colo." *Bull.* No. 320 U. S. Geol. Surv., pp. 60-61.

Conclusions

The facts described above would seem to lead to the following conclusions:

(1) The mineral contents of even the limestone deposits of Leadville are so diversified that no one theory or source of ore deposition will cover them. The fact that one oreshoot may carry gold in paying quantity and a parallel shoot scarcely a trace, that one hill may contain silicious gold ores and another gold-free iron, is in itself significant. The deposits of copper, bismuth and other minerals cannot be wholly due to secondary causes.

(2) The pay shoots in the limestone are so intimately associated with intrusive dikes and sheets of gray porphyry as to suggest a genetic relation, particularly when the dike walls are decomposed, softened and mineralized, indicating possible vents for gases or channels for circulating waters. Near such places the limestones often carry large orebodies. Furthermore, ore has been found on dike walls in every Leadville formation from the white porphyry to the granite, while today one mine is producing ore from a fault dike in the Archean granite.

(3) The recent Tucson development in the lower quartzite shows that ascending solutions permeating the Cambrian quartzite have also played an important part in the formation of orebodies in the white limestone of Iron hill.

Shipments of chrome-iron ore are being made from the Rhodesian mines via Beira to iron works in America, France, Germany (the Krupps), Holland and Belgium as well as to British ports.

Operations of French Companies

Special Correspondence

The Chamber of Deputies has reduced the duty on aluminum from 1.5 fr. per kg. to 75 centimes general tariff and 50 centimes minimum tariff.

For the first 10 months of 1909 the lead production of Balia-Karaidin (Turkish Asia) was 9876 tons as against 9870 tons for the same period in 1908. The zinc-ore output was only 366 tons against 2060 tons in 1908, the hoisting having ceased last March. The extraction will enter a new phase at the beginning of 1910, as a new shaft at Ary will soon be in working order. Moreover, the new magnetic plant, which will also be in operation soon, will permit the treatment of the blende, which has lately been neglected.

The new method of sinking by cementing, which has been so successful particularly at St. Pierremont, is being applied at St. Ovold. The Société Internationale de Charbonnages has let a contract for this work, and 24 bore holes have been put down.

During the first six months of 1909 the district of Pas de Calais produced 9,338,757 tons of coal, the output of 95 shafts, against 8,928,431 tons during the first six months of 1908; an increase of 417,806 tons. The principal producers are the mines of Lens with 1,680,055 tons from 16 shafts; Bruay, 1,281,432 tons from 8 shafts; Courrières with 1,189,848 tons from 10 shafts, and Béthune, 1,006,110 tons from 11 shafts. The northern coal basin, with its 46 shafts, had an output of 3,488,673 tons of coal, showing an increase of 86,089, comparing this output with the corresponding period of 1908. The Miñes d' Anzin, of this district, is the principal French coal producer, with an output of 1,681,489 tons from 20 shafts as against 1,680, 820 tons for the corresponding period in 1908.

The districts of Pas de Calais and of the north together produced 918,813 tons of coke and 722,414 tons of briquets as against 900,824 and 632,365 tons, respectively in the first six months of 1908. The districts of Aubin and of Carmaux, second in importance, produced 457,099 tons and 423,950 tons, respectively, against 481,996 and 406,460 tons.

A syndicate proposes to work the iron mines of the Haute-Deule, a concession granted at the end of 1907, situated on the communes of Wavrin, Sainghin-en-Weppes and Annœulin. A deposit of iron carbonate containing 42 units of iron and 2 of manganese is said to exist here. The deposit is estimated at 10,000,000 tons. The estimated working cost is 11.35 fr. per ton.

The shaft at Wittelsheim, owned by the Gewerschaft Amile (Société Alsacienne pour l'Extraction de la Potasse) has struck the first layer of salt of potassium at a depth of 640 m. It is believed that working will soon begin.

A Primer for Suckers

On Nov. 30, 1909, J. Walter Labaree and George W. Emanuel were sentenced to prison, the former for 2½ years and the latter for 1¼ years, for swindling in connection with the stock of the Dos Estrellas Mines and Development Company of Mexico. Operating as George W. Emanuel & Co., they realized over $150,000 from suckers. They were convicted of using the mails to defraud. They had represented that the company owned valuable property, but the Government proved that the alleged mines were simply holes in the ground.

Wallace D. Hopkins was found guilty in Chicago, Dec. 4, of using the mails to defraud in connection with an effort to float the Consolidated Zinc Company a few years ago and on Dec. 13, 1909, was sentenced to 4¼ years and fined $1500. This company was exposed by the Joplin *Globe* and by the Journal.

The stockholders of the Orphan Copper Company are now trying to find out where that concern stands. The absence of merit in this enterprise was exposed by the Journal when it was brought out, and shortly afterward the stock was ruled off from the list of the New York curb market. Cardenio F. King, who was engaged in the market operations, is now serving a term in prison.

Mrs. W. W. Wheeler, a clairvoyant, who was convicted of having obtained money under false pretences by telling patrons they would make fortunes by investing in South Dakota and Nevada gold mines, was sentenced in court in Denver on Nov. 27, 1909, to six years in the penitentiary.

Charles Wesley McCrossan, formerly a Baptist preacher in Los Angeles, convicted of making false representations in the prospectus of a mining company of which he was president, was sentenced in Los Angeles, Dec. 21, 1909, to pay a fine of $4000 or to serve one year in jail. McCrossan said he would pay the fine.

Exploitation of a $40,000,000 railway project in Chile has failed owing to disappearance of its promoter, known as James Jeffrey Williams, following disclosure that he is Harry Silverberg, a well known crook. He had secured a concession from the president of Chile and had enlisted financial support of well known Englishmen.

Careful experiments extending over a period of months has definitely proved that the Kafirs can do more work, man for man, with the hammer type of air drills than can white laborers. The test was to decide if it is economically possible to use Europeans in the mines.

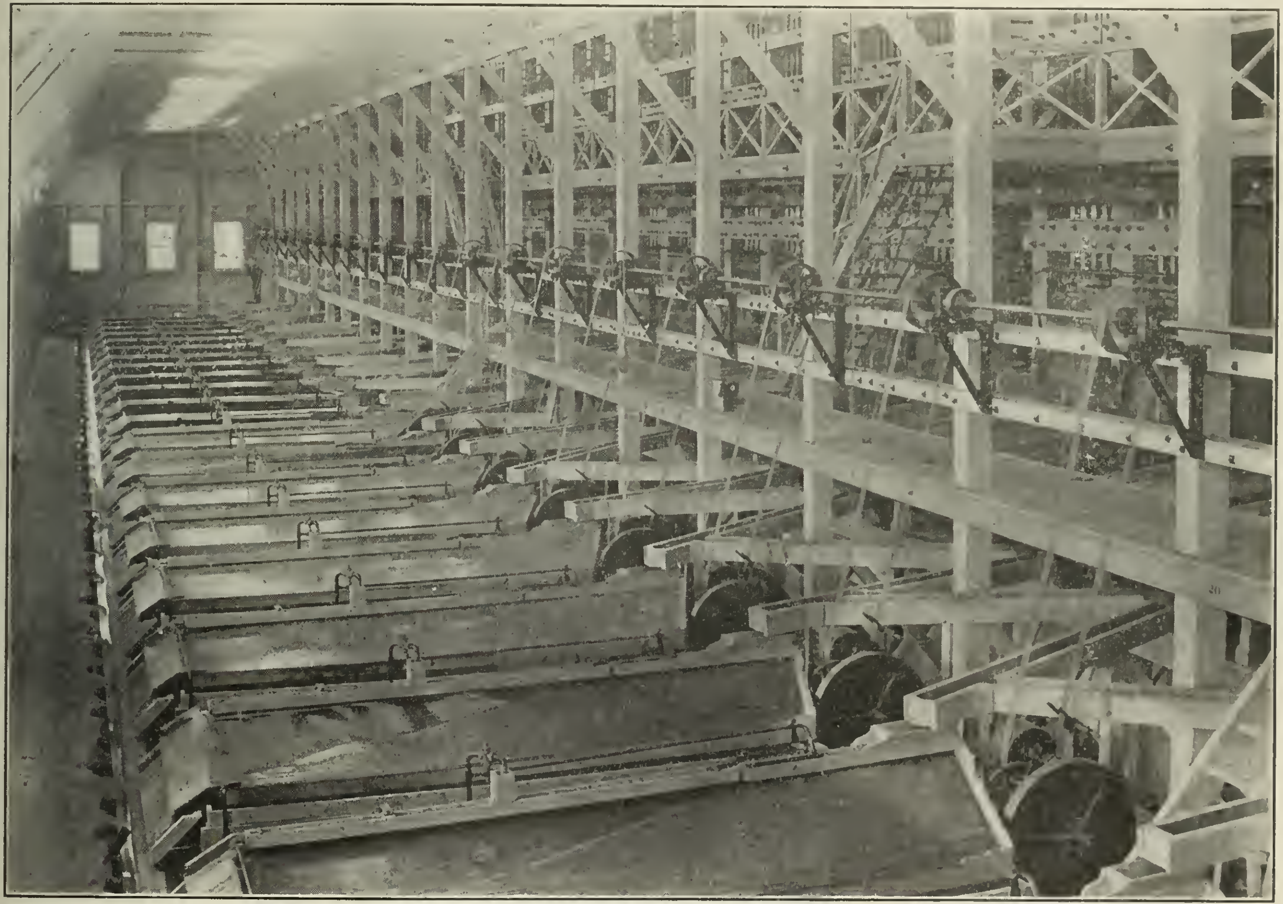
Analysis of Mine and Mill Practice on the Rand—II

No Machine Yet Found to Replace Stamps; Ventilation and Supervision Improved; Central Power Plants; Deep Mining Found to Be Feasible

BY E. M. WESTON*

In addition to the changes in milling ractice described in the preceding art- cle, several other metallurgical improve- nents are being experimented with or ave been partially adopted on the Rand. Mr. Salkinson, on the Witwatersrand Deep, successfully employed the waste eat of exhaust steam from winding engines to heat cyanide solutions for the limes plant, thereby greatly increasing he capacity of the plant and extraction wing to more rapid slimes settlement. he Adair-Usher process has continued o hold its own despite unfavorable riticism from high quarters and has also een adopted by numerous outside mines. he Stark process, of which so much was eard a couple of years ago and by hich it was hoped to retreat all the Rand tailings heaps, proved an economic ailure except on a few mines where the onditions were favorable.

Ridgway filters were tried at Randfontein but could not compete with the standard decantation process for treating slimes. No metallurgist appears convinced that the all-sliming process is as yet economically profitable. At any rate I am aware of no new plants being designed to carry out the policy to its fullest extent, the extra number of tube mills to be installed in the City Deep mill being obviously intended to facilitate the use of coarse screens in the stamper boxes.



CONCENTRATORS AND CONVEYER FOR REMOVING CONCENTRATES, CASON BATTERY, EAST RAND PROPRIETARY

STAMP MILLS STILL STANDARD CRUSHING UNIT

One hears nothing today of the opinions expressed a few years ago that the gravity stamp would become a unit of little or no importance in the crushing of rock, and that its place might be taken by a series of rock breakers followed by chilean mills. Engineers here seem to be of the opinion that the installation of secondary breakers to reduce the ore before entering the stamps to half- or three-quarter-inch size is unnecessary. In the Simmer Deep mill the ore is broken to 1¾-in. cubes and reduced to pass a 500-mesh screen, aperture 0.033 in., in one operation.

Recent experiments carried on by the engineers of the Consolidated goldfields have gone to show that the economic limit of the stamp mill as a crusher lies between 1¾-in. cubes and 9-mesh screening, and that the duty of a 1400-lb. stamp between these limits is 15 tons per 24 hours. A new type of stamp is being experimented with, having a very long head with shorter stem working in open-fronted mortar boxes.

Engineers are not increasing the crushing area of the shoe in anything like the proportion of increase of weight of stamp, evidently believing that the falling weight per square inch of striking area has not yet reached its economic limit.

The Holman pneumatic stamp is the only competitor of the gravity stamp on the Rand today. The Mines Trials Committee, an inter-group committee intrusted with the task of experimenting with and testing any promising metallurgical or mining device, is running one on the Kleinfontein mine at present. One stamp is crushing 80 tons per day and its total cost of installation is said to be half that of ten heads of gravity stamps. It is said that several will be installed as an experiment in a new mill shortly to be erected on the East Rand.

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*Mining engineer, 20 St. Mary's building, ohannesburg, South Africa.

Remarkable increase of efficiency in tube mills is reported by Hamilton's use of a slightly diagonal axis: with an elevation of 10 per cent. it is stated that 30 per cent. increase of efficiency has been gained with 64 per cent. passing a 90-mesh screen.

UNDERGROUND HAULAGE

Underground mechanical haulage is being introduced into the East Rand Proprietary mine, and electric haulage will be introduced in the Geduld and other mines of the far East Rand where the grade of the reefs is from 5 to 15 per cent.

The shaking-tray conveyer and plain chute laid on the footwall of stopes continue to be largely employed, and in some cases water is used to assist in moving rock along such chutes. Self-acting aèrial trams are still used in large stopes. The Wager-Bradford system of elevated monorail trucks has not been largely adopted as difficulties met with in supporting the line have offset advantages due to decreased friction.

MINE VENTILATION

Real attention has been given to the question of ventilation, it having been at last realized that both white and colored miners have been called upon to labor under unfair conditions leading to a too large mortality among both and preventing efficient work. Many parts of even the best ventilated mines are at times unfit for men to exist in. Mechanical ventilation has been installed in the East Rand Proprietary mines and an official appointed to look after this department; it has already been discovered (though the initial cost was £20,000) that the scheme pays.

Many of the deeper mines are realizing that something of this sort must be done. Where possible, ventilation is improved by making connection with outcrop mines; but where these mines are working the miners naturally object to having to breathe the waste gases from a large mine below them. For the ventilation of some of the large deeps on the central Rand it is probable that a central upcast shaft, fitted with a suction fan, will be provided.

GASES FROM EXPLOSIVES

In connection with the Chemical, Metallurgical and Mining Society a great deal of work has been done by W. Cullen, H. Heyman, Doctors Weiskopf, Moir and others in the investigation of mine gases and the products of explosion of gelignite and blasting gelatin. Some surprising results have been attained; it has been found that even the best grades of gelignite and blasting gelatin produce under working conditions a much larger proportion of deadly carbon monoxide than had been realized before, and that the partial combustion of fuse and wrapper added to these amounts.

STEEL HEADFRAME, CITY DEEP MINE

W. Cullen showed that the gases after an ordinary blast in a drift contained from 0.011 to as much as 1.28 per cent. of CO and that the ratio of CO to CO_2 produced averaged about 1 to 7, rising sometimes to 1 to 5. W. Cullen and Doctor Weiskopf have, however, succeeded in producing a blasting gelatin in which the proportion of CO to CO_2 has been reduced to about 1 to 17. This explosive is stated to be as strong as ordinary blasting gelatin, and should the miners on this field find it to be so its use will undoubtedly be beneficial.

Blasting gelatin is now delivered on mine sidings at 46s. 6d. per case of 50 lb. so that the Rand is now supplied with the most powerful explosive known at a very cheap rate. Explosives are supplied from a local factory at Modderfontein, from De Beers' factory in Cape Colony, from one near Durban, Natal, and some from Europe.

ELECTRICITY THE FUTURE POWER

The next year will see the policy of electrification of the Rand well on the way to realization. At the present time the Randfontein and the East Rand Proprietary mines have their own central power stations. The Victoria Falls Electric Power Company has abandoned the somewhat far-fetched project of taking power from Victoria falls, Rhodesia, to the Rand and is erecting central steam-driven generating stations in the vicinity of Johannesburg. At Brakpan, on the East Rand, the company has two 3000-

kw. Curtis turbines and an older generating plant driven by vertical engines. It has also a similar old plant at Dreihoek and has recently completed a station containing four 3000-kw. sets driven by Curtis turbines at Germiston on the East Rand. These deliver 3-phase alternating current at 10,500 volts at 1500 r.p.m. These turbines are set horizontally and are 4 ft. in diameter and 5½ ft. long.

Great attention has been given to ventilation of the generators, and the bearings are water cooled. Slack coal is largely used, delivered from the rail trucks into bins, from thence elevated to hoppers above the boilers and falling from there through automatic measurers to the feed hoppers and chain-grate stokers.

There are 16 Babcock & Wilcox watertube boilers of 1500-2000 h.p. placed in two rows and generating steam at 215 lb. pressure; superheaters raise the temperature to 670 deg. F. and Green's economizers raise the feed-water temperature to about 200 deg. F. Forced induced draft is used. The draft is caused by centrifugal fans forcing a jet of air into the base of upcast chimneys shaped like inverted cones, producing a suction through the fire boxes. Surface condensers give a high vacuum.

Turbo-Compressors Used

A contract has been entered into to supply 270,000,000 Board-of-trade units at a load factor of 70 per cent. to completely electrify all the 15 large mines controlled by the Rand Mines, Ltd. In the mines all steam plants will be discarded. Eight sets of turbine generators of 12,000 kilovolt-amperes totaling 100,000 h.p. will be provided. Of these about 30,000 h.p. will be generated on the Vaal river at Vereeniging where coal and abundant water are available, and transmitted by a power line to the Rand. The remainder will be generated within 30 miles of the Rand, probably near the Klip river. The transmission line from Vereeniging is estimated to cost £130,000. About 40,000 h.p. will be devoted to working central compressed-air plants; one of these will be steam driven from boilers already available at Brakpan, another will be near Germiston and another on the central Rand.

The sets will be of about 8000 h.p., compressing air in two stages to 100 lb.: the first stage will be to 30 lb. by 3000-h.p. turbo-compressors of the Rabeau or Zoelly type. One compressor of the Zoelly type is working at Brakpan now. Five thousand horsepower will be devoted to driving 2-stage reciprocating compressors by synchronous motors from the main station. Air will be distributed to the mines by mains having joints welded by oxyacetylene blowpipes.

Central Power Stations Reduce Costs

These central stations are expected to reduce costs on the Rand mines from 6 to 8d. per ton. The price to be paid per kilowatt-hour has not been disclosed, but it is probably from 0.75 to 0.5d. The municipal station, a small plant not yet provided with the most efficient working facilities, works at 0.6d. and the Randfontein at 0.5d., so that a large central station should be able to supply at a very cheap rate and yet earn large profits.

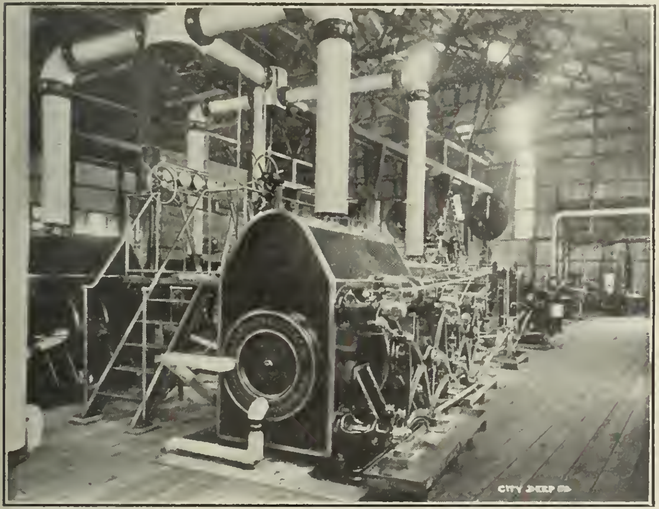
It is estimated that two years hence 25,000,000 tons per annum will be crushed on the Rand, and that a total of 500,000,000 units will be required annually. The stations to supply the Rand mines are to be completed by October, 1910, in order to be available for the City Deep when it is ready to crush. The initial cost of equipping mines is expected to be reduced from £50,000 to £100,000 by the provision of electric power.

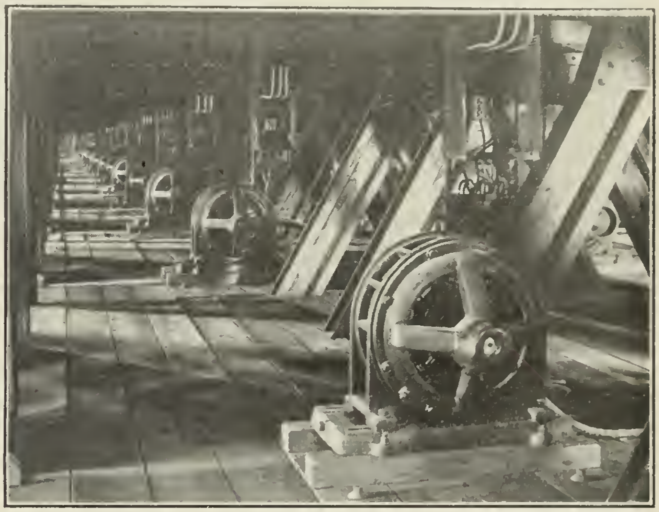
The East Rand Proprietary Mines Company has long had a central air-compressing station and is adding two of the largest steam-driven compressors yet made to supply 96,000 cu.ft. per min. at 90 lb. pressure. These will be made by Keelerton, Hodgart, Barclay & Co., England, and will be fitted with Meyer valves. Steam will be delivered at 180 lb. Two underground electric hoists have also been ordered to lift 6650 lb. of rock in 5000-lb. skips up a 45 per cent. grade 3500 ft. Skips will be balanced and will run at 3000 ft. per min., and also at 500 ft. per min. for inspection purposes. Two cylindrical drums will be 8½ ft. in diameter and 4 ft. 9 in. wide. The motors will be made by the Allgemeine Electricitäts Gesellschaft of the 3-phase induction type direct coupled to the drum shaft with a normal load speed of 111 r.p.m. These motors of the 6-pole type will work at 3000 volts with 25 cycles per second. The starting and regulating control will be of the Allgemeine Electricitäts Gesellschaft liquid type, regulation being effected in the rotor circle of the motor.

Mine Supervision Improved

Supervision of work underground has greatly improved; the leaders of the mining industry realize now that in the administration of a large mine there is not only work for an eminent consulting engineer and the best manager obtainable, but managers need ample assistance. Inadequate supervision is the poorest economy. Many changes are taking place, and among them is the practice of allowing the manager to have a qualified assistant as right-hand man. The tendency is to divide the underground workings into sections under separate mine captains or shift bosses, supervised in turn by an underground manager.

Comparative cost keeping, though sometimes somewhat overdone, is largely used for checking the comparative work of mines. The mines of the large corporations have their monthly returns thus


Corliss Winding Engine, City Deep No.2 Shaft


Motors and Steel Bin Construction, Simmer Deep

checked and the managers have their attention constantly drawn by the head office to various items of expenditure which appear to require explanation.

Possible Depth of Mining

The prospects of mining to great depths depend: (1) On the grade of rock to be expected; (2) on the underground rock and water temperatures met with; (3) on the pressures tending to break down the roof of excavations. Should these not be such as to make mining unpayable or impossible the problems of haulage and ventilation should be easily solved.

Recent temperature tests at a depth between 3000 and 4000 ft. in the Cinderella Deep, Robinson Deep, Simmer Deep, Jupiter, Brakpan and other mines have tended to show that the temperature rises at the rate of 1 deg. F. in 255 ft. vertical, as against the figure given by older experiments in Europe of 1 degree in 65 feet. At the bottom workings of the Jupiter mine, 4400 ft. from the surface, the rock temperature is 82 deg. F. At this rate the temperature at 7000 ft. vertical would be from 92 to 93 degrees.

The outcrop of the main reef is known for about 60 miles, and taking the average dip at 30 per cent (about 17 deg.) this would give a dip measurement of about 14,000 ft. to a vertical depth of 7000 ft. On the far east Rand there exists a vast basin, eight or ten miles square, whose deepest point is about 5000 ft. so that the area of possible future work is a large one.

The question of average grade in depth is still an open one. There have been severe disappointments and agreeable surprises in the Deep mines (1000 to 2000 ft. deep) as well as in the Deep Deeps (2000 to 5000 ft. deep). One would be inclined to say that there is a larger proportion of unpayable ground at great depth; but a mine like the City Deep could be adduced to disprove such a statement.

The chairman of the Modderfontein Outcrop mine lately pointed out that the grade of ore developed in that mine was almost similar to that in the Deep Deep mine at a depth of over 3600 ft. on its dip. In the Turf mines shaft of the Village Deep the south reef was struck at 3894 ft., assaying 6.9 dwt. over 41 in., and the main reef leader at 3994 ft., assaying 6.8 dwt. over 51 in. A disquieting feature was, however, the meeting of a spring of heated water during shaft sinking.

The Future of the Rand

Falls of ground have already occurred in some of the deeper levels which may or may not be due to increased pressure. This may have been due to reckless mining. Careful mining by leaving pillars of sufficient area and packing stopes with waste rock or sand should render mining possible at extreme depths, and there is a possibility of the dip of the reef becoming so small that long-wall methods might become common in the deepest mines.

The Rand is most favorably situated for the supply of cheap steam-generated power, and it was recently stated that ore could now be hauled as cheaply from 3000 ft. as a few years ago from the outcrops. It is hard to estimate what the ultimate life of the Rand will be, but it may be taken as certain that recent increases in crushing capacity will more than offset the quantity of low-grade ore rendered available in most producing mines today.

The chairman of the Rand Mines, Ltd., stated recently that the reduction of working costs had reduced the percentage of unpayable ore developed in all the mines of this company from 16 per cent. in 1905 to 11 per cent. in 1909. Certainly other low-grade bodies remain undeveloped; but one would be inclined to estimate that at a rate of production of 25,000,000 tons per annum, 15 to 20 years would see the exhaustion of most of the ore in the present mines above 4000 feet.

There is, however, still room for development in tracing the reef along its outcrop, especially in the western Rand. The West Rand Estate claims to have found by boreholes a payable reef for a stretch of ten miles under the dolomite.

Smelting Rates in Mexico

By Thorington Chase*

A close competition between the Mexican smelters has led to rather uniform smelting rates in most sections. The encouragement of newly developed properties has always been aimed at, and the minor clauses in contracts leave much latitude to the discretion of the ore-buyer. If a mine be new and there is a possibility of developing a large tonnage within a reasonable time, favorable terms are made the seller and his shipments are smelted at a minimum smelting margin. Where the tonnage is large and the ore especially prized for the fluxing qualities it possesses, the smelting charges may also be low. Much depends upon the "insoluble," iron and lime contents of the ore, and the position of each smeltery in relation to ores of certain desired consistency. Naturally the producer of self-fluxing ores has a great advantage.

Payments

In general, all the smelters pay for 95 per cent. of the silver (if not under 50 grams per metric ton), at New York quotations. One gram of gold is usually the minimum, all over that being paid for at current price, though a deduction of 2 per cent. of both silver and gold values is made for the Federal tax.

When amounting to 5 per cent. or more, 90 per cent. of the lead contents are paid for at an adjustable rate per kilogram (which varies with the London lead market), with £13 lead as a base. For each fluctuation of a shilling (or, as is often the case, shilling and a fraction) which the price of lead undergoes, there is a premium or deduction of so many cents per hundred kilograms.

Copper is paid for at 90 per cent. of the content (cyanide assay, less 1.3 per cent.) at Engineering and Mining Journal or other weekly quotations for cathode copper, a deduction of about 9c. being made per kilogram, if under 10 per cent. copper, with deduction somewhat lower per kilogram for higher assays. The minimum paid for varies considerably among different smelters, and depends largely upon the copper contents of their charges.

A premium (which may vary considerably in purchase contracts, even with the same smelter) in the neighborhood of 17 centavos per unit, is paid for the combined manganese and iron. Lime, when not combined with fluorine, is paid for at the rate of 12 centavos per unit.

Penalties

Turning to the penalties exacted by the smelters, the principal one is for silica; yet here again no firmly fixed deduction can be quoted, though in the majority of cases it is 25 centavos (maximum) per unit. In lead ores, 8 per cent. zinc is usually allowed, and above that deductions are made at the rate of 50 or 75 centavos per unit, this *pena* not being effective beyond a maximum charge per ton of, say, 7.50 pesos. A low percentage of sulphur, varying among the smelters, is allowed (usually around 1 or 2 per cent.) and a rate, closely following that charged for zinc, obtains up to a specified maximum per ton (which is somewhat under the zinc maximum). Arsenic, antimony and bismuth combined. above 3 per cent., are charged for at 75 centavos per unit.

Freight and treatment charges vary according to the lead contents of the ore, and the rates as usually quoted include freight from the railroad shipping point (f.o.b.) to the smeltery. For example, an ore is valued at not over 25 pesos per ton. The maximum rate will be for the minimum lead contents allowed the shipper. For each per centum above, a different rate obtains, the deductions from the freight and treatment charge increasing between the units of lead as they ascend until, say, 15 per cent. is reached, when a flat deduction per unit becomes operative. It is plain that if the mine be near the smeltery and the ore rich in lead, in place of deductions for freight and treatment, the shipper may receive premiums. This acts as an incentive toward more careful cleaning of the ore.

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*Chemist, Mazapil Copper Company, Ltd., Concepcion del Oro, Zacatecas, Mex.

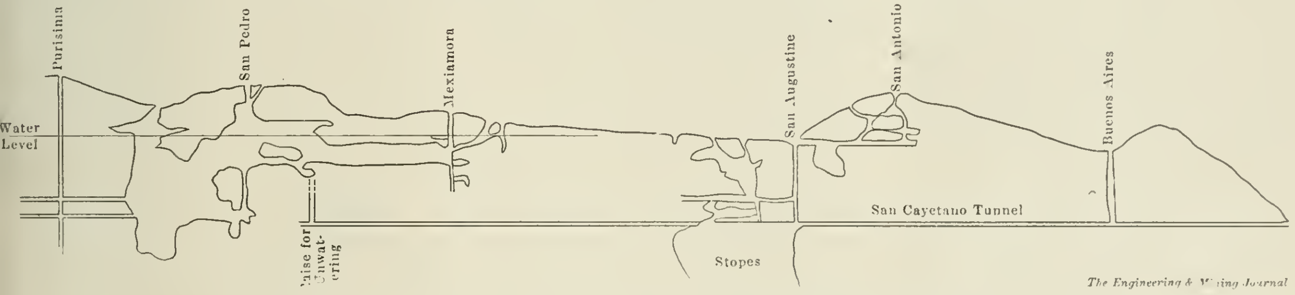
Unwatering the Mexiamora Mine at Guanajuato

Many Attempts Failed; Work Hindered by Water and Gas; Final Success by Raising from Tunnel Level; Connection Made by Heavy Blast

BY F. H. CLARK*

The accompanying vertical section along he San Cayetano vein in Guanajuato, Iex., shows the situation which induced he San Cayetano Mines, Ltd., to underake the unwatering of the Mexiamora nine and incidentally the partial unwaering of the San Pedro and Purisima nines. These three mines were worked n the olden days by means of "malaates," or horse whims, until the time rrived when the flow of water and caronic-acid gas made operations unprofitble and they were allowed to fill up.

The ores of the Mexiamora mine are igh in iron pyrite. The decomposition of his together with that of the old mine imbers made the mine water extremely cid. The reaction of the acid on the oluble material in the vein produced a vater heavily charged with carbonic acid, errous sulphate and sulphuric acid.



SECTION ALONG SAN CAYETANO VEIN SHOWING TUNNEL AND RAISE

The two-mile tunnel of San Cayetano xtending under the Mexiamora mine at depth of 1000 ft. offered so good an pportunity for drainage and ventilation hat several attempts had been made by revious owners to open a connection for hese purposes. The first plan tried was hat of boring a hole to tunnel level from he bottom of the Mexiamora shaft by neans of a churn drill of the type used n boring oil wells. This attempt failed n account of difficulties with the casing n loose rock in the bottom of the shaft, nd also because the tools were destroyed y the acid water. The other attempts vere to open connections by raises from he tunnel level. These failed because he ground caved badly and the gas drove he men from the work.

PROBLEM OF SAN CAYETANO COMPANY

Last year the new owner of the proprty, the San Cayetano Mines, Ltd., decided to make at attempt to unwater the ld mines by means of a raise on the ein from the tunnel level, a vertical distance of 350 ft. to the point of connection. The point of attack chosen was the site of one of the previous attempts, an inclined raise partly on the vein at the extreme inner end of the tunnel. This raise had already been driven 280 ft. at an average incline of 50 deg., leaving about 200 ft. to be driven on the incline. These data were taken from old surveys which were known to be unreliable and incomplete, and the uncertainty as to the exact point of connection added much to the difficulty of the work. Assuming these figures to be correct, there would be a head of water of 250 ft. at the point of connection.

The original plan was to clean and retimber the old raise, which had caved badly, and to unwater the mines from the top of the working by means of a diamond drill. This plan had to be abandoned because no drill runner could be found to undertake the work on account of the danger and uncomfortable working conditions. The foot of the raise is 3000 ft. from the nearest ventilating shaft in the tunnel and air was brought in from this point through an 8-in. pipe. By means of a ventilating door the natural draft of the shaft was used supplemented by a No. 6 Buffalo blower.

The retimbering of the old raise was carried out without especial difficulty and raising commenced in the new ground. After advancing 15 ft. water started from the face at the rate of 50 gal. per min. This water was heavily charged with carbonic-acid gas and at times spurted out with the force of a fire nozzle. That this came from the mine above was shown by the gradual lowering of the water level in the Mexiamora shaft as the work progressed.

As the raise advanced the character of the vein and hanging-wall rock changed. The quartz in the vein became soft and badly broken up and the hanging-wall rock, a decomposed andesite breccia, softened into a clay-like mass containing boulders of harder rock. These conditions made it necessary to adopt a system of spilling and breast-boarding and progress was necessarily slow, especially as rushes of water or gas frequently drove the men from the working face. At no time was it easy to keep lights burning near the top of the raise. Not the least of the difficulty at this point was due to roaring noises, resembling thunder, which were continually heard around the raise and which terrified the men and made it difficult to keep them at their posts.

This portion of the raise was timbered with shaft sets of 8x8-in. timber. The chute was 3 ft. by 4 ft. 2 in. in the clear, and the manway was 2 ft. 6 in. by 4 ft. 2 in. Heavier timber could have been used to advantage in this ground, but all timber had to be brought up on the backs of men.

INCREASED DIFFICULTY AS WORK PROGRESSED

At a distance of 75 ft. from the expected point of connection, the increasing weight of the ground gave a great deal of trouble. The descending waters washed out the talcy material surrounding the boulders and the latter settled, at times with sufficient force to break the breastboards. The caving following such accidents greatly delayed the work. It was thought that if left to itself the water would make its own connection; accordingly the top of the raise was left open and the ground allowed to cave. The cave ran up along the hanging-wall of the vein for a distance of about 50 ft. when the unsupported hanging-wall material began to fall and the cave assumed a funnel shape. As the top of the funnel increased in area the ground caved so rapidly that it choked the top of the raise and dammed back the water. It soon became evident that the connection could not be made in this manner.

While this work was in progress provision was made to prevent the flooding of the lower workings shown in the section. The floor of the tunnel for a distance of 1000 ft. is more or less on a fill of the old stopes, which would be difficult to seal. For this reason it was decided to build a bulkhead close to the foot of the raise and to regulate the flow of water through this by means of pipes and valves. The bulkhead was built of masonry, 10 ft. thick and with a radius of curvature of 10 ft. It was provided with three 3-in. pipes fitted with valves and with a 2x5-ft. doorway. The door was made of 10x10-in. pine timbers placed horizontally and bolted together. On both sides of these timbers 2x12-in. plank were nailed vertically, and the entire door covered with a coat of pitch. This door was calculated to resist the pressure due to a head of 550 feet.

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*Manager, Mexiamora mine, San Cayetano Iines, Ltd., Guanajuato, Mexico.

During the entire progress of the work the flow of water was measured four times per day by means of a small wier, and the men were withdrawn from the work in case an increased flow indicated that the water might break through from above. When it was found that the connection could not be made by caving it was decided to carry the raise the probable remaining 75 ft. with a single compartment and small tunnel sets. These sets were of 8x8-in. pine, 3 ft. center to center, 5 ft. 6 in. by 2 ft. 8 in. in the clear. The compartment was a continuation of the chute and so arranged that in case of a rush of water the flow would be down the chute, leaving the manway clear for the escape of the men.

CONNECTION MADE BY HEAVY BLAST

The single compartment was carried up 35 ft., at which point a safety hole was driven ahead by churn drilling. Bits were welded into lengths of 1-in. pipe and as the hole advanced the drill was lengthened by screwing on more pieces of pipe. The drill was operated by four men at a time, two gangs relieving each other every 20 minutes. Bad air, close quarters and frequent caving of the hole made it impossible for the men to work to advantage and the best speed made was 3 ft. in one shift. The hole was carried up 40 ft. when the bit was jammed by a cave and lost. Three small shots were fired in the hole and it was considered safe to advance the raise.

Another 35 ft. brought the top of the raise almost to the expected point of connection. From this point another safety hole was driven up 16 ft. A slightly increased flow of water and a considerable increase in gas indicated the proximity of the workings above. The top of the hole was chambered with 10 sticks of dynamite and 75 lb. of 60 per cent. dynamite were placed in the chamber. Experiment had shown that the men reached the bulkhead in 12 minutes from the top of the raise. The shot was fired by three fuses, each 50 ft. long. This guarded against a misfire and gave the men over 30 min. to reach a point of safety behind the bulkhead. Lights were left at intervals along the raise to facilitate their descent.

The explosion of this shot opened a chamber over 3 ft. in diameter. This was enlarged a little and filled with 500 lb. of 60 per cent. dynamite which was fired in the same manner as the previous charge. This shot opened the connection; the water was caught behind the bulkhead and the flow regulated by the valves to the maximum amount which the ditch would carry through the old workings, about 700 gal. per min. At the end of 12 days the flow diminished and the water level in the shaft indicated that the mines were nearly, if not entirely drained.

The escaping water had carried with it large quantities of carbonic-acid gas which completely filled the workings out to the ventilating shaft. By running the blower as an exhauster, and by absorbing large quantities of the gas with lime, it was made possible to work in the raise two weeks after the unwatering. In this connection it was calculated that a ton of the local lime would absorb 9000 cu.ft. of carbonic-acid gas. It was found that the rush of water and rock had carried away all the timber in the upper 150 ft. of the raise. This is now being reopened to establish ventilation which will make it possible to examine the upper mines.

The Sulphur Industry

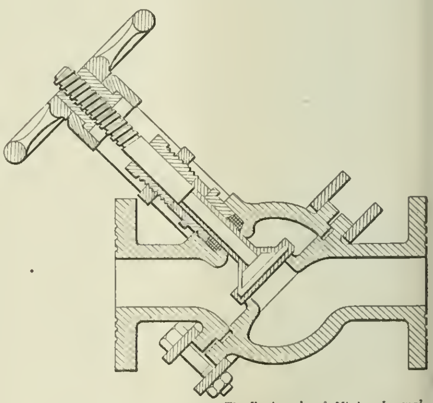
As far as it is possible to ascertain, the home production of sulphur in 1909 was slightly below that for 1908. This was due to a reduction of the stocks on hand held by the principal American producer. The 1909 output will probably total at a figure nearer that of the consumption than was the case in previous years when large stocks were piled up. Prices remained constant throughout the year at $22 per long ton at New York for prime Louisiana sulphur and $22.50 at Boston, Philadelphia and Baltimore. Quotations on roll sulphur were firm at $1.85@2.15 per 100 lb.; $2 @2.40 for flour; $2.20@2.60 for flowers sublimed. The Sicilian brimstone was held at the same figure, but could not compete successfully with the American producer at even prices on account of the importer not being able to offer the same facilities to the consumer as does the American maker, and also due to the natural preference here for home produce.

Trade returns for the first 10 months of 1909 showed that the imports of sulphur were 23,813 tons and exports, 31,902 tons, an excess of exports amounting to 8089 tons. (Importations at San Francisco, Cal., and Portland, Ore., for the first 11 months of 1909 were 13,305, which represents in great part sulphur from Japan). For the same period of 1908 imports were 18,751 tons, exports 20,046 tons, or only an excess of 1295 tons exported. This shows plainly that we produced more sulphur in 1909 than was necessary for our own consumption; the large exports may also account for the Consorzio's holding down the price of Sicilian sulphur imported into the United States.

Returns showed that the export of sulphur from Sicily for the first nine months of 1909 were only 282,015 tons, as against 301,127 tons for the same period of the year before: Stocks on hand, Oct. 1, 1909, were 654,151 tons, and Oct. 1, 1908, 621,016 tons. The exports to North America for these periods were respectively 11,123 tons (1908) and 12,878 tons (1909), but during the first nine months of 1909 only 4877 tons of foreign sulphur were imported into New York and this figure probably covers nine-tenths of that brought into the United States from Sicily.

A New Acid Valve

A valve called the Ruppel acid valve, designed to withstand the hard service of modern chemical plants, has just been brought out. One of its advantages is that it can be set at any angle and serve as globe, angle or corner valve. It can be repaired and reground while in place.



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RUPPEL ACID VALVE

Ordinarily these valves are made of hard lead but any other composition can be employed. The sizes range from 1¼ to 8 in., and each valve is tested to 115 lb. before leaving the shop. All parts are interchangeable. There are also pipe couplings made of a similar design which serve to connect pipes at any angle. The valve and coupling are being placed on the market by A. Innerhofer, 30 Church street, New York.

Pitchblende has been found in Gilpin county, Colorado, at the German mine. One pocket of this mineral has been taken out and stored.

Labor Troubles at the Homestake Strike

In the *Daily Call* of Lead, S. D., a communication, signed "A Miner" under date of Dec. 26, 1909, presents some interesting inside facts about the labor situation at the Homestake mine. This agitation of the Western Federation has resulted in the suspension of operations of that important property and the enforced idleness of the several thousand well-paid laborers who were engaged in the extensive activities of that company's mines and mills. Extracts from the article herewith given indicate the trend and development of the situation and disclose the motives and purposes back of the movement. The communication says in part:

"The latter part of September of this year, there arrived from Denver, Colo., three persons, Mrs. Langdon, representative of the *Miners' Magazine*, James Kirwan, member of the executive board of the Western Federation of Miners, and Mr. Tracy, official organizer of the same organization. Everything was peace, quiet and serenity in Lead, the Homestake was running as it always had, men were content, they worked harmoniously, satisfied with the conditions under which they were toiling, their hours of labor were satisfactory, their pay as good as that paid for like work anywhere, they had good air, good bosses, and their pay was as sure as fate.

Mass Meetings Held

"A few days after their arrival a mass meeting was called for the purpose (so it was said) of more fully organizing the workers of Lead and Central City. The trio' mentioned were the speakers. Each one of the three assured us that Lead was known throughout the country as the model mining camp.' They told us we were working under more favorable conditions than existed in any other in the jurisdiction of the federation; that our local union was known everywhere for its charity, benevolence and its magnificent building. They told us these were good things, but of no avail, and in order to have the favor of the parent body (Western Federation) we must at once organize not only industrially, but politically as well; we must become class conscious.

"Another mass meeting was called; Mr. Mahoney told his hearers at this meeting as well as at the regular union meeting on the night following, that right there was a camp working under the best conditions of any that he had visited, and he understood there had never been any trouble here between employer and employees, but with all this the Western Federation was not satisfied and would not be until every worker here belonged to the federation and thus contributed his share to the maintenance of the organization. In short, it would either have to be a 'union' camp or a 'scab' camp, that although the men here seemed to be satisfied with their conditions, they were not getting the full product of their labor, and he thought it about time they were asking for more. He did not say that this plan of organization was for the purpose of making a demand for an increase in pay or for the ultimate confiscation of the Homestake property, but he did assure them that organization and political action along socialistic lines would make us the bosses and the other fellow the digger, and that a man must be a socialist to be a good union man.

"The socialist element by this time considered they were sufficiently organized to spring another number on the program. The resolution stating we would not work with non-union men after Nov. 25, 1909, was the result. It is true that a great many men, not socialists, voted for this resolution. Many were led to believe it would be used only as a bluff to bring in the hesitant, who required some sort of persuasion, and that they would be revoked before the time specified for their becoming effective, while others, afraid of the abuse and ridicule which would be heaped upon them did they oppose, voted with the crowd.

False Reports by Committees

"Committees were now appointed for the purpose of seeing all non-union men throughout the mine. These reports were so flattering we were led to believe that long before Nov. 25 everything would be completely organized and there was absolutely no danger or desire for trouble. The committee that had interviewed Mr. Grier reported that gentleman to be in hearty accord with the movement and stated he had urged them to go on with the work. This report has since been proven to have been utterly false and unfounded, made purposely to deceive those who had the welfare of themselves and the community at heart and would therefore have put an end to further agitation, had they known the company to be opposed to the action taken. About this time the Homestake company made its first move in the controversy by bringing suit against the union for the acts of some of its committeemen. To the rank and file this came like a thunderbolt; it was learned that some of the committees had given false reports and others had used threats to induce men to join. The conservative forces got busy at once. Mr. Tracy and others of the leaders were seen and told that the resolution must be withdrawn, that they would not stand for trouble with the company, in fact, they would leave the union unless such was done. A promise that the resolution would be withdrawn at the next meeting was given, but like all socialistic promises, made to be broken, this was no exception.

"Each party had now made its first move—the union through its outside socialist agitators, the first; the Homestake company, in sheer self-defense, the next."

The communication then sets forth the negotiations with Mr. Grier, the results of which were misrepresented to the meeting of the laborers by the committee having charge of these negotiations. It discusses the personal attack made on Mr. Grier through the newspaper organs of the union which led up to the second move on the part of the company which was a notice that all loyal, self-respecting men could remain in the employ of the company by forswearing their allegiance to an organization when the stand taken by it became un-American and criminal.

The socialist wing of the organized labor then called a mass meeting to condemn the action of the Homestake company, before which Mr. Grier appeared, reviewing the various acts of the union which led up to the issuance of the notice by the company. At this meeting Freeman Knowles, in the words of the communicant, "was allowed to freely insult the man who could do more and has done more for labor organized and unorganized than a thousand Knowles could or would do."

An attempt was then made to have the resolutions withdrawn as a basis for settlement but this attempt, according to the communicant, was frustrated by a campaign of direct deception and fraud, in which the union members were led to believe that a satisfactory arrangement of terms was practically assured. At the meeting of Nov. 21 the article states that Chris Christiansen said:

"'No, we did not settle, and by G—d, we won't settle until 50c. or $1 a day is tagged to our pay. The Homestake has run us a long time, now we are going to run the Homestake; boys, it belongs to us, and by G—d some of these days we will take it.'

No Referendum Vote

"Permission for strike had been voted. However, the leaders realized that in order to make it legal in accordance with the constitution and by-laws of the federation a referendum vote would have to be taken, and should this be done, they would yet be defeated in their effort to bring about a strike; consequently, Mr. Ryan moved that Mr. Kirwan be empowered to have full authority to call a strike at any time he saw fit. This motion was carried, although not one-third of the members present voted for it, thus invalidating the vote of 2000 men, and placing the judgment of one man, and he a paid agitator, against the sane and impartial judgment of the men most directly interested.

"In the face of the fact that a strike might be called at any minute the company made no move, but waited for the next act of the union, and this came on Monday evening, Nov. 22, 1909. At the regular meeting of the union that night, after matters had been fully discussed and it became evident that Mr. Kirwan was about to use the authority conferred upon him by calling a strike, Mr. Thomas, a hoisting engineer, asked Mr. Kirwan that, if in the event of a strike being called, the hoisting engineers should be allowed to remain at their post long enough to hoist any perishable property that had to be brought to the surface, such as horses, powder, fuse and the like. Mr. Kirwan answered:

"'When I call a strike, everything will stop, by G—d, things will be closed tighter than h—l. I'll show them what the Western Federation can and will do.'

"The company could not and would not take a chance of allowing its animals to starve in the mine, and as they were necessary for the successful operation of the mine, work could not be carried on after their removal, therefore the only thing left to do was to suspend operations.

"Thus again was the company compelled to act in self-defense, and instead of locking out its employees, the employees, through their socialist leaders, locked themselves out, and this in the name of unionism."

The union voted the strike Nov. 21 and Nov. 24 the company shut down all operations.

A card system has recently been established by the principal operators in the Black Hills district, and it is stated that the Homestake company is gradually resuming operations with nonunion labor.

Cyanide Practice at El Tajo Mill, Jalisco, Mexico

The Tajo Mining Company, San Sebastian, Jalisco, Mexico, recently completed the installation of a 10-stamp mill and cyanide plant, which may be considered typical of some of the smaller reduction plants in Mexico. It consists of 1 crusher, 2 feeders, 2 five-stamp batteries, 1 cone classifier, 1 tube mill, 40 in. by 16 ft., 4 conical-bottom agitating tanks, each 16 ft. in diameter and 20 ft. deep, 1 Burt filter press, 1 clarifying tank, 2 zinc boxes, 2 large sump tanks, pumps, etc. The plant is constructed on a selected millsite whereby the ores are worked by the gravity system from the mines to the tailings dump.

The capacity of the plant is 30 tons of ore per day, milled through a 20-mesh screen and reground with tube mill to between 150 and 200 mesh. The chief chemist, George F. Bridger, recently employed by El Oro Mining and Railway Company, has charge of the chemical department, and after a series of experiments has succeeded in securing a high extraction of the metal contained in the ores.

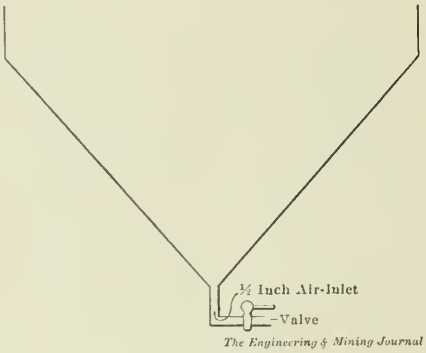
Cyanide Process at El Tajo Mill

The ore is usually highly silicious, but occasionally carries calcite. The valuable metals are gold and silver, the gold being in a fine state of division and the silver present chiefly as sulphide (argentite) with some bromide, chloride and native. The ore is crushed in cyanide solution, the solution being kept at 0.04 per cent. KCN and carrying 1½ lb. CaO per ton. The necessary lime is added at the ore bin.

From the batteries the pulp passes to a Callow thickener in which an upward current of compressed air is used in place of the usual ascending current of solution under pressure. A slight agitation is thus gained in the cone and the coarse pulp well aërated before passing into the tube mill.

A considerable extraction is made in the tube mill, as the thorough agitation and aëration together with the heat generated by the friction of the pebbles makes conditions for the extraction almost ideal. Hard pieces of ore are used for pebbles. The tube mill product is resized, the oversize being returned for regrinding. The slimes and fine sands are overflowed from the Callow cone and conveyed together with the fine tube mill product through a launder to the collecting tank.

The treatment tanks are used as collectors, being provided with an overflow pipe for the weak clear solution. When a sufficient charge has been collected, the pulp flow is changed to another tank and sufficient sodium cyanide added to bring the solution up to 0.15 per cent. KCN. The lead salt is added and agitation begun.



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Cone Bottom Treatment Tank

The treatment tanks are cone-bottomed, the cone sloping at an angle of 60 deg. The manner of introducing the compressed air can be best shown by the accompanying sketch. Four agitations or washes are given to the pulp, the first agitation being 12 hours, and each of the remaining ones four hours. Five hours is allowed for settlement and the clear solution decanted to sand filters, clarified and passed through the zinc boxes. After the fourth wash the pulp is discharged to a Burt rapid filter, and sufficient wash water passed through the cakes to keep up the mill stock. The cakes, carrying 30 per cent. moisture, are then discharged to the arroyo.

The extraction, calculated upon the assays and bullion shipped, is 98 per cent. of the gold and 94 per cent. of the silver. The precipitate averages 75 per cent. metal. All zinc shorts are returned to the zinc boxes, no acid treatment being used.

The labor required to treat 1000 metric tons per month is as follows: Two solution men at one peso each per 12-hour shift; for cleaning up, 3 peons at 75 centavos per day, for eight days; Burt filter, 2 peons at one peso each per shift; or at total labor cost of 0.138 peso per ton for cyanide operation.

The chemicals, etc., used per metric ton treated are: Sodium cyanide, 0.765 kilo; lead acetate, 0.15; lime, 10; zinc shavings, 0.5. The results have been so satisfactory that additional machinery for increasing the capacity has been ordered and the plant will be immediately enlarged to treat 100 tons per day.

Mine Development

The mines are being thoroughly developed by blocking out large bodies of good milling ore. The present ore supply is taken out through the Boquitas tunnel, which is a crosscut tunnel, 580 ft. in length, and cutting the ledge at 500 ft. below the surface. Sinking has been done to 500 ft. below the Boquitas tunnel, showing the ledge to a depth of 1000 ft. The Porvenir tunnel is driven a distance of 1325 ft. and will be continued a total distance of 2000 ft. to the ledge and 400 ft. below the present deepest workings. When the Porvenir tunnel is completed the entire ore supply will be taken out through it.

Improved Shaft-sinking Methods at Ducktown

Small Raises Run to Connect from Levels and the Whole Will Be Reamed out, Alined and Timbered after All Connections Are Made

BY WILLIAM YOUNG WESTERVELT*

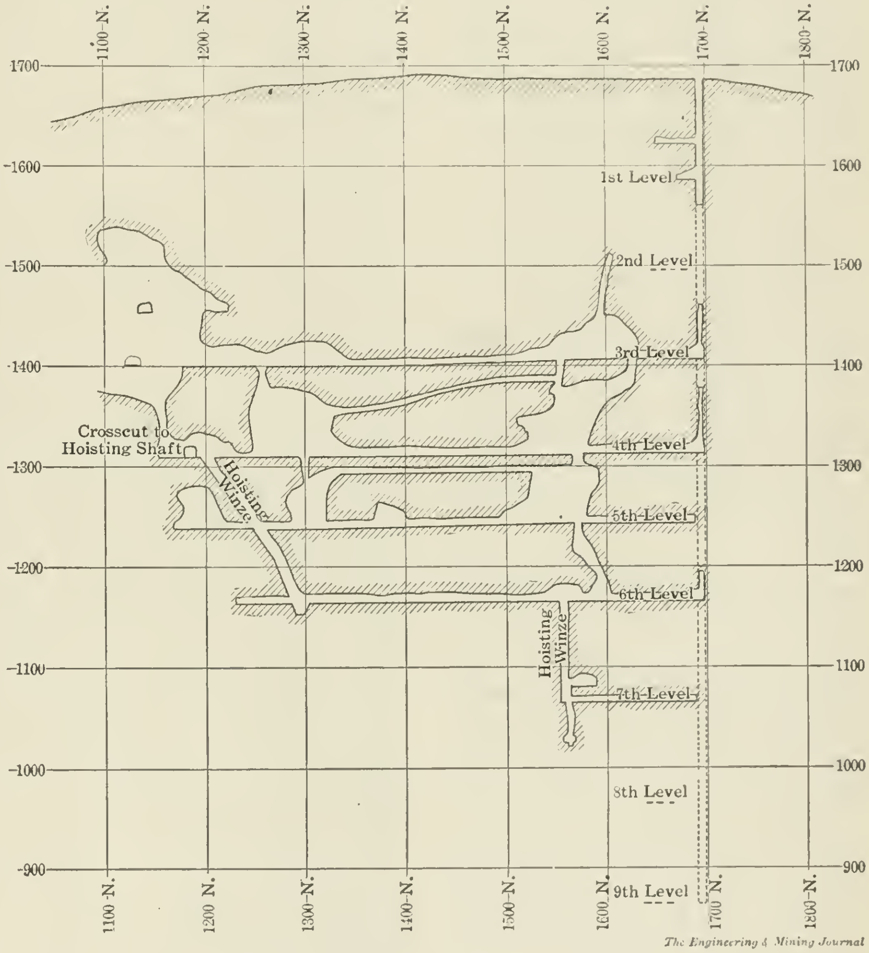
An interesting piece of shaft sinking is being carried on by the Ducktown Sulphur, Copper and Iron Company at its Mary mine near Isabella, Tenn. By means of diamond-drill holes, crosscuts and drifting work a considerable mass of ore has been proved to lie to the north and west of the main orebodies of the Mary mine and to extend from the gossan zone, less than 100 ft. below the surface, to a depth of over 800 ft. The richest ore being found in the bottom, and the limits of practical development and extraction having been reached by the indirect methods employed, it became highly desirable to sink a standard equipped shaft from the surface and to get it in operation at the earliest possible moment.

The Gordon Shaft

Accordingly, a new shaft, named the Gordon after the company's technical managing director, is being sunk, not only from the surface but, drifts having been run out to the location of the shaft at each of the available levels as shown in he accompanying drawing, raises are being pushed up on the center line of the shaft. These raises are being made only large enough (from 5 ft. to 6 ft. n diameter) to secure good delivery hrough them of broken material, and are o be reamed out to the full size of the shaft after breakthroughs have been made; this will admit of carrying plumb ines down directly from the surface work where the shaft is being sunk in he usual manner.

The surveys on which these raises are ocated include a traverse from the surface into the mine about 2000 ft. long and with but few long sights. Accordngly, in order to reduce possible error o a minimum, it has been gone over seven times by the company's resident engineer and finally independently checked by an outside engineer. The method of carrying the raises only 5 ft. o 6 ft. in diameter and on the center line of the shaft, however, allows for several feet of variation in location at the different levels so that no difficulty is anicipated in having the completed shaft come out true to the surface level.

The shaft consists of three compartments, two for hoisting and one for ladder and pipe lines. It is being timbered with standard-framed 12x14-in. Georgia pine, set on 5-ft. centers and having 8x10-in. dividers. The dividers are, of course, set on edge and the wall timbers flat-wise. The wall timbering is being carried down only far enough to insure complete entrance into the solid ground which is encountered immediately below the gossan zone. In the solid ground the dividers and end timbers are set in well cut hitches, such being all that is required to hold the guides, etc. In this solid ground the shaft has a cross section of 7x14 ft. and is correspondingly larger outside the timbering in the softer ground.



THE GORDON SHAFT AT THE MARY MINE

Working Methods

As shown in the elevation, the construction of the shaft will be completed by working at seven different points, sinking at the top and bottom and raising from the five developed crosscuts. The sinking work carried on from the surface is being done by two crews *per diem,* each of eight men and a boss underground and a hoister and lander on top. Four 3-in. Ingersoll-Rand, reciprocating, compressed-air drills, mounted on two shaft bars, are being used in this work. The raises are being made with air-feed, hammer drills (usually two in a raise) manufactured by the Ingersoll-Rand and the Cleveland Rock Drill companies. Two men and a steel boy, with the usual complement of trammers to remove the muck as it accumulates, comprise the crew per shift employed in the raises on this underground shaft work.

The country rock at Ducktown consists of silicified mica schists, frequently remarkably tough on account of hornblende crystals present, in addition to being extremely hard so that shaft sinking is a very slow, laborious and expensive process, 30 ft. of advance per month being exceptionally good work in sinking. By the means adopted by the Ducktown company, however, it is expected that the shaft will be completed to the ninth level, a total depth of nearly 850 ft., in from 15 to 18 months' time, or perhaps even less. At any rate it is hoped to average around 50 ft. per month, which will be not less than double the average rate of progress which has heretofore been made in sinking to any considerable depth in the mines of the Ducktown basin. These figures consider all timbering and equipment as included. It is also expected that the method of reaming down or benching around raises will be found decidedly cheaper than that of ordinary sinking.

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*Consulting mining engineer, 100 William street, New York.

The top of the shaft is being raised about 15 ft. above the original surface and ,at this higher level the new shaft yard is to be graded. From the shaft a self-acting, inclined plane will deliver the ore across the top of the hill to the main ore bunker whence the ore is already being delivered by similar means to the 18x36-in. jaw crusher which reduces the ore to 4-in. size preparatory to its being elevated to the railroad bunkers.

Gold Mining in Russia

The gold production of Russia, as reported to the Imperial Mint—to which the law requires all gold to be delivered, is reported by our special correspondent for six years past as follows: 1903, 2302.175 poods (1 pood = 36.112 lb. Av.); 1904, 2281.825; 1905, 2016.900; 1906, 2262.475; 1907, 2314.450; 1908, 2584.750 poods. For the first half of 1909 the Mint returns show 1141.625 poods.

For a series of years the returns for the second half of the year have been much larger than for the first half, the average being 40 and 60 per cent., respectively, on the year's total. Moreover, it is usual in estimating the production to allow 10 per cent. for gold concealed, or not delivered to the Mint. Many engineers who have had experience in that country think that the allowance is too small. Estimating on that basis, however, the gold production of Russia for the year 1909 may be put at $34,160,000, a substantial increase—$3,215,000—over the preceding year. The gain was chiefly from the operations of a few companies, notably the Lena Gold Mining Company, Ltd., which reported in the first half of 1909 a total of 674 poods.

According to our correspondent's analysis, in the first half of 1909 the Ural district reported 312.600 poods of gold, or 24 per cent. of the total; the Tomsk district, or West Siberia, 140.300 poods, or 12.3 per cent.; the Irkutsk and Amur districts, West Siberia, 688 poods, or 60.3 per cent. A further analysis shows that 74 per cent. of the yield was from placers worked in the ordinary way; 4 per cent. from dredges; 0.4 per cent. from hydraulic operations; a total of 78.4 per cent. from placers. The remaining 21.6 per cent. was from quartz mines, chiefly in the Ural district; 18.9 per cent. being obtained by milling and 2.7 per cent. by cyanide and other chemical processes.

Our correspondent, in further comment, says that the increase of production does not necessarily involve an improvement in the Russian gold-mining position at the end of 1909. The gain was due chiefly to the large increase in production of three or four companies which have adopted improved methods, or which are working new districts. In fact, considering the area of ground worked, the average production has rather decreased.

The adverse conditions are most marked in the Ural district. In the Southern Ural the Kochkar system, from which brilliant results were expected in former times, has now partially failed and is making very poor returns. Some of the workings show a loss and the remainder have been supported chiefly by the lixiviation of the old tailings, which had accumulated at the mines. Some of the older mines in the Ural mountains have been worked nearly 100 years, a few 150 years, and can no longer be exploited profitably, at least by the present system. There have not been new mines enough opened to take the place of these old operations.

The most promising region in Russia is found in the basins of the Vitim and Olekma rivers in the Irkutsk province and extending over into the Yakutsk province. These goldfields are notable for their extent and for the high content of gold in the gravels. This is not only the most favored district in Russia, but it will not be far from the truth if it is claimed that the deeper placers of the region are the richest in the world. This district in West Siberia gives about one-third of the total yield of gold in Russia.

In East Siberia, in the Amur and the Seacoast districts, the gold placers already show signs of exhaustion. This is especially the case in the Amur where Blagoviestchenk, formerly the center of an important field, is now almost deserted, and other places are in the same condition. New methods of working are being tried, especially excavators and dredges, in the placers of these provinces. Besides the exhaustion of some mining districts East Siberia has suffered very much from the lack of labor. The Chinese and Koreans, who formerly worked there in large numbers, are now excluded by the government and are not allowed in the mines.

Gold dredging in Russia develops slowly, notwithstanding the number of low-grade placers where it is believed that dredges could be profitably employed. One reason for this is the lack of the capital necessary to install the machinery; another is the failure of a number of dredges, which were set at work without proper preliminary investigation of the ground, and which were not adapted to the local conditions. There are now about 60 dredges at work in the goldfields, but a number of them are operated at a loss.

We may add to our correspondent's remarks the known fact that many operators in East Siberia have been disappointed because they were unable, owing to political conditions, to extend their operations into the placers of Manchuria, south of the Amur, which are known to be richer than those on the Russian side of the boundary.

Asbestos in the Eastern Townships of Quebec

As usual the Eastern townships of Quebec supplied in 1909 practically all of the asbestos consumed in the United States. Nearly all of the mines about Thetford, Black Lake, East Broughton and Danville were active and as far as returns show made a larger production than in 1908, which was a record, and amounted to 65,157 tons of asbestos and 24,011 tons of asbestic. Considering financial conditions the asbestos business was satisfactory in 1909 and prices were fully up to the average of 1908. Inquiries and contracts from abroad also show a recovery in foreign markets.

An amalgamation of much interest was that of the Kings, Beaver, Thetford, British Canadian, Standard and Dominion mines. into a company known as the Amalgamated Asbestos Corporation Ltd. This company operated its mines and proceeded to enlarge and improve the equipment at its properties.

Uses for Asbestos Increasing

Asbestos producers are generally optimistic regarding better conditions in the industry, as new uses fo rthe mineral are continually being developed. In 1909 these developments were principally in the direction of fireproofing materials; the use of asbestos building paper between floors, etc., and the use of artificial slate and sheathing in the manufacture of which asbestos is largely used. This material was originally manufactured in Austria, but is now turned out by companies in many countries and consumed all over the world.

The textiles manufactured from long-fibred asbestos also came into more general usage. There was an increased demand for high-pressure packing and for the first time automobile brake bands made of asbestos were used.

In the laboratory of the Oriental Consolidated Mining Company in Korea, 30,591 assays were made during the last fiscal year at a cost of $6714.

The London Tin Market in 1909

The market opened firm, three months' arrants touching £134; but a speedy reıpse followed on dealers' cheap purhases in eastern markets. This connued for a fortnight or so, the relapse eing quickened by the realizations of isappointed speculators, the pressure of ear sales, the impending sale of Banka t the end of the month, and the prosect of unfavorable statistics following n heavy shipments from the Straits. peculative interest, however, was in reat measure diverted to copper which, ı turn, was heavily depressed throughut the month: and tin suffered in symathy. Realizations and bear sales connued to predominate until the end of the ıonth when cash warrants were quoted t £124 7s. 6d. and £126 2s. 6d. for three ıonths.

February found the market depressed ı sympathy with copper, and holders anxous to liquidate; £123 10s. was accepted or cash warrants. Selling pressure soon eased; but the underlying conditions vere favorable enough to raise prices to 130 2s. 6d. on Feb. 11, and to keep uctuations within narrow limits during ne rest of the month.

March statistics disclosed a reduction f 1532 tons in the previous month. The narket was comparatively uneventful for everal days, the volume of trade being bout normal, and prices moving within arrow limits. A transient improvement n American demand carried the three nonths' price up to £133 on March 11. By the middle of the month demand had lackened and prices fell back in symathy with depression prevailing in surounding markets and in view of the aproaching periodical sale of Banka, three nonths' delivery at one moment touching £129 12s. 6d.

After touching £133 3s. 9d. for cash varrants and £134 3s. 9d. for three nonths, on April 7 values improved to £133 7s. 6d. and £134 10s. respectively. The highest was touched on April 20, at £134 10s. for cash, and £135 12s. 6d. for hree months'.

In May the market opened with a downward tendency due to heavy bull iquidations and short sales, eastern prices being also lowered, till £130 2s. 6d. was touched for cash warrants, and £131 for three months': but this comparatively low level attracted American buyers who sent substantial orders. Speculation followed, resulting in a sharp rally to £132 12s. 6d. and £133 10s. Speculation then became rampant in tin as in copper, and the three months' price was carried up to £134 15s.

In June the market opened quietly, with eastern sellers apparently ready to meet demand, and statistics showing an increase of about 1000 tons. Three months' warrants stood at £134 10s. on April 7, from which point bears were allowed to depress the price to £133 7s. 6d. Leading operators, however, were alert to counteract this with a vigorous bull campaign which was quite in harmony with prevailing sentiment and carried the price up to £136 15s. on June 10. Closing quotations were £132 for cash warrants, and £133 12s. 6d. for three months'.

July opened with a decrease of 1084 tons in the visible supply and improved advices concerning the American tinplate industry, as well as a firmer tendency in the eastern markets. The three months' price touched £133 10s. and remained thereabout until July 7 when, in sympathy with copper, the market relapsed on bear selling and the three months' price fell to £132. The tendency during the remainder of the month was mostly upward, being largely influenced by some rather sudden purchases for American account, the highest prices being paid on July 23, when cash warrants changed hands at £135 5s., and three months' at £134 15s. On July 29 the periodical sale of Banka tin in Amsterdam disposed of 2000 tons at the average equivalent of £134 17s. 6d., but without having much effect on the London market.

The August statistics proved rather more favorable than had been expected, and the market opened with an advance of £1 10s. per ton, but promptly relapsed 10s. as a result of profit taking and the readiness of importers to meet all demand. The first week closed with cash warrants at £132 15s., and three months' at £134 7s. 6d. Trade was active, and closing prices were £139 for cash warrants, and £140 for three months'.

Disappointment was felt at the September opening by reason of the small decrease of 635 tons in the published statistics, and a sharp decline took place down to £137 2s. 6d. per ton for cash warrants, and £138 2s. 6d. for three months'. Bears became aggressive and forced down prices to £135 10s. and £137 on Sept. 8. The bull party bought largely at each decline and were thereafter successful in establishing improved values for the remainder of the month. The covering of bear commitments tended further to enhance prices which, on Sept. 28, stood at £140 10s. and £141 12s. 6d. respectively.

October, opened inauspiciously with a market vulnerable to bear attacks, and prices lowered to £138 12s. 6d. and £139 15s. At this point eastern sellers withdrew and surrounding conditions appeared more favorable, with the result that bears hastened to cover their sales and prices advanced to £140 5s. and £141 7s. 6d. respectively on Oct. 5. Then followed a relapse prompted by dearer money and depression in the market for copper. Forced realizations carried values down to £137 10s. and £138 17s. 6d. on Oct. 13, from which point they recovered by reason of improved trade demand coinciding with firmer share markets and withdrawal of offers from the East.

Market values touched £139 15s. and £141 5s. on Oct. 18. By this time the financial situation caused uneasiness, and leading operators withdrew their support; a fall of £2 per ton ensued, but was partly recovered as a result of good and steady trade with consumers.

November was a busy month throughout, with numerous fluctuations in price, but mainly upward. An initial improvement was due to a decrease of 1935 tons in the monthly statistics, followed by covering of short sales; cash and three months prices being raised to £139 10s. and £141 10s. respectively. This advance was a little too rapid to withstand the pressure of consequent realizations, and prices dropped to £138 and £140 5s.; but a good consumptive trade caused a recovery to £138 15s. and £141 by the end of the first week. The second week opened with an advance of 10s. per ton. The Banka sale comprised 2000 tons which realized the average equivalent of £141 10s. Thereafter new support induced a sharp rally, not fully maintained, but again recovered on the last day of the month, when cash warrants commanded £142 15s., and three months' £144 12s. 6d. per ton.

December found the market active and prices advancing, in spite of strenuous bear efforts and in spite of a statistical increase of 1938 tons. American demand was sufficient to outweigh all adverse factors. On Dec. 13, the market opened strong with the three months' price at £150. A reaction to £149 was only temporary, being followed by smart recovery and a further advance to £151 10s.; the week closing—after violent fluctuations—at £149 10s. for cash warrants, £150 15s. for three months'. The next week opened with a sensational advance of £4 per ton, and a turnover of about 800 tons. The advance was accomplished by leading operators who took over no large quantity on balance, but were able to work upon the prevailing bullish sentiment which gathered strength and inspired increased activity, in contrast to the quietness which prevailed in other markets with the near approach of the Christmas holidays. This advance held well until the end of the year, prices closing at the highest.

Wire Ropes in Colliery Practice

Illustrating the Various Arrangements of Pulleys and a Discussion of the Benefits Conferred by Lubricating both Winding and Hauling Ropes

BY R. H. ROWLAND[*]

From the earliest period to the present time, ropes have been the subject of constant interest to all concerned in the transport of minerals. There is adequate proof of this in the various interesting records of the vigorous efforts made in the early part of the last century to supply the needs of the limited mining operations being carried on at that time and now, owing to the enormous developments in depth, the considerably increased loads, extensive mining areas, and the rapid winding speeds, the needs of the present time are such as to allow for no relaxation in effort, and the subject is still of the utmost importance to the consumers, as well as to the producers. The mining engineer and the ropemaker frequently find themselves handicapped, and sometimes crippled, by restrictive limits.

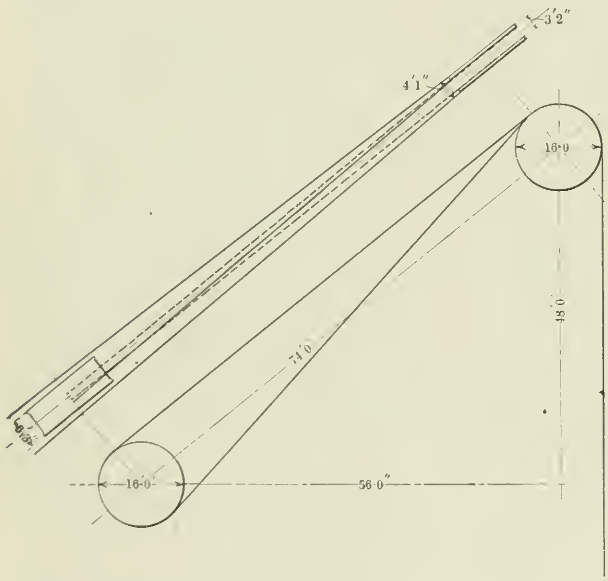
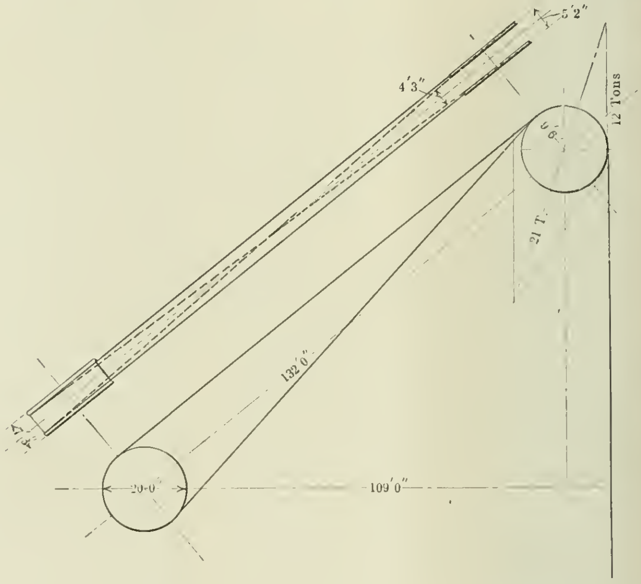


Fig. 1. Showing Relative Positions of the Drum and Pulleys at a Shaft 1440 Ft. Deep



The Engineering & Mining Journal

Fig. 2. Winding Arrangement at a Pit Where the Depth Is 1200 Feet

Without describing the chief characteristics of the most important developments in the manufacture of wire ropes, it is my intention to make some observations on their tensile capacity, inasmuch as it is that which constitutes the most important factor for the users' consideration, and also some notes which may be of useful interest to those concerned.

The same consideration that is given to the conditions under which hoisting ropes have to work should be applied also to haulage ropes, for while the breaking of a haulage rope may not involve the same risk of loss of life as a broken winding rope, it is a fact that the haulage rope expenditure for a modern colliery is usually far in excess of the winding-rope expenditure; therefore the greatest economies are possible by having suitable ropes made to meet the conditions, rather than by the adoption of the cheapest class of rope that can be produced.

It would appear that when wire ropes became generally adopted in mining practice, they were used more freely in hauling than in winding (hoisting) operations, there being a prevalent contention that a metal rope to withstand the severe bending stresses of winding could not be constructed, and the wires must necessarily break off short. The ropes generally in use at this time were made of a soft and ductile iron wire of approximately 40 tons to the square inch, while at the present time at many mines, the hoisting ropes are made of steel wire of 160 tons to the square inch and even upward.

At a number of mines in this country the winding ropes used are of manila fiber, and at some European mines, they have gone so far as to replace steel ropes with such manila ropes. Inasmuch as the manufacture of steel wire combining very high tensile resistance is undoubtedly an art, it would appear that the replaced steel winding ropes were by no means of the best quality that could be produced, otherwise such a change would hardly be justifiable.

Wire used in the manufacture of ropes is subject to what has aptly been termed "fatigue," and this refers particularly to ropes used for winding purposes. The wear of a rope usually is caused by fatigue of the metal from bending over sheaves relatively too small. This fatigue is shown in the steady crystallization of the wires, which become brittle, and of a glassy "shortness," and although their surface may be but little worn, breakage occurs in short lengths throughout the rope. One of the most serious sources of destruction in ordinary hoisting is the injury from bending beyond the elastic limit of the wires of the rope over the small sheaves necessarily used. The number of times that the rope can be bent around a sheave before breaking will vary with the diameter of the sheave.

Injury to the Rope Increases as the Sheave Is Made Smaller

The experiments of Andrew S. Biggart, member of the British Institute of civil engineers, show that the probable life of a wire rope ½ in. in diameter, running over a sheave 16 in. in diameter, with a load of one-tenth of the ultimate strength, would be about 160,000 bends in one direction. The injury to the rope increases very rapidly as the sheave is made smaller, and correspondingly the life of the rope increases rapidly as the sheave is increased in diameter. When the sheave reaches a diameter of about 100 times rope diameter, the factor of the wear so far disappears as to be negligible. If the pulleys are so arranged that the rope is bent one way on one sheave and the opposite way on the other, the life of the rope will be from one-half to two-thirds of what it would be if bent one way only.

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[*] Mining engineer, 202 Alexander avenue New York City.

The majority of wire-rope manufacturers appear to be now agreed that the steel adapted for winding purposes should be of as mild a quality as the factor of safety will allow. The milder grades of steel possess much greater torsional efficiency and immunity from fatigue than those of a very heavy tonnage to the square inch, however excellent in this respect the latter may be when their extraordinary tensile resistances are considered. On the other hand, however, there are many engineers who consider that winding ropes of plough-steel wire should be of the highest tensile resistance, although the shafts may be of limited depths. It would appear to me, however, that plough steel of a high tensile strain should not be adopted for winding in preference to a milder steel, unless the shaft is of such great depth that the weight of the rope itself becomes a serious item in the load; and also when the load on the rope of an existing plant has been materially increased, and the drums and sheaves cannot be altered to meet the new requirements. In this case, the same size of rope, but made of plough steel, can be used with an increase in strength from 50 to 100 per cent. In many cases, however, where an entirely new plant is being erected, after the load has been determined, a high plough-steel rope is specified to hoist it, while it would be more desirable to use a milder steel rope of slightly larger diameter, and this latter would have the longer life. The rope would naturally be heavier, but the cost in regard to the weight would be considerably less.

There are instances where all the winding plant has been originally designed for the reception of a high plough-steel rope of a certain diameter, and under this condition it would be inadvisable to alter it to suit a milder steel rope of necessarily larger diameter; but it is a fact that at various mines the winding ropes consist of high plough steel while ropes of a milder steel, and of exactly the same diameter, would give the required factor of safety.

It is a difficult matter to gather a formula which would give the breaking strains of the various types of wire ropes with accuracy, but there are various formulas for ascertaining the breaking strains of ropes composed of six strands of seven wires, each based principally on a standard weight per foot. The weight, however, varies according to the angle of lay adopted, and the results therefore can only be accepted as approximations, and cannot be applied in the case of compound ropes in which all the wires are laid in several strands. It may be taken, however, that the strength of the rope is dependent on the tensile capacity per square inch of the metal employed, the aggregate square area of the wires employed, and also upon its particular formation. The second condition, being governed largely by the third, the difficulty in laying down one formula to cover all the possible modifications will be quite obvious. As a matter of principle, however, it should be taken for granted, that the greater the number of planes the wires are laid in, the greater will be the loss in tensile efficiency.

For ropes in which the wires are laid in two planes, such as ropes above mentioned, composed of six strands of seven wires each, the breaking strain will be the aggregate sectional area of the wires multiplied by 95 per cent. of the breaking strain per square inch of the material employed, and when the wires are laid in three planes, the sectional area of the wires multiplied by 90 per cent. of the breaking strain of the material used. For every additional plane there should be allowed 5 per cent. for loss in tensile efficiency.

Regarding the breaking strain of ropes consisting of wires of sections other than round, as for instance in the locked coil, such strains are given in the various makers' tables as to make it evident that material of a lower tensile capacity is used, or that a considerable portion of the rope's section is not available for strength. For example, one maker's table gives for a 4-in. circumference plough-steel rope, a breaking strain of 90 tons. Now as the square area of a 4-in. circular rope is 1.227 sq.in., the aggregate breaking strain of 90 tons is equal to a breaking strain of 73.3 tons per square inch of the rope's sectional area. In the case of a 4-in. circumference patent-locked cast-steel hoisting rope, the breaking strain is given as 67 tons, which is equal to a breaking strain of 54.6 tons per square inch of the rope's sectional area. Under these circumstances it would be correct to assume that plough-steel ropes have a breaking strain equal to their sectional area in square inches multiplied by 73.3 and for cast-steel ropes the breaking strain is equal to their sectional area multiplied by 54.6. Moreover, let it be assumed that plough steel has a breaking strain of 110 tons per square inch, while the breaking strain of cast steel is 95 tons to the square inch; it is therefore evident that there is a loss in the tensile efficiency of 33.4

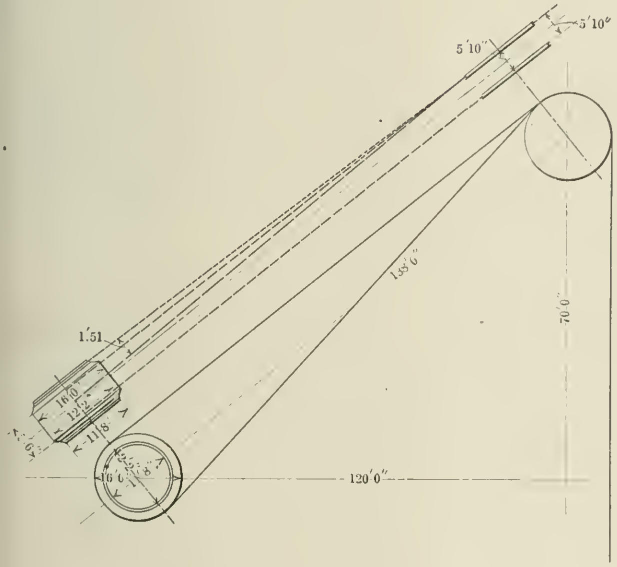

Fig. 3. Winding Arrangement Where the Drum Is Semi-conical

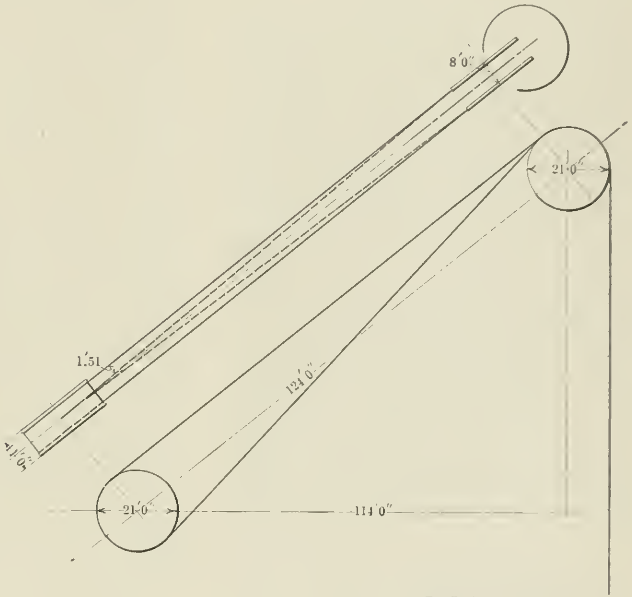

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Fig. 4. Winding Arrangement with Pulleys Fixed in Parallel Planes

per cent. in the plough steel and in the cast steel of the locked-coil type, there is a loss in the tensile efficiency of 42.5 per cent. As to exactly how much of this very considerable loss is due to the fact that the wires are laid in five or six planes, in the absence of certain information, it is not easy to ascertain; there is, however, sufficient evidence to confirm the theory that the tensile efficiency of a rope decreases proportionately as the number of planes in which the wires are laid and vice versa.

Regarding the application of ropes for winding purposes, owing to the fact that there are hardly two positions alike, unless the ropemaker is acquainted with the relative positions of the drum and pulleys, etc., in each case, and recognizes the value of certain factors which affect the life of a rope, it must necessarily remain a matter of chance as to whether the rope is suitably constructed for the work required of it.

Frequently it is erroneously considered sufficient that the manufacturer shall require to know what the load will be, and the sizes of the drum and pulley, but this information gives no idea as to what the lateral angle will be, and consequently no idea of the amount of side friction which would have to be provided for. It is also important that the maker should know the distance between drum and pulley centers, and the space occupied by the rope on the drum after the wind has been completed, and any other special conditions that may be due to local circumstances. This information would enable the maker to know what the angle will be which the rope will have to traverse from the plane in which the pulley revolves, and consequently know whether the lateral friction will be normal or abnormal. It should also enable him to ascertain the length of the arc of contact with the pulley, and the amount of compression which the wires must resist in working over the pulley; and if the degree of lateral friction and the compressional force is appreciated at its true value, then the ropemaker should be able to make a rope that will give satisfaction.

VARIOUS ARRANGEMENTS OF PULLEYS

Several methods which have been adopted to induce ropes to coil on the drum where the lead is unsatisfactory, and where the pulleys are fixed in planes which are not at right angles with the drum shaft, are shown in the illustrations. Fig. 1 shows the relative positions of the drum and pulleys at a shaft where the actual winding depth is 1440 ft. and the load is approximately eight tons The diameter of the drum is 16 ft. and the width between flanges 6 ft. 3 in. The pulley is also 16 ft. in diameter. The diameter of the shaft only allows 3 ft. 2 in between the ropes as they hang in the pit shaft, so that the natural plane of tension between the load in the pit shaft and the drum must be 1 ft. 7 in. from the drum center line, and unless some method were adopted to prevent it, the rope would naturally coil in that line and there would be nearly 2 ft. of coil space vacant, which of course could not be spared. To overcome this difficulty the pulleys were fixed so that they revolved in planes which were about 18 in. outside the drum altogether. They were 3 ft. 2 in. apart toward the shaft, and 4 ft. 1 in. apart towards the drum. By this arrangement the ropes were induced to coil without any loss of space, but the friction on the flange of the pulleys was so considerable that the ropes were worn out in a very short period of time.

Fig. 2 shows an arrangement at a pit where the winding depth is 1200 ft. and the load is approximately 12 tons. It will be observed that the arrangement of the pulleys is exactly opposite to the former instance. The distance between the two pulleys narrows down from 5 ft. 2 in. in the shaft to 4 ft. 3 in. toward the drum; so that they revolve in planes which are toward the drum center line, resulting in abnormal friction on pulley flange and rope.

Fig. 3 is an illustration of an arrangement where the depth is about 1350 ft. and the load is about 21 tons. The drum is semi-conical, rising in five revolutions, from 11 ft. 8 in. to 12 ft. 2 in. in diameter, then in 2½ revolutions to 16 ft. in diameter. The pulleys are 5 ft. 10 in. apart and fixed parallel to each other, and at right angles to the drum shaft. The ropes are therefore induced to coil, by metal grooves, over a distance of about 20 in. beyond the plane in which the pulley revolves. In this case it remains to be seen how long the ropes will work with safety. There can, however, be little doubt that with such a load the friction in the grooves must be very great.

Fig. 4 is an illustration of an arrangement for a pit 1800 ft. in depth, showing the economic lead, size of drum with the pulleys fixed in parallel planes at right angles to the drum shaft.

LUBRICATION

While the winding ropes receive every attention in the way of lubrication at most collieries, there are many instances where similar care is not bestowed on the hauling ropes, and consequently they are many times found to be running in far too dry a state. It should be borne in mind that the sole object of greasing is not only to protect the outside of a hauling rope from corrosion, but also to benefit the inside lengths of wire and to preserve the hemp core, which, if very dry, will invariably crumble away with disastrous results.

ONE BENEFIT RESULTING FROM LUBRICATION

There is one benefit conferred by lubrication upon both winding and hauling ropes which is often overlooked, and that is to lessen the friction of the internal wires, which chafe heavily on each other when a loaded rope is passing over a pulley. This is one reason why the lubricating compound should be thoroughly worked into the interstices of a rope, and not applied in a meager way to the exterior. Apart from the reduction in the sectional area of the wires which this constant friction causes, and which cannot be seen unless the rope is opened out, it is believed that it also induces fatigue of the steel. It has been stated that an unlubricated wire rope stood 16,000 bends before fracture, while the same rope when lubricated stood 38,700.

Lubricating compounds which contain acids should be avoided, inasmuch as they corrode and pit the steel, and perhaps the most frequent offender is common unrefined tar, and some of the greases contain acid. Linseed oil is not to be recommended, as it is liable to harden on the wire and peel off, and this hardening may prevent the succeeding lubrication from reaching the inside of a rope. It has also a tendency to harden the hemp cores, and so effect their early destruction.

PROTECTED HEAD GEARS

While the protection of head gears is not practised at many of the collieries in this country, this system is adopted almost universally in most of the European countries, and is to be recommended, inasmuch as when the winding rope is idle, the cage is usually left suspended at the same place in the shaft, so that until recapped one portion of the rope is on the pulley brow and exposed to the elements, and the rope being slightly out of shape at that part, moisture more readily penetrates to its inside.

The Coal Mining Industry in Montana During 1909

The State coal mine inspector has recently submitted his report for 1909. The total output for the year is estimated at 2,541,679 tons as against 1,978,347 for 1908. This increase was due to increased production in the old mines rather than to the opening of new properties. A total of 3862 men were employed in the industry. The inspector urges the necessity for fire drills in the mines as a means of averting accidents. Legislation is urged, providing for avenues of escape from the mines when the main shaft becomes blocked, and providing for underground refuge rooms where the men may be safe from gases and floods.

Mine Rescue Stations and Mine Accidents

The Secretary of the Interior has sent
ie following reply to the inquiries of
ie Senate about mine-rescue stations
nd the causes of mine accidents:

"1. There have been established and
re now in operation under the U. S.
eological Survey in connection with in-
estigations as to the causes of mine
xplosions, for which the current ap-
ropriation is $150,000, one Federal sta-
on at Pittsburg, Penn., which is ac-
essible to the coalfields in western
ennsylvania, northern Ohio, and north-
rn West Virginia, and three branch sta-
ons—one at Knoxville, Tenn., accessible
the coalfields of eastern Tennessee,
outheastern Kentucky, and southwest-
rn Virginia; one at Urbana, Ill., ac-
essible to the coalfields of Ilinois and
iiddle western Indiana; and one at
eatle, Wash., accessible to the coalfields
f the northwestern Pacific coast region.
ach of these stations is supplied with
ich equipment as is needed by the Gov-
rnment experts and their assistants in
ntering mines immediately following
isasters for investigations, and which
ey have used incidentally in rescuing
ntombed miners and in determining
hen and how the mine ventilation could
e restored, and general rescue work
arried forward by local authorities.

"At each of these four stations a min-
ig engineer has been placed with a lim-
ed amount of equipment, including
xygen helmets, necessary for the use
f himself and his assistants in entering
iines in part or entirely filled with
oisonous gases, as is usually the case
nmediately following a mine explosion.
t each of these stations the mining en-
ineer in charge has trained as volunteer
ssistants a limited number of young
ractical miners in the use of the special
rescue' apparatus, on condition that in
ase of a mine disaster occurring in that
egion each of these would accompany
ie Government's expert and aid him in
ntering the mine immediately following
ie explosion for the purpose of examin-
ig into its causes and results. In carry-
ig out this plan not only has valuable
nformation been obtained, but a number
f miners supposed to have been killed
ave been rescued, and subsequent ex-
losions have been prevented, thus
emonstrating beyond question or esti-
iate the value of such work.

"The majority of the investigations
nto the causes of mine explosions are
eing conducted at the Pittsburg mine-
xperiment station, this being not only
he greatest coal-mining center in the
ountry, but the point nearest to the
arger number of mine disasters which
iad occurred within a few years previous
o the inauguration of this work. The work now in progress here includes researches in connection with the explosives used in mining, the nature, extent, and behavior of the gas and dust found in coal mines, and other factors which are believed to be direct or indirect causes of mine explosions.

"The investigations at Pittsburg have been supplemented as far as practicable by an examination into the local causes and attendant conditions of each of the coal-mine disasters occurring in the United States during the past year. But the long delay in reaching the majority of these mines from the Pittsburg station following the occurrence of each of these disasters was found to be a serious handicap to the success of the work. With the view to lessening this difficulty as far as practicable, the three branch stations were established.

"2. It is recommended that there be established other branch stations, fully equipped, accessible to the more important coalfields of the United States, as follows:

"(1) At some point near the boundary between southern Ohio, western West Virginia and northeastern Kentucky, readily accessible to the coalfields of each of these three regions.

"(2) At or near Birmingham, Ala., accessible to the coalfields of Alabama, southeast Tennessee and northwest Georgia.

"(3) Near the boundary between southern Indiana and western Kentucky, accessible to the coalfields of these two regions and southern Ilinois.

"(4) At some point in eastern Oklahoma or western Arkansas, accessible to the coalfields in these two States.

"(5) At some point in eastern Kansas or west central Missouri, accessible to the coalfields of these two States and central and southern Iowa.

"(6) Near Trinidad, Colo., accessible to the coalfields of New Mexico and southern and central Colorado.

"(7) At or near Salt Lake, Utah, accessible to the coalfields of Utah, western Colorado, and southern Wyoming.

"(8) At a point in southern Montana, accessible to the coalfields of Montana and northern Wyoming.

"(9) In the anthracite coalfields of Pennsylvania, accessible to these coalfields and also the northern bituminous coalfields in Pennsylvania.

"The cost of equipping and maintaining these stations during the next fiscal year is estimated as follows:

"This estimate does not include the cost of the Pittsburg station, which would be cared for in connection with the general investigations of 'mine explosions' already authorized under a separate appropriation.

Equipping nine additional branch stations, at $4300 each..............	$38,700
Housing for same, at $4000 each....	36,000
Additional equipment and furnishing for three existing branch stations, at $3000 each..................	9,000
	$83,700
Maintenance for 12 months, 12 branch stations, at $6500 each....	78,000
Total for equipment and maintenance	$161,700

"3. The causes of certain mine accidents have been traced with a fair degree of ease and certainty to the improper use of explosives, open lights, to faulty electric equipment, to falls of roof, to lack of discipline, etc.; but the larger mine disasters, involving gas or dust, or both, are still little understood, notwithstanding the investigations under way in this and other countries. Unfortunately in most such cases those who might have thrown light on the initial causes have not survived the disaster. In all cases the development of satisfactory preventive measures is still more difficult, and in this country has been long neglected, though equally deserving of inquiry and research of the widest scope and most thorough character.

"The urgency of this work is further emphasized by the fact that as our coal mines are becoming deeper the gas is becoming more abundant and the mines correspondingly more dangerous. The number of such disasters and the loss of life have been for some years steadily increasing. Furthermore, disasters have been occurring in regions where they were least expected and in the 'safest' mines.

"The investigations authorized by Congress as to the 'causes of mine explosions' are now under way, and the facts already developed are such as to encourage the belief that means of lessening disasters from such causes will be in hand in the near future.

"Under the wording of the current appropriation the mine investigations are limited to 'mine explosions,' which are generally responsible for less than 15 per cent. of our mine fatalities. The benefits that may reasonably be expected from this expenditure will be doubtless largely increased if its scope be widened to include also the causes and prevention of other 'mine accidents.' Furthermore, in view of the exceptionally dangerous character of the work as well as its importance and the difficulty in securing the services of suitably trained experts, it seems proper that the investigation work on mine accidents should be placed on as permanent basis as possible.

"As to the action that the Federal Government should take to prevent or at least minimize mine accidents, it is assumed that in mining, as in agriculture, the function of the Federal Government is strictly limited to research and educational or demonstration work, and, therefore, its function in relation to safeguarding the lives of miners must be limited to investigations of the causes and means of preventing mine accidents, developing methods of rescue work, and enough of demonstration or educational work to induce mine operators and miners to adopt these measures, under State supervision, and to lead the States to enact more uniform mining regulations.

"It is on this basis that the additional branch stations described above are recommended. It is believed that they will be adequate for the purposes named and that the work of these stations will be sufficient to induce coal operators and coal-mining States to ultimately establish a sufficient number of small local stations for ordinary rescue work.

"Meanwhile at each existing station, along with researches to develop causes and preventive measures, every effort is being made, and with reasonable expectation of success, to find ways of cheapening the cost of rescue equipment and methods, with a view to their more general introduction by States and individual operators.

"It is, therefore, reasonable to expect that, as progress is made in the investigation and demonstration work at these several branch stations of the Federal Government, preventive rather than rescue measures will increase in importance; that most of these Federal stations can then be discontinued, and that whatever rescue work may prove necessary will, like the enforcement of preventive measures, be fully cared for by local and State authorities.

"Conditions involving mine safety are more uniform than are agricultural conditions, being less influenced by climatic changes. Hence these mine investigations and inquiries, though conducted at these few stations, are of value to the people of all the States, and this value is increased by the fact that the experts of the Federal Government collecting data from all the States and the various foreign mining countries bring to these problems in each State the results of this wider experience and method, with minimum duplication of cost and effort. Fortunately in most of the States the larger mine disasters occur so rarely that several years may intervene without opportunity for mine examinations or rescue work under complicated conditions; and in such cases especially experts from the Federal investigation stations would be able to render special service to the State authorities by virtue of their more frequent and wider experience under equally complicated conditions in other portions of the country."

Connellsville Coke Wages

A new scale of wages for the Connellsville and lower Connellsville region was posted Jan. 10 by the H. C. Frick Coke Company, the coke subsidiary of the United States Steel Corporation, to become effective Jan. 16. As usual, the new scale will be adopted by the independent operators in the region. The new scale restores the basis of $1.35 for mining and loading 100 bu. room and rib coal, which was the basis of the scale in force for a portion of 1903 and again for a portion of 1907, the scale since then having been based on $1.20. Several minor jobs are advanced slightly above the 1907 basis, while very few are placed below it. At the usual rough estimate of one man per oven, the advance affects about 35,000 men, 20,000 of the steel corporation and 15,000 of the independents.

The old high scale, the intermediate scale, and the new scale, are given in full below, with the dates of their becoming effective:

WAGE SCALES, CONNELLSVILLE REGION.

	Mar. 1. 1907.	Jan. 1. 1908.	Jan. 16. 1910.
Mining and loading room and rib coal, 100 bu.	$1.35	$1.20	$1.35
Mining and loading heading coal, per 100 bu.	1.50	1.38	1.50
Mining and loading wet heading coal, 100 bu.	1.60	1.50	1.62
Drawing coke, per 100 bu. charged	0.77	0.70	0.78
Drivers and rope riders (shafts and slopes)	2.55	2.40	2.60
Drivers and rope riders (drift) per full run	2.45	2.30	2.55
Cagers, per full run	2.55	2.40	2.60
Tracklayers, blasters ers and timbermen (shafts and slopes) per day	2.55	2.40	2.60
Tracklayers, blasters and timbermen (drifts) per day	2.45	2.30	2.55
Assistant tracklayers and inside laborers per day	1.95	1.75	2.00
Dumpers and tipplemen, per full run	1.95	1.80	2.00
Leveling, per oven	0.12½	0.11½	0.12½
Chargers, per oven	0.04½	0.04½	0.04½
Chargers, per day	2.00	1.85	2.00
Forking cars, 40,000 lb. capacity and less	1.65	1.50	1.65
Forking cars, 50,000 and 60,000 lb. capacity	1.75	1.60	1.75
Forking cars, over 60,000 lb. capacity	1.90	1.75	1.90

The different scales which have been in force in the region, showing the dates effective and the rate for mining and loading 100 bu. room and rib coal, have been as follows:

	Mining.
February 10, 1894	$0.78
April 1, 1895	0.90
October 1, 1895	0.954
January 1, 1896	1.05
April 29, 1899	1.12½
March 1, 1900	1.25
January 1, 1903	1.35
December 16, 1903	1.10
March 1, 1905	1.20
March 1, 1907	1.35
January 1, 1908	1.20
January 16, 1910	1.35

Colliery Notes

Recent experiments have proved conclusively that coal dust which has been ground to a state so fine that it will pass a 200-mesh sieve, will explode from contact with either a naked flame or with the arc of an electric current.

The deepest coal seams mined in America lie above a depth of 2200 ft.; some of the coal mines in England are developing seams at a depth of 3600 ft., while coal mining is carried on at a depth of about 4000 ft. in Belgium.

Mr. Fisher, of the U. S. Geological Survey, says: "Few coals less than 14 in. thick are mined in a commercial way in the United States, but beds only 8 in. thick are mined commercially abroad. The first English Royal Commission on coal supplies in 1871, fixed 12 in. as the minimum workable thickness, however, many separate beds 8 and 10 in. thick are now worked commercially in England."

A safety lamp for detecting small percentages of firedamp without lowering the flame of the lamp, has been invented by two English engineers. The inventors recently gave a demonstration with the new lamp, showing how the introduction of sodium carbonate into the flame—by means of a piece of asbestos saturated with it—converted the blue cap, produced by gas, into a bright yellow flame, without lowering the lamp flame.

The production of coal in Canada in 1874 was 1,063,742 tons; it took 12 years' of growth to double this annual production, and in 1886 the coal output totaled 2,116,653 tons; in 1898 the production was 4,173,108 tons; in 1904, the production was 8,254,595 tons. In the four years following 1904, the Canadian coal output increased only about 2,000,000 tons, but present indications confirm the belief that the future production will increase at a more rapid pace than it has in the past, and that before a great while, Canada will be able to supply all her own fuel and have coal left for export.

Until a few years ago, all public coal lands were valued uniformly at a rate of $20 or $10 an acre, according if they lie less or more than 15 miles from a railroad. Since July, 1906, the Government has been appraising its coal land according to the value of its contained coal. The present value fixed for the Government coal land, based on the new regulation, is $149,772,443; the value fixed for these same coal lands before the new classification was adopted was $48,240,971. According to these figures, it is evident, therefore, that if these lands had been sold at the prices prevailing before July, 1906, they would have brought the Government about $100,000,000 less than their value at the prices now fixed.

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specifications of any of these
›atents issued by the United States Patent
)ffice will be mailed by THE ENGINEERING
ND MINING JOURNAL upon the receipt of 25
:ents. British patents are supplied at 40
:ents. In ordering specifications, correspond
ents are requested to give the number, name
f inventor and date of issue.

ALUMINUM

SOLDER—Aluminum Solder. John Wir-
;ovits, New York, N. Y., assignor, by direct
nd mesne assignments, of one-third to Henry
Heller and one-third to Glenn M. Smith, New
'ork, N. Y. (U. S. No. 941,835; Nov. 30,
909.)

COAL AND COKE

COAL DUST—Apparatus for Exhausting
'oal Dust from Coal Breakers. Walter S.
'arpenter, Wilkes-Barre, Penn., assignor of
ne-third to Benjamin Harold Carpenter and
ne-third to Edmund N. Carpenter, Wilkes-
Barre, Penn. (U. S. No. 945,375; Jan. 4,
910.)

COAL-MINING MACHINE. Arthur H. Gib-
on, Easton, Penn., assignor to the Ingersoll-
ergeant Drill Company, New York, N. Y., a
'orporation of West Virginia. (U. S. No.
44,029; Dec. 21, 1909.)

COKE OVEN—Vertical-Flue Coke Oven.
'arl Wilke, Sheffield, England, assignor to
imon-Carves Bye-Product Coke Oven Con-
truction and Working Co., Ltd., Manchester,
ngland. (U. S. No. 946,181; Jan. 1, 1910.)

COKE OVENS—Improvements in or Relat-
ıg to Coke Ovens. A. O. Jones, Whitley Bay,
'orthumberland. (Brit. No. 15,078 of 1909.)

COKE OVENS—Method of Preventing the
estruction of Coke Oven Walls through the
lkalies Contained in the Charge. Heinrich
'oppers, Essen-on-the-Ruhr, Germany. (U. S.
o. 945,331; Jan. 4, 1910.)

COAL-CUTTING MACHINES—Dust Pre-
ntive Attachment for Coal-Cutting Ma-
ines. Arthur E. Wood, Charleston, W. Va.
Brit. No. 8727 of 1909.)

EXPLOSIONS—A Novel or Improved
ethod of Preventing Explosions of Coal
ust, Inflammable Gas and the Estimation
Underground Fires in Coal or Other Mines.
. W. D. Gregory, Stoke-on-Trent. (Brit. No.
5.329 of 1908.)

HOISTING—Improvements in Connection
ith Winding Engines for Collieries or the
ike Purposes. A. J. Worth and Messrs.
'orth, Mackenzie & Co., Ltd., Stockton-on-
ees. (Brit. No. 18,147 of 1908.)

SAFETY LAMPS—Improvements in or Ap
icable to Miners' Safety Lamps. Joseph
restwich, Eccles, Lancaster. (Brit. No.
58 of 1909.)

SAFETY LAMPS—Improvements in or Re-
ting to Miners' Safety Lamps. John C.
est, and Maxwell Best, Morley, Yorkshire.
Brit. No. 4001 of 1909.)

WASHING—Method of Washing Coal.
mes R. Campbell, Scottdale, Penn. (U. S.
. 945,692; Jan. 4, 1910.)

COPPER

CONVERTER—Metallurgic Converter. Wil-
m H. Peirce, Baltimore, Md. (U. S. No.
4.905; Dec. 28, 1909.)

EXTRACTION FROM RESIDUES—Im-
oved Process for Extracting Copper from
pper Residues. D. Crispo, Antwerp, Bel-
ım. (Brit. No. 12,565 of 1909.)

ORE TREATMENT—Improvements in the
eatment of Copper and Other Ores. F. B.
ck, Sunbury, England. (Brit. No. 16,667
1908.)

SMELTING FURNACES—Improvements in
rnaces for the Smelting of Ores, Residues
d the Like for the Obtainment of Copper or
her Metals Therefrom. B. de Saint Seine,
ris, France, and Thwaites Bros., Ltd.,
adford, England. (Brit. No. 23.179 of
08.)

GOLD AND SILVER

AMALGAMATOR. Charles R. Hotchkiss,
kland, Cal., assignor of one-half to George
Montgomery, Oakland, Cal. (U. S. No.
5,539; Jan 4. 1910.)

IRON AND STEEL

BLAST-PIPE for Blast Furnaces. Samuel B. Shutts and William McHugh, Joliet, Ill. (U. S. No. 946,404; Jan. 11, 1910.)

DIRECT PRODUCTION—Improvements in and Relating to the Direct Production of Iron from Its Oxides or Oxide Ores. W. S. Simpson and H. Oviatt, London, S. W. (Brit. No. 24,846 of 1908.)

DIRECT PRODUCTION—Improvements in Connection with the Direct Production of Steel or Steel Alloys from the Ore. W. S. Simpson and H. Oviatt, London, S. W. (Brit. No. 24,845 of 1909.)

NODULIZING—Method of Disintegrating and Removing Annular Salamanders in Nodulizing Kilns. August Bräutigam, South Orange, N. J., assignor to August Heckscher, New York, N. Y. (U. S. No. 13,062, reissue; Dec. 28, 1909.)

SLAG CEMENT—Improvements in Machines for the Treatment of Blast Furnace Slag in the Manufacture of Cement. G. F. Metzger, Manchester. (Brit. No. 15,165 of 1909.)

TITANIFEROUS ORES—Improvements in or Relating to a Process of Treating Titaniferous Iron Ores. Wilhelm Borchers, Aix-la-Chapelle, Germany. (Brit. No. 24,590 of 1909.)

LEAD

LEAD OXIDES—Improvements in the Manufacture of Certain Lead Oxides. G. V. Barton, Liverpool. (Brit. No. 4465 of 1909.)

SULPHUR AND PYRITES

PYRITE ASHES—Improvements in or Relating to the Treatment of Pyrite Ashes. A. Pezzolato, Rome, Italy. (Brit. No. 11,263 of 1909.)

TIN

DETINNING—Process of Treating Detinned Iron and Residues. William W. Murray, Baltimore, Md., and Harry M. Fernberger, Philadelphia, Penn. (U. S. No. 943.986; Dec. 21, 1909.)

ZINC

ELECTRIC FURNACE—Electric Furnace for the Continuous Extraction of Zinc from its Ores. Eugène F. Cote and Paul R. Pierron, Lyon, France. (U. S. No. 944,774; Dec. 28, 1909.)

EXTRACTION PROCESSES—Improvements in or Relating to Apparatus for Use in Solution and Precipitation Processes and Particularly for the Extraction of Zinc from Its Ores or Compounds. W. Hommel and the Metal Extraction Corporation, Ltd., London, England. (Brit. No. 26,152 of 1908.)

MINING—GENERAL

GASES—Apparatus for Testing Mine Gases. Joseph Smith, Trinidad, Colo. (U. S. No. 944,247; Dec. 21, 1909.)

GASES—Improved Means for Detecting the Presence of Gas in Mines or the Like. (Brit. No. 525 of 1909.)

HOISTING—Improvements in Apparatus for Preventing the Overwinding of Cages in Mines or the Like. H. D. Bayley, Beeston, and B. Froggatt, Bulwell. (Brit. No. 5273 of 1909.)

PROPS—Improvements in and Relating to Mining Props. F. Sommer, Essen Ruhr, Germany. (Brit. No. 24,347 of 1908.)

PROPS—Improvements in Mining Props. J. H. Eickershoff, Düsseldorf, Germany. (Brit. No. 14 962 of 1909.)

SAFETY ATTACHMENT for Hoisting Engines. Augustus L. Le Grand, West Pittston, Penn. (U. S. No. 946,236; Jan. 11, 1910.)

SIGNALING—Improvements in Apparatus for Electric Signaling in Connection with Mine Haulage and Winding or Operations of a Similar Nature. Robert Rutherford, Ferryhill, Durham. (Brit. No. 21,693 of 1908.)

SURVEYING—Mining-Transit-Center Finder. William A. Berger, Boston, Mass. (U. S. No. 944,654; Dec. 28, 1909.)

THAWING DEVICE for Frozen Ground. Walter T. Ross, Vancouver, British Columbia, Canada. (U. S. No. 944,382; Dec. 28, 1909.)

ORE DRESSING—GENERAL

MAGNETIC ORE SEPARATOR. G. E. Oehrn, New York, N. Y., assignor to American Grondal Kjellin Co., New York. (U. S. No. 946,395; Jan. 11, 1909.)

MAGNETIC SEPARATOR. Sheldon Norton, Mineville, N. Y. (U. S. No. 945,408; Jan. 4, 1910.)

ORE-CONCENTRATING TABLE. Thomas W. Scott, Morenci, Ariz. (U. S. No. 944,917; Dec. 28, 1909.)

ORE FEEDER—Improved Automatic Ore Feeder for Stamps or the Like. John H. Thomas, Bodmin, Cornwall. (Brit. No. 3867 of 1909.)

ORE SEPARATOR. Frederick T. Snyder, Chicago, Ill., assignor to International Separator Company, Chicago, Ill., a Corporation of New Jersey. (U. S. No. 944,699; Dec. 28, 1909.)

ORE TREATMENT—Improvements Relating to the Treatment of Ores of the Like. A. A. Lockwood and M. R. Anthony Samuel, London. (Brit. No. 16,229 of 1909.)

ORE TREATMENT—Process for the Treatment of Minerals for the Extraction of the Metal which They Contain. Buenaventura Junguera of Santa Susana, Oviedo, Spain. (Brit. No. 21,837 of 1908.)

PEBBLE-MILL. Max F. Abbé, New York. (U. S. No. 944,996 and 944,997; Dec. 28, 1909.)

SCREENING—Improvements in or Relating to Machinery for Screening Crushed Stone, Ore and Like Materials. W. H. Baxter, Leeds. (Brit. No. 19,586 of 1909.)

SEPARATION—Improvements in Means for Separating Crushed Ore Products or Other Comminuted Matter from Solid. A. F. Arbuckle, and A. Osborne, Belgravia, near Johannesburg, Transvaal. (Brit. No. 27.767 of 1908.)

STAMP MILLING—Ore-Stamp-Mill Mortar. Peter N. Nissen, Los Angeles, Cal., assignor to the Nissen Engineering Co., a Corporation of Arizona. (U. S. No. 945,135; Jan. 4, 1910.)

VANNER. Daniel K. Allison, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis., a Corporation of New Jersey. (U. S. No. 945.300; Jan. 4, 1910.)

METALLURGY—GENERAL

CHARGING FURNACES—Improved Means for Charging Roasting and Other Furnaces. Utley Wedge, Ardmore, Penn. (Brit. No. 12,766 of 1909.)

COMPLEX ORE TREATMENT—Improvements in Obtaining Zinc and Copper from Complex Ores or the Like. John Richard Williams, Henry Wentworth and Benjamin Bradley, Sheffield, Eng. (Brit. No. 26,711 of 1908.)

DESICCATION OF AIR—Improvements in the Desiccation of Air for Metallurgical Operations. Louis Sterne, London. (Brit. No. 23,529 of 1908.)

FLUE DUST—Process of Reclaiming or Recovering Values from Dust. Nathan H. Livingston, Globe, Ariz. (U. S. No. 943,752; Dec. 21, 1909.)

FURNACES—Improvements in Regenerative and Reverberatory Furnaces. Oskar Friedrich, Bobrek, Upper Silesia, Germany. (Brit. No. 6561 of 1909.)

LIXIVIATION PROCESSES—Improvements in the Arrangement and Construction of Appliances Employed in Lixiviation Processes for the Extraction of Metals. James Williams, London, Eng. (Brit. No. 26,831 of 1908.)

ORE ROASTING FURNACE. Benjamin Hall, Nevada City, Cal. (U. S. No. 945,522; Jan. 4, 1910.)

POWDERED COAL—Method of Burning Powdered Coal. Louis S. Hughes, Joplin, Mo. (U. S. No. 945,846; Jan. 11, 1910.)

RECOVERY FROM SCRAP—Apparatus for Recovering Material from Scrap Metal. Solomon W. Egbert, Joliet, Ill. (U. S. No. 945,024; Jan. 4, 1910.)

SMELTER SMOKE—Improved Method of Treating Corrosive Gaseous Fumes or Smoke. Clarence B. Sprague, Salt Lake City, Utah. (Brit. No. 26,681 of 1908.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

John Mason Boutwell was married at Lawrenceville, N. J., Jan. 22, to Miss Esther Miner.

E. P. Merrill, formerly manager of the Real del Monte y Pachuca Company in Mexico, is in New York.

A. G. McKenna, of Washington, D. C., has been looking over interests in the Nederland district, Boulder county, Colorado.

J. Parke Channing will start for the West next week. He expects to be absent from New York for two or three months.

J. W. Flanagan, president Buena Fe Mining Company, Ojuelos, Jalisco, Mexico, has just returned to the mine from Houston, Texas.

M. W. Mouatt, general manager of the Bellevue-Hudson mines at Georgetown, Colo., has left for Mexico to make an examination of a mine.

Pope Yeatman will leave New York next week for Chile. He expects to examine the Braden copper mines, and will be gone about 75 days.

M. Sidney, manager of the East Argentine Mining Company and Commonwealth Power Company in Summit county, Colo., is on a business trip to the East.

C. H. Repath, chief engineer of the International Smelting and Refining Company, recently lectured before the mining students of the University of Utah.

E. J. Schrader, superintendent of the San Miguel Gold Mining Company, Sonora, Mexico, has been examining the old Mexicana mine near Querobabi, Sonora.

S. W. Eccles, vice-president of the American Smelting and Refining Company, left New York recently on his annual tour of inspection of Mexican properties.

J. J. Kennedy, formerly with the Shenango Furnace Company at Chisholm, Minn., is now with the San Miguel Gold Mining Company at La Palma, Sonora, Mexico.

R. B. Lamb, of the C. L. Constant Company, has returned from a professional trip to Ontario, and has left New York for Central America on important examinations.

John C. Greenway has returned from New York to Coleraine, Minn., and has resumed his work as superintendent of the Canisteo district of the Oliver Iron Mining Company.

Richard M. Atwater, Jr., has been appointed consulting engineer of the Boston & Alta Copper Company. Mr. Atwater is also consulting engineer and manager of the Butte & Superior.

John Moreland, of San Antonio, Texas, general manager of the San Jose Mining Company, at Charcos, San Luis Potosi, Mexico, is visiting the mine, where operations have just been resumed.

S. A. Richards has resigned his position as manager of the Struthers Furnace Company, Struthers, O., after 50 years spent in the iron industry, 30 of them being with Struthers furnace.

M. W. Head, formerly treasurer of the Jamison Coal and Coke Company, Pittsburg, is now general superintendent of the company's West Virginia plant, with an office in Fairmount, W. Va.

J. B. Tyrrell, of Toronto, Ont., is delivering a short series of lectures on "The Structure and Origin of Placer Gold Deposits" to the more advanced students of mining at McGill University, Montreal.

Dr. E. G. Acheson has been awarded the Perkin gold medal of the American Electrochemical Society. The presentation was made Jan. 21 at a meeting held in the rooms of the Chemists' Club, New York.

M. J. Butler, recently deputy minister of the Railway Department of the Dominion of Canada, has been chosen vice-president and general manager of the Dominion Steel and the Dominion Coal companies.

W. B. Allen, of Birmingham, Ala., manager of the Land Department of the Tennessee Coal, Iron and Railroad Company, who has been in bad health for several months, has gone to Johns Hopkins Hospital at Baltimore.

J. E. Edwards has returned to Colorado Springs, Colo,, from Mexico City, where he has been planning the new testing plant for the British Mexican Development Company, of which H Lawrence Read is manager.

Dr. Frederick N. Pease, of Altoona, Penn., has been appointed chief chemist of the Pennsylvania Railroad Company, to succeed the late Dr. C. B. Dudley. He had served under Dr. Dudley in various capacities for 28 years.

Alexander Dempster, recently chairman of the executive committee, has been chosen president of the Monongahela River Consolidated Coal and Coke Company. George W. Theiss, late president, becomes vice-president.

Arthur Yates has been appointed general manager of the Ketahoen mine in Sumatra, for the firm of Erdmann & Sielcken, which owns the Redpang-Lebong, the Lebong-Siman, the Ketahoen and other gold and silver mines in Sumatra.

F. A. Glass will engage in the general practice of mining engineering at Brainerd, Minn. He has been recently with the Duluth Diamond Drilling Company, and with the Rogers Brown Ore Company at the Kennedy, the first producing mine on the Cuyuna range.

Robert H. Plate, superintendent of the Copper Mines Company at Ely, Nev., and who has also looked after other Gunn-Thompson properties at Ely, has resigned and is now in New York. Mr. Plate's work at Ely will be taken over by Arthur Smith of the Ely Securities Company.

Obituary

J. W. Fuller, a director of the Empire Steel and Iron Company, owner of the Lehigh Carwheel and Axle Company, and one of the best known iron and steel men in the eastern Pennsylvania district, died Jan. 14, at Catasauqua, Penn., after a very short illness.

Harold A. Wiley died in Toronto, Ont., Jan. 15, aged 51 years. He was for many years prominent in mining affairs in the Port Arthur district, where he held large interests, and was also interested in the earlier development at Cobalt. He was president of the Canada North-West Steamship Company.

Harvey A. Shipman died at Denver, Colo., Jan. 3, aged 55 years. He was born and educated in Wisconsin, and went to California as a young man, beginning work there as a mining engineer, For several years he had charge of the management of the Searles properties. In 1899 he was called to Colorado to take charge of the Stratton's Independence. He stayed there three years and then went to Australia. In 1905 he returned to Denver and took up general consulting work. A year ago he went to West Africa and it was then he contracted the fever which eventually led to his death.

Societies and Technical Schools

American Mining Congress—The proceedings of the Goldfield convention have been published. A circular from the secretary says: "Our province is essentially one of agitation; being without power to command the enactment of these reforms, our only course is to educate the public and legislative bodies to the necessity of giving due consideration to the demands for various reforms made by the congress. As one of the means of increasing the effectiveness of this organization, we will soon begin issuing a monthly journal devoted to the advocacy of these principles, the columns of which will be open to all members for purposes of discussion We are planning also the holding of monthly meetings of the branch organizations at which questions either of a loca or general nature will be discussed There are now seven branches of the Mining Congress; others are in process of formation, and we hope soon that every important mining center will have its own local branch."

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Jan. 21—In the Nevada City district, e Champion mines have been important 'oducers and when in full operation, ive employment to hundreds of men. iese mines were bonded to an English ndicate after the lawsuit with the adining Home mine, but the bond was not ercised. Recently an entirely new vein is encountered on the 800-ft. level of e Champion, which is said to mill $30 r ton and is the greatest strike in this oup for years. In the same district, ar the Idaho-Maryland, the Nassau ormerly the Dana) is sinking a doublempartment shaft which is down 350 Electric power is used in hoisting d the shaft is being deepened 4 ft. per y with machine drills. The Pittsburgıld Flat Mines Company was organized 1908 to take over the Pittsburg, Gold at and Potosi mines. The property is w being actively opened up. Electric wer has been installed operating all machinery. The Pittsburg mill is uipped with 10 stamps and four vanrs and is crushing ore night and day. od rock has been found in the north fts of the 900- and 1000-ft. levels the Pittsburg with considerable unped ground above these levels. A ıtract has been let to sink the Pittsrg shaft 140 ft. deeper. This mine is dited with a production in excess of 000,000, previous to 1900.

In the Union Hill mine near Grass lley, the Greek vein has been struck the 600-ft. level and shows good ore. Jan. 10 was the best pay-day that the le town of Kennett ever saw; on that , the Mammoth Copper Company disrsed $80,000 to its employees. The ınty ordinance prohibiting gambling been strictly observed, and in conquence the men have paid their bills re promptly than in the past and a d many of them have deposits in ıks.

Extending in a north-south direction ough Sierra county, there is a belt of phibolite-schist, flanked and penetrated serpentine dikes, that is notable for number of quartz veins it contains, t are rich in coarse gold and highde arsenical sulphides. The most ed camp is Alleghany, where are load the Tightener, Eldorado, Sixteenone, and Rainbow mines with their nomenal pockets of gold ore. These ies are in the green amphibolite-schist not at serpentine contacts as frequently stated, although serpentine dikes occur near by. Across the cañon of the North Yuba to the west and north of Downieville are other similar deposits, although none have been found as rich as those at Alleghany. This section has had, however, less persistent prospecting. At the Standard mine in Sailor ravine, four miles north of Downieville, there is little coarse gold but the arsenical sulphides are rich, a recent shipment assaying $1650 per ton of concentrates. The country rock is here also an amphiboliteschist or greenstone, but there is serpentine 200 ft. to the west. This mine, operated by Frye & Winrod, shows a distinct shoot of the arsenopyrite ore, and not a pocket.

W. P. Hammon and others have bonded 7000 acres, 7 miles north of Redding, near the mouth of Clear Creek at $100 per acre, for dredging purposes. Water rights have been secured on Hat creek and Brown lake.

Articles of incorporation were filed at Fresno Jan. 8, by the American Oil Fields Company, having a capitalization of $25,000,000. It is understood that the incorporation of this company will consolidate interests controlling thousands of acres in the Coalinga field.

Butte

Jan. 21—The city council of Butte is acting with deliberation upon the petition of the Davis-Daly company for permission to run an electric tramway from the Colorado mine through the streets to the Great Northern railway. In response to a request of the street and alley committee of the council for an opinion on the legality of the proposed grant the city attorney has rendered his opinion to the effect that the council may safely give its permission without submitting the question to the taxpayers since the permission would amount merely to a license and not a franchise. It is probable, however, that the council will act upon the matter shortly. Until then the shipments will not be begun.

At the annual stockholders' meeting of the Butte & Superior Copper Company, held in Duluth, the following were elected directors: J. B. Becher, A. M. Chisholm, A. B. Wolvin, William White, I. Freimuth, J. G. Williams and John S. Killorin, of Duluth, and H. S. Clark, of Butte.

The Big Blackfoot Railway Company, capitalized for $250,000, and having its principal place of business at Missoula, has filed its articles. Its original board of directors is named as follows: John Gillie, L. O. Evans and C. F. Kelley, of Butte, and John R. Toole and Kenneth Ross, of Missoula. The road will extend from some point on the Big Blackfoot river in a northeasterly direction to the north end of Powell county. The country tapped by the railway is well timbered and contains some promising mines. The Big Blackfoot Milling Company is one of the Amalgamated subsidiary companies and is backed by the same interests, so it is probable that the primary object of the new railway is to transport lumber for the milling company.

The State Railway Commission, by its letter to the Montana, Wyoming & Southern railway, has indicated that unless that company takes some action to furnish more cars for the use of the Bear Creek coal district it will take steps to make that company do so. During the periods of intense cold, so frequent in Montana winters, the coal supply is a matter of vital importance to the people of the State, and the commission is empowered under the law to compel railway companies operating in the State to furnish sufficient service, both freight and passenger. The fact that there has been a coal shortage has been due in some measure to the lack of sufficient motive power on the Montana, Wyoming & Southern railway which taps the Bear Creek coalfields. These fields are at present offering the railway considerably more coal than it can handle.

In a statement issued by F. A. Heinze to the holders of La France Copper Company bonds, it appears that the company is unable to meet the interest which was due on those bonds Jan. 1, 1910. An offer is made to give the company's notes for the interest due, these notes being payable six months after the coupons fall due and bearing interest at the rate of 6 per cent. The company's Lexington mine has not been in operation for a number of months and this is the cause of its inability to meet the interest on its bonded indebtedness. The ores of the Lexington are chiefly valuable for their zinc content, and since the Basin concentrator, also controlled by the same interests, is being put in readiness to operate at its full capacity and is now treating zinc ore for the Butte & Superior company, it is possible that the

Lexington may soon be started up and its ores also shipped to Basin.

Denver

Jan. 23—From that prolific center of mining sensation and high finance, Colorado Springs, comes the startling story, wisely prefixed with an "if the claims of the Apex Copper Company are true," that a district 50 miles west of the above town, near Lake George, "comprises the richest goldfields on the American continent, which will make the entire output of Cripple Creek, Leadville and Alaska a mere bagatelle," etc., *ad nauseam.* It is stated that a drift has been run through "immense deposits of quartz schist (?) and hornblende schist that carry $34 to $43 values in flour gold," and that a shaft has been sunk 250 ft., "every foot of which was in ore that ran $34 or better." The company has been looking for copper for months, but all at once by "careful assays by a new process consisting of a combination of fluxes and fire," the presence of gold was discovered; and the reason that the gold was not discovered in these Lake George ores years ago is, it is further stated, due to the fact that "the values were in flour gold, and were driven off in the fumes and gases by the old fire assay methods," and further, that these values are to be saved now by a "special form of concentration." What a pity that the "old fire assay" should be so unreliable, and that no remedy has been found for it, as for thirty years we have been hearing stories about ore carrying high gold values that were not revealed by the "fire assay!" Also, what a pity if the story of the discovery of this great goldfield is true, that its announcement in a daily paper should be accompanied by such piffle.

Exceptional interest now attaches to the advance of the Cripple Creek deep drainage tunnel, as it is now believed to be entering the mineral-bearing area, and this idea is strengthened by the fact that the heading is in fluorine-stained rock, a characteristic of many of the veins of the district. The district, which contains 6500 acres, has been heretofore successively drained or partially so by four tunnels, the Blue Bell, Ophelia, Standard and El Paso; the recession of water in the mines on the completion of each showed that it had a general level. The present tunnel will be over 700 ft. below the El Paso, the next one above it, and it is estimated by the engineers of the district that its completion will effect a reclamation of ore of a gross value of $130,000,000; and this is based on the hitherto average production of $250,000 per vertical foot over the whole camp. The permanence of ore down to the lowest workings of many of the big mines strengthens the above belief.

The Iron Silver Mining Company, Leadville, has resumed the sinking of the Tucson shaft, which work terminated about a year ago in the middle of the lower quartzite. The next lift will probably put the shaft well into the granite. The principal object in this work is to get below the orebodies, which have gone down below the present bottom level of the mine. It will also develop the fissure system in the quartzite, from which considerable high-grade ore was obtained during the last six months. Three separate contact deposits have been profitably worked through the shaft: first, the porphyry and blue limestone contact; second, the contact between the blue limestone and intrusive gray porphyry; third, a shoot over 900 ft. long near the bottom of the white limestone, and underlying another sheet of intrusive porphyry.

Indianapolis

Jan. 24—Mayor Shank, Governor Marshall and Aquilla Jones, president of the Board of Trade, welcomed the 1600 delegates to the convention of the United Mine Workers of America, Jan. 18. Governor Marshall said he hoped to see an employers' liability act passed in the mining States that will provide for adequate payment for injuries to employees under whatever condition of contributory negligence on the part of corporations. President Lewis, in responding to the welcome said: "I believe it better that the application of common sense should be the basis of the new method of promoting industrial peace in the mining regions. The strike as a method of organizing has not proven a success. The enormous expenditure of funds and the tremendous waste of energy incident to industrial strife, should be avoided. Our right to strike can never be surrendered, but it should be the last resource and every other means exhausted before a suspension of work is ordered or takes place."

Edwin Perry, secretary-treasurer, in his annual report deplored the unprecedented loss of life in the mines of America during the last year and declared that, "not until the function of protecting life is placed where it rightfully belongs, namely, on the operator or mineowner, can we reasonably expect any material change." The report showed that the income of the association for the year was $831,730, making a total of $1,427,470 in the treasury. The expenditures were $956,639, leaving a balance of $470,602, a sum less by $125,119 than a year ago.

The mine workers in convention are emphasizing their position of former years in demanding the enactment of a law creating a national bureau of mines and mining. They also insist that the testing stations and other agencies now established should become part of the bureau.

The real interest of the convention centers in the conference to be held with the operators in Toledo to consult upon the making of a new wage contract. It may be that an attempt will be made to agree upon a sliding wage scale, to be based on selling prices.

Scranton, Penn.

Jan. 24—The first step of a practical kind taken since the passage of the act authorizing county judges to purify the mine-examination boards of the anthracite regions was effected last week by the judges of the Luzerne county court. Some time ago the officials of the first district of the miners' union petitioned the judges of Luzerne county court to oust the existing members of the examination boards, on the ground that the members were corrupt, inefficient and partial. The indictment was perfectly true. Fradulent miners' certificates during the past 20 years have been issued wholesale throughout the anthracite regions, but nowhere with such systematic audacity as in Luzerne county. It was stated by counsel for the petitioners that 90 per cent. of the certificates held by foreign miners were fraudulent. In all probability he could have placed the percentage higher without exaggeration. Practically every saloon in Luzerne county, owned by a foreigner, retailed miners' certificates. Mine inspectors have frequently stated that nearly every disaster in that county—and they have been frequent—was due to the possession of certificates by incompetent persons.

In appointing the new boards the judges took into consideration the representations that were made to them, dismissed all the members of the old boards and filled their places by practical miners whom they believe to be men of integrity and experience. Instead of appointing three men to each district of the county as an examining board, the judges have appointed 10 men for the entire county with a chairman at their head. These examiners will be permitted to organize as seems best to them, set the dates of the examinations and follow out the intention of the act as well as they can. The judges will not interfere with them in the execution of these duties as long as they perform them properly.

Cobalt

Jan. 22--The first shipment to be made from Gowganda this year was recently sent out from the Blackburn mine. The shipment consists of 20 tons of high-grade ore that will assay about 2800 oz. and 10 tons of medium-grade ore that will run approximately 500 oz. of silver per ton. The ore was teamed out from the mine to Charlton. There are now a large number of teams on the road hauling supplies, and it is estimated that there will be about 10 carloads of ore to be brought out of the Gowganda camp.

The Bartlett mine, which was last year responsible for a great part of the publicity given to this section, has reverted back to the original owners, McLaughlin & McIntosh, as the Bartlett company failed to make the last payment. It is a peculiar thing that although this company spent thousands of dollars, and a great deal of it wastefully, absolutely no money was spent in surface prospecting and this is particularly noticeable in a country where this form of prospecting is practically the only means of picking up the numerous small veins which constitute the silver-bearing ores of this district.

Another big discovery of free gold in the Porcupine district was made recently on two lots in the southeastern part of Tisdale township. The samples brought in showed an abundance of nuggets. A party of Cobalt men recently sold five claims, some of which showed free gold, for $20,000. A great deal of interest is centered in the diamond-drilling operations on the O'Brien claim, which are to test the vein at a depth of about 100 feet. As the option on the claims will soon expire the results are looked forward to with considerable anxiety, not only by those holding the option, but also by all who are interested in the country. Several stages are now running regularly and about 50 teams are hauling supplies into the camp. The trail from the railroad to Porcupine lake is 33 miles in length, and the stages can make the trip in a day.

Toronto

Jan. 22—A. A. Coles has made a report to the Ontario government of his inspection made last month of several of the best-known properties of the Porcupine Lake gold district. He states that as there was at least one foot of snow on the ground his inspection was confined to the Dilson, Miller, Gillies, Hollinger, Davidson and Bannerman claims, on all of which he saw free gold in place. The veins are composed for the most part of rusty quartz with a wallrock of schist. In southern Tisdale on the Wilson, Miller, Gillies and Hollinger the veins run northeast and southwest and stand up in ridges above the adjacent schist. To the north of the Bannerman and Davidson the veins are not so prominent. Mr. Coles was informed that some of the schist adjoining the veins also carries gold. Several veins will average 25 ft. in width, and the large vein on the Wilson was stated to average 75 ft. in width for at least 500 ft. Very little work had then been done on them but all the signs were favorable for a good gold camp.

On Jan. 19 the Mines and Minerals committee of the Canadian House of Commons at Ottawa entered upon an important investigation as to the nickel resources of Canada. Arthur Wilson, an expert who has been for some time investigating the situation, gave important evidence as to existing conditions. He urged that development had been retarded by the fact that the mines were largely controlled by the International Nickel Company, of New York, who by keeping down production maintained the price so high that only governments were able to purchase in large quantities. Tens of millions of tons of the deposits were lying idle because it did not suit the purposes of the trust to hasten production. There was being exported from Canada annually to the New Jersey smelters 38,000,000 lb. of nickel matte, the loss in wages to Canadian artisans owing to its not being manufactured as a finished product before export, being over a million dollars annually. He suggested that an export duty should be placed on nickel matte and that the government be recommended to foster in every way the manufacture of nickel steel in Canada. The committee decided to institute an investigation into the operations of the trust and to summon officials of the Canadian Copper Company, representing the Canadian branch of the international organization to give data as to the industry.

A bill introduced in the House of Commons by George Gordon of Nipissing to strengthen the existing legislation for the punishment of ore stealing, received a third reading on Jan. 19. It makes it a criminal offense for anyone to be found in possession of gold or silver ore for which he cannot account.

Mexico

Jan. 22—The Guatemala government has given assurance that the permit for building the Pan-American railroad's international bridge will be granted at once. This means that construction will be begun upon the bridge and that the connecting link between the Mexican railroad systems and the railroad lines of Guatemala will be soon constructed, affording the promised south extension of the Pan-American railroad. The Pan-American road recently passed into the control of the former American Ambassador Thompson, and is said to be well backed financially, to carry on the plan of extending the line through the Central American countries to ultimately connect with the Panama canal. The Pan-American railroad now runs from the station of Geronimo, on the Tehuantepec road along the Pacific coast to the boundary of Guatemala. It has been built for several years and is said to be a profitable road, but with the extension will become important as opening up an outlet by rail for the mineral and agricultural resources of the Central American countries. The mineral development along the Pan-American road in Mexico has not been important so far, although those who have investigated say that the possibilities are large. Some interest was developed in a silver property in this territory some years ago, but on investigation it was proved that the deposit was not extensive. Operations are being carried on at several copper properties in Chiapas, which are tributary to the road, although not directly on the line, and investigations of a copper deposit at Tonala have been made recently. The whole country, south of the Tehuantepec line, and extending into Guatemala, is very inadequately explored as to its mineral resources, and there are reasons to expect that important deposits will be developed there with the extension of the railroad and the assurance of better transportation facilities.

The island of Tiburon, in the Gulf of California, has at last yielded up its mystery. An expedition of American explorers has returned from the island and Fayette A. Jones, of Albuquerque, N. Mex., a mining geologist, who accompanied the expedition, writes specifically concerning the mineral possibilities of the island. He says:

"The recent expedition penetrated the interior of the island and practically covered every portion of the same, where any mineral would seem most likely to exist. Nothing of value in minerals was found and the unanimous verdict of the party pronounced the island practically destitute of mineral wealth. Thus, the supposed golden treasure of the island is now a shattered dream, and the spell of enchantment that once surrounded it has been forever broken by the Jones' expedition. The purported find of pitchblende by the Meadow's party is not credited, and what that party doubtless mistook for pitchblende was evidently obsidian, since abundance of that rock abounds.

"Geologically, the island is volcanic, and was doubtless elevated at or near the close of the Tertiary. The types of lava are profuse and belong to the effusive class. The nearest approach to a true granite is in the northeast part of the island and would, perhaps, be more properly classed as granite porphyry, rather than a true granite. No limestone or sedimentaries were observed, although a small fragment or two of limestone were found, seeming to be an occluded fragment from one of the lavas. The principal eruptive types of rock are species of andesite and rhyolite, the latter passing into the extreme phases of obsidian and pumice stone."

For many years it has been heralded that there were fabulous riches on this inaccessible island which were rendered unavailable by the terrible cannibals of the island, according to the lurid stories of the frontier journalists. Tiburon island apparently is no longer of interest to the prospector or the explorer for mines and minerals.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY·
INSTALLATIONS·DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Alabama

Bibb County

The Woodstock Iron Company has blown out its furnace at Woodstock after a short run. It is said that a thorough reconstruction of the plant is needed.

Jefferson County

Birmingham Horseshoe and Rolling Mill Company—This company has let the first contracts for the construction of steel works, a rolling mill and forge at Gordon Heights, between Birmingham and Bessemer. The plant will cost over $150,000. Officers of the company are N. K. Reid, of Middleton, O., president; W. T. Shipe, vice-president; T. R. McCarty, secretary and W. A. Porter, Birmingham, treasurer.

Alaska

Kupreanof—This copper mine is making preparations to ship about 500 tons of ore March 1. John T. Towers, Sitka, is manager.

Arizona

Cochise County

The December production of blister copper from the Calumet & Arizona smeltery was as follows: Calumet & Arizona, 2,275,000; Superior & Pittsburg, 2,030,000 pounds.

Gila County

Miami—The first churn drill has struck ore assaying a little better than 2 per cent. copper about 500 ft. in advance of the mine workings in the direction of the Inspiration.

Warrior—The company has been shipping 85 tons daily to El Paso from the 200- and 300-ft. levels, where the ore is being stoped from a 60-ft. vein.

Arizona Commercial—The two winzes being put down from the sixth level between the Eureka and Black Hawk shafts have attained an inclined depth of 75 ft. The connections of the 1000-gal. Prescott pump recently installed on the 700-ft. level of the Eureka shaft have been made and if this pump proves equal to handling the water, crosscutting northeast and southwest will be commenced to open the Black Hawk vein at that depth. Most of the ore is being taken from the sixth level, but the fifth level is also yielding well.

Superior & Globe—A station, 30x9x10-ft., has been cut at the 650-ft. level, and a 30-ft. sump is ready for the final timbering. The crosscuts north and south from this station have been driven 30 and 18 ft. respectively. The south crosscut is being driven to open the Yuma vein, and the north crosscut will cut two veins that outcrop north of the shaft. The foundation for the new 60-h.p. hoisting engine is nearly completed. H. V. Snell is superintendent.

Mohave County

The Idaho and Broken Hill mines, owned by E. F. Thompson, have been bought by E. A. Clanton, Jr., of Philadelphia, and A. M. Masters, of Jacksonville, Ill., who bonded the Golden Star mine at Cerbat recently.

In the San Francisco district the Carter shaft is being put down rapidly. In the same district C. F. Kuencor, of Pasadena, Cal., has sold the Golden Star, Esperanza, American Boy, West Point,, Red Bluff and Felix prospects to H. H. Simpson, of Los Angeles, for $27,500.

L. D. Godshall, local manager for the U. S. Smelting, Refining and Mining Company, continues to buy mining property in the Cerbat range. The latest purchase is the Summit mine on Stockton hill, owned by James Bone. Doctor Godshall proposes extending the present crosscut tunnel on the Summit about 600 ft., and will begin work at once. As soon as hoists arrive, he will also start active development on other prospects recently acquired.

Goldconda—A new zinc orebody has been discovered on the 300-ft. level at the junction of the drifts connecting the two shafts. This is probably the middle vein of a parallel system of three traversing the mine and of which one alone has furnished all the ore shipped to the present time. More ore wagons have been added, but the ultimate solution of the transportation problem lies in the building of a spur, a survey for which has already been made, and which is now being considered by Santa Fé officials.

Dixie Queen—This mine in the Virginia district is to be equipped with four Nissen stamps.

Yuma County

Tank Pass Consolidated—The company owns claims in the Harcuvar mountain, nine miles north of Salome. One property, the Ultimatum, has been under development by a Houghton (Mich.) company for some time. The ore is copper, carrying gold and silver. An inclined shaft is being sunk on the Carbonate Hill group, and on the Ultimatum drifting is being done at the 100-ft. level. A new vertical shaft will be sunk to 500 ft. on the Carbonate Hill. D. W. Hall is superintendent.

California

Amador County

Ginnochio—A shaft will be sunk at this mine in Murphy's gulch. George Hambric is interested.

Kennedy—The old officers of this company have been reëlected. At the 3300 level the hanging-wall vein has been cut and shows 5 to 6 ft. of good ore.

Bunker Hill—The cleanup for December was at the rate of $1100 per stamp, though a large quantity of low-grade rock was crushed to save ore handling.

Calaveras County

Cuneo—This mine at Esmeralda is running a tunnel with machine drills under superintendence of Edward Steinberg, of Sheepranch.

Kern County

Yellow Aster—It is reported that the property has been sold. Extensive developments have been undertaken recently and the results are said to have been favorable.

Nevada County

Constitution—John Drabb is running two drifts at this property, one on the Constitution and the other on the Great Western vein.

Last Chance—Lucian Kahn has begun work on reopening this mine in Washington district. There are three veins.

Placer County

Neilsen & Harrie—This company in Canada Hill district, above Westville, is opening up a tunnel to reach the gravel.

La Trinidad—At this mine, Westville, J. L. Robinson, superintendent, work has begun on the new tunnel.

San Bernardino County

Bagdad Mining and Milling Company—The Orange Blossom Mining Company property, nine miles from Bagdad, recently sold under bankruptcy proceedings, has been given this name and new stock will be issued to holders in the old company. The main shaft will be sunk to 600 feet.

Needles Mining and Smelting Company—This company has been organized a subsidiary of the United States nelting, Refining and Mining Company operate the recently purchased Nee-es smeltery and the numerous Arizona d California properties also recently quired. The smeltery will be enlarged. D. Godshall is general manager.

San Luis Obispo County

At Chorro, Easton and Albert Mills have greed to put up a five-stamp mill on a ining property owned by Lewis Silva, d others.

Young America—This drift mine at rest, closed for a year through litiga-n, is being reopened under direction of . M. Beggs.

Mott—At this mine near Forest, Man-er O. A. Harlan has started the work reopening by drifts and inclines.

Shasta County

Uncle Sam—This mine at Kennett is ing reopened with Louis Monahan as perintendent.

Milkmaid—The company operating this d mine at French Gulch is called the ench Gulch Mining Company; J. J. eeby is superintendent.

Sierra County

White Bear—Gravel has been struck in is property at Monte Cristo.

Sixteen-to-one—This mine at Alle-any which has been idle on account of igation will be reopened with E. H. ilson as manager.

Siskiyou County

Elk Creek—This mine at Hawkinsville, rth of Yreka, is milling ore worth $50 r ton.

Colorado

Lake County—Leadville

Spring Steel Tunnel—In order to de-lop claims on the north side of the llian property, this tunnel has been iven 500 ft. and is being pushed ahead, d has about 400 ft. more to go. An-her tunnel has been driven on the vejoy claim, Printer Boy hill, both der the superintendence of J. C. rsey.

Breece Hill Mining and Development ompany—The company, operating in elaide park, has under lease the Dolo-ite, Laurel, Echo, Cora Bell and zahakoa claims. A new shaft on the lomite has been completed, and ship-ents are going forward, under the man-ement of S. P. Fremont.

Ollie Reed—The property, in South ans gulch, is being prospected with o shafts.

Cleveland—The 1200-h.p. electric ist is now installed and running.

Adelaide—The mine, being worked rough the Yak tunnel, is shipping about 0 tons of sulphide ore monthly.

Mikado—Leasers on this old-time ban-r producer have caught a streak of ore 6 in. wide that runs high in silver and copper.

Ibex—Leasers on the Little Jonny, seventh level, ran into a small streak of ore that gave unusually high returns in gold and silver.

Colonel Sellers—The shaft has been unwatered, and the first carload of zinc ore shipped. It is expected to hoist 100 tons daily.

Teller County—Cripple Creek

Abe Lincoln—This mine, which belongs to the Stratton estate, in Poverty gulch, is shipping from a 3-ft. vein on the 300 and 400 levels.

Portland—This company paid its first quarterly dividend for 1910, Jan. 16, at the rate of 2c. per share, amounting to $60,000, making the total amount of dividends paid $8,497,080.

W. P. H.—This mine is sinking its shaft to 600 ft. with the object of catching on its dip the flat vein from which the Jerry Johnson adjoining is producing so heavily.

Findley—President Carlton's report gives the production for 1909 at 6820 tons, of a value of $155,663. The company has $16,000 in the treasury, and no debts. Lessee Frank Clay has entered a rich oreshoot between the 10th and 11th levels.

Jennie Sample—It is now announced that James F. Burns, formerly president of the Portland company, has purchased a controlling block of stock in the Jennie Sample company.

Vindicator—This company will pay its first quarterly dividend for this year, amounting to $25,000, on Jan. 25. Its production from Bull hill during December was about 3000 tons of gold ore, with an estimated value of $75,000.

Joe Dandy—The lessee on this property, W. L. Shocky, is said to have opened a new vein 3 ft. wide. In addition to this is a narrow seam of sylvanite and free gold returning $3 per pound of ore.

Stratton Estate—The American Eagle, under lease to the Colorado Mines Investment Company, of Denver, is shipping good ore.

Idaho

The mineral production of Idaho for 1909 is officially given at $15,000,000, an increase of a million and a quarter over 1908.

Cœur d'Alene District

Bunker Hill & Sullivan—Fine bodies of ore have been opened 600 ft. below the Kellogg tunnel, giving a depth of 3000 ft. on the dip of the vein. The ore surpasses in quality that on the Kellogg level. The two mills are treating 1500 tons daily.

Government Gulch—This property has been optioned to the Federal company for six months. Option price is 3c. per share. The Federal tunnel disclosed a vein of high-grade galena in Government Gulch ground.

Hercules—This company is treating 350 tons of lead ore daily in the Tiger mill.

Blaine & Emmet—Development has been begun by a new company.

Morning—One of the largest stations in the world has been completed at the end of the two-mile tunnel. From the station a four-compartment shaft will be sunk.

Monarch—The output will be increased when a raise 864 ft. long is finished Feb. 1. The mine is shipping eight carloads per month.

Indiana

Clay County

The drawing of the pillars of the Bogle mine near Brazil, caused the surface to sink for 6 to 8 ft. A number of houses, occupied by miners, were toppled from their foundation, and a large brick school house, recently completed, was ruined. The township trustees will bring suit against the company for damages to the school house.

Greene County

The Glenburn mine, owned by the United Fourth Vein Coal Company, is hoisting coal for the first time in two years. This mine was closed two years ago for repairs. Since then it has been carefully overhauled and is now in first-class condition.

Sullivan County

The Union mine north of Sullivan has broken its record by hoisting an average of 901 tons a day for the last week.

A fire occurred in Hymera No. 33, Jan. 19. The superintendent and miners were hoisted just in time to save them from suffocation. The fire is believed to have been of incendiary origin, as it was started in an entry. The mine inspector is making an investigation.

Vermilion County

Charles Walter, who recently completed sinking mine No. 4 for the Clinton Coal Company, has begun work sinking a mine for the Jackson Hill Coal Company east of Clinton, and at a point between Deering mines Nos. 6 and 8.

The Miami Coal Company, which has just commenced to hoist coal from a new mine sunk south of Clinton, has begun to sink another shaft.

Vigo County

Augustus Bayne & Son, of Coalmount, are incorporating a company to sink a shaft on the Bayne farm, near Coalmount.

The Retlaw Mining Company has been organized for the purpose of shipping coal and other minerals. Amount of stock, $100,000. Waller S. Bogle, Charles W. Gilmore, James K. Wallace, Walter V. Adams and John Shirkie, directors.

Michigan

Copper

Mohawk—The company has encountered the Kearsarge lode in the crosscut driven from the first level, 210 ft. from the surface of its No. 6 shaft. The lode is well charged with copper and gives promise of yielding much better mineral returns than at other portions of the mine. The crosscut will be extended to the hanging-wall side and then drifting north and south will be started. Sinking is to be resumed in the shaft, which is going down in the footwall 60 ft. behind the lode.

Hancock—No. 2 shaft is nearing the point where it is calculated that No. 2 lode will be cut. This lode has been opened by No. 1 shaft near the surface, and while it is not as well mineralized as No. 1 or No. 3 lodes, its opening at depth will be awaited with interest. The openings on No. 3 lode are continuing in well mineralized ground.

Lake—The rock crusher has been installed and everything is in readiness to begin shipments to the Franklin mill. It is planned to ship about 1000 tons per week. The crosscut from the sixth level is going forward and will soon reach the lode, its existence having been proved by a drill; the core taken shows the same high-grade mineralization as opened in the upper levels. A contract has been let for a high-duty hoisting equipment for summer delivery.

Superior—At No. 1 shaft a crosscut is being extended to cut the lode at the 13th level, and the extension of drifts from the levels above are maintaining the same mineral contents. A much better recovery of copper is being noted at the Atlantic mill, owing to the changes put into effect, which include the pulverizing of the sands.

Franklin—This mine has started exploratory work to ascertain conditions of the No. 3 Hancock lode on its lands.

Oneco—The company has made arrangements for a second drilling outfit, and as soon as it is delivered will go into commission in proximity to the recent strike. No. 5 hole is down about 750 ft. on its way to cut the Oneco lode, which it is calculated will be reached at a depth of about 1000 ft. When this has been finished the drill will be moved to the eastern portion of the tract and a hole put down vertically to cut the New Baltic formation.

Atlantic—Operations are centered in underground exploratory work at the section 16 tract to open up the Baltic lode. The shaft is down to the 25th level, and from that point drifts are being extended in both directions with very encouraging ground being exposed. At the 16th level a crosscut is being driven eastward across the tract; it is now 800 ft. from the shaft and has cut several copper-bearing formations, but no lateral work has been started on any of these. At the 13th level a limited amount of stoping is being done.

South Lake—The company has encountered three copper-bearing lodes with its No. 1 drill. These lodes will be further opened by drill work. No. 2 drill is operating vertically to penetrate the Lake lode.

Adventure—This company has called an assessment of $1 per share payable Feb. 1, to provide for exploratory work. The only work being done on the property is the sinking of a vertical shaft to expose the three copper-bearing lodes revealed by the drill.

Elm River—The company will be reorganized under the laws of Michigan with a capital of 100,000 shares at $25 par value. This reorganization will provide for further explorations. Crosscutting is being done from the bottom of its exploratory shaft.

Missouri

The Puxico Iron Company has been organized as successor of the Puxico Mining Company to work a deposit of brown iron ore in the Ozark region. The offices are at Cape Girardeau, Mo. C. J. Crawford is president and A. J. Meyer, treasurer.

Joplin Zinc-lead District

United Zinc—This company has taken a lease on 97 acres of the Riseling land west of Joplin, near the Mikado and Live Oak mines, and will work the sheet ground as well as the upper ground.

Granby—The company is drilling the Lone Elm land at Joplin where shallow lead and zinc deposits were worked many years ago. The land has never been worked to a deep level on account of the strong flow of water. The Granby company is reported to be developing this land with the idea of mining the tract instead of leasing it as has been the custom.

Montana

Butte District

Amalgamated—The Leonard and East Colusa mines and the Silver Bow, Berkeley and Gray Rock mines are again working. The mine-coal supply is coming into Butte regularly so there is no immediate apprehension of a fuel shortage.

Butte & Superior—A seven-drill compressor has been installed and another 20-drill compressor ordered. Shipments of zinc ore are being made to the Basin concentrator at the rate of 200 tons daily. The crosscut from the Black Rock shaft to the recently acquired Colonel Sellers shaft is now in about 75 feet.

British-Butte—The annual meeting of stockholders has been held in Butte. Norman W. Jenks, son of one of the heaviest British stockholders, was appointed general manager to succeed Colonel De Hora. During the meeting a telegram was received from the company's attorney at Washington to the effect that the hearing on the contested patents for the company's placer ground had been completed but no decision reached. In the hearing at Butte the company won, but the Government appealed the case to the Department at Washington. The diamond drilling on the placer ground is going on with one shift but three shifts will soon be put on. No definite date for the resumption of dredging operations was decided upon but the decision of the contested applications for patents will probably be the determining factor in the matter.

Butte-Ballaklava—Foundations are being built for the electric hoist. The hoist has double drum and is capable of sinking 2000 ft. The old steam hoist will remain in position for emergency.

Jefferson County

Corbin-Montana—At a recent meeting of directors the name of the company was changed to Corbin Metal Mining Company to avoid the similarity of the former name with that of the Montana-Corbin company operating in the same district. The shaft is now down 290 ft. and will be sunk 700 ft. before drifting is done.

Boston & Corbin—The new electric hoist, good for 2000 ft., is being installed and the motors and new compressor are being placed in position. The pole line is completed. A 200-ton concentrator will be erected in the spring.

Amazon-Montana—A gallows frame and an electric hoist good for 500 ft. are being installed, and a compressor has been ordered. A power line is being constructed from the main line of the Missouri River company to the mine, 1⅔ miles. The shaft is down 100 ft. and will be sunk 250 ft. before other development is done. Crosscuts will then be run north.

Montana-Corbin—The shaft is down 400 ft. and sinking is being pushed.

Granite County

Shakespeare—The management states that a 30-in. vein of high-grade ore has recently been encountered. The mine has not produced in ten years but about a year ago was purchased by L. U. Loomis and others who have been steadily engaged in exploration.

Madison County

Conrey—Plans for a new gold dredge will be submitted to the directors shortly.

Elfrieda—Duncan Brothers are makg regular shipments from the mine ear Virginia City.

Nevada

LANDER COUNTY

Western Milling and Reduction Com- ıny—The company, M. C. Scully, man- ger, will erect a 20-stamp mill at the ·w gold district of Kimberly, 18 miles om Battle Mountain.

LINCOLN COUNTY

The disastrous flood of New Years' day ı the Salt Lake route which destroyed early 100 miles of roadbed was also a eat calamity to the mining interests in e Pioche district. Most of the branch ıe from Caliente to Pioche was de- royed and Modena, Utah, is now the earest railroad point, both for mail and ıpplies, a 40-mile haul over rough agon road. This means that a great any mines about Pioche will have to ose down for some time, until the rail- ad can be rebuilt which probably will over a new route nearer Pioche to oid similar washouts in future.

Alunite—This property, in charge of obert T. Hill, of New York, will resume velopment.

Lenape—This company has been or- nized to operate claims in the Search- ght district. A. M. Jennings is man- ger. The property yields copper and ee milling gold ore.

LYON COUNTY

Rock Point Mill—The plant at Dayton, stroyed by fire, has been rebuilt. It s 40 stamps.

STOREY COUNTY

Union Consolidated—A new north drift as started from a point in the east osscut, 930 ft. from the shaft, on the 00-ft. level. Development here will watched with interest.

WHITE PINE COUNTY—ELY

Giroux—The annual meeting of the mpany will be held at Duluth, Feb. 1.

New York

United Mining Company—Frank C. aker has been appointed receiver on e application of Francis C. Nicholas, a ndholder, who obtained a judgment ainst the company for $70,017. The mpany is a Maine corporation incor- rated five years ago and capitalized at ,000,000. The company holds a con- olling interest in the United Mining and evelopment Company of America, and ıd options on numerous mining proper- es in the United States, Mexico and anada.

North Carolina

Brewer—W. U. Clyburn, Lancaster, as purchased the mine tract with ma- iinery and property, paying $20,000. he DeSoto Mining Company operated this mine in the northern part of Chesterfield county.

Consolidated Nickel—Three mines at Webster are installing machinery.

Oklahoma

Omaha-Petersburg—This company is planning the erection of a 500-ton mill at Quapaw and has asked for bids.

Oregon

EASTERN OREGON

Many mines in this district have recently reopened, after having been closed down for many months, the principal cause being due to the extension of the Sumpter Valley railroad from Austin to Dixie, the crest of the mountains.

White Swan—The mine was purchased, Dec. 13, by D. W. French, of Baker City. The future operation of the mine has not yet been decided.

Red Boy—The mine, in the Granite district, 40 miles west of Baker City, under management of D. W. Chapman, is running two shifts and shipping rich ore.

Pennsylvania

ANTHRACITE COAL

Lehigh Valley Coal Company—This company has let a contract to the Jenkins Contracting Company to do a large amount of stripping on the Mammoth vein at the Continental colliery, 1½ miles east of Centralia. The vein is to be uncovered for about a quarter of a mile, and will be mined on the open-pit plan; but the coal will be handled underground to the Centralia breaker.

BITUMINOUS COAL

Hicks Coal Company—This company at Leechburg, is arranging to put in 15 new coal-cutting machines, with the necessary electrical equipment.

Utah

BEAVER COUNTY

Cupric—This property near the Horn Silver mine is planning to ship. A railroad spur will be built.

Horn Silver—The company has entered into a contract with the American Smelting and Refining Company for the treatment of 2500 tons monthly.

Moscow—A body of lead-carbonate ore, carrying silver, has been opened on the 400-ft. level. Angus Buchanan is manager.

Orphan Boy—A strong vein has been encountered in the tunnel on this property.

JUAB COUNTY

American Star—The company has made final payment on the Town View properties, Tintic and will sink to 1100 ft. to develop ore proven from the 900-ft. level of the Eagle & Blue Bell mine.

SALT LAKE COUNTY

Bingham Mines Company—This reorganized company has cleared all litigation and effected the consolidation of the Yosemite, Cluster and Mississippi properties and will resume operations. The company is the legal successor to the Bingham Consolidated Mining and Smelting Company.

Tennessee

The Maxwell Knight Iron Company has been incorporated to work the Maxwell iron-ore land on the Virginia & Southwestern road, three miles from Butler, Tenn. The tract includes 600 acres, with a large deposit of brown iron ore. H. V. Maxwell, of Butler and H. J. Knight, of Boston, are the incorporators.

South Dakota

Homestake—The property has resumed operations and it is expected will be running as usual in a few weeks with nonunion labor.

Columbus and Hidden Fortune—Negotiations are under way to consolidate and reorganize these properties near the Homestake.

Gold Dollar—The property will be operated soon. The Eleventh Hour mill is erected on the Crown Hill claims. Stamps will be substituted for rolls.

Virginia

It is reported that the mine of arsenical pyrites of Brinton, Floyd county, is to be reopened soon by C. R. Brinton, of Floyd, who is also arranging to establish works for the manufacture of paris green at Norfolk. The Brinton mine has been closed for over two years; it was last worked by a Pittsburg company.

Wyoming

In the Sunlight Basin mining district east of the Yellowstone Park and 35 miles north of Cody, the Winons Mining Company of Denver is driving a tunnel now in 800 ft., and the Gold Dollar company is planning to begin operations in the spring on a placer deposit.

Canada

BRITISH COLUMBIA

Consolidated—The company will build a two-mile tramway from mine No. 7 to Boundary falls, where a mill will be erected.

Tyee—The December report is as follows: One furnace in blast 26⅓ days; smelted 7400 tons, producing 625 tons of matte, valued at $92,000.

ONTARIO

Shipments of ore from Cobalt for the week ended Jan. 15 were as follows: Buffalo, 64,500; City of Cobalt, 54,000;

Coniagas. 59,945; Crown Reserve, 122,432; Drummond, 230,000; La Rose, 255,972; Right of Way, 63,061; total, 859,910 pounds.

A 99—On this property in the Gillies Limit, owned by J. H. Waldman, a smaltite vein 1½ in. wide carrying silver has been traced for 60 ft. on the surface. A shaft will be put down.

Waldman—The shaft is down 75 ft. and preparations are being made to stope east and west. The vein dipped out of the shaft at 70 ft. and had to be reached by a crosscut. From this a raise was started, the vein showing at the head of the raise with about 8 in. of good smaltite ore carrying native silver. Drifting has been done for about 70 ft. to the west at which point a raise will be started. Diamond drilling will be done from the bottom of the shaft to discover the dip of the vein at 150 ft., further sinking of the shaft being delayed until cheap power is available. Several tons of high-grade ore have been sacked. The property is in the Gillies Limit near Cobalt.

Mikado—This mine, Lake of the Woods district, has been closed for the last seven years but an option has been taken by Capt. H. A. C. Machin who will shortly begin active operations.

Northern Pyrites—The company intends to electrify the mine equipment and to install a crusher plant at Fort William where cheap power can be obtained. The property is at Lake Superior junction, F. C. Becker, manager.

Atikokan Iron Company—On the application of Mackenzie & Mann, who are extensive shareholders in the company, Judge Clute made an order Jan. 19 staying proceedings against the company on Sept. 8 and discharging Joseph D. Fraser, provisional liquidator. The shareholders have procured the necessary funds to satisfy all debts and continue the business. The property is near Port Arthur.

Reeve-Dobie—A shipment of about 30 tons of high-grade ore has been made to the Coniagas smeltery at Thorold, Ont. This is the second shipment from the Gowganda district.

McArthur Gold Mining Company—Peter McLaren, representative of this company, Porcupine lake, the headquarters of which are in Glasgow, Scotland, has gone to Porcupine to push development work on the Bannaman, Way and Griffith claims at the northwest end of Porcupine lake. Two test pits are down on a quartz vein varying from 4 to 8 ft. in width, a short distance apart with good gold showings in both. Shafts will be at once put down.

YUKON

Extensive preparations are being made for the building of a power ditch near the mouth of the North fork next spring. A. N. C. Treadgold is interested in the project and will use the power to be developed on several creeks of the camp.

Lone Star—One of the most encouraging results of quartz work in the Klondike has been obtained on this property in Victoria gulch. The tunnel tapped the vein at the 90-ft. level.

Mexico

CHIHUAHUA

The New York officers of the Chihuahua Mining Company and of the Potosi deny that there are any pending negotiations for the rate of the properties.

The monthly zinc shipments from Chihuahua are 3000 tons as compared with nearly twice the figure before the United States tariff changed. Foreign agents are negotiating with several of the largest shippers of high-grade ore in the eastern part of the state.

San Gregoria and Esmeralda—These properties, near the Mina Vieja, Santa Eulalia, have been purchased for $150,000 by the Exploration Company, of London.

Los Sauces—This company, of which Frank Hine is manager, has completed its matting plant which will be started up shortly. The plant is reached from Santa Maria del Oro in the Parral & Durango railway, and is near the Durango state line.

San Jose del Sitio—The surface improvements, including a 40-stamp mill and 22-km. railroad of the Pittsburg company formerly operating at this place in western Chihuahua, have been levied on for wages and supply accounts. The property has been idle for several years.

El Rayo—The results for December were: Mill ran 29 days; ore crushed, 4300 tons; value of ore per ton, $14.33; extraction, 83 per cent.; value of product shipped, $46,326; operating expenses, $27,465; operating profit, $18,860.

GUANAJUATO

Guanajuato Consolidated—The report by telegram for December was: Mill ran 30 days and crushed 7784 tons of dry ore; concentrates shipped to smeltery, 183 tons; estimated realizable value of bullion, 59,400 pesos; of concentrates, 52,200 pesos; total gross value, 111,600 pesos; expenses, 72,800 pesos; estimated profit, 38,800 pesos. of this 9200 pesos was expended on 354 ft. of development.

HIDALGO

Real del Monte y Pachuca—The company has declared a dividend of 200 pesos per share.

JALISCO

Tecalitlan—A 20-ton Bryan mill and concentrating and amalgamating equipment have reached the properties of A. J. Stewart and G. S. Johnston in the Nogales camp, Tecalitlan district. Three gold and gold-copper mines are being developed. The machinery will be operated by water power.

Amparo—Reports for the last two months show that a production of over 100,000 pesos monthly is being maintained. In November the output was $111,402 pesos, from 5103 dry tons of ore, and in December, 111,449 pesos, from 5440 tons. A body of high-grade ore was recently encountered, and shipments are being made.

MEXICO

Esperanza—The December return was as follows: Mill ran 27 days and crushed 14,450 dry tons of ore; tailings treated, 2962 tons; concentrates shipped to smeltery, 28 dry tons; estimated realizable value of bullion, $220,086; concentrates, 20,937; receipts from other sources, $877; total, $241,900; less mine expenses, $118,329, leaving $123,571; estimated profit, £25,072. Expended on construction account, $13,419; 913 ft. of development were done.

QUERETARO

El Doctor—This mine, owned by the Braniff estate, has completed a tramway 22 km. long from the Santo Entrerro to the smeltery, and is operating under favorable conditions. L. A. H. Stockdale is manager.

TEPIC

Certuchena—A 20-ton Lane mill and concentrating plant have been erected and are in operation. Steam power is used. Later electric power will be secured. A cyanide annex is planned. The owners are A. R. Bird, of San Antonio, Tex., M. P. Wright of Los Angeles, Cal., and Alfred Lonergan and Sydney Kempton, of Tepic.

Tepic Gold Mining Company—This company, organized in Los Angeles, has acquired gold properties near the Certuchena, Ahuacatlan district.

ZACATECAS

San Carlos—As a result of the recent reorganization, the 50-stamp mill and cyaniding plant at the mines in the Mezquital del Oro district will be immediately overhauled, and extensive development will be resumed.

Asia

KOREA

Oriental Consolidated—The mail advices of the results for November are as follows: 220 stamps crushed 26,182 tons; running time, 27½ days; gross receipts, $138,471; operating costs, $65,601; operating profit, $72,869; put into improvement, 2500; net profit, $70,368.

Australia

WESTERN AUSTRALIA

Gold production in December was 134,153 oz. fine. The total for the year was 1,595,341 oz., or $32,975,698; a decrease of 52,571 oz., or $1,086,643, as compared with the previous year.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND
STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Jan. 26—The coal trade in e West is in a little better shape. De- and continues strong and the mines are l busy, while transportation is improv- g, both in the matter of car supply and e car movement.

In the East poor car supply and stormy eather are making the trade uneven and icertain. There is, however, some bet- rment in demand.

The anthracite trade shows no special cident and continues very steady.

The great point of discussion in the estern trade is the wage-scale confer- ice which will take place in Toledo next onth. The United Mine Workers at idianapolis have resolved to ask for a ck mining rate of $1 per ton for next ear, which will be an advance of 10 to 5 per cent. on present prices. The oper- ors, on the other hand, declare that a duction is necessary in view of the esent condition of the trade. Doubtless ere will be a long discussion ending ith a compromise at something like the esent rates.

The Anthracite Trust Suits—After me two years spent in taking testimony e Government brief against the alleged nthracite Trust has been filed in the nited States Circuit Court at Philadel- iia. It alleges various general and ecific acts in contravention of the anti- ust law.

COAL TRAFFIC NOTES

Bituminous coal and coke tonnage of ading railroads in Pennsylvania and Vest Virginia, 11 months ended Nov. 30, iort tons:

	Coal.	Coke.	Total.
alt. & Ohio........	21,156,064	4,206,225	25,362,289
uff., Roch. & Pitts.	6,111,609	460,364	6,571,973
uff. & Susqueh'na	1,328,344	296,373	1,624,717
enn. lines, N. Y. C.	6,849,298	86,147	6,935,445
tts. & L. Erie.....	8,994,715	5,061,622	14,056,337
tts., Shawmut&N.	851,067	16,546	867,613
orfolk & Western.	12,736,642	2,387,146	15,123,788
hes. & Ohio.......	12,399,588	420,879	12,820,467
irginian	206,798	....	206,798
Total..............	70,634,125	12,935,302	83,569,427
Total, 1908........	60,781,059	8,036,551	68,817,610

Total increase in 1909 was 14,751,817 ons, or 21.4 per cent. The Virginian ailway report is tidewater tonnage only. ı addition to the above the Baltimore & hio carried 719,681 tons anthracite in 908, and 783,355 in 1909; increase, 63,- 74 tons.

Coal tonnage of railroads in Ohio Coal raffic Association, 11 months ended Nov 0, short tons:

	1908.	1909.	Changes.	
Hocking Valley......	3,033,023	3,066,137	I.	33,114
Toledo & Ohio Cent.	1,473,228	1,254,843	D.	218,385
Baltimore & Ohio....	1,319,549	1,416,400	I.	96,851
Wheeling & L. Erie..	2,493,773	2,910,375	I.	416,602
Cleve., Lorain & Wh.	2,217,064	2,342,083	I.	125,019
Zanesville & Western	1,180,104	994,929	D.	185,175
Toledo Div., Pen. Co.	1,410,128	1,695,220	I.	285,092
L.Erie,Alliance&Wh.	986,756	1,016,076	I.	29,320
Marietta, Col. & Clev.	50,791	74,284	I.	23,493
Wabash-Pitts. Term.	....	32,268	I.	32,268
Total...............	14,164,416	14,802,615	I.	638,299

The total increase in tonnage this year was 4.5 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

Coastwise shipments of coal from Atlantic ports, 11 months ended Nov. 30, long tons:

	Anthracite.	Bitum.	Total.	PerCt
New York....	13,087,275	9,652,531	22,739,806	60.7
Philadelphia	1,824,982	4,318,560	6,143,542	16.4
Baltimore....	211,582	3,079,433	3,291,015	8.8
Newp't News	....	3,216,661	3,216,661	8.6
Norfolk......	....	2,078,880	2,078,880	5.5
Total......	15,123,839	22,346,065	37,469,904	100.0
Total, 1908.	15,877,952	20,789,970	36,667,922	.....

The total increase in 1909 was 801,982 tons, or 2.2 per cent.

New York

ANTHRACITE

Jan. 26—Business continues good although local deliveries have been seriously disturbed by stormy weather. Barges for city and near-by delivery have been held up and delayed on this account.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points: Pea, $3.10@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. Some coal is reported sold higher where quick delivery is wanted.

BITUMINOUS

In some respects the bituminous trade is improving. There is more demand for coal and it is quite generally distributed. The improvement in trade has not been quite so great as expected, but still there is an improvement manifest.

The leading feature in the trade continues to be the scarcity of cars. On the Baltimore & Ohio mines are doing well if they can get 25 per cent. of the cars they need. On the Pennsylvania the proportion may run up to 50 per cent. Transportation is better and coal comes through in fair time if it can once be loaded.

The car shortage has held back shipments and stocks of coal at tidewater are low. In many cases it is hard work for shippers to fill contracts. Prices continue about the same, and fair grades of steam coal can be had at $2.60 f.o.b. New York harbor points. Gas coal is especially scarce, and it is difficult to get consignments through, consumers being dependent on day-to-day receipts.

The coastwise trade is demoralized. The nominal rate for moderate-sized vessels is 85c. from New York to points around Cape Cod; but vessel owners are afraid of the continued stormy weather and in some cases 90c. and even $1 is asked on pressing shipments.

Birmingham

Jan. 24—There is no hesitation in the coal-mining regions in Alabama and labor is being added to the present forces wherever it can be secured. There is need for all the coal that can be mined. A favorable rail-freight rate on coal from the Birmingham district into New Orleans is proving of considerable advantage, more than 3000 tons of Alabama product going into that market daily now. Alabama operators have been assured that there will be a steady demand for some time to come. The home consumption of coal is also large and steady. Every mining company in the State is adding to its force as quickly as the men can be brought into the district. The North Kentucky Coal and Manufacturing company has been incorporated here with H. M. Morrison, of Ohio, president. The Gulf States Coal Company has been incorporated by Birmingham and Mobile men.

Chicago

Jan. 24—The coal market is in much easier condition, with supplies to this market coming in more freely and the demand for domestic uses somewhat lighter, both features being due to milder weather all over the Middle West. For some coals, however, notably western screenings, the prices remain high; other steam coals are still above normal quotations for winter delivery, although there is a falling tendency as more and more supplies come in. With a continuance of mild weather and large shipments overstocking of the market through too large receipts can easily occur.

Screenings from Illinois and Indiana mines are selling at $2@2.20, run-of-mine from the same source brings $2.30@2.50 and lump remains $2.75@3.50, lump being least at a premium. The high prices of fine coals seem to show conclusively that the Chicago market is becoming more and more one for such coals, a tendency that has been noted for a number of months.

Coals from east of Indiana are coming in more freely, in general, but the supply is variable from day to day and the demand is not so variable; consequently prices are fluctuating. Run-of-mine continues to be most in demand, at $3.30@3.50; lump brings $3.75@4; Hocking is steady at $3.15; Youghiogheny sells for $3.25, steam, and $3.30 gas, with about normal conditions. Anthracite demand is less, with chestnut still scarce.

Cleveland

Jan. 24—Car supply and transportation are the chief elements in the trade this week. The local demand is strong, but it is hard to get coal in sufficient quantity to supply customers.

Prices are nominally unchanged, but premiums of 10c. up to 25c. are paid to secure early deliveries, so that it is hard to give definite quotations.

Some tonnage has already been engaged for the Lake trade for next season. Most of it is at rates 5 or 10c. above last year.

Indianapolis

Jan. 24—The coal trade continues active, both for domestic and steam coals. Mines are all busy and are shipping as fast as they can secure cars.

Interest centers on the United Mine Workers' convention, a report of which is given elsewhere. There appears to be a general agreement on the demand for a higher mining scale for next year.

Pittsburg

Jan. 25—The coal market shows greater strength this week; buyers wishing to stock up against a possible suspension of mining April 1 in connection with the wage scale. Prices are not higher, but demand is improved. The car supply is not as bad as last week, but is still not satisfactory, and the movement continues very slow. The official announcement made last week that a 99-year traffic arrangement has been made between the Western Maryland and the Pittsburg & Lake Erie (New York Central) removes any doubt there may have been regarding the assumption that the recent buying of Pittsburg Coal stock was on behalf of the Western Maryland. A 93-mile single-track line will be built between Cumberland, Md., and Connellsville, Penn., connecting the Western Maryland with the Pittsburg, McKeesport & Youghiogheny, which the Pittsburg & Lake Erie leases, affording an outlet to seaboard for freight originating on the Pittsburg & Lake Erie lines, which tap a large portion of the Pittsburg Coal Company's properties.

The local coal market is strong, as noted, for mine-run and screened coal, prices remaining at $1.15 for mine-run and nut., $1.25 for ¾-in., and $1.40 for 1¼-in. domestic. Slack, as often happens with a strengthening market for screened coal, is easier, and may be quoted 5c. lower than a week ago, at 85@95c. per ton.

Connellsville Coke—The market has continued dull, uncovered consumers being reserved in making inquiries, while operators are not pressing for business. It seems clear that the uncovered requirements for the half year or year are less than operators estimated in December. Information became available during the week as to furnace-coke contracts made earlier in the month, covering one contract for February-June inclusive, about 25,000 tons monthly, at $2.50 at ovens, and another contract involving about 10,000 tons monthly over the year, at a ratio of seven to one on basic pig iron; that is, furnace coke at ovens is one-seventh the average price of basic pig iron at Valley furnaces, as determined monthly from an average of sales effected in the month. The present market is $17, Valley, which would make $2.43 for the coke.

The market is quotable at $2.50@2.60 for prompt furnace coke, and nominally at about $2.60 for furnace coke on contract, with 72-hour foundry coke at $3@3.15 for prompt and $3.15@3.25 for contract.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Jan. 15 at 457,415 tons, the largest weekly tonnage ever reported; shipments at 5422 cars to Pittsburg, 8130 cars to points west of Pittsburg, and 936 cars to points east of Connellsville, a total of 14,488 cars.

St. Louis

The market for lump coal began to soften last Monday and has been getting weaker daily since. The market has declined about 40c. per ton this week and lump is being offered freely at $1.10@1.20 today. This was due largely to the weather, which has been mild all week. While today the weather is brisk again, it is not enough to stop the downward trend of the market. Not only is the local market off but orders from out of town places do not seem to be coming in like they were a week ago, with the consequence that the premium prices which are being paid for cars that will go out of town have eased up and very little more is being offered for out-of-town coal than for local.

The market on screenings, on the other hand, is a little stiffer than before both for out-of-town and local shipment. The wide differential on screenings which will go out of town is still being maintained.

High-grade coal is in good demand, though the quantity actually coming forward is microscopic. During the last month when prices have been so good, drivers in the mines were scarce. Some operators, in order to get drivers, offered $3 per day while the scale is only $2.56. This has caused dissatisfaction; nearly all the drivers are demanding $3 and many of the mines which have been anxious to run acceded to their demands at once. However, a large number of operators refused to pay above the union scale and the Illinois Operators' Association is having a meeting in Chicago today to straighten this matter out. Unless it is adjusted at once there may be some trouble in the association.

Standard 6-in. lump is $1.75 at mine or $2.27 St. Louis; 2-in. lump is $1.40 at mine or $1.92 St. Louis; mine-run is offered at $1.20 at mine or $1.72 St. Louis; 3-in. nut is $1.10 at mine or $1.62 St. Louis; 1½-in. nut and pea is worth $1 at mine or $1.52 St. Louis. Screenings are worth 70c. at mine or $1.22 St. Louis for local shipment and $1 per ton at mine for Chicago shipment; ¾-in. pea and slack are 50c. at mine or $1.02 St. Louis.

Springfield, Mt. Olive and Staunton 6-in. lump is $2 at mine or $2.52 St. Louis; 2-in. lump is $1.50 at mine or $2.02 St. Louis; mine-run is $1.40 at mine or $1.92 St. Louis; screenings are $1.10 at mine but are all going north or northwest.

Carterville 6-in. lump is $2 per ton at mine or $2.67 St. Louis; 3- to 2-in. nut is $1.90 at mine or $2.57 St. Louis; 1½-in. screenings are $1.10@1.20 at mine or $1.77@1.87 St. Louis. The greater part of the screenings is going to Chicago.

Franklin county 6-in. lump is $2.25 at mine or $2.92 St. Louis; 3-in. nut is $2 at mine or $2.67 St. Louis; 1½-in. screenings are being offered at $1.25 per ton mine but are all going northwest.

Anthracite is in good demand for all sizes and is being readily absorbed. More stove coal has been sold in this market since chestnut has been so scarce than ever before. No deviation is being made from the circular of $6.95 for the smaller sizes and $6.70 per ton for grate.

Foreign Coal Trade

Bunker Coal at United States Ports—Coal furnished to steamships in foreign trade at United States ports, 11 months ended Nov. 30, long tons:

	1908.	1909.	Changes.
Coast ports..........	5,304,900	5,431,364	I. 126,464
Great Lakes.........	219,842	224,945	I. 5,103
Total..............	5,524,742	5,656,309	I. 131,567

Adding the exports, previously reported, makes a total of 16,475,653 tons in 1908, and 17,310,796 in 1909, sold for consumption beyond the limits of the United States.

Transvaal Coal—Shipments of coal from mines in the Transvaal, 11 months ended Nov. 30 were 3,284,081 tons.

Iron Trade Review

New York, Jan. 26—The waiting po-ion which has characterized the iron d steel trades for the last month is ll in evidence but there are some gns of its early disappearance, and of a adual broadening of business.

In pig iron buying is developing gradu-ly in the East both in foundry and basic g. The Central West is a little behind, wever, and business is increasing more owly. It is noticeable that sellers of g iron are beginning to weaken a little d are disposed to take orders for sec-d-quarter delivery at current prices in-ead of asking 25 or 50c. more, as they ve been doing for some time.

In finished material business is also proving. Quite a number of orders for ructural steel are coming forward. usiness in plates is good and in bars ill better. Distribution by jobbers and ores to smaller consumers is reported be active.

United States Steel Corporation—The atement for the fourth quarter of 1909 ows that the net earnings, after de-cting all working expenses, mainte-nce and repairs, were:

	1908.	1909.
tober	$ 9,415,668	$14,048,205
vember	8,756,729	13,711,765
cember	8,053,088	13,211,339
Total	$26,225,485	$40,971,309
preciation, reserve funds, etc		$6,570,877
terest and sinking funds		7,311,963
Total charges		$13,882,840
Surplus for the quarter		$27,088,469

The appropriations from this surplus ere $7,637,126 for additions to property nd $15,200,213 for dividends; these ividends including the regular 1¾ per ent. on preferred, a regular dividend of per cent. and an extra of ¾ per cent. n the common stock. The balance over ll appropriations was $4,251,180. The nfilled orders Dec. 31 were 5,927,031 ons, an increase of 1,130,198 tons over ept. 30; and 2,323,504 tons over Dec. 1 of the previous year.

Baltimore

Jan. 24—Imports for the past week in-luded 112 bars antimonial lead from ntwerp; 1391 tons ferromanganese, 80 ons silicospiegel and 2000 tons spiegel-isen from Liverpool; 5325 tons mangan-se ore from Poti, Russia, and 2250 tons rom Middlesboro, England; 10,347 tons upreous pyrites from Huelva, Spain; 6,450 tons iron ore from Cuba.

Birmingham

Jan. 24—Inquiries for pig iron to be elivered on during the third quarter of he present year are being received by Southern furnace companies and a few rders are being booked. The buying is little more active than it has been, but far from being as strong as had been expected. The aggregate business for the first quarter of the year is good. There is no delay in deliveries and some of the resale iron is still being moved out. The make is a little off, another furnace having to be put out of blast for repairs. The quotations continue to be $14@14.50 per ton No. 2 foundry, with the furnace companies demanding the higher figure. Charcoal iron is in good demand.

Chicago

Jan. 24—The recovery of the iron market has become more apparent in the last week with increased buying of pig iron for all purposes, though the regular foundry trade is doing more inquiring than buying, on second-half needs. For second-quarter deliveries considerable business is being done, and the tone of the market is upward, with a stiffening of prices. Southern, the chief supply for the present market, brings $14@14.50 Birmingham, or $18.35@18.85 Chicago. Northern remains quiet and firm at $19 @19.50, with little available for early deliveries, except upon contracts. On deliveries after the opening of navigation, April 1, the advance of 50c. on ore received by Northern furnaces means an advance of $1 a ton on pig iron. For Lake Superior charcoal there is a good demand at $19.50@20 per ton.

For iron and steel products the market continues to advance, with sales increasing of railroad supplies, structural material, plates, bars and other shapes.

Philadelphia

Jan. 26—The week's dealings in crude iron have failed to realize the expectations of some makers. Based on inquiries made early in the month a number of large sales were counted on. The prospective buyers are still holding off but no reason can be had for the delay. The only transactions worth noting were in forge iron and these were made up of orders for material to cover new business. A fair quotation for No. 2X foundry is $19; gray forge $18; basic $18.50 @19. Some brands of No. 2 foundry can be had at $18. There is no immediate probability of much business.

Scrap—An abundant supply of scrap is promised as soon as it can be delivered. Buyers are awaiting deliveries from yards. Foreign scrap will probably figure to some extent in this market. The best seller at present is heavy melting steel scrap.

Pittsburg

Jan. 25—The iron and steel market is beginning to show signs of a definite trend. Inquiry for pig iron and ferroalloys, like ferromanganese, has shown an actual increase this week over the early part of the month, while in finished steel products the dullness is prolonged and possibly accentuated. In unfinished steel, billets, sheet-bars and rods, claims are made that the market is firm, but information is coming out that shipments are heavy on contracts and that in some cases consumers are holding up deliveries. The quantity of resale steel, already a factor, promises to increase.

Pig Iron—An Erie, Penn., malleable foundry has contracted with a local furnace for 12,000 tons of malleable covering 1500 tons a month over second quarter and 1200 tons a month over second half, at $18, delivered. This would be equivalent to $17.10, f.o.b. Valley furnaces, but they would probably not have met the figure. The Pittsburg market is dull, and prices are hardly more than nominal. Asking figures remain at $17 for No. 2 foundry and basic and $19 for bessemer, f.o.b. Valley furnaces, for prompt and early delivery. The preponderance of opinion is that the market is in line for a slight decline, as after 60 days of quietness consumers naturally expect a concession.

Steel—Quotable prices are unchanged at $27@27.50 for bessemer billets, $27.50 @28 for open-hearth and $28.50@29 for sheet-bars, rods being $33, all prices f.o.b. maker's mill, Pittsburg district. It is reported that the Pennsylvania Steel Company is considering the abandonment of rail manufacture at Steelton, for billets and finished products outside of rails, and will concentrate rail manufacture at the Baltimore mill.

Ferromanganese—While there is more inquiry, prices are easier by 50c., at $44, Baltimore, for prompt or delivery in the next two or three months.

Sheets—Mills are rather slow at accepting new business, being well filled. It would probably require three or four months, on an average, to clean up business now on books. Black sheets remain at 2.40c and galvanized at 3.50c., both 28 gage, with corrugated roofing at $1.70 per square for painted and $3 for galvanized. Blue annealed sheets have cut entirely loose from the price of 1.75c. for 10 gage made by the leading interest, as it is sold to July 1 and will not quote for third quarter. Only one independent mill is able to make reasonable deliveries, its price being 1.90c., at which we quote the market.

St. Louis

Jan. 24—The past week has been one of the most uneventful in regard to pig iron than has been experienced in a long time. Scarcely a contract worth mentioning has been written up by any St. Louis concern. This is just a local depression and is expected that pig iron will pick up next month. Prices are firm at $15 per ton Birmingham, or $18.75 St. Louis for No. 2 foundry.

Metal Markets

New York, Jan. 26—The metal markets generally continue quiet and rather uninteresting. Consumptive demand is good, but supplies are abundant.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1909..	$10,579,304	$ 2,083,772	Exp. $ 8,495,532
" 1908	7,357,707	5,152,732	" 2,204,975
Year 1909..	132,880,821	44,086,966	" 88,793,855
" 1908 .	81,215,456	50,276,293	" 30,939,163
Silver:			
Dec. 1909..	5,297,965	4,167,276	Exp. 1,130,689
" 1908	4,726,289	4,409,454	" 316,835
Year 1909..	57,592,309	46,151,282	" 11,441,027
" 1908	51,837,671	42,224,130	" 9,613,541

Exports from the port of New York, week ended Jan. 22: Gold, $1,403,200, chiefly to Argentina: silver, $1,403,901, principaplly to London. Imports: Gold, $63,939; silver, $25,417, both chiefly from the West Indies and South America.

Gold—The demand for gold on the open market in London has not been excessive and prices remain at 77s. 9d. per oz. for bars, and 76s. 5d. per oz. for American coin. Most of the current supplies went to the Bank of England. In New York gold is still going to South America on London account.

Platinum—Business is quiet and dealers quote $28.50@29 per oz. for refined platinum and $34.50 for hard metal.

Our special correspondent writes from St. Petersburg, under date of Jan. 6, that there has been very little business, owing to the Christmas holidays. Quotations at Ekaterinburg were 5.50 rubles per zolotnik—equal to $20.68 per oz.—for crude metal, 83 per cent. platinum; at St. Petersburg, 23,000@23,500 rubles per pood—average, $22.79 per oz. These prices are nominal and subject to negotiation.

Silver—The market has continued steady on buying for both India and China, and closes firm at 24⅛d. in London.

SILVER AND STERLING EXCHANGE

Jan.	20	21	22	24	25	26
New York....	52¼	52¼	52⅜	52⅜	52¼	52¼
London .	24⅛	24	24 3/16	24 3/16	24⅛	24⅛
Sterling Ex..	4.8650	4.8650	4.8625	4.8625	4.8645	4.8650

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Jan. 13, as reported by Messrs Pixley & Abell:

	1909.	1910.	Changes.
India	£ 106,100	£423,000	I. £ 316,900
China	50,000	27,000	D. 23,000
Straits			
Total	£ 156,100	£450,000	I. £ 293,900

Average price of India Council bills in London for the week was 16.09d. per rupee.

Gold and silver movement in France, 11 months ended Nov. 30:

		Imports.	Exports.	Excess.
Gold ..	Fr.	378,422,000	F.177,096,000	Imp. Fr.201,326,000
1908..		885,568,000	21,898,000	Imp. 863,670,000
Silver.		135,467,000	115,381,000	Imp. 20,086,000
1908..		140,018,000	137,893,000	Imp. 2,125,000

Imports of nickel and copper coins, 68,000 fr. in 1908, and 72,000 fr. in 1909; exports, 731,000 fr. in 1908, and 1,125,000 fr. last year.

Copper, Tin, Lead and Zinc

Jan.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
20	13¾ @14	13½ @13⅝	60 7/16	32⅜	4.70	4.55 @4.60	5.90 @5.95
21	13¾ @14	13½ @13⅝	60½	32¼	4.70	4.52½ @4.57½	5.90 @5.95
22	13¾ @14	13½ @13⅝	....	32¼	4.70	4.52½ @4.57½	5.90 @5.95
24	13⅝ @13⅞	13⅜ @13⅝	60¾	32⅝	4.70	4.50 @4.55	5.90 @5.95
25	13⅝ @13⅞	13⅜ @13⅝	60½	32¾	4.70	4.50 @4.55	5.87½ @5.92½
26	13⅝ @13⅞	13½ @13⅝	60½	32¾	4.70	4.50 @4.55	5.87½ @5.90

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Although manufacturers both in this country and in Europe are very busy, they have naturally kept out of the market during the great weakness in Wall Street. On the other hand, producers being well sold ahead have not pressed sales, although electrolytic copper has been freely offered and sold to some extent at 13¾, delivered, 30 days, which is equivalent to about 13.60c., cash, New York. Since Monday some speculative lots have been sold at slightly lower prices, which have also been accepted by some first hands who were evidently testing the market. Sales of Lake copper since Jan. 19 have been insignificant, and quotations for this kind of metal are merely nominal. On Jan. 26 there was a slight recovery. At the close electrolytic is quoted at 13½@13⅝c., while Lake is nominally 13⅝@13⅞c. Casting copper is quoted nominally at 13¼@13½c. as the average for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is very good.

The market in London for standard copper has been firm, particularly considering the dullness of the refined article and the weakness in the New York stock market. Prices have fluctuated within narrow limits and at the close spot is quoted at £60 10s. and three months at £61 7s. 6d.

Refined and manufactured sorts are quoted: English tough, £64; best selected, £64@64 10s.; strong sheets, £74@75 per ton.

Copper exports from New York and Philadelphia for the week were 5268 long tons. Our special correspondent gives the exports from Baltimore at 1741 tons.

Tin—The London market was without special features during the week. Operators prefer to keep the market quiet whenever a Banka sale takes place. There is one scheduled for today, and after it is over there may be more activity. The domestic market continues as dull and uninteresting as it has been for quite some time. The only feature of interest is the premium exacted for spot material, notwithstanding the fact that the visible supplies on this side are fairly large. The London market closes at £147 for spot, and £148 7s. 6d. for three months, while in this market tin is quoted at 32¾ cents.

Lead—The market is quiet. Lead at New York is unchanged at 4.70c., but at St. Louis somewhat lower prices have been made, and at the close 4.50@4.55c. is quoted.

The London market is steady, Spanish lead being quoted at £13 12s. 6d. and English lead at £13 15s. per ton.

Spelter—There has been little demand, and as some metal was pressed for sale prices have declined, and close at 5.87½@5.90c. St. Louis, and 6.02½@6.05c. New York.

New York quotations for spelter Jan. 20-24, inclusive, were 6.05@6.10c.; Jan. 25, 6.02½@6.07½c.; Jan. 26, 6.02½@6.05 cents.

The London market is unchanged at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market remains quiet, and only a small business is being done. In the absence of large sales prices are nominally unchanged. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7⅝@7⅞c. named for outside brands.

Aluminum—The current price of aluminum is 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—The market remains steady and firm. New York quotations e $52.50 per flask of 75 lb.; jobbers sk 72@75c. per lb. for small lots. The an Francisco price remains at $50.50@ .50 for domestic orders and $2 per ask less for export. The London price £9 15s. per flask; jobbers are quoting . 6d. per flask less.

Nickel—Large lots, contract business, 0@45c. per lb. Retail spot, from 50c. r 200-lb. lots, up to 55c. for 500-lb. ts. The price for electrolytic is 5c. igher.

Magnesium—The price of pure metal $1.50 per lb. for 100-lb. lots f.o.b. ew York.

Cadmium—Current quotations are 65 70c. per lb. in 100-lb. lots at Cleveand, Ohio. In Germany 450@475 marks er 100 kg., at factory in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great ritain, year ended Dec. 31, figures in ng tons, except quicksilver, which is pounds:

Metals:	Imports.	Exports.	Excess.
opper, long tons	173,216	63,661	Imp. 109,555
Copper, 1908....	165,972	68,820	Imp. 97,152
in, long tons....	41,725	41,413	Imp. 312
Tin, 1908........	47,730	42,103	Imp. 5,627
ead, long tons..	207,660	45,904	Imp. 161,756
Lead, 1908	237,508	49,428	Imp. 188,080
pelter, l'g tons..	121,552	8,567	Imp. 112,985
Spelter, 1908....	108,523	8,402	Imp. 100,121
uicksilver, lb...	3,237,321	1,653,868	Imp. 1,583,453
Quicksilver, '08	3,270,412	1,676,167	Imp. 1,596,245
Ores:			
in ore and con.	24,082	....	Imp. 24,082
Tin ore, 1908...	25,013	....	Imp. 25,013
yrites..........	791,078	....	Imp. 791,078
Pyrites, 1908...	758,910	....	Imp. 758,910

Copper totals include metallic contents f ore and matte. Exports include rexports of foreign material. Of the imorts in 1909 the United States furnished n all 236 tons copper matte, 70,065 tons ine copper and 33,404 tons lead. This ead was chiefly Mexican, refined in this ountry.

Zinc and Lead Ore Markets

Platteville, Wis., Jan. 22—The base rice paid this week for zinc ore was 47@48 per ton; lead ore, $56@60 per on.

SHIPMENTS, WEEK ENDED JAN. 22.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point..........	420,000	....	553,000
Platteville............	199,400	....	101,670
Cuba City..............	386,767	91,160	....
Benton.................	177,050	....	....
Council Hill...........	80,000	....	....
Harker.................	70,500	....	....
Rewey	61,000	....	....
Montfort...............	50,000	....	....
Linden.................	....	64,450	....
Total..................	1,444,717	125,610	645,670
Year to Jan. 22........	3,666,247	350,169	832,870

In addition to the above there was shipped to the separating plants 951,345 lb. zinc concentrates during the week.

Joplin, Mo., Jan. 22—The highest price paid for zinc sulphide ore this week was $51, the base being $46@48 per ton of 60 per cent. zinc. Zinc silicate sold on a base of $26@28 per ton of 40 per cent. zinc. The average price, all grades, was $44.94. Lead ore sold as high as $58 and this figure was generally paid for the bulk of this mineral, with deductions for ore that did not grade up to an 80 per cent. standard. The average price, all grades, was $56.06 per ton.

The shipment of zinc ore was an increase of 747 tons over last week, but is still over 100 tons under an average of last year's weekly shipments. The decision of some companies to sell the lead stock on hand in preference to accepting a reduction in the price of zinc increased lead purchases for immediate and future delivery, buyers being in the market to take all ore salable at $58 per ton, being busy until a late hour tonight.

SHIPMENTS, WEEK ENDED JAN. 22.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	5,149,630	786,810	$141,257
Joplin..................	1,950,870	554,620	61,929
Galena..................	787,800	93,690	20,842
Miami...................	436,470	28,540	9,528
Duenweg.................	442,360	5,160	9,047
Quapaw..................	361,500	28,180	8,742
Alba-Neck...............	296,720	23,720	7,944
Badger..................	321,220	......	7,548
Granby	405,800	5,000	6,375
Aurora..................	341,900	......	6,336
Spurgeon................	141,450	100,000	4,989
Carthage................	184,770	......	4,526
Carl Junction...........	139,740	......	4,121
Stott City..............	134,050	......	3,150
Sarcoxie................	53,220	......	1,250
Totals	11,147,500	1,625,720	$297,584
4 weeks..............	38,510,270	6,436,160	$1,063,761

Zinc value, the week, $250,558; 4 weeks, $877,547
Lead value, the week, 47,026; 4 weeks, 186,114

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February....	36.63	36.94	34.92	34.37	49.72	50.50
March.......	36.19	37.40	34.19	34.71	49.90	50.82
April.......	35.40	38.63	34.08	37.01	52.47	55.63
May.........	34.19	40.06	33.39	37.42	56.06	56.59
June........	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September ..	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	49.50	33.28	45.75	52.63	55.02
November....	39.13	51.31	35.02	48.29	54.53	53.94
December....	42.75	49.45	39.63	47.57	49.68	55.26
Year.......	$36.63	43.98	$34.31	41.20	$53.93	54.60

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Jan. 26—The market remains generally quiet, with a fair amount of new business.

Copper Sulphate—Prices are unchanged at $4.10 per 100 lb. for carload lots, and $4.25 per 100 lb. for smaller parcels.

Nitrate of Soda—On a moderate business the prices of this article are steady at 2.10c. per lb. for spot and 2.07½c. per lb. for futures.

Arsenic—Sales have been a little larger, some 300 tons changing hands during the week. Prices are lower, $2.50 per 100 lb. being quoted for white arsenic.

Sulphur—Parsons & Petit, New York, report the arrival this week of a cargo of 950 tons Sicilian crude brimstone, of which 250 tons will be unloaded at New York and 700 tons at Baltimore.

Mining Stocks

New York, Jan. 26—Business on the Stock Exchange was demoralized early in the week by the sudden collapse of the Hocking Coal and Iron pool; an incident which is being investigated by the Exchange authorities. This was followed by a weak market, prices of many securities declining while trading was only in moderate volume. The close is almost at the lowest points.

On the Curb trading followed very much the same lines. Business decreased and prices declined. The copper stocks especially felt the weakness and showed declines all along the list, but on quite moderate trading. The Amalgamated Copper directors at their meeting made no change in the dividend, declaring ½ per cent. for the quarter.

Speculation in Steel Corporation stocks was active on rumors of an increased dividend on the common. The dividend declared yesterday was 1 per cent., quarterly, with an extra dividend of ¾ per cent., which with 3¼ per cent. already paid will make up a total of 4 per cent.

Boston Jan. 25—Copper stocks are having their reactions but not until after record prices had been named in Lake, North Lake and Indiana shares. Attention is being diverted to the Lake Superior issues almost to the exclusion of the others. Calumet & Arizona has been the weak feature and recorded a $30 break during the week to $6 with some slight recovery from this. The street is much perplexed over this slump and accounts for it in two ways; a decline in the copper contents of the rock and the fact that the Cole-Ryan contingent has disposed of its holdings and no longer has a voice in the management.

Lake Copper fluctuated widely but struck a new high on Jan. 22 at $94.50 A third mill test came disappointing and the stock broke to $74. Whereas the two previous mill runs yielded 82 and 80 lb. of mineral to the ton of rock stamped, the third showed but 69 lb. of mineral. North Lake touched $19.50, but fell back to $12.75 today. Indiana, after soaring to $38 on the Curb, fell back to $27 again, but fluctuations have been more even the past few days.

South Lake and Oneco also attracted considerable attention on the Curb. Realizing profits in the former causes a decline from $15.25 to $8.50, while Oneco had a market move from $6.75 to $9 and back to just above $7 again. The liquidation in the New York market brought sympathetic weakness in the local copper share list and prices declined quite severely today throughout the list.

Curb stocks have followed pretty closely the run of the general market.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Totals	1,405,403,056	705,051,591	680,942,620

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.440	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	52.226	22.493	24.030
Total	52.864	51.502	24.402	23.726

New York, cents per fine ounce; London pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	61.198
February	12.905	12.949	13.098	13.295	58.786	57.688
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56[illegible]	12.928	12.93[illegible]	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	[illegible]	12.870	13.698	13.210	60.338	59.021
October	13.[illegible]	12.700	13.[illegible]	13.030	60.139	57.551
November	14.130	13.12[illegible]	14.[illegible]	13.354	63.417	58.917
December	14.111	13.2[illegible]	14.411	13.[illegible]	62.943	59.906
Year	[illegible]	[illegible]	13.424	13.335	59.902	58.732

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	32.913
			Av. year	29.465	29.725

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	4.560	4.459	13.166	13.125
Year	4.200	4.273	4.153	13.439	13.049

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.518	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	6.249	4.987	6.099	20.625	23.094
Year	4.726	5.503	4.578	5.352	20.163	22.201

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

COLO. SPRINGS Jan. 25

Name of Comp.	Bid.
Listed:	
Acacia	.06
Cripple Cr'k Con.	.03
C. K. & N.	.11
Doctor Jack Pot	.08¼
Elkton Con	.70½
El Paso	.66½
Fannie Rawlins	.67½
Findlay	.11
Gold Dollar	.11
Gold Sovereign	.04¼
Isabella	.18
Mary McKinney	.47½
Pharmacist	.04
Portland	.90½
Vindicator	.75
Work	.06⅛
Unlisted:	
Golden Cycle	1.40
United Gold Mines	.10

S. LAKE CITY Jan. 25

Name of Comp.	Clg.
Carisa	.50
Colorado Mining	.78
Columbus Con	.76
Daly Judge	4.40
Grand Central	1.80
Iron Blossom	.83
Little Bell	1.80
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	2.25
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.60
New York	‡.13
Prince Con	.93
Red Warrior	‡6.00
Silver King Coal'n	3.56
Sioux Con	.35
Uncle Sam	.46½
Victoria	1.50

SAN FRANCISCO. Jan. 25.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	‡.11	Belmont	1.35
Belcher	1.30	Jim Butler	.10
Best & Belcher	.76	MacNamara	.27
Caledonia	.46	Midway	.27
Challenge Con	.30	North Star	.01
Chollar	‡.32	West End Con	.23
Confidence	1.35	Atlanta	.10
Con. Cal. & Va.	1.75	Booth	.09
Crown Point	1.27	C.O.D. Con	.06
Exchequer	‡.30	Columbia Mt	.05
Gould & Curry	.38	Comb. Frac	.31
Hale & Norcross	.59	Goldfield Belmont	.90
Mexican	1.75	Goldfield Daisy	.98
Ophir	2.05	Jumbo Extension	.23
Overman	.65	Oro	.03
Potosi	.66	Red Hill	.03
Savage	.14	Sandstorm	.04
Sierra Nevada	.71	Silver Pick	.07
Union	[illegible]	St. Ives	.12
Yellow Jacket	1.30		

N. Y. EXCH. Jan. 25

Name of Comp.	Clg.
Amalgamated	77¾
Am. Agri. Chem.	43½
Am.Sm.&Ref.,com	89¼
Am. Sm. & Ref., pf.	108
Anaconda	49⅛
Bethlehem Steel	30½
Col. & Hock. C. & I.	21
Colo. Fuel & Iron.	39⅞
Du Pont P'd'r, pf.	86
Federal M. & S.	85
Great Nor., ore ctf.	70¾
Nat'nalLead,com.	81½
National Lead, pf.	‡109
Pittsburg Coal	20½
RepublicI&S,com.	36¾
Republic I & S, pf.	100
SlossSheffi'd,com.	77
Sloss Sheffield, pf.	118½
Tennessee Copper	33⅜
Utah Copper	49⅛
U. S. Steel, com.	82¼
U. S. Steel, pf.	121½
Va. Car. Chem.	50⅛

N. Y. CURB Jan. 25

Name of Comp.	Clg.
Big Vein Copper	8⅞
Bonanza Creek	3
Boston Copper	17⅝
Braden Copper	4⅜
B. C. Copper	7¼
Buffalo Mines	3½
Butte Coalition	25¼
Chino Copper	12¼
Cobalt Central	.16
Combination Fra.	.32
Con. Ariz. Sm.	$2\frac{13}{16}$
Cumberland Ely	9
Davis-Daly	3⅝
Dominion Cop.	7
Ely Con	.82
El Rayo	2¾
Florence	2⅝
Gila Copper	8⅝
Giroux	9⅝
Gold Hill	1¾
Goldfield Con	7⅜
Greene Cananea	9¼
Guanajuato	2
Guggen. Exp.	241½
Kerr Lake	.09
La Rose	4⅜
McKinley-Dar-Sa.	.75
Miami Copper	23⅜
Mines Co. of Am.	50
Montezu. of C. R.	3½
Mont. Shoshone	$\frac{15}{16}$
Mont.-Tonopah	.70
Nev. Utah M. & S.	$1\frac{5}{16}$
Newhouse M. & S.	3½
Nipissing Mines	10
Ohio Copper	4⅝
Pacific Sm. & M.	$1\frac{5}{16}$
Silver Queen	.20
Standard Oil	638
Stewart	⅝
Tonopah	6½
Tonopah Ex.	.76
Tri-Bullion	1
Utah Apex	5⅛
Yukon Gold	4¾

LONDON Jan 26

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 8 6
Esperanza	3 0 9
Tomboy	0 17 6
El Oro	1 8 0
Oroville	0 9 0

BOSTON EX. Jan. 25

Name of Comp.	Clg.
Adventure	8¼
Allouez	47
Am. Zinc	31½
Arcadian	8
Arizona Com	41
Atlantic	10
Boston Con	17¾
Calumet & Ariz.	65
Calumet & Hecla	640
Centennial	30
Con. Mercur	.12
Copper Range	79
Daly-West	‡9
East Butte	10½
Franklin	18
Greene—Can	9⅜
Hancock	21
Isle Royal	22½
Keweenaw	4¼
La Salle	16
Mass	7¼
Michigan	7
Mohawk	68
Nevada	23¼
North Butte	40½
Ojibway	9⅞
Old Dominion	45
Osceola	155
Parrot	20
Quincy	‡88¼
Shannon	14¾
Superior	56
Superior & Bost.	15
Superior & Pitts.	13
Tamarack	63
Trinity	9¼
U. S. Smg. & Ref.	46¼
U.S.Sm. & Re., pd.	50¾
Utah Con	41
Victoria	4¾
Winona	10
Wolverine	144
Wyandotte	2½

BOSTON CURB

Name of Comp.	Clg.
Ariz. Mich	.95
Ahmeek	218
Bingham Mines	3½
Boston Ely	$4\frac{1}{16}$
Calaveras	6⅛
Champion	.10
Chemung	11¾
Chino	12⅜
Corbin	.10¾
Cactus	$5\frac{3}{16}$
Crown Reserve	$5\frac{15}{16}$
First Nat. Cop.	5
Gila Copper	‡9¾
Indiana	29½
Majestic	.91
Ray Central	3½
Ray Con	23
Rawhide Coal	.16
Rhode Island Coal	‡11½
San Antonio	8½
South Lake	9
Trethewey	..
Vulture	8⅝
Yuma	$1\frac{9}{16}$

ST. LOUIS Jan. 22

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	2.00	1.75
Cent.C.&C.	86.00	85.00
C.C. & C. pf.	85.00	84.00
Cent. Oil	105.00	100 00
Columbia	9.00	7.00
Con. Coal	20.00	18.00
Doe Run	110.00	100.00
Gra. Bimet.	.33	.30
St. Joe.	13.00	12.00

‡Last quotation.

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.	....	Feb. 1	$1.00
Arcadian Copper, Mich	....	Mar. 1	0.59
Bullion, Nev	Jan. 11	Mar. 1	0.05
Con. Imperial, Nev	Jan. 11	Feb. 3	0.01
Con. Virginia, Nev	Dec. 20	Jan. 10	0.25
Exchequer, Nev	Dec. 15	Jan. 5	0.05
Gordon M. & M., Utah	Jan. 15	Feb. 4	0.002
Hancock Min., Mich	....	Feb. 1	1.00
Maxfield, Utah	Jan. 31	Feb. 19	0.00½
Palmyra G. & C., Utah	Dec. 29	Jan. 19	0.002
Precious Metals M. & M., Cal.	Dec. 27	Jan. 31	0.01
Reindeer C. & G., Ida	Dec. 31	Jan. 19	0.003
Savage, Nev	Feb. 10	Mar. 8	0.10
Seven Bros. Pioche, Nev.	Jan. 15	Feb. 4	0.002
Sheba Gold & Silver, Utah	Jan. 19	Feb. 23	0.05
Sierra Nevada, Nev	Jan. 11	Feb. 3	0.10
Silver Hill, Nev	Dec. 23	Jan. 14	0.05
Silver King Con., Utah	Jan. 17	Feb. 5	0.10
Union Con., Nev	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah	Feb. 1	Feb. 20	0.00½
Western Monitor, Utah	Feb. 1	Mar. 1	0.00½

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The Butte Combination

There are good combinations and bad ones. Those that promote efficiency are good. Those that are to restrain trade are bad and unlawful.

The general copper consolidation, so much talked about last fall, whereof the purpose was to elevate the price of copper, as its promoters themselves unwisely declared, promised to be of the nature of a restrainer of trade and consequently actionable.

Besides this, there was too much difficulty in bringing together a large number of interests, each claiming the lion's share of the swag. Hence the idea of two or three separate combinations. We have previously expressed the opinion that the giant combination would not be effected. It seems to be as far away as ever.

The objections that were weighty against this do not exist against combinations that simply increase efficiency. The Utah and Boston amalgamation was quite proper. So is the combination of the Butte mines, announced this week.

The Anaconda, true to its name, is to swallow the others, strange as it may appear for Amalgamated to be absorbed by one of its constituents. In its mining and smelting operations Amalgamated has always been characterized by the best possible management. The new arrangement will eliminate certain difficulties and increase efficiency. The disappearance of Amalgamated—a corporation that has never made a decent report to its stockholders—will not be regretted. We venture to say that the enlarged Anaconda will introduce a different policy and will take pride in being a great industrial enterprise rather than a stock-jobbing operation.

The Green Gold Myth

Our Toronto correspondent reports that at a meeting of the Kenora Miners and Prospectors' Association on Dec. 7, the president, Major Vereker, gave an address on the Thurber process of gold extraction. He said that he and Captain Machin, having decided to back the inventor, had set up an experimental plant where several tests had been made, giving satisfactory results. They had obtained irrefutable proof that gold had been extracted in paying quantities from comparatively worthless ore pulp. The plant was inexpensive and not complicated. Some of the results of the tests were as follows: Ore which assayed by fire 70c. to the ton before it was submitted to the process gave a return of \$15.70 afterward. Ore that had assayed 70c. in a 20-lb. lot was put through the process and gave \$25.65 to the ton. A 330-lb. lot, which assayed 80c. to the ton, after being treated by the process yielded \$13.60. Major Vereker and Capt. Machin announced their intention of forming a company to operate the process.

The idea that there is gold hidden to the fire-assay test that will yield to a "process" is a myth that will not down. Perennially does it bob up serenely. We call it the "Green Gold Myth" because long ago, in the early days of California mining, if our recollection be correct, a faker introduced it with an ingenious explanation, to wit: The only gold that the fire-assay determines is the perfect metal such as we know in our watch-chains, coins, etc., if we are lucky enough to have them. Now there is also in some ores an imperfect, immature gold—a young gold that has not existed through sufficient geological eons to ripen, in other words "green gold"—which in its tender-ness escapes collection by the assayer's rude methods. But by treatment with the right kind of chemicals from the nurturing hands of the "professor" this delicate gold could be ripened as quickly as Presto, change! and be put upon the same footing as its Silurian or Archean congener.

The myth undoubtedly goes further back. Perhaps an examination of the pages of Agricola would disclose that he knew of it. The alchemists in a way were believers in it. Possibly it existed even in the time of the Argonauts.

We congratulate the gentlemen who are mentioned by our Toronto correspondent upon their success in obtaining irrefutable proof that gold has been extracted in paying quantity from comparatively worthless ore, which is undoubtedly important if true. We beg them, however, to reflect upon what disastrous effect this may have upon the cost of living in the world and in the interest of humanity we hope that they will bury the secret beyond all chance of recovery.

Sound Sense

James J. Hill has long been a prophet, who unlike many has enjoyed honor in his own country. He is preëminent as a speaker of sound sense. It was he who a few years ago turned the phrase "undigested securities" into "indigestible securities" as the cause of our financial troubles of that time, later prescribed the "rest cure," and within a few days has said that our present trouble is not so much the "high cost of living" as the "cost of high living."

Now he throws light upon the attitude of Washington toward the trusts, what may happen if the Supreme Court decides adversely to the Tobacco company, and the other things that have been worrying us.

"Washington's attitude is not a menace," says Mr. Hill. "The President has to do something along this line. All over the country there is a clamor against high prices, and people look to the Government for relief. So Mr. Taft announces investigations of corporations and combinations which have been evading the laws. He couldn't do anything else.

"I don't believe that many of our companies have knowingly violated the laws governing them. If a combination has been effected in opposition to law, it will have to dissolve.

"What then? The property is all there just the same. What is the difference whether the owners have one green certificate to represent their interest, or two red ones? We have been through the same thing with the Northern Securities Company."

Mr. Hill was asked what was responsible for the depressed stock market.

"Hysteria," he replied.

Corporate Conferences

The custom is growing among large industrial companies of bringing together the heads of departments in an annual convention, at which matters affecting the interests of the company are discussed. The exchange of notes, coördination of practice, etc., that result from these meetings are advantageous.

It is interesting to note the adoption of this scheme by the mining department in Mexico of the American Smelting and Refining Company, and affiliated concerns, which held its first annual convention at Velardeña, Durango, Dec. 30 to Jan. 1. The mining department of these companies comprises the general manager and assistants of divisions, an exploration division, a general organization, a medical department, and the superintendents of mine units, of whom there are eighteen.

The schedule for the convention included discussion of the following subjects: Organization, labor and contracts, development, breaking and stoping, cost sheets, hand and machine drilling, power, hoisting, pumping, laboratory work, marketing, transportation, tramming, sorting, weighing, loading, mine sampling, taxes, state and federal laws, and others of similar character.

The discussion of such subjects is surely to the advantage of the men concerned and to the companies employing them. We hope, also, that the public may be allowed to share in the purely technical information, which may be divulged without injury to the companies especially concerned. As to this, George C. Kaufman, the general manager, stated at the convention that it is the policy of the Smelting and Securities companies to give out no information respecting the condition of their mines, operating expenses, profits, etc. However, there is no objection to superintendents contributing, under their own names, to the technical periodicals articles about the treatment of ores, new processes, or notes on practical details that will be of benefit to the profession. In this connection it is interesting to note that the new department of "Details of Practical Mining" in the JOURNAL received formal approval at this convention.

It is chiefly by the exchange of such information through the columns of the technical periodicals that progress in the art of mining is made.

The American Smelting and Refining Company, and its affiliated concerns, have heretofore been criticized for the ban of silence that they have imposed upon their technical men. It is gratifying to learn of the introduction of a broader policy in Mexico, and Mr. Kaufman is to be congratulated for his part in this. We hope that the same policy will soon be extended to the other interests of this important mining and smelting concern.

Transvaal Gold

The December returns of gold production in the Transvaal, as cabled from Johannesburg, make the total output for the year $150,488,000, an increase over 1908 of $4,711,100, or a little over 3 per cent. These figures do not differ greatly from the estimate of production made a few weeks ago. Some superficial comment has been caused by the fact that the returns for the month of December gave a total of 604,987 oz. of fine gold, whereas in December, 1908, the reported yield was 660,600 oz. It has been said that this apparent decrease represented a serious falling off in the output of the Transvaal mines. It does not appear, however, that this is at all the case. The return for December, 1909, is a practical working return, giving the actual output of the mines for the month; whereas it is well known that the figures for December, 1908, were unduly swelled by the inclusion of a quantity of miscellaneous returns and also of so-called "reserve" gold which had been held back from month to month by some of the operating companies in order to "equalize the returns" as their managers claimed. This holding back caused a great deal of comment at the time. Though the practice of reserving gold was rather lamely de-ended by some managers, it is noticeble that this year it has been abandoned y all the prominent companies.

Some of the Transvaal managing firms ave suggested that the practice of makig monthly returns be hereafter abanoned; but this has met with general isfavor. It is urged that the present ractice is very much fairer to stockolders generally, and that the withholdig of returns would give a great advanige in speculation to directors and iniders in a position to obtain the figures. does not appear probable that any hange will be made in the present istom.

Pig Iron Production in 1909

In the review of the iron trade in 1909, ublished in the JOURNAL for Jan. 8, we stimated the pig-iron production of the nited States for the year at 25,711,846 ns, and added: "The production of 909 was close to that of 1907 by the stimate; so close that it is altogether ossible that the final official figures may ake it quite equal, if not a little greater. he difference, however, cannot be more an a few thousand tons."

This anticipation has proved correct. or the second half of 1909 the complete gures collected by the American Iron nd Steel Association put the make of g iron at 14,773,125 long tons, the exess over our estimate being due to the ushing of work in December, and to n unexpectedly large contribution from e charcoal furnaces. The figures by alf-years for three years past are as llows:

	1907.	1908.	1909.
irst half.	13,478,044	6,918,004	11,022,346
cond half..........	12,303,317	9,018,014	14,773,125
Year...............	25,781,361	15,936,018	25,795,471

The great production of the second alf of 1909 brought the total for the ear up to 14,110 tons above that of 907, making it the greatest of any year our history. The second-half make as not only 3,750,779 tons greater than at of the first half; it was 1,295,081 ns larger than that of the first half of 907, the greatest previously reported.

The drop of 9,860,000 tons in producon in one year was an extraordinary uctuation, far greater than had ever beore occurred. The loss was greater than the entire output of Great Britain, and greater than our own entire yearly production only a few years ago. Usually in the past when a crisis in the trade has brought about a large decrease, it has taken two or three years to return to the high point. This time the recovery was made in a single year, showing an equally extraordinary change. It is possible that the gain has been a little too fast; and we do not expect to see any increase in the first half of the current year.

A gain can be made if the demand warrants it, however. The production of the second half of 1909 was at the rate of 29,500,000 tons a year; and with the present blast-furnace capacity this can be increased to 32,000,000 tons, if the iron is needed.

The State of Trade

The depression in the stock market in January evoked the inquiry whether it did not reflect a recession in business. So far as we have been able to determine, it did not, but we think that the revival in business in the last quarter of 1909 was greatly overestimated, leading to overspeculation in the stock market and a collapse upon recognition of the actual condition.

There was no general buoyancy in business until the middle of 1909, although some branches had become active in the spring, but even up to the end of the year some branches had experienced only a slight improvement.

The dullness and weakness in the metal markets during the last six weeks indicate that the enormous deliveries for consumption in 1909 were misleading and that the supplies were not fully consumed, it being rather a case of transferal of stocks. However, the development in trade seems to be holding its own, with prospects regarded favorably and the probability of a resumption of progress before long.

The collapse of the speculative bubble that was blown in the second half of 1909 has naturally had an effect upon trade. The uncertainty over the policy of the administration as to the corporations, and the legal status of the latter under the Sherman Act, is also a demoralizing factor.

The Pape Process

One of the earliest occurrences of mixed sulphide ores, presenting a hard metallurgical nut to crack, was the deposit of the Rammelsberg in the lower Harz, Germany. Around this famous ore deposit has centered some of the most interesting metallurgical experimentation during the last 50 years and the development of the unique and classic methods that are practised at Oker and Lautenthal. Yet there has remained a large part of the low-grade, mixed and rebellious ore that has heretofore defied successful beneficiation.

It is interesting to report that this ore has lately been treated successfully by the Pape process which is based to a large extent upon American ideas as developed at Cañon City, Mineral Point, Coffeyville and elsewhere. The zinc is recovered as oxide, part of which is sold for use as a pigment and part of which is passed on to the smelters for reduction to spelter. At the Billwärder Zinkhütte, of the International Metal Company, near Hamburg, 8000 tons of spelter have already been produced from oxide obtained by the Pape process.

Enforced Reports

A new Nevada law requires all corporations, local and foreign, doing business in that State to file an annual statement and to publish it in a local paper, subject to a fine for failure so to do, which must cover the financial transactions of the corporation during the year and indicate specifically the present financial condition of the company. The authorities are planning to undertake a campaign to require the observance of the law. The requirement of such an annual statement is to be commended and will undoubtedly be of benefit, particularly to the investors who are so widely interested in the numerous Nevada corporations and who will in this way be able to obtain an official sworn statement of the financial affairs of the companies in which they have invested. The Nevada step is in the right direction and could well be followed by the other States, but what a disgrace it is that corporations should have to be compelled by law to state what they ought voluntarily to give to their stockholders.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Accidents with Gelignite at Cobalt

The large number of powder accidents that are occurring in the mines of the Cobalt district calls for some concerted action on the part of the mine managers as to the class of explosives to be used. On looking over the causes of these accidents, a large proportion of them can be traced to the use of gelignite. This blasting compound has several advantages over common dynamite, chief of which are its greater breaking power and comparative freedom from noxious gases when exploded. It is, however, much more sensitive when it is frozen than under normal conditions, and when in the former state can usually be exploded by a blow from a pick.

The manual of explosives of the Ontario Bureau of Mines says: "Gelignite possesses many advantages over common dynamites and is rapidly supplanting them in most European countries. It is not, however, as safe a material, being entirely untrustworthy in cold weather."

The accidents from blasting compounds in Cobalt mines occur with much greater frequency in winter than in summer, thus showing the effect of the cold weather on the powder. Many of the mines use only the straight dynamite, while some have made a practice of using dynamite in the winter and gelignite in the summer. Others still continue to use gelignite all the year round.

Some time ago the Ontario Bureau of Mines considered having an act passed to prohibit, during the winter months, the use of those powders that are particularly unsafe in cold weather, but decided that it would be too much like interference with personal rights, and so the matter was dropped.

OBSERVER.

Cobalt, Ont., Jan. 29, 1910.

A Bureau of Mines?

The communication by Royal P. Jarvis in the JOURNAL of Jan. 22, is in keeping with most of the arguments advanced in opposition to the establishment of a Federal bureau of mines.

The essence of the whole article is that should the Federal authorities create a bureau of mines, the men engaged in the research work provided by said bureau would trespass upon what its critics consider the legitimate field of activity of the mining engineer. In other words, they are opposed to any line of Federal activity which may possibly lessen the field of employment open to the professions.

If this argument were carried to its logical conclusion we would do away with the Geological Survey, because most of the work now carried on by the Survey, outside of the statistical branch, might be accomplished by the mining geologist. I can see how the field for the mining geologist might be greatly enlarged if the Geological Survey were abolished, but would the JOURNAL join in a movement to have the Geological Survey abolished? It is not easy to conceive of an engineer or a scientific man who is so narrow as to oppose any proposed Federal bureau which has for its purpose investigations looking to the betterment of our industrial life.

It may be of interest to the readers of the JOURNAL to know that the bureau does not contemplate any work which will encroach upon the field of the mining engineer, the investigations being of such a character as to apply to the broad, fundamental problems in which the mining engineer has little or no time to engage. Since some of the foremost mining engineers of the country are ardent advocates of the bureau of mines, I think it would be difficult to find an organization of mining men in the country that would not support it were the facts fairly presented to them. Kindly refer to the action taken by the American Association for the Advancement of Science, the Association of State Geologists, the Association of Mining Inspectors, the American Mining Congress, etc.

I am aware of the position taken by the JOURNAL in this matter, but would like to mention to the readers of this paper that all the mining journals, with this exception, are urging the creation of this bureau.

E. R. BUCKLEY.

Rolla, Mo., Jan. 28, 1910.

[It is a sound principle of political economy (not yet successfully controverted, although it is entirely foreign to ideas of paternalism and socialism) that a government should not undertake to do what its citizens can and ought to do for themselves; moreover, that a government should not enter into competition with its citizens. We admit that most governments have departed from this principle to various extents. The Prussian government, as a producer of a certain mineral, is a member of a cartel to regulate the business, control price, etc. Our own Government, through its Department of Agriculture, has joined the exchanges, boards of trade and private persons in the enterprise of collecting data on the growing crops, and has deliberately taken a hand in the game of speculation, or "gambling," which some characterize as a wicked thing, with the result that it would be a mighty good thing if the Department of Agriculture were to go out of this business.

The reference cited by Doctor Buckley to the work of the United States Geological Survey is not at all pertinent. This work, excluding the extraneous things with which lately it has been saddled, is something that the people cannot successfully do for themselves. The reasons are so obvious, it seems to us, that it is unnecessary for us to pause now to point them out.

As to the proposed bureau of mines, our position has been consistently as follows: We do not see any real need for it, and we can anticipate a good deal of vexation to the mining industry that might arise through bureaucratic interference under a loosely drawn bill (which the present proposal certainly is).

The regulation of mining under the police power, which is in all respects desirable, is wholly a matter of the States, and will be so until our Federal constitution is amended. A bureau of mines can do nothing in this direction except to act in an advisory capacity. This may be useful but it seems to us to be a narrow ground upon which to organize a bureau.

We believe that the United States Geological Survey has suffered from the diversion of its attention to irrelevant matters. We believe that the mining industry wants and needs more geology, and for upward of 25 years we have discouraged the adventures of the Survey into the field of technology, which has been successfully cultivated by the people themselves.

In discussing this subject two years ago we remarked that among the things that a bureau of mines might properly be expected to do are the following:

1. To collect statistics of production, number of men employed, wages, and in general such matters as are covered in the decennial census.

2. To investigate the dangers of mining and study precautionary measures.

3. To investigate and standardize methods of assaying and measurement.

4. To appoint and supervise the inspectors of mines in the Territories; to regulate and supervise the leases of the oil lands of the Indians in Oklahoma.

5. To represent the Government as ie lessor in the event that legislation be nacted for the leasing of the reserved oal lands of the nation.

6. To investigate questions in which ie prosecution of the mining industry ffects the direct functions and rights of ie Federal Government (such as ydraulic mining and the control of avigable streams; damage to forest reerves by smeltery smoke).

7. To test material required by the 'ederal Government for its own use.

8. To supply expert information to ie post office, land office and other govrnmental services that may require it in ie regular performance of their duties.

Practically all of this work is now eing done by the Geological Survey. If y transferring it to a bureau of mines 'c can promote the efficiency of the urvey in its own domain, which we are uite sure is wanted by the people enaged in the mining industry, by all ieans let us have a bureau of mines, ut let us limit it in the organic law so iat it will not have any loop holes irough which to embark upon irritating dventures. Under the bill that is now efore Congress a bureau of mines can o almost anything from the identificaion of mineral specimens to the contruction and operation of smelting 'orks, limited only by the appropriation iat it can extract from Congress. We ave not had any reason to alter the pinions expressed in our editorial of an. 18, 1908.—Editor.]

Not a Billion Dollar Fraud

In the January number of McClures nagazine there was an article on the oalfields of southern Alaska which aserts that they are worth a billion dolars, and that land grabbers have almost ucceeded in getting possession of them y fraud. The article is important beause, with its candid and impartial manier, it will mold the opinions of many. Does it in the main convey the truth?

That there is $1,000,000,000 of wealth n coal lying ready to hand in the Alascan forest is a grotesque exaggeration. This false idea of the fabulous worth of he field constitutes not only an error of 'act but the major premise of the reasoning. The irregularities in entry spoken of were in themselves comparatively small offenses, especially as there has been as yet no regular way provided for filing upon Alaskan coal lands. The essence of the presentation lies in an atmosphere of corruption and connivance mistily painted as a background to the vivid and startling richness of the prize.

The value of $1,000,000,000 (or more) is arrived at by multiplying an estimated tonnage of 2,000,000,000 by an estimated profit of 50c. per ton. This is claimed to be conservative because the "Government expert" put the profit at $1 per ton.

No coal, in Alaska or out of Alaska, is worth 50c. per ton as it lies in the seam. The highest-priced coal lands in the United States, lying in the anthracite regions of Pennsylvania and in the Connellsville coke district, are valued at no more than 5 to 10c. per ton of coal contained. This is a high rate due to tremendous local demand, unequaled mining and transportation facilities and the approaching exhaustion of the beds. Elsewhere in the United States developed coal land is worth, say, from 1 to 3c. per ton of coal in the ground, excluding all seams but the one actually mined upon. Undeveloped land without railroad connection is worth much less.

In distant places values are lower than in the nearby thickly populated localities. Thus the Crow's Nest Pass Coal Company, of British Columbia, which owns the greater part of about 22,000,000,000 tons of fine bituminous and anthracite coal, and which has coke ovens and mine works and a trade approaching 2,000,000 tons per year, is worth in the stock market only about half a mill per ton of coal owned.

The Alaskan beds have been opened up at a number of prospect holes, but it is idle to estimate from present knowledge the tonnage of workable coal. The seams have not been classified so that it can be told how many there are. Some of the openings disclose poor coal and a few good, the best so far discovered on the Pacific coast. Fortunately the finest coal is in thick seams 20 ft. or more where examined. The coal is friable, more or less crushed and usually dips steeply. The country is rugged and is also considerably faulted. The conditions of mining, even assuming the construction of the necessary railroads, would all be unfavorable; wages high, overburden heavy, pitch steep, climate rigorous and country inaccessible. Only one thing could make such coal lands of great or even ordinary value, and that is the existence of an unsatisfied neighboring market that will take whatever is mined and pay a high price for it.

The Pacific Coast market takes altogether about 5,000,000 tons of coal per year, principally from Nanaimo, Coos bay and across the Pacific. Fuel oil has taken the place of coal in California. This market is both small and competitive. Even assuming the Alaskan coals to capture a third or one-half of the total, the output would be only 4000 to 6000 tons per day; enough for two or three mines of moderate size. In order to capture any considerable share of the market some years of development must be entered upon, and some of the existing coal driven out by competition of price as well as of quality. The local market in Alaska will take little, say a few hundred thousand tons after the copper mines are opened.

Thus the Alaskan coal lands cannot be considered so valuable as the ordinary coal lands of fields with which we are more familiar. Instead of the coal being worth 50c. per ton in the ground including all seams, some one seam, in the few localities where it can most advantageously be opened, will be worth, at the most, one-half cent per ton, after development. The rest will be worth practically nothing.

The statement of values is therefore exaggerated 500 or 1000 times at least in the article in question. The figure of $1,000,000,000 for these small and distant, undeveloped fields would mean a value for the coalfields of the United States of over ten times what we have modestly claimed as the total of our national wealth. As a matter of fact prospective coal operations in southern Alaska are not of great economic importance except as they are a sign of the opening up of that country. The coal will be necessary to the railroads and to the copper industry.

Ignorance hastens to stir the pot of trouble. Where a deplorable controversy, wrecking men's usefulness, has been urged on its way by foolish exaggeration of the sort here met with, the truth needs no apology.

Morrell W. Gaines.

Brooklyn, N. Y., Jan. 31, 1910.

American Institute of Mining Engineers

The 118th meeting will be held at Pittsburg, beginning March 1 next. Headquarters will be at the Hotel Schenley, and the meetings will be held in the lecture room of the Carnegie library. Harrison W. Cramer is secretary of the local committee; his address is at the Carnegie library, Pittsburg.

The annual business meeting of the corporation will be held at the office of the institute, 29 West Thirty-ninth street, New York, on Feb. 15, 1910, at 11 a.m. At this meeting, members present in person or by proxy will elect three directors of the corporation, and officers and members of the council, as required by the constitution. The following list comprises all the nominations received for officers and members of the council. For president of the council, D. W. Brunton, Denver, Colo.; for vice-presidents of the council, Benjamin B. Lawrence, New York; Albert Sauveur, Cambridge, Mass.; Joseph W. Richards, South Bethlehem, Penn.; for councilors, Robert E. Jennings, New York; William Kelly, Vulcan, Mich., and Charles F. Rand, New York.

The subject of an institute excursion to Japan in the autumn of 1910 will be considered. The cost of the trip is estimated not to exceed $500 per person from San Francisco.

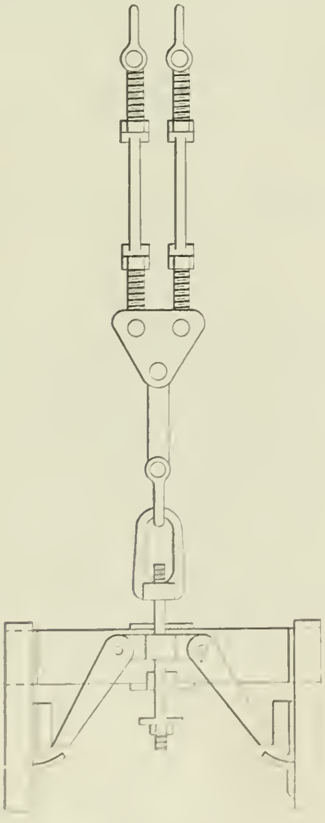
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Double Hoisting Cables

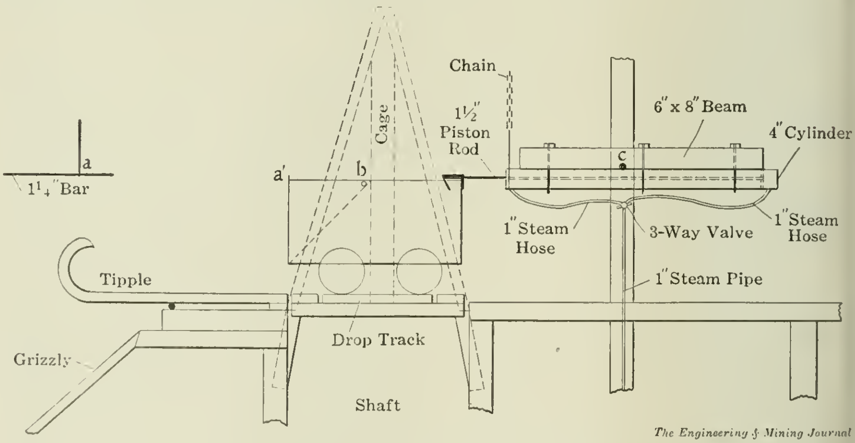
At the Beust shaft of the Deutschland mine at Hasslinghausen, Germany, the slipping of the cable is prevented by using a double rope running on double-grooved sheaves. Thus the bearing area on the packing in the sheaves is increased. As shown in the accompanying drawing, the cables are attached to the cage by a drawbar to which the cables are fastened by turnbuckles. These turnbuckles permit the strain on the cables to be equalized. Bolts prevent the moving of the turnbuckles by the twisting of the ropes.



DOUBLE HOISTING CABLE

Steam Ram for Dumping Ore Cars

The accompanying illustration shows a steam ram that is used in moving ore cars from the cage to the tipple and dumping them. The cars with which it is being used are of 1½ tons capacity and are hoisted upon a cage that has a drop track, so that the cars are always in the same position in the cage. The drop track is lifted up by the chairs as the cage rests upon them. Surrounding the top of the shaft is a frame 3½ ft. high, and when the cage is down this frame is always in place, so there is no chance for a workman to fall in the shaft. As the cage approaches the top of the shaft the frame is carried on top of the cage, while the cage closes the mouth of the shaft.



The Engineering & Mining Journal

STEAM RAM FOR DUMPING ORE CARS

There is one ram for each compartment of the shaft, and in this particular case one man operates both. In many cases two, and sometimes three, men are required to handle cars of this capacity, so that the use of the rams does away with one or two men. At the same time it is much safer, as there is no occasion for a man to step across the shaft, nor is there anyone working near the opening.

The man operating the ram is about 8 ft. from the shaft, and there is a guard rail between him and the shaft. As the car comes up the hook engages it automatically, all parts being so adjusted that the hook is always over the end of the car. The operator turns on the steam with a three-way valve, which opens an exhaust port at the same time. The car is pushed out by the piston to the tipple. A bar *a* engages the front of the car at *a′* and holds the hood in place, while the car tips and allows the ore to slide out the end. The hood is hinged at *b* and forms the end of the car. The piston cylinder is made of 4-in. steam pipe bored out to make it smooth. The end of the piston nearest the shaft is a little heavier than the other end, and for this reason is supported by a chain. The piston is fastened securely underneath a 6x8-in. beam which is supported between two posts on an axis *c* near the center. This allows the piston to move up or down at the car as necessary.

This apparatus has been in operation about three years at the Desloge Consolidated Lead Company's mines at Desloge, Mo., and was invented and patented by Thomas Fisher, who is the company's mechanical engineer.

Disposal of Tailings

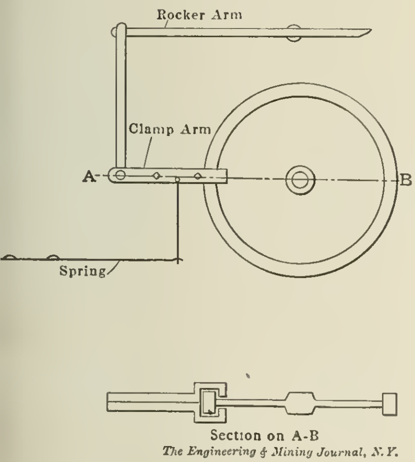
At the Oronogo Circle group of mines at Oronogo, Mo., the ground for the disposal of tailings is limited, and it became necessary to install a system of disposal which would not encroach upon other property, including railroad tracks. The scheme adopted consists of a track inclined at approximately 30 deg. upon which is operated a 2½-ton car, drawn by a cable from a small hoisting engine. The car is self-dumping, and it requires only one man to operate the car, as he loads the car and also attends to the engine.

The tailings are dewatered and run into a 100-ton bin from which they are drawn into the car. At present the car dumps at an elevation of about 50 ft. and when the pile is so high that the car will no longer empty itself, an additional bent is built on the trestle, which throws the tailings further over and at the same time higher.

The tailings being dry do not spread out to such an extent as when run out by water as is the regular practice in the Joplin district. In this case, the further the track extends, the higher it becomes, while in the usual method, the longer the trough, the lower the dump becomes.

Feeder Mechanism

Where old-style Challenge feeders have been in use for a long time it will pay o replace the disks and pawls with the single, simple disk shown in the sketch, provided, of course, the latest and best roller-clutch mechanism cannot be afforded. This scheme is in use at Bodie, Cal., and gives good satisfaction. The wo-piece clamp arm, which is bolted to embrace the edge of the disk, is pulled and kept tight by the spring. As the rocker arm is raised by the feed collar on the tem, this clamp arm turns the feeder isk and through it the feeder plate, sliping back to its original position as soon s the rocker arm is released by the feed ollar. The clamp arm fits loosely around he edge of the disk and gets its hold by inching the rim on the up stroke.



FEEDER MECHANISM

Steam Stamps on the Rand

A steam stamp is being designed for ubmission to the Mines Trials Committee with the idea of attempting to do on the Rand what is done with steam stamps in he Lake Superior district in crushing opper ore. This equipment does not seem so desirable for crushing "banket," where amalgamation is insisted upon, as does for silver ores where no amalgamation or concentration preliminary to ne grinding is required. The American team stamp is best adapted for coarse rushing, from 3/8 to 5/8 in. size, and it s questionable whether 40-mesh crushing an be done advantageously by their use. If amalgamation after tube milling be adopted, the steam stamp might be acceptable.

Laboratory Balance Troubles

By Donald M. Liddell*

In those laboratories where the balances cannot be supported on proper stone piers, trouble is often experienced from the jarring to which they are subjected. This can be eliminated, in great measure, by supporting the balance legs on truncated pyramids cut out of old rubber packing, the lower base of the support being about 2 in. square and the upper base about 1, the thickness also about 1 in. A small square of ground glass should be cemented to the top of each piece in order to take the direct thrust of the balance legs. These truncated pyramids give a much better support than an equal amount of rubber in the form of a rectangular prism as there is not the same tendency to oscillation.

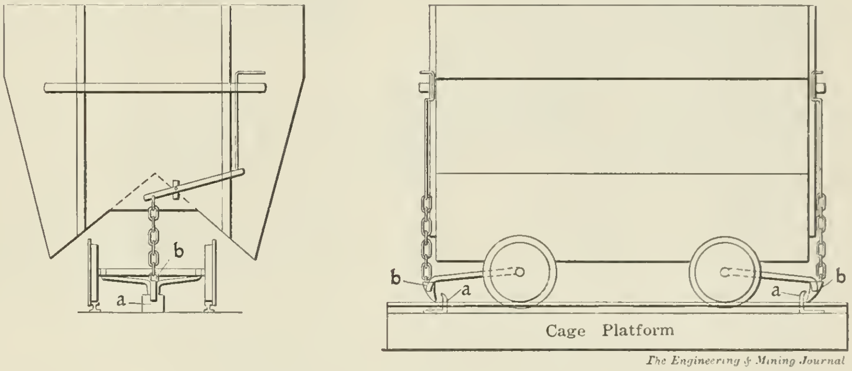
Another variation of the same idea is to bore four holes about 1/2 in. deep in the table on which the balance stands and insert No. 5 rubber stoppers, placing on top of these a lead plate upon which the balance rests. The lead plate, if of the proper size, completely deadens any motion due to accidentally touching the balance, while still leaving enough spring in the rubber to deaden any external vibrations. By experiment it was found that the best results seemed to be obtained with a 225-lb. lead plate with small holes bored in it so that the balance legs were sunk about 3/16 in. below the surface. This obviates any tendency of the balance to slip and still allows sufficient play in the set screws to adjust the balance. The above is the suggestion of A. E. Knorr.

Occasionally delicate gold balances will be found which seem to be subject to disturbances from the mere approach of a person, apart from any jarring of the floor due to such cause, or even from movements of the operator's hands. It has been my experience that these balances usually have had pans blackened on one side and bright on the other. The only apparent explanation is that there is some action analogous to that of the vanes in a Crooke's radiometer. However improbable as this may seem, the behavior of two balances affected this way has been greatly improved by the substitution of pans blackened both inside and out.

Car Locking Device

Cars should always be locked on a cage in hoisting, this being best accomplished by having iron straps hinged on the frame of the cage which are pulled down when the car is on the platform, holding it firmly in position. The car-locking device here illustrated may also be used on any cage.

On the cage platform two plates, bent as shown at *a*, are placed to engage hooks *b* suspended from either end of the car. These hooks are hung from levers by chains and pivoted from the car axles. When the car is run on the cage the hook on the front of the car passes over both catches but the rear one engages and the car is firmly locked in position.



CAR-LOCKING DEVICE IN OPERATION

Lime for Cyanide Plants

W. A. Caldecott has called attention to a serious defect in the lime which is ordinarily supplied to cyanide plants. Much of it, burned in open kilns, contains partially burned coal or wood, either of which is a good precipitant of gold and silver. Where lime burned in retorts is not available, that fed to the plant should be in the form of a solution or as a thin emulsion. A discovery usually made at every cyanide plant during its life is that wood ash can be used to replace lime for neutralizing acidity. It is not always followed by the discovery, however, that the ash should be leached rather than fed into the pulp, on account of the precipitation caused by the unburned charcoal.

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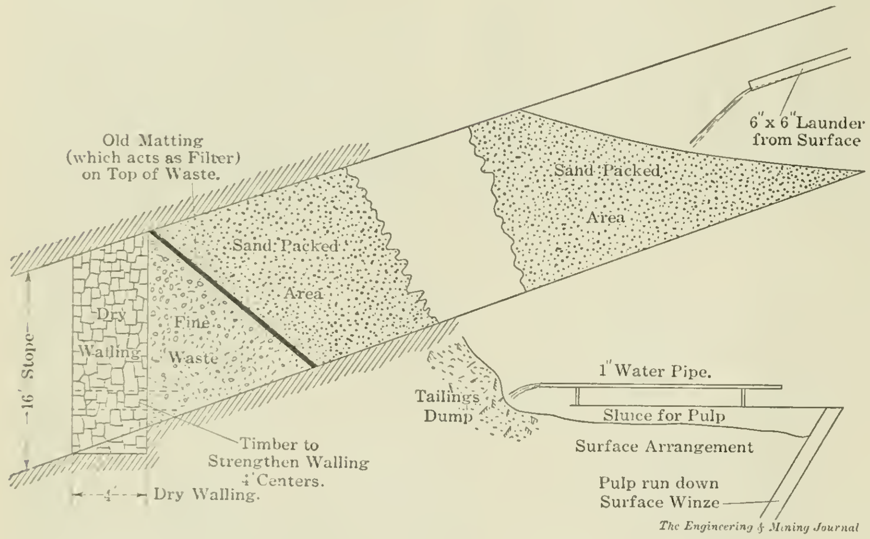
*Grasselli, Ind.

The Spuelversatz Method of Hydraulic Filling

As a solution of the problem of preventing the extensive caving and subsidence of the worked-out areas underlying the battery at the Robinson mine, Transvaal, experiments were made with a view to testing the utility of the Spülversatz method (water flushing), and the *Min. Journ.* says that from present appearances the system is highly successful and likely to be generally adopted on the Rand. Briefly, the work as done on the Robinson consists in sluicing the sand of the tailings dumps into a 6x6-in. launder, which conveys the pulp underground to the stope to be supported. The bottom of the stope is dry walled (see sketch); on the walling fine waste is placed, which in turn carries old matting from the cyanide tanks. This matting acts as a filter. Other dry walls at right angles cut up the stope into panels for the reception of the incoming pulp, the sands quickly settle, and the water filtering away through the walls is pumped back to the surface and re-used. The proportion of water to sand is 1 to 2, the gradient of the launder being 10 to 15 deg. A small quantity of lime is added to maintain alkalinity. The cost works out at 2.1d. per ton, and from 80 to 100 tons are sent underground daily. The sand sets hard and compact in two or three days, and the crush is, approximately, 10 per cent.



The Engineering & Mining Journal

METHOD OF FILLING STOPES WITH TAILINGS

Determination of Small Quantities of Copper in Slag

By C. A. Heberlein*

The quick determination of very small quantities of copper in irony slags offers extreme difficulty, particularly when very high in iron as in slags made in pyritic smelting. While blowing in the plant of the Maine & Nebraska Mining Company at Balsas, Guerrero, Mexico, the ore proved to be ideal for pyritic smelting, but the content of copper was so low—averaging about 0.3 per cent.—that I became interested in the actual loss of copper in the slag.

The chemist reported "no copper in the slag," which I knew could not be true. During the short run I supervised, the copper concentrated from 2.5 to 4 per cent. in the matte, determination thereof being made by the current smeltery method, precipitating the copper with H_2S, but I found the following method quicker, easier to handle and just as accurate:

Five grams of chilled slag are boiled in hot water, enough HCl added to thoroughly decompose the slag, then HNO_3 and KNO_3 are added and all run to dryness and with H_2SO_4 to fumes. After cooling, hot water is added, then more H_2SO_4 and boiled, the solution then being poured off on a quick-acting filter and the residue boiled again with water, and again filtered. The filtrate is then brought to boiling, and addition of a few grams of crystalline hyposulphite is made, precipitating the copper very rapidly. After filtration, the copper sulphide is ignited in the front of the muffle in a porcelain crucible. Then the copper is dissolved in 5 c.c. of HNO_3 neutralized with NH_4OH and titrated with potassium cyanide solution (0.25 per cent.) in the presence of an excess of 3 c.c. of NH_4OH, the same amounts of acid and ammonia being used in standardizing the cyanide solution.

I found the results to be good and the method more convenient than the H_2S method. If 0.25 per cent. cyanide solution is used and the assay is over-titrated, say 0.1 c.c., the error would still be very small. For example, if the copper ran 0.086 per cent., requiring on a 5-gram charge and 0.25 per cent. solution, 1.72 c.c., or 0.43 per cent. copper, deducting therefrom 0.1 c.c., or 0.025 per cent. copper, would give for the correct contents

$$0.430 - 0.025 = \frac{0.405}{5} = 0.081$$

per cent. copper instead of 0.086 per cent., or expressed per ton of slag 0.05 kg. metallic copper, which is small enough to be neglected.

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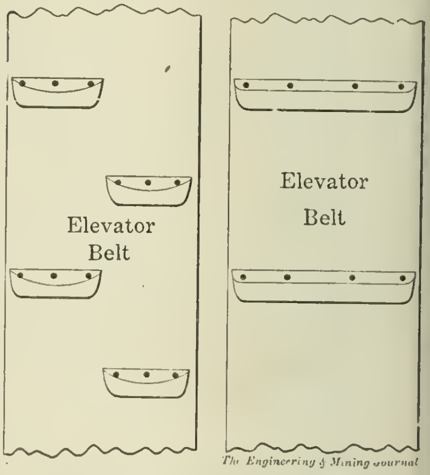
*Metallurgical engineer, Campo Morado, Guerrero, Mexico.

Staggering Elevator Buckets

The life of elevator belts may be considerably prolonged by staggering the buckets as shown in the accompanying illustration. The Continental Zinc Company of Joplin, Mo., has been using this scheme for a number of years. The belts used are 20 to 24 in. wide and in place of using buckets reaching the entire width of the belt, buckets half as long are used and placed alternately on the belt as shown in the accompanying illustration. Of course this necessitates practically the same number of holes in the belt, but they are so distributed that the line of holes does not extend entirely across the belt. Again the load is not so heavy at any one point on the belt. In case the belt wears so much that it is necessary to shift the buckets, they are moved about half the distance to the next bucket, and at no time does a row of holes extend entirely across the belt.



The Engineering & Mining Journal

METHOD OF STAGGERING ELEVATOR BUCKETS

January Dividends

ne accompanying table shows the unt per share and total amount of dividends paid during January, 1910, a number of mining and industrial panies in the United States, Canada, th and Central America.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
ka Mexican, g....	Alas.	$0.60	$108,000
ka Treadwell, g..	Alas.	1.00	200,000
on & Mont., c...	Mont.	3.00	750,000
ker Hill & Sull., s.l.	Ida.	0.15	45,000
field Con., g.....	Nev.	0.30	1,067,510
Silver..........	Colo.	0.10	50,000
son, g..........	Cal.	0.02	7,800
Idria, q........	Cal.	0.30	30,000
land, g.........	Colo.	0.02	60,000
r King Co't'n...	Utah	0.15	187,500
lard Con., g.s...	Cal.	0.75	133,795
pah of Nev., s.g..	Nev.	0.35	350,000
ed Verde, c.....	Ariz.	0.75	224,945
Con., c........	Utah	0.50	150,000
icator Con., g...	Colo.	0.03	45,000

S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
Cement........	Penn.	$0.10	$20,000
Sm. & Ref., pfd..	U. S.	1.75	875,000
Sm. & Ref., com.	U. S.	1.00	500,000
. C. & C., com...	Mo.	1.50	76,875
. C. & C., pfd....	Mo.	1.25	23,437
olidation Coal...	Md.	1.50	285,370
Lack. & Western al............	U. S.	2½%	
ire S. & I., pf...	N. J.	1.50	37,500
eral Chem., pf....	N. Y.	1.50	150,000
onal Lead, com..	N. Y.	1.25	186,292
ublic I. & S., pfd.	Ala.	1.75	357,295
Sheffield, pf....	Ala	1.75	117,250
Car. Chem., pf...	U. S.	2.00	360,000

oreign Mining ompanies.	Situation.	Amt. per Share.	Amt. Paid.
hitlan M. & M...	Mex.	$0.02½	$12,500
alo, s..........	Ont.	0.05	50,000
vn Reserve, s....	Ont.	0.15	262,500
inion Coal, com..	N. S.	1.00	150,000
eranza, s.g.......	Mex.	0.24	109,200
najuato Dev., s..	Mex.	3.00	30,000
genheim Expl....	Mex.	2.50	262,500
ley, g...........	B. C.	0.30	36,000
Rose, s..........	Ont	0.10	149,850
ky Tiger, g......	Mex.	0.05	37,500
Kinley-Darragh, s.	Ont.	0.05	112,384
ssing, s.........	Ont.	0.37½	450,000
iskaming & H. B.	Ont.	3.00	23,283
. St. & Coal, com.	U. S.	1.00	60,000

ronology of Mining for January, 1910

an. 1—Floods destroyed 100 miles of Salt Lake-Los Angeles railroad in vada, greatly impeding mining.

an. 8—Annual statistical number of JOURNAL issued.—Fire destroyed rehouses and stores of Dolores comny at Madera, Chihuahua, Mexico. ss $100,000.

Jan. 13—Pearl Consolidated mine, ho, sold to J. H. Harper of Spokane, sh., for $225,000.—News received of th of Harry S. Elliott, of Elliott-Hubrd Copper Company, of Chicago, and C. Greer, of Seattle, Wash., in snowde, Dec. 30, in Alaska.

Jan. 14—Payment in full of 500,000 sos made by Marcus Daly estate for nco Minas property in Jalisco, Mexico.

an. 15—Homestake mine resumed par l operations with nonunion men, the principal mines of district adopting card system.

Jan. 17—W. P. Hammon and others took a bond on 7000 acres of dredging ground on Clear creek, six miles south of Redding, California.

Jan. 23—Mill of Wasp mine at Lead, S. D., burned. Loss, $97,000.

Jan. 26—Payment of 9,000,000 pesos made by the Camp Bird, Ltd., of London, for the Santa Gertrudis mine in Hidalgo.

Jan. 26—E. A. Wall's injunction against Utah Copper Company dissolved and merger of Utah Copper Company and Boston Consolidated consummated.

Jan. 27—Announcement of call of special meeting of the Anaconda Copper Mining Company, March 23, to consider increasing the stock from 1,200,000 shares, par $25, to 6,000,000 shares to effect a merger of Butte properties.

Jan. 29—A fire damaged the shaft of the Goldfield Consolidated at Goldfield, Nev., to the extent of $60,000.

Jan. 31—Explosion in coal mine at Primero, Colo., results in large life loss.—Directors of Nevada Consolidated Copper Company vote to submit proposed merger with Utah Copper Company to a vote of the stockholders.

American Smelting and Affiliated Companies

The statements of the "Guggenheim companies," just issued, are herewith reproduced. The earnings of the American Smelting and Refining Company were at the rate of about 6½ per cent. per annum on the common stock during the half-year under review, ended Oct. 31, 1909. The American Smelters Securities Company earned during the half-year ended Nov. 30, 1909, on the basis of 7 per cent. annually on its common stock, and Daniel Guggenheim anticipates that future earnings will be increased. The American Smelting and Refining Company owns about 60 per cent. of the common stock of the Smelters Securities company.

AMERICAN SMELTING AND REFINING COMPANY.

PROFIT AND LOSS STATEMENT.

	Six Months Ended Oct. 31, 1909.	Six Months Ended Oct. 31, 1908.
Net earnings from operations..........	$3,112,193	$3,917,683
Deduct construction and improvements........	18,771	75,922
	$3,393,419	$3,841,761
Dividends preferred 3½%..	$1,750,000	$1,750,000
Dividends common, 2%...	1,000,000	1,000,000
Total dividends........	$2,750,000	$2,750,000
Net surplus to profit and loss..................	$643,419	$1,091,761

STATEMENT OF ASSETS AND LIABILITIES.

Assets.	Oct. 31, 1909.	Oct 31, 1908.
Property............	$86,845,671	$86,845,671
Investments....	1,368,191	2,858,617
Metals (refined values)	16,207,043	18,218,785
Material........	1,221,605	1,249,561
Net current assets	592 716	....
Cash and demand loans..........	9,415,379	8,629,550
Total	$118,683,605	$117,802,184
Liabilities.		
Capital stock..	$100,000,000	$100,000,000
Bonds (O. & G. Sm. Co. 1st Mtg.)	237,000	349,000
Net current liabilities		801,645
Unearned treatment on metals in process	2,551,917	2,148,559
Profit and loss......	15,891,688	11,499,980
Total	$118,683,605	$117,802,184

AMERICAN SMELTERS SECURITIES COMPANY.

PROFIT AND LOSS STATEMENT.

	Six Months Ended Nov. 30, 1909.
Net earnings from operations ..	$2,490,526
Deduct construction and improvements..........................	186,999
	$2,303,527
Less dividends...................	1,260,000
Net surplus to profit and lost....	$1,043,527

STATEMENT OF ASSETS AND LIABILITIES.

Assets.	Nov. 30, 1909.	May 31, 1909.
Property and investments...............	$78,846,077	$78,846,077
Metals...............	10,265,102	6,964,093
Material...............	1,049,890	984,527
Cash...............	703,881	1.285,335
Total...............	$90,864,950	$88,080,032
Liabilities.		
Capital stock..........	$77,000,000	$77,000,000
Net current liabilities...	8,307,258	6,418,999
Deferred liabilities.....	2,360,640	2,557,360
Unearned treatment charges............	1,598,773	1,518 921
Profit and loss........	1,598,279	554,752
Total...............	$90,864,950	$88,080,032

In the statement of the Guggenheim Exploration Company, dated Dec. 31, 1909, all of the items are carried at cost, the nominal value of $1 being assigned to a par value of $11,249,000 of Smelters Securities common stock. Mr. Guggenheim places the total value of Guggenheim Exploration Company stock outstanding (207,933 shares) at $65,500,000, or $315 per share. The present net earnings, based on the dividend disbursements of the subsidiary companies, are stated to be on the basis of 14.7 per cent. per annum. The surplus was increased $213,375 over that of a year ago.

GUGGENHEIM EXPLORATION COMPANY.

Assets.	December 31, 1909.
Treasury stock..........	$1,206,700
American Smelters Securities Co. (A)	13,860,000
American Smelters Securities Co., common....................	1
Other properties and investments .	19,149,552
Furniture, fixtures and equipment	6,936
Bills and accounts collectible ..	1,170,801
Cash and demand loans	1,163,075
	$36,857,065
Liabilities.	
Capital stock	$22,000,000
Bills and accounts payable	1,000,000
Surplus	13,857,065
	$36,857,065

During the year the Exploration company converted its holdings of Cumberland-Ely stock and Nevada Northern Railway bonds into Nevada Consolidated stock. This stock was placed on a dividend basis during the last quarter of the year, the initial dividend being 37½c. per share quarterly, 30 per cent. of the par value. Yukon Gold commenced dividends during the third quarter on a basis of 8 per cent. per annum. All the Guggenheim copper companies are now issuing quarterly statements to the stockholders.

The item "Other Properties and Investments" in the assets of the Guggenheim Exploration Company is detailed as follows, all items being carried at cost: Esperanza, $322,347; Nevada Consolidated, $4,234,408; Utah Copper, $4,788,-648; Yukon Gold, $9,794,639; miscellaneous investments, $9510.

Official Views of the Proposed Merger of Utah Copper and Nevada Consolidated

At the meeting of the directors of the Nevada Consolidated Copper Company in New York, Jan. 31, 1910, Pope Yeatman, consulting engineer, submitted a report in which he said: "I strongly advise the stockholders of the Nevada Consolidated Copper Company to accept the offer of the Utah Copper Company. My chief reason for making this recommendation is that I believe that after two years, during which time the concentrator of the Utah company is to be increased from 8000 tons to 12,000 tons daily, and the Boston concentrator from 2750 tons to 6000 tons per day, and necessary advance stripping of overburden and railway improvements made to insure delivery of such increased tonnage for the plants, the annual profits to be distributed per share of Nevada Consolidated stock exchanged will be materially greater than would be the case if the stockholders retained their Nevada Consolidated stock and depended upon the profits of that company, and that these increased earnings will extend over a much greater period of time."

This takes into consideration an increase of the Utah company's capitalization to 2,500,000 shares with a par value of $10 per share, and is based on exhaustive consideration by Mr. Yeatman of the physical and technical aspects of the Utah Copper Company's property.

It is said that considerable friction between the opposing factions developed at the meeting. The Guggenheim directors voted favorably on the merger proposal, but owing to bitter opposition, it was finally determined to lay it before the shareholders without official recommendation. After the meeting President James Phillips, Jr., of the Nevada Consolidated company, issued a statement in which he said:

"The meeting of the directors was called by the Utah interests in the board for the purpose of taking action on the letter of the Utah company making an offer for exchange of stock. Consistent with what I believe to be for the interests of the Nevada stockholders, I voted against the proposed action. It seemed to me a subtle and unfair method of procedure, and especially unfair to Nevada stockholders because supported by four of our directors who are directors of the Utah company, also one of our directors who has been acting as counsel for the Utah, one who is auditor for the Utah, and two others who are employees of the Guggenheim interests."

On Feb. 3, President Phillips specifically denied that the Guggenheim interests controlled 50 per cent. of the Nevada Consolidated stock and stated that he had notified the members of the Nevada Consolidated board who were interested in the other companies in the proposed deal that he would challenge their right to act on the proposal of the consolidation.

The Greater Anaconda Company

The shareholders of the Anaconda Copper Mining Company will vote, March 23, on increasing the capital stock from $30,000,000 to $150,000,000. Part of the new stock to be issued is for the purpose of acquiring the property of certain Amalgamated and Cole-Ryan companies in the Butte district, among which are the following: Anaconda Copper Mining Company, Boston & Montana Consolidated Copper and Silver Mining Company, Butte & Boston Consolidated Mining Company, North Butte Mining Company, and Butte Coalition Mining Company. The official announcement says in substance:

"The 'law of the apex,' or the right to follow a vein on its dip extra-laterally beyond the surface lines of a mining claim, prevails in Montana, and has given rise to many perplexing problems; it was this law that was chiefly responsible for the costly Heinze-Amalgamated litigation, which was finally terminated some years ago only by the purchase of the Heinze properties and the subsequent formation of the Butte Coalition Company.

"The mining claims of the Anaconda Copper Mining Company and of the other companies affected by this plan are all located upon the Butte hill within a comparatively circumscribed area, and are so closely and inextricably interlaced as to make almost impossible the segregation of the ownership of the underground orebodies.

"Some of the operating features which have been considered in favoring the proposed plan are the economies which will result from working all the mines in accordance with a general system of ventilation, drainage and development, thus relieving the owners from the necessity of maintaining numerous expensive surface and underground plants which
under separate ownership are essent
for working the scattered properties
the different companies.

"The Anaconda company is regard
as the logical company to become t
purchaser of the properties of the oth
companies, and the step taken at t
recent board meeting was the first towa
submitting the matter to the stockholde
of the different companies. It is r
likely that all of the increase of stock,
authorized, will be used at present
carrying out this plan."

Recent Coal Mine Explosions

The coal-mining industry in Ameri
seems to have entered another danger p
riod, as is shown by the latest mine d
asters. The first of these explosions to
place in the Nottingham colliery of t
Lehigh & Wilkes-Barre Coal Company
Plymouth, Penn., Jan. 11, 1910. This a
cident was due to the firing of a bo
of gas that had accumulated in tv
abandoned chambers. This accumulati
of gas was due to the breaking do
of a check door by a fall of roof, whi
took place about 16 hours before the e
plosion occurred. The verdict of the co
ner's jury disclosed that the fire boss w
negligent in his duty in not notifying t
men who were working in this section
the mine, before the air current was ta
pered with. It was also shown that t
assistant mine foreman was negligent
his duty in leaving the check door down f
so long a period before having it repaired

Probably the most important finding
the jury in connection with this expl
sion was that the certificates of co
petency of two of the deceased mine
were fraudulent and were irregularly i
sued. This question of fraud in the i
suance of miners' certificates is a dange
ous practice and a violation of the mi
laws that should be immediately co
rected for once and all. The existence
this evil has been known for years to t
higher State officials, and that correcti
measures have not been applied befo
is an evidence of incompetency or negl
gence on the part of those responsible f
an observance of the State mine laws.

The second important explosion in t
recent series occurred in one of t
mines of the Colorado Fuel and Iro
Company at Primero, Colo., Jan. 3
This accident resulted in the death
about 79 miners and was said to be du
to an explosion of gas in the main slop
of the mine. It has been stated th
safety lamps were used in the Prime
mine.

Following the two explosions just me
tioned, another similar accident has bee
reported in the Browder mine, 1½ mile
from Drakesboro, Kentucky, Feb. 1. Th
explosion at the Browder mine was sai
to have been caused by gas, and at lea
30 miners have perished.

Charles B. Parsons

Charles B. Parsons, superintendent of e St. Joseph Lead Company, died at s residence at Riverside, Mo., Jan. 28, 10. He was born at Benson, Vt., Feb. , 1836, and received his education in e public schools of Michigan, where s parents moved while he was yet a y. He practiced dentistry for awhile it joined the Fourth Michigan Volun- ers as a lieutenant on the breaking out the Civil War and saw active service the McClellan campaign. At the close the war he took charge of a small ver-lead mine at Northhampton, Mass., ience he went to Missouri about 1867. nce that time, for nearly 43 years, he d been the superintendent and resident inager of the St. Joseph Lead Com- ny, and the credit of its upbuilding d great success is largely due to him.

When he took charge of the property 1867, it was but little better than a pher-hole operation with some hand s, and its annual output was scarcely) tons. He promptly recognized that the property had a future, it was in indoning surface work and in opening deep mining. He at once secured the y diamond drill in the country—a chaux drill that had been imported m France—which had done a little lling in the red-slate district of Ver- nt. While it was a very crude af- , it was able to drill about 200 ft., and demonstrated the occurrence of the ge bodies of disseminated lead which e since been so great a source of fit to this company and have made the leading lead district in the United tes. With the discovery of the dis- inated lead his real troubles be- , as the company had no money nor lit and the nearest railroad point was niles distant, with wretched roads in- ening—certainly a most discouraging e of affairs to open up a low-grade erty. With indomitable grit and gy, that tolerated no such word as ire, Mr. Parsons began the tedious, rious work of developing the prop- . In the years of hard work that owed, a little mill was slowly evolved r many experiments and trials of all s of ore-dressing machinery. The oll was the most serious obstacle eet and it was frequently six months nore in arrears, and usually had to paid in store orders. Mr. Parsons' gy and confidence inspired a whole- grocer in St. Louis to ship him eries on credit, but when the goods ed, the company was unable to se- them as it had no money to pay the ht. A local friend was prevailed o advance the money and in this arious manner the company existed several years. A large foundry in ouis was induced to take stock and for the machine supplies, but when it was necessary to raise $1000, to buy a boiler, as the boilermaker would only take the order with the cash in advance, Mr. Parsons went around the community and borrowed the amount in lots of $5 and $10.

With the assistance of the neighboring Desloge Lead Company, a narrow-gage railroad was built—or rather laid—in 1880 from the mine to the Iron Mountain road, at Summit, and this put the company "on the map." The hundreds of teams that labored over the wretched hilly roads in hauling supplies in and lead out at 500 to 1000 lb. per trip, were dispensed with. The railroad was on the top of a ridge, which it followed closely with all its sinuosities, hollows and summits, and while seldom the 13-mile trip was made without running off the track, or having to double with a 3-car train, it put actual dividends in sight. When the pioneer mill—which was largely a museum of mill machinery and patched-on annexes—burned down in 1883, Mr. Parsons feared that his struggling company had received a deathblow. But his indomitable courage and energy, his ability to succeed under conditions that would have disheartened any other man and his faith in the property at last won recognitation. One of the largest banks in St. Louis was only too glad to give him credit for building a new mill. From that time he enjoyed relatively smooth sailing in the financial seas and the company began to prosper. He boldly erected a 500-ton mill which at that time was regarded as a giant. It was built on entirely new lines and had many features that were not only original, but meritorious. He made valuable improvements in the Rittinger table and developed the Parsons' under-piston jig, that requires a minimum of space and attention.

Before Mr. Parsons recently turned over the details of office to his son Roscoe, the holdings of the company had increased to over 20,000 acres; seven mines were in operation that supplied two mills of 1500 tons daily capacity each; it had the largest lead smelter in the Mississippi valley. The little narrow-gage road was replaced by 75 miles of well built, standard-gage railroad and the annual output exceeded 30,000 tons of lead. After paying for these improvements and building the large model towns of Bonne Terre, Herculaneum and Leadwood out of part of the profits, over $6,000,000 has been distributed in dividends and the stock sells on the open market at such a high rate as to yield only 4½ to 5 per cent.; a most excellent value for a mining stock.

In 1862 Mr. Parsons married Miss Jane Doolittle, of Canada, who survives him. He had eight children, five of whom are living and will inherit a more than comfortable competence.

The Bureau of Mines Bill

Special Correspondence

After a long and tedious debate the House of Representatives, on Tuesday, Jan. 25, passed the bill for the establishment of a Bureau of Mines. This bill is the same that was reported some time ago from the committee on mines and mining of the House as a substitute for all the other mining-bureau bills that were pending before the committee and was on the calendar as H. R. No. 13,915. The bill was passed with some minor amendments in the form in which it was reported from the committee and in which it has already been fully described in this correspondence. The final vote was not recorded and the passage at the last took place in a routine way.

The measure has now gone to the Senate where it has been referred to the committee on mines and mining in that body. No meeting of the committee has been held since the passage of the measure by the House but one is expected to occur in the near future. A meeting had, however, been held shortly before the action of the lower chamber and at that time a discussion of the measure, forecasting its passage by the House, was engaged in. There is a difference of opinion among the members of the committee with respect to the measure although up to date, it is stated, there is no active and persistent opposition so far as known. The chairman of the committee, Senator Dick, of Ohio, states that it is his earnest desire to report and pass the bill at the earliest moment. Democratic members of the committee are senators Hughes, of Colorado, Johnston, of Alabama, Tillman, of South Carolina, and Gore, of Oklahoma. It is the general belief that there will be some delay in getting any report from the committee and still more serious delay in getting action one way or the other upon the floor of the Senate.

The debate in the House developed the sources of opposition to the Bureau of Mines bill in that body and there will be antagonism of the same sort in the upper house. One chief source of opposition was found among those who believe that the measure is a useless expense to the Government in view of the fact that the work supposed to be actually necessary in connection with mining is now being done in the technologic branch of the Geological Survey.

A second serious group of opponents is found in those who believe that the proposed bureau is merely an entering wedge thrust in by a group of boomers who want to get a department of mines established and who are desirous that the Government shall do work that ought to be done at private cost by the interests for whose benefit the work is undertaken. Mr. Slayden, of Texas, put this point.

A third source of opposition is seen in the attitude of the Southern congressmen who believe that the proposed bill transcends the scope of the powers of the Federal Government and invades State rights. This position was urged by various representatives.

The Tariff on Scrap Iron

SPECIAL CORRESPONDENCE

Assistant Secretary Curtis of the Treasury Department has, with the approval of Secretary McVeagh, practically reversed the scrap-iron ruling which has been giving so much anxiety to New England manufacturers. He has sent, under date of Jan. 28, the following letter to the collector of customs at Philadelphia, in which is contained the new interpretation:

"Since the publication of the department's instructions of Oct. 23, 1909 (T. D. 30063), relative to scrap iron and scrap steel, the department has received many requests from persons interested in the business of remanufacturing these commodities for further consideration thereof.

"In determining the interpretation to be placed upon paragraph 118 of the Tariff Act of 1909, the important point to be borne in mind is the intention of the Congress, as indicated by the change in the rate of duty upon scrap from $4 to $1 per ton. It is not only a matter of common knowledge, but also within the specific knowledge of the department that Congress intended scrap iron and scrap steel to be imported with a duty of $1 per ton; and that Congress did not intend to permit the entry as scrap, of iron and steel not really waste or refuse. In order to give full effect to the primary intent of the statute, i.e., the lowering of the tariff on scrap, the defining clause must be interpreted in a manner that will not render nugatory the principal clause immediately preceding it. In other words, a proper and just construction demands that more stress be laid upon the clause by which the duty is lowered than upon the clause excepting certain materials from the operation of the paragraph. The department is of opinion that the phrase, 'fit only to be remanufactured by melting and excluding pig iron in all forms' was intended by Congress to be a more accurate definition of the term 'scrap iron and scrap steel' than was contained in the act of 1897 and was not intended in any way to be a further limitation thereof.

"After a careful investigation into the methods of remanufacturing waste or refuse iron or steel now in operation, the department is of opinion that all scrap iron and scrap steel is dutiable at $1 per ton except such as can be profitably remanufactured by a process of rolling, hammering or cutting, or any other process which does not include the complete change of form of the material by fusion caused by the application of heat.

"T. D. 30063 is hereby modified accordingly."

The Anthracite Trust Suits

The Government brief in the case against the alleged "Anthracite Trust," which was filed recently in the United States Circuit Court at Philadelphia, is a voluminous document. Besides the general charges of confederation in restraint of trade and of monopoly, there are nine specific acts of which complaint is made. These charges are summarized as follows:

SPECIFIC COMPLAINTS

(1) The interests of the defendant railroad companies in anthracite-coal land and in coal-owning and producing companies acquired since Jan. 1, 1874, are held in violation of the constitution of Pennsylvania.

(2) Railroads engaged as defendants in transporting coals of the same kind from a restricted area of production to the principal market are competitive, although their tracks may not reach the same mines.

(3) The evidence establishes that all the defendant railroads and their coal companies are parties to a combination and conspiracy to stifle competition and create a monopoly of trade and commerce among the States in anthracite coal, in violation of the anti-trust act.

(4) The 65 per cent. contracts, so-called, suppress competition among the coal companies of the defendant railroads in the purchase of coal from independent producers, and in the sale of coal to the public, remove such independent producers as competitors of the railroad coal companies in the sale of coal to the public and restrict their output at the will of the latter; prevent competition for the transportation of the independent output, either among the defendant railroads or by any new railroad, and by operating to give a preferential freight rate prevent the independent output not sold to the railroad companies from getting to the leading market on equal terms: which is, all in violation of the anti-trust law.

(5) The exchange of shares of the Erie Railroad Company for shares of the New York, Susquehanna & Western created a combination in restraint of commerce among the States.

(6) The acquisition by the Reading Company, while owning all shares of the Philadelphia & Reading, of a majority of shares of the Central Railroad of New Jersey, created a continuing combination.

(7) The Temple Iron Company is combination in restraint of trade.

(8) The acquisition by the Erie Ra road Company of all shares of the Del ware Valley & Kingston, a projected cor peting carrier, and all shares of tl Pennsylvania Coal Company, created combination.

(9) The acquisition by the Lehi Valley Railroad Company of all shar of Coxe Brothers & Co., the only r maining important competitor of the L high Valley Coal Company, constitut a combination.

THE TEMPLE IRON COMPANY

Paragraph 7 requires some explan tion to those who are not familiar wi the anthracite situation. The Temp Iron Company is a small concern owni a blast furnace and one or two sma collieries. Apparently there is no o casion for frequent meetings of tl board. But all the directors are pres dents of anthracite-carrying railroad and the board meets at short interval The charge is that these meetings, whic are not necessary to attend to the nom nal business of the company, are simp a cover for conferences of the membe of the alleged trust.

International Asbestos Associatio

The International Asbestos Associatio was recently organized at a meeting hel in New York. Its membership is com posed of representatives of American an Canadian mine owners and manufactu ers. The interests at the meeting repre sented between 80 and 90 per cent. o the asbestos business in the United State and Canada, and included the larges producers and users of asbestos in thos countries, such as the Amalgamated As bestos Corporation, Ltd., Keasbey & Mat tison Company, Philip Carey Manufact uring Company, Asbestos Protected Meta Company, Franklin Manufacturing Company, H. W. Johns-Manville Company Sall Mountain Asbestos Manufacturin Company, Ling Asbestos Company, an the United States Asbestos Company The aggregate capitalization of the con cerns so far represented is over $40,000,000. The following were elected officer of the association: T. F. Manville, presi dent; R. V. Mattison, Jr., vice-president R. P. Doucet, secretary.

It is announced that the purposes o the association are the general exploitation of the uses of asbestos, particularl in the field of fireproof construction, coöperation between consumer and producer, cultivation of new markets and development of processes whereby the wastes in the industry may be rendered commercially valuable. The association will establish a bureau that will be devoted to the aforementioned purposes

quipment and Methods at the Hecla Mine

This Coeur d'Alene Mine Developed by Levels at 300-ft. Intervals; Stull Timbering in Overhand Stopes; Ilgner Electric Hoisting System

BY ROY HUTCHINS ALLEN*

e Hecla mine at Burke, Ida., has at- d little attention in the mining press, t is one of the most important of Cœur d'Alene district and has a rec- of which any mine might well be . The equipment and method of ng are unusual, and alone merit a iption of this splendid mine.

Geology of the Deposit

e country rock at the mine is the itic Burke quartzite, which has a nearly northwest, and a dip of t 80 deg. to the northeast. The rock istinctly bedded and in places, as the railway station at Wallace, s well developed ripple marks. On unt of its thin platy structure and the nce of the many fine scales of mus- e mica, or sericite, the rock has at ort distance the appearance of a , and it is only in the fractures ss the bedding that its hard com- character is seen.

e Hecla lode is a true fissure vein h is almost parallel to the bedding he quartzite, yet cuts it, in most es, at a small angle in both strike dip. It has a strike northwest and heast, and dips toward the north- at angles varying from 70 deg. to cal in the upper workings, while in es in the lower workings the dip is rsed to a steep angle toward the hwest.

e vein is unusually straight and va- in width from 5 to 25 ft. It follows ke 18 to 36 in. wide, the ore occur- sometimes on one side, sometimes on other, and often on both sides of it. unaltered dike rock is dark greenish and fine grained, and has been ed an odinite by the members of the . Geological Survey. The rock, how- , for the most part is altered largely chlorite and in places is merely a wnish mud. The fresh rock disinte- es rapidly when exposed on the dump. ions of the dike are mineralized and laces narrow streaks or veinlets of run through it. An examination of relations underground would lead to belief that the ore deposition was la- than the dike but F. L. Ransome[1] after ographic study, has decided that the is younger than the ore.

he ore shoot was first encountered 800 southeast of the shaft. It has an ap- ently vertical pitch, and extends for r 1200 ft. in length. The ore, consisting chiefly of galena with a very little blende and pyrite, occurs in streaks and bunches between the walls of the vein. Occasionally the walls are impregnated, but for only a short distance. Many stringers of ore branch from the lode into the footwall, but never extend for more than a few feet. The vein matter consists almost entirely of the country rock, quartzite, which between the walls is much cut up with slips, mostly vertical, but also with transverse, horizontal and diagonal slips. Most of these slips show slickensiding and a development of talcose material which makes the stability of the roofs of the stopes very uncertain.

Mine Plant and Equipment

The Hecla mine has one vertical three-compartment shaft, 19 ft. by 7 ft. 2 in. inside the lagging, and 1200 ft. deep. There are two main hoisting compartments, each 4 ft. 4 in. by 5 ft. 2 in., and a third compartment 7 ft. by 5 ft. 2 in., which is used as a pipe and ladder way, and also for handling the bucket used in sinking the shaft. The shaft timbers are all 12x12 in. in section, except the girt between the hoisting compartments, which is 8x12 in. The posts of the sets are 4 ft. 4 in. long, with an additional tenon of 1 in. on each end. The guides are of 4x6-in. timbers.

Three-ton skips are used for handling the ore, and to the bottom of each skip is attached a double-deck cage for the raising and lowering of men and supplies. The Ilgner system of hoisting is used, a system which has not yet come into common use in this country, but which is extensively employed in Germany. The German installations (and one American) have been described in several articles published in the JOURNAL.[3] Briefly stated, the system consists of a direct-connected motor-driven hoist, the direct current for the hoisting motor being furnished by a motor-generator set which has a heavy flywheel on the armature shaft common to both motor and generator, or steering dynamo, as the latter is called. The speed of the hoisting motor is controlled by varying the current intensity in the field of the steering dynamo, a slight variation in the field producing a relatively large change in the current given out by the armature. The field of the hoist motor is separately excited by an exciter dynamo connected with the generator set.

The advantages of the system are many, but the following are important: In the first place, polyphase current may be used to operate the motor-generator set, thus obtaining all of the advantages which that current possesses in economy of transmission and ease of transformation; and yet the advantages of the direct-current motor for hoisting at varying speeds are retained. When polyphase-current motors are started under load there is a heavy current shock, resulting in the formation of a high peak on the recording wattmeter diagram, and a large expense to the consumer who buys power according to the "on-peak" load. To control the speed of this type of motor it is necessary to pass the entire current through a resistance, thus causing the waste of a large amount of power. With the Ilgner method of control a wide range of speed is possible with the loss of almost no electrical energy, and there is no sudden rush of current upon the hoisting motor for the current automatically builds itself up to the requirements of the load. Sudden variations in the load are compensated for by the energy stored by the flywheel of the generator set, and indeed the flywheel enables hoisting to be continued in case of short interruptions to the current from the central power station.

Details of Hoist and Generator Set

The hoist at the Hecla mine was furnished by the Wellman-Seaver-Morgan Company of Cleveland, Ohio, and has two reels, 5 ft. in diameter when empty, 13 ft. in diameter when full, each with a capacity of 2800 ft. of 4½x⅜-in. flat rope. The 10-in. drum shaft supports a 375-h.p. Westinghouse direct-current motor which has a speed of 60 r.p.m. and takes a current of 620 amp. at 500 volts. The speed of winding, when hoisting from the 1200-ft. level, accelerates during a period of 10 sec. from a zero initial speed to 1900 ft. per min. at the end of the trip. When the reel is full the maximum hoisting speed will be 2300 ft. per minute.

The power for the hoist is furnished by a motor-generator set consisting of a Westinghouse constant-speed induction motor, having a speed of 720 r.p.m. and taking a current of 109 amp. at 2100 volts, placed on the same shaft with a 450-kw. Westinghouse direct-current generator delivering a current of 860 amp. at 525 volts running at 720/580 r.p.m.;

Mining engineer, Lunenburg, Mass.

Professional Paper, No. 62. U. S. Geol. ., 1908.

[2] Eng. and Min. Journ., Vol. 88, p. 110.

[3] Eng. and Min. Journ., Vol. 82, p. 537; Vol. 82, p. 585; Vol. 83, p. 238; Vol. 83, p. 718; Vol. 83, p. 897.

and a 25-kw. Westinghouse direct-current exciter-generator which supplies current at 125 volts for the field of the hoist motor. On the shaft between the motor and generator is a 29,000-lb. flywheel which stores sufficient energy to enable the hoist to be operated for several minutes after the power has been cut off.

An objection to electrically operated hoists for mining work is the liability of accident to the source of power, depriving the motor of current, often at critical periods. It would seem that the Ilgner system solved this problem in a most satisfactory way. The action of the hoist is smooth, being entirely free from any jerky motion, and on account of the absence of gearing is noiseless.

For handling the bucket and pipes in the third compartment the company has built over an old duplex geared hoist, by removing the old drum and gearing, and connecting the crank rods directly to a drum, 30 in. in diameter and having a 36-in. face. Compressed air is used to operate the machine.

Headframe and Ore House

The headframe is substantially built, 16x20-in. timbers being employed, and is 100 ft. high from the collar of the shaft to the center of the sheave wheel. The skips are dumped near the top of the headframe, each on a heavy plate made of interlocked steel rails, from which the ore slides to a grizzly about 12 ft. in length. The first 6 ft. of the grizzly is made of 2-in. round iron bars, spaced about 6 in., center to center, while the second section is composed of 1½-in. round bars. The oversize material from the grizzly drops on a steel plate, in reality a trap door, on which it is sorted. The screening is not complete and that which is sufficiently small is thrown back through the bars of the grizzly. Of the remainder three products are made: (1) coarse silicious ore which later is broken by hand and thrown down through the trap-door opening; (2) coarse smelting ore, and (3) coarse milling ore. Each grade of ore is thrown into its own bin, there being a set of bins for each side of the shaft. One man sorts the coarse ore from each skip, and is kept busy when the hoisting is at the normal rate.

The undersize of the grizzly drops into two bins which have hopper bottoms provided with end-shaking discharge chutes, the operating mechanism of the chutes being thrown in and out by means of friction clutches. The chutes, or feeders, deliver the ore on a 30-in. rubber sorting belt which travels about 30 ft. per min. A stream of water washes the ore on the belt. Two men attend to the feeding chutes and do all of the sorting, picking out the waste and the high-grade or smelting ore. The milling ore is left on the belt and is discharged on a grizzly about 3 ft. in length, made of ten ¼-in. iron rods with 1¼-in. spaces, feeding to a 9x15-in. Blake crusher. The wash water is collected at this point and goes to a settling tank. The undersize of the grizzly and the product of the crusher both drop into a bin from which the ore is fed through a gate to a 16-in. rubber belt and conveyed up an incline of 6 deg. to the railroad bins about 225 ft. distant. This belt discharges into a long hopper which may be moved backward or forward on a track, and delivers the ore to any one of four chutes or troughs, each of which serves a bin.

Sorting plants are not in general use in the Cœur d'Alene district but the advantages of their use are seen at a glance by anyone visiting the various concentrating mills. Crushing to at least 30-mesh is necessary in order to liberate all of the metallic particles, and though graded crushing is employed, the ore produces a considerable amount of slimes which on account of the talcose nature of this fine material is difficult to concentrate. In mills which do not employ sorting before concentration, it is no uncommon thing to see on the Wilfley tables fans of galena concentrates up to 18 in. in width. The loss in milling ore of such high-grade material is obvious.

Surface Plant at Hecla Mine and Portion of Town of Burke, Idaho

Compressor Plant

Air for the mine and surface plant is furnished by an Ingersoll-Rand, Imperial, Type 10, two-stage air compressor having a capacity of about 1800 cu.ft. of free air per min. when operated at a speed of 115 r.p.m. This compressor is belt driven by a 300-h.p. General Electric, Type I, Form M, alternating-current motor, taking current at 2050 volts and running at 514 r.p.m. There is also an old steam-driven Fraser and Chalmers duplex, single-stage air, Corliss compound steam, air compressor with a capacity of about 2500 cu.ft. of free air per min., which is used only in case of emergency. Steam for th compressor is furnished by two 250-h. Stirling boilers.

The mine has a well equipped machin shop and blacksmith shop, the latter cor taining also an Ajax drill sharpener. Th carpenter shop contains a circular sa for cutting the stull timbers, what littl framing is required being done by han

Methods of Mining

The mine has three working levels, viz at the 300-, 600-, and 900-ft. levels, an a fourth level is being started at a dept of 1200 ft. The drifts from the shaft t the orebody, about 800 ft., are drive 5x7 ft. in the clear, while in the o the drift is cut out for the full width o the vein before stoping is commence The development work, shaft sinking an drifting from stations to ore, is done o contract. With a 2¼-in. machine, work ing two 8-hour shifts every day in th week, the monthly advance averages 100 ft., while with a 3¼-in. machine the average is about 120 feet.

In stoping the vein matter is taken out from wall to wall, no pillars being left. The ore is mined by overhand stoping in successive horizontal slices, work being carried on simultaneously throughout the length of the orebody, 1200 to 1500 ft. The stopes are all timbered with stulls 12 to 20 in. in diameter, the average being about 16 in.. As the maximum length that can be conveniently handled underground is 16 ft., two stulls with their butts together are used in the wider stopes. No hitches are cut in the walls, the ends of the stulls bearing against headers, or blocking, which, when all is in place, are tightly wedged. These headers are removed as required to relieve the pressure from the walls. The ends of the stulls, as is also the butt joint where two are used, are supported on posts resting on the stulls of the floor below. In some nstances the middle of a long stull is supported by an intermediate post, but his is not universal. Occasional pieces of 2-in. or 3-in. plank serve as collar braces, but many of the stulls have no bracing. The floors of the stulls are 9 ft. apart vertically, and the stulls are placed 5 ft. apart, center to center, in he rows. Three-inch planks cut 5 ft. ong are used for flooring and for lagging.

Both the walls and vein filling give a great deal of pressure, and most of the stopes have to be filled. For this purpose waste is sorted from the ore underground and that from the sorting plant on the surface is lowered on the cages and rammed into the stopes. All of the waste from development work is used for filling; before the sorting plant was operated blind raises were driven into the walls of he stopes and the country rock broken for filling.

At 50-ft. intervals along the drifts hree-compartment raises, consisting of an ore chute, a compartment for hoisting imbers and tools, and a ladderway beween them, are carried up with the stopes. Except in the case of a cribbed aise each compartment occupies the space between two stulls. In the ladderway platforms are placed at every second loor, and the ladders are inclined, making climbing easy and safe.

Hoists Used in All Stopes

The chutes are carried up vertically hrough the stopes, and there are no offsets except where the dip of the vein makes it necessary or advisable to jog he chutes toward the footwall. This means a long drop for the ore and the resulting wear of the timbers is severe. The chutes are kept within one or two loors of the roof of the stope. The broken vein matter is dropped to this loor where it is rough sorted and the ore wheeled to the chutes in wheelbarrows, or shoveled if near enough. Three raises, one at each end and one in the middle, are put up through the orebody in advance of stoping. A small winze hoist operated by air is placed near each raise for hoisting steel and timbers to the stopes. No other raises are put up n advance, windlasses being used in other cases to hoist timbers, etc., to the stopes.

In most cases, 2-in. lagging is carried clear across the worked-out portion of the vein on each side of the raises, and the intervening 50 ft. of open stope filled with waste. An open space is thus maintained 15 ft. long and the width of the vein, in which the chutes are built. The latter are marked off by girts between the stulls. The ordinary ore chute is lagged with planks placed vertically, the planks being cut in 9-ft. lengths so that the joints come at the centers of the stulls. The manway and timber compartment are lightly lagged, the side next the open stope being frequently left without lagging. In spite of the fact that the portions of the stulls opposite the chutes have no bracing except an occasional piece of plank, they show no effect of pressure or crowding from the filling behind them.

A few cribbed chutes are used. These are made of 10x10-in. squared timbers and are lined with 3-in. planks. The wall plates of the cribbing are 12 ft., and the end plates 6 ft. 4 in. long. The space thus inclosed is divided to form the ore chute, the timber compartment, and a narrow ladderway. Waste is packed all around the cribbing. The opening for both styles of chute are 30 in. wide, and are provided with plank gates made in three sections.

The ore is trammed to the shaft in end-dumping cars of 1½ tons capacity, drawn by mules in trains of seven cars each. A mule is worked but four hours each day and consequently the animals are kept in excellent condition. All drifts and underground stations are lighted by electricity.

Comments on the Mining Practice

During the last few years the tendency in mining practice has been to increase the distance between the working levels. The Hecla mine probably represents the extreme in this tendency, yet the method employed has given excellent satisfaction. The chief point of objection is the fact that the length of the time required to extract all of the ore from a block of ground 300 ft. in hight and 1200 to 1500 ft. in length allows ample opportunity for the complete deterioration of the lower sets of timbers, and a cave on one of the levels would shut off, temporarily, a large part of the normal output of the mine. As a matter of fact the drift sets have to be renewed before the stopes are half worked out, but the hight of the sets allows ample space for reinforcing, and facilitates the placing of new sets whenever required.

It is likely that a saving in the cost of handling the ore would result if the chutes were placed farther apart and light mine cars were used in the stopes. The present chutes are just too far apart to shovel into to the best advantage, making necessary the use of wheelbarrows. The cost of these chutes is considerable, the ordinary chute requiring about 50,000 ft. of sawed lumber, while about 130,000 ft. are required for the cribbed chute. At $18 per 1000 ft. the cost for sawed lumber alone would be $900 and $2340 respectively, or a total of $32,400. for the 23 lagged and five cribbed chutes which are in the block between the 900- and 600-ft. levels. The cost in place would be approximately $40,000. By the use of cars in the stope the number of chutes could be reduced to eight, the cost for each of which should not greatly exceed the average cost of those now in use. Assuming a tonnage of 250,000 in the block of ground mentioned, there should be a saving through the decrease in the number of chutes, of over 11c. per ton to apply to the increased cost of tramming in the stopes. The trammers in this mine receive $3.50 for eight hours' work, so the saving would not be large.

The use of stulls, rather than square sets, in stopes as wide as those in the Hecla mine is not common, yet it has here proved most satisfactory. There is a saving in the first cost of the timber, and almost no framing is required. The Hecla management is able and progressive and the property is maintained in far better condition than are some which have larger and more expensive staffs.

Goodrich Gulch, Washington

Wolframite was discovered in Goodrich Gulch, Wash., Nov. 1, 1909. The discovery is eight miles from Twin Bridges, Mont., the nearest railroad station, and is reached by wagon road from that point. Advices from the spot state that the wolframite carries 60.2 per cent. tungstic acid; as the pure mineral contains about 75 per cent., it is probable that this assay represents a specimen rather than the ore itself.

The ore occurs in two narrow veins, 12 and 18 in. wide, in a mica schist and gneiss. The veins are exposed in three places over a length of 1150 ft., and the owners contemplate making surface cuts and running a drift tunnel as soon as the snow leaves the ground in the spring.

There are other veins in the district, some of large size, and the gold, silver and lead contents of these are encouraging prospectors to further work. Among these are the Grand View, Two Sisters and Red Bell groups, owned by Schmidt, Miller, Clodius and Schmidt, who are opening them by tunnels.

Dullea & Trauffler are working to the north of the Red Bell. This group has shipped some ore from the surface workings. The Little Goldie group, owned by Anderson & McKinzie, produces free-milling gold ore, and the Carolina group is now shipping. The American Goldfield Placer Mining Company proposes to spend $15,000 in the spring building a dam to store water for hydraulic purposes.

In Bear gulch, next to Goodrich gulch, the Stuart brothers are working a galena claim. Moffett and partners own a group of claims, carrying copper and gold, and developed to a depth of 265 ft. The adjoining group has opened the same vein, but both are idle, it is said on account of disagreement between the owners of these properties.

Experiments in Reverberatory Practice, Cananea

Oil a Better Fuel Than the Local Coal; Pure Quartzite for Furnace Bottoms; Use of Reverberatories with Blast Furnaces Recommended

BY L. D. RICKETTS*

In 1895 or 1896 the Cananea Consolidated Copper Company decided to install a reverberatory furnace in connection with McDougal calciners. Accordingly a calcining building, containing four six-hearth McDougal roasters 18 ft. in diameter and a reverberatory furnace 19 ft. wide by 100 ft. in length, on the general plan and style of the Anaconda furnaces, were erected.

On account of the special features of the only possible site, the boilers had to be set at some distance from the reverberatory and were connected with it by a flue supported for a portion of the distance on a steel bridge, and having a cross-section of but 25 sq.ft. A departure was made from the Anaconda practice, three boilers of 300 h.p. each being set up in parallel, the idea being that two of these boilers could be run and one stand as a spare.

The original reverberatory was built with the furnace having a grate area 17x7 ft., and having the bridge wall 2 ft. 2 in. above the grating. The area over the bridge wall was 110 sq.ft., and the throat of the reverberatory was 21 sq.ft. less than the cross-section of the flue. The general dimensions of the furnace may be seen from Fig. 1, except that the firebox has now been removed. The throat has been increased to 32 sq.ft. and the flue to 27 sq.ft., the greatest cross-section obtainable under existing conditions.

PURE QUARTZITE BEST FOR FURNACE BOTTOMS

At the time of the installation of this reverberatory good material for a bottom was not to be had in the vicinity, and while silica brick was imported from Pennsylvania, an attempt was also made to build the bottom out of local material. The first bottom put in was made of sands separated from the tailings from the concentrator, and having the following partial composition: SiO_2, 66.4 per cent.; Al_2O_3, 13.1; Cu, 0.8; Fe, 2.6; S, 1.9.

This material immediately gave trouble. It was slagged and floated up and had to be torn out. A quartzite that was used for converter lining, containing about 90 per cent. silica, and 2 to 3 per cent. alumina was then tried. This material also failed, and a very pure quartzite, running about 95 per cent. silica, from Colorado, was tried and proved a success, and the bottom has never since been changed.

The records of metallurgical operations previous to 1907 are very incomplete, and while experiments were made in smelting flue dust, the records regarding the tonnages and tests are not sufficiently complete to warrant quoting them; but it may be taken for granted that the tonnage treated previous to Jan. 1, 1907, was small.

The reverberatory resumed operations on Feb. 1, 1907, and ran for nine months, the total operating time being 247¾ days, and during this time the furnace averaged 122 dry tons of charge per day.

SOUTHWEST COAL NOT SATISFACTORY FUEL

Two classes of coal, costing during this period from $9 to $10 per ton, were available. One of them was coal from Dawson, N. M., representing the general composition of the coking coals of that district, and the other a lignite from Gallup, N. M. I quote the analyses in each case, representing composite samples of a number of carloads.

COALS USED IN 1907.

	Dawson. Per Cent.	Gallup. Per Cent.
Water	1.7	10.7
Volatile matter	32.6	34.6
Fixed carbon	52.4	48.4
Ash	13.3	6.3
	100.0	100.0
B.t.u.	12,135	10,247

The Dawson coal is a high-ash coal with strong coking qualities, and when using this fuel alone the volatile matter burned off rapidly and left a heavy bed of coke on the grates, which burned very slowly. The Gallup coal, on the other hand, is too light and does not produce a sufficiently intense heat, and it was found that a mixture of the two coals, about half and half, produced the best results obtainable, which were, however, bad at their best, as the tonnage treated by the furnace shows.

After trying these fuels from February to August with unsatisfactory results, we installed pulverizers, removed the firebox, and burned pulverized coal in the furnace. The figures, however, do not show that the experiment was successful. While we could undoubtedly produce a much longer flame and a much higher degree of heat, yet a number of difficulties were encountered.

One arose in regulating the amount of air, as sometimes too much was admitted, and at other times so little that incomplete combustion resulted, even to the extent of depositing a layer of fine carbon on top of the charge which appeared to form a nonconductor and retarded the smelting operations. Another difficulty, and by far the most serious one, was due to the fineness of the ashes which would fill up the flues and render the recovery of waste heat from the furnace gases impossible.

During this period the highest monthly cost per ton of dry charge treated was $8.49, and the lowest cost was $4.75. The highest cost per ton for coal alone was $6.16, and the lowest was $3.32. The highest percentage of coal used was 61 and the lowest was 33.6 per cent. It should be noted that the least coal consumption occurred during the two months in which we used the pulverized coal, and during which there was no steam generated from the waste gases. The average net cost, giving fuel credit to the reverberatory for the period in question, was $5.49 per ton, made up of the following costs: Labor, $0.795; supplies, $0.293; coal, $4.067; power, $0.177; miscellaneous, $0.13; repairs, $0.358; flux, $0.01; total, $5.83; from which is deducted a steam credit of $0.34; leaving a net cost of $5.49 per ton smelted.

The works closed down in the latter part of October, 1907, and experiments were stopped for the time being, but it was thought we had proceeded far enough to demonstrate that the coal obtainable from the Southwest was not well adapted to reverberatory practice.

RESULTS WITH FUEL OIL FROM OKLAHOMA

Hitherto there had been a prohibitive duty on fuel oil imported into the Mexican republic, but during the early part of 1908 the Mexican government modified the law in this respect and permitted the importation of fuel oil into Mexico under restrictions, to be used strictly for fuel purposes, and permission was given the Cananea Consolidated Copper Company to import this fuel oil.

As a consequence, all idea of using coal as a fuel in the reverberatory was abandoned, and when the work was resumed at the reduction works at Cananea, preparations were made for burning fuel oil and a contract was made for our requirements for fuel oil from the Oklahoma fields. On account of the fact that this oil as produced from the wells, although having an asphaltic base, contains a large amount of gas and some small amount of light paraffins, it is subjected to a preliminary distillation and the residue shipped as fuel oil. This distillation is very light, and the resulting residuum has a specific gravity of about 0.9, and contains from 19,400 to 19,700 B.t.u. per

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NOTE.—A paper read before the Institute of Mining and Metallurgy, London, Nov. 18, 1909.

*General manager of the Cananea Consolidated Copper Company, Cananea, Mexico.

lb. avoirdupois, and weighs about 310 lb. per bbl. of 42 gal. at a temperature of 60 deg. Fahrenheit.

We resumed operations at the reverberatory in the latter part of July, 1908, using this oil fuel, and for the time being turned the gases out of doors. We used Hammel locomotive oil burners for feeding the oil, and ran for about five months of 1908, and on Sept. 1 we turned the gases through the three 300-b.h.p. Stirling boilers. In the first five months we ran 150 days and treated the following material:

Flue dust, 19,737 tons; calcines, 9554; silicious ores, 1192; iron and limestone, 574; barren silica, 274; total, 31,331 tons.

The total charge averaged 209 tons per day. We produced 7039 tons of matte and 20,351 tons of slag, and 3941 tons were volatilized. The charge contained 8.43 per cent. copper and 8.99 per cent. sulphur—1.065 units of sulphur to the unit of copper.

The matte averaged 36 per cent. copper, and the copper recovery in the matte averaged 95.76 per cent. of the total copper contents. The slag had the following partial composition: Cu, 0.55 per cent.; SiO_2, 39.20; Al_2O_3, 10.10; FeO, 40; CaO, 4.30. The costs for the five months are given in an accompanying table.

COSTS FOR FIVE MONTHS IN 1908.

Labor, operating and repairs	$11,829.39
Shop expense	1,966.64
Supplies (firebrick, etc.)	5,613 13
Fuel oil	56,217 15
Power	445 83
Miscellaneous expense	533 78
Total	$79,605 92
Cost of barren fluxes	609 90
Total	$80,215 82
Less steam credit	21,267 37
Net account smelting	$55,948.45
Average cost per dry ton smelted	$1.785

OPERATIONS IN 1909

For the first six months of 1909 the reverberatory furnace ran 165.7 days, and treated the following tonnage: Flue dust, 29,802 tons; calcines, 5484; silicious ores, 2300; fluxes, 3129; total, 40,715 tons. We produced 10,120 tons of matte and foul slag, 25,658 tons of slag, and volatilized 4937 tons.

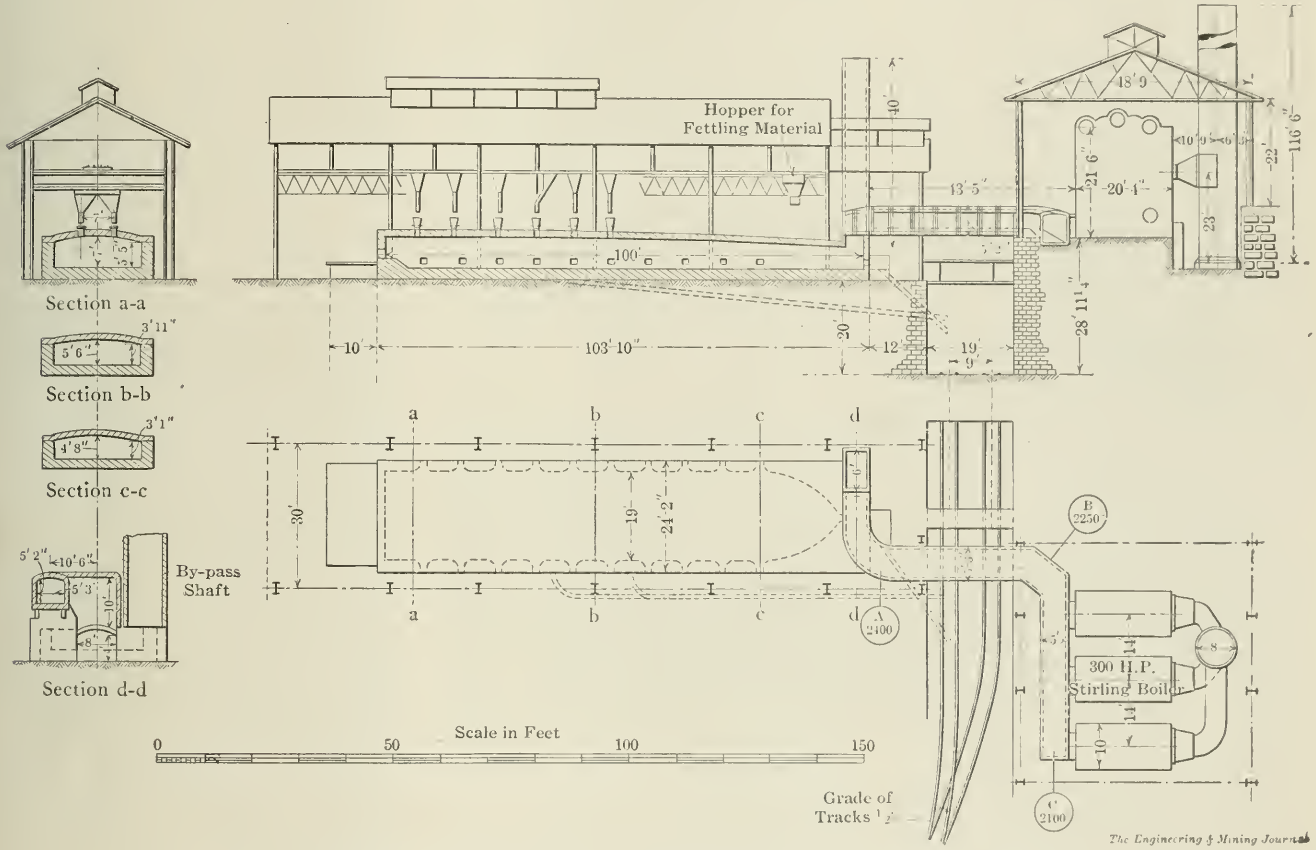

FIG. 1. ORIGINAL REVERBERATORY OF CANANEA CONSOLIDATED COPPER COMPANY

The percentage of copper in the charge was 7.08, and of sulphur, 9.77; the ratio of sulphur to copper was 1.38 per cent.; the percentage of copper in clean matte, 30.57; and the percentage of recovery of copper in the matte, 96.04; dry tons smelted were 245 per day.

OIL CONSUMPTION

Barrels of oil consumed	39,117
Barrels of oil credited to steam	17,471
Net gallons of water evaporated	9,883,493
Barrels of oil charged to smelting	21,946
Gross barrels of oil consumed per dry ton of charge	0.968
Barrels of oil per dry ton smelted credited to steam generation	0.430
Net barrels of oil per dry ton charged to smelting	0.538
Average net b.h.p	664.3

The actual water evaporated per pound of oil burned in the reverberatory was 6.74 lb., whereas the pound of oil burned under the smeltery power-house boiler evaporated 13.96 lb. Taking account of the temperature of feed water and converting into evaporation from and at 212 deg. F., we have the following figures: Evaporation per pound of oil burned in reverberatory, 7.45; evaporation per pound of oil burned under power-house boilers, 16.08 pounds.

The average slag analysis during the period was as follows: Cu, 0.45 per cent.; SiO_2, 40.10; Al_2O_3, 11.20; FeO, 34.80; CaO, 8.50; S, 0.70; ZnO, 2.30; MnO, 0.30; MgO, 0.40; total, 98.75 per cent.

The total cost of smelting per dry ton in this period is given in an accompanying table.

This cost in no way refers to calcining the concentrates that were smelted, and the weight is the weight of the calcines and not the weight of the dry concentrates.

COSTS PER TON SMELTED, FIRST SIX MONTHS OF 1909.

Labor, operation	$0 24
Labor, repairs	0 16
Supplies	0 22
Fuel oil	1 73
Power	0 02
Miscellaneous	0 08
Total direct costs	$2 45
Cost of fluxes	0 08
	$2 53
Steam credit	0.77
Net cost	$1.76

The concentrates roasted in the McDougal calciners were of the finest grade that we produce. The concentrates and calcines had the partial composition shown in an accompanying table.

The shrinkage in calcining averaged about 15 per cent. from dry concentrates to calcines.

PARTIAL ANALYSIS OF CONCENTRATES AND CALCINES.

	Concentrates. Per Cent.	Calcines. Per Cent.
Copper	7.91	9.36
SiO_2	25.90	30.50
Al_2O_3	4.60	5.40
FeO	21.90	29.30
S	27.90	9.00
	91.24	83.56

Best Tonnage and Cost Records

The record month as regards both tonnage and costs was January, 1909. In this month we smelted: Flue dust, 4639 tons; calcines, 2711; silicious ores, 359; fluxes, 440; total, 8149 tons; an average of 263 tons per day. We used 7003 bbl. of oil, of which 3102 bbl. were recovered as an equivalent in steam, and 3901 were charged to smelting.

The charge contained 7.13 per cent. copper and 7.51 per cent. sulphur; the matte contained 40 per cent. copper, and the recovery of copper in the matte for the month was 95.97 per cent. The slag had the following partial composition: CuO, 0.41 per cent.; SiO_2 41.20; Al_2O_3, 11; FeO, 34.60; CaO, 7.30.

The net cost per dry ton smelted, including cost of fluxes, was $1.29 per ton, after $0.67 per ton had been deducted from the gross cost on account of steam credit.

Fuel and Water Carefully Measured

With regard to determining the fuel consumed and the amount of water evaporated, it may be stated that the fuel oil is brought in standard-gage tank cars to three receiving tanks of 10,000 bbl. capacity each, and discharged into them by gravity. From these storage tanks it is conveyed through pipe lines either by gravity or by the aid of pumps to the various points where it is consumed.

At each point of consumption there is sometimes a subsidiary storage tank and always two small tanks with accurate gages upon them. Oil is consumed from but one of the latter tanks at a time, and at the end of each shift the alternate tank, which in the meantime has been refilled, is thrown in and the other tank cut out. A record is kept by measure of the amount of oil consumed by each shift.

At the end of each month a careful survey is made of the storage tanks and the subsidiary tanks, in connection with oil received during the month, and any discrepancy due to shortage of oil in the cars, or any deficit whatever between the oil actually paid for and the record of the oil consumed (and there is always a small discrepancy) is charged up against each point of consumption in proportion to its record of the barrels of oil consumed.

The feed water for the reverberatory boilers is fed into a storage tank by means of a weighing meter, a simple tilting device connected with a revolution counter, designed by David Cole, assistant general manager. It has various appliances for minimizing friction, and is provided with a double-headed piston working in a cylinder closed at both ends, but with a slot in the middle which prevents the measure from falling with great force when it once starts to tilt.

This device has been found to be quite satisfactory and is checked frequently by temporarily stopping the feed pump to the boilers and letting the meter run until it fills the tank into which it discharges. The water going into the main power-house boiler is likewise measured.

Both at the boiler house and at the reverberatory, the boilers are blown off at regular intervals and a deduction is made from the total amount of water fed, in accordance with a close estimate of the amount of water blown off. This factor is decided on by instructing the attendant to blow off his boiler for a definite length of time with an agreed amount of opening through his blowoff valve, and the quantity of water blown off has been estimated by reading the gage glasses. I think, therefore, that these figures of evaporation are trustworthy.

Operation of Boilers

The reverberatory furnace is required to pay for operating and maintaining its own boilers. All three boilers are used in parallel, except when being cleaned. A damper is provided for each boiler and once a month each boiler is cut off and cleaned, so that for about five days in each month there are but two boilers in operation, and the balance of the month three boilers, it taking nearly two days to clean a boiler thoroughly. When repairs to the reverberatory are necessary all of the boilers are cleaned, even if they have run less than a fortnight without cleaning.

We have tried three classes of burners: first, the Hammel locomotive oil burner; second, the Shelby burner, designed by Charles F. Shelby, superintendent of our reduction works, and third, the Kittle burner. We have found that the Shelby burner is better adapted to the work than either of the other two, for the reason that it throws the flame farther toward the front of the furnace, thus avoiding the intense heat produced by the other two classes of burners at the back of the furnace. We use four burners.

We set up a portable boiler at the reverberatory and have made a number of tests to determine the amount of steam used in operating the burners. We find on an average that 0.44 lb. of steam is required to inject a pound of oil through the burners, and this amount is deducted from the net steam evaporated by the waste gases. In other words, the reverberatory pays for the steam it uses in injecting the oil into the furnace. Thus, for the first six months of 1909 the evaporation was 6.74 lb. actual, but 0.44 lb. was deducted for steam used in the burners, making the credit 6.30 pounds.

Calcining in McDougal Furnaces

Our costs for calcining in McDougal furnaces are of little value on account of the intermittent character of the work and the small tonnage calcined. In January we treated 3186 tons of concentrates, dry weight, and produced 2711 tons of calcines. The cost was $0.54 per ton of dry concentrates, and the shrinkage in weight amounted to 14.9 per cent. In June the cost was $0.38. In other months we have calcined so little, even less than 200 tons, that the costs have been excessive and have been as high as $1.14 per ton of concentrates. For the 11 months from July, 1908, to June, 1909, we calcined 17,533 dry tons of concentrates at a cost of $0.5176 per ton, and produced 15,038 tons of calcines. There were 177 tons of fine lime rock mixed with the concentrates during the period.

The reason for the low tonnage treated in the McDougal calciners is that at Cananea 45 per cent. of the blast-furnace charge is concentrates, and while we use a low blast pressure, about 20 oz. as a rule, we produce on an average, from 4500 to 5000 tons of flue dust per month, and all of this material has to be smelted in the reverberatory. This is the reason why we have not obtained lower costs in calcining.

The concentrates are, however, well adapted for calcining in McDougal furnaces, and were we to run these furnaces at their full capacity the total expense would probably not exceed $0.40 per dry ton. This is only an estimate, because we have never spent the money to provide proper bins from which the concentrates can be drawn into charging cars, and we have never run the furnaces up to their full capacity; frequently all four of the furnaces have been closed down. As yet we have experienced little wear and tear, except on the blades of the rakes on the top tier, at times when very wet concentrates are being treated.

Effect of Calcines on Smelting Cost

In inspecting the monthly costs and the tonnages smelted per day in the reverberatory, it is evident that the calcines are more cheaply smelted than flue dust, and during the month of January, when our reverberatory costs were but $1.29 per ton, we smelted the highest percentage of calcines that we have ever treated for any one month, and we also had the least consumption of fuel oil per ton smelted. In my opinion the reason for this is twofold: In the first place, the calcines as they enter the furnace are hotter than the flue dust by probably 400 to 500 deg. F., but this is not the main reason why the tonnages are greater with calcines. Flue dust is blown from the top of the charge in the blast furnace and the particles have not had time to come into contact with and adhere to other particles, but are blown by the blast from the top of the charge and largely oxidized with extreme rapidity while traveling through the air.

On the other hand, in the McDougal furnace the particles of concentrates are gradually ignited, and are thoroughly stirred in contact with each other for a long period of time; the temperature reaches a red heat, and were it not for the rakes the charge would undoubtedly sinter. In other words, in the McDougal furnaces the particles are heated to incipient fusion, and besides the oxidation of the iron and the sulphur, a notable chemical union takes place between the acid and base. I think this chemical action that has occurred in the McDougal calciners between acid and base, permits much more rapid fusion in the reverberatory furnace.

Claying the Furnace

The method of claying the furnace to protect the side walls from corrosion at the matte line is illustrated in Fig. 2. This method originated in Cananea, I think, and was suggested by Mr. Gmahling and installed with the approval of Mr. Shelby. The side walls of the furnace are built with a slight batter, as is shown in the sketch. A 5x5-in. aperture is left in the arch close to the side walls on either side, and these apertures are 18 in. between centers for the entire length of the furnace.

A hopper on either side of the furnace travels on a rail so that the charge of fine silicious ores previously wetted down may be brought over any one of the holes in question. Every day this material is simply dropped through these holes in proportions that are deemed necessary from the appearance of the furnace, and it trickles down along the side walls and builds up in a bank against the slag line. It is then gently tamped down with an iron tamping bar. If we are not actually charging this material, the holes are kept closed with firebrick and covered with fine ore to prevent infiltration of air into the furnace.

By this method we do not have to run down the furnace to clay it, and every day 10 to 15 tons of silicious ore are thus smelted, and while this material requires flux, as our records will show, it not only protects the sides of the furnace but smelts this very refractory material more cheaply than we could smelt it in the blast furnaces.

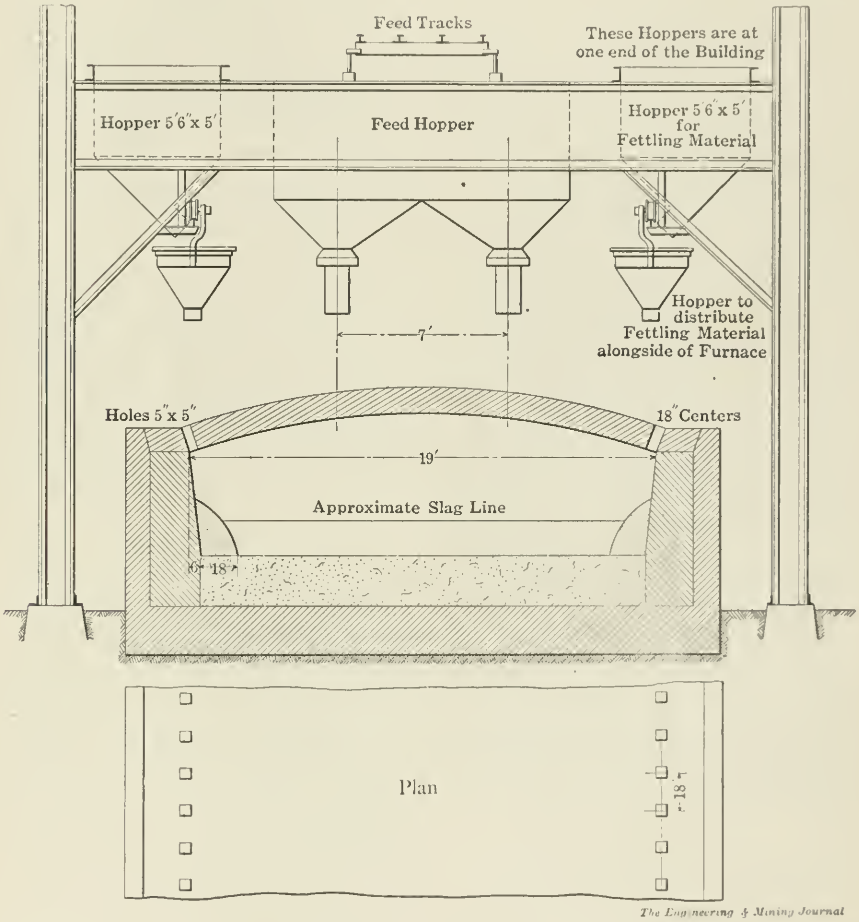
Feed Tracks
These Hoppers are at one end of the Building
Hopper 5'6"x 5'
Feed Hopper
Hopper 5'6"x 5' for Fettling Material
Hopper to distribute Fettling Material alongside of Furnace
7'
Holes 5"x 5"
18" Centers
19'
Approximate Slag Line
6" 18"
Plan
18"
The Engineering & Mining Journal

Fig. 2. Section of Furnace Showing Method of Charging

Temperature of Gases

A number of experiments were conducted at my request by John Langton, consulting engineer, with regard to the temperature of the escaping gases, and a series of tests shows that the temperature of escaping gases between the reverberatory and the boilers averages as follows:

At *A* (see Fig. 1), 2400 deg. F.; at *B*, 2250; at *C*, 2100. Repeated tests show that the temperature of the gases after passing the boilers and escaping in the common boiler stack is 750 deg. Fahrenheit.

Mr. Langdon estimated that further cooling of the gases by the use of economizers would increase the percentage of recovery of steam from the waste gases about 20 per cent., with the understanding that the amount of heat to be recovered is so considerable that the feed water for the main power-house boilers would be heated in these economizers as well as that for the reverberatory boilers themselves. He calls especial attention to the fact that the flue leading from the furnace to the boilers is far too small in cross-section, and that properly this flue should have at least 50 sq.ft. in cross-section, instead of 27 square feet.

Analysis of Costs

An examination of the statistics given above shows plainly that the costs for labor, supplies and repairs have been high. This has not only given too high a cost per ton, but has necessitated stoppages of from one to ten days for repairs to the arch. During the shorter stoppages we have simply filled up the furnace with flue dust at the point where repairs to the arch were to be made, and tamped it down, using the flue dust for a center. After repairs are made, the flue dust is partially raked out and smelting operations proceed.

During the time of making minor repairs we open up one of the doors on either side in front of the point to be repaired and keep two oil burners burning through these doors to prevent the slag from chilling to an excessive degree; but in spite of this it follows that after smelting is resumed the capacity of the furnace is very light for several days, and it takes four or five days to get back again to its normal capacity. This, of course, tends to increase the cost of smelting.

Another cause for the high costs for repairs was that at the time of using pulverized coal as fuel, we had to tear out the flue leading to the boilers and build a side stack to allow the gases to escape directly into the air. Later on we rebuilt the flue to the boilers, using firebrick because we had no silica brick, and in starting up with fuel oil we found that this burned out rapidly, and the entire flue had to be torn out and replaced by silica brick when we got it. All this was charged to operation.

But the main cost and most serious expenditure has been for repairs to the arch. The furnace was built with 12-in. brick in the arch, and in experimenting with oil burners we have burned out the roof three times, once to such an extent that we had to close down for days and entirely rebuild one-half of the arch at the back end of the furnace.

We are of the opinion that this was due to insufficient knowledge of how to use the burners, and to permitting the flame to impinge against the roof, thus destroying it. We have burned out the roof frequently, and that we can prevent the necessity for such frequent repairs in future is as yet a matter of opinion only; but we believe that we have now learned to fire without destroying the roof, and we feel that our opinion should carry weight.

I have ordered 20-in. silica bricks, and when they come we shall close down the furnace to rebuild the arch with these 20-in. bricks, and then we shall determine whether our opinion is correct or not. I may say, however, that I am convinced that in burning oil no bricks shorter than 18 to 20 in. should be used in the arch.

We feel that, considering the results of our tabulated experiments and of the experience that we have gained, we can materially decrease our present costs in three ways: (1) By decreasing the cost of material and labor for repairs; (2) by decreasing the excessive stack temperature at present existing; (3) by increasing the average daily capacity by fewer delays due to repairs, and by decreasing the amount of flue dust produced by the blast furnaces, and increasing the amount of calcines from the McDougal furnaces.

SUMMARY

A summary of the preceding pages will show that we have smelted about 30,000 tons of material, using such coal as is available in the Southwest for fuel, and that we have smelted about 72,000 tons, using oil as a fuel. The cost of smelting with coal with the conditions under which we operated was very high, and with our decreased costs in blast-furnace practice it would now be prohibitive, but our figures show that our average cost of smelting with fuel oil, including every possible charge, has been about $1.77 per dry ton of charge. The material smelted has consisted for the most part of flue dust, but to some extent of calcines and the latter have been derived from our finest grade of concentrates.

I have called attention to the fact that calcines are much more cheaply smelted than flue dust, and while we have to pay the cost of calcining, we have to smelt but 85 per cent. of the weight of concentrates. Allowing for a reasonable decrease in costs due to the nature and temperature of the calcines, it may be safely said that a ton of fine concentrates of the composition quoted may be calcined and smelted in a reverberatory furnace for about the same cost as a ton of flue dust. We have demonstrated that we can smelt flue dust and fine concentrates at a cost of $1.77 per ton, and, if my conclusions are correct, this cost may be reduced to $1.40 per ton and probably to even a less amount.

A very important question is what application should be made of this knowledge? My experience on an extensive scale in mining and beneficiating copper ores is limited to Arizona in the United States, and Sonora in Mexico. In this latter district, there are copper mines of various classes, either developed and producing, or in the process of development. These include mines that produce first-class smelting ores solely; mines that produce first-class ores together with ores that have to be concentrated; mines that produce concentrating ores solely, but with a notable amount of the concentrates in cubes of about 4 mm. diameter; and lastly, mines now in process of development from which the ores will be concentrating ores entirely, with no concentrates coarser than 1- or 2-mm. cubes.

BLAST FURNACES AND REVERBERATORIES COMPARED

Although experiments have been tried with small reverberatories, the Cananea company is the only one using a reverberatory regularly, and smelting operations elsewhere in this district are virtually confined to blast-furnace practice. I think it is safe to say that the cost of smelting a dry ton of self-fluxing mixture deducting the flue dust produced, and the matte if any be added to the charge, is seldom less than $2.50 per ton, and I believe never less than $1.75 per ton in blast-furnace practice in the district referred to, and this cost applies to the average mixture, including all grades of ores and concentrates. It is undoubtedly true that the cost of smelting flue dust or fine concentrates in a blast furnace will average far higher than does the cost per ton of the average mixture, and if we assume a cost of $2 per ton of dry charge exclusive of flue dust produced and matte added, the actual cost of smelting fine concentrates and flue dust in the blast furnace more nearly approximates $4 per ton.

The sulphur ratio in a blast-furnace charge will vary owing to the composition of the sulphides and the ease with which the sulphur is oxidized in a given combination, but to a much greater extent it depends upon whether the minerals containing the sulphur are in a state of fine division or in coarse lumps. Thus there can be no question that pyrrhotite or iron sulphides in coarse lumps added to a charge requiring more sulphur will produce a lower grade of matte than the same sulphides in the same quantity would produce if crushed exceedingly fine. The all-important question of the sulphur ratio, therefore, depends upon the composition and coarseness of the charge and each case must be settled by experience and empiric knowledge.

In the case of Cananea the major smelting operations must be conducted in the blast furnace, and we must keep in mind the necessity of maintaining a sufficiently high percentage of sulphur in the charge with a view of smelting with a high degree of oxidation to the production of a medium grade of matte using a minimum amount of coke.

As long as our first-class ores maintain their present composition, and are produced in the same ratio to the concentrates made, I do not see how we can expand our reverberatory operations beyond present practice, but the figures given will, I think show the great advantage the reverberatory is to us under the present conditions. It not only permits us to smelt our flue dust and some fine concentrates for less than the ton costs in the blast furnace for the average mixture, but by removing fine material from the charge it lessens the blast-furnace ton costs in several obvious ways and decreases the flue-dust losses.

I do not hesitate to express my belief that great saving may be made by the Introduction of reverberatory practice elsewhere, and I think that there are no works of large size in the Southwest that would not find it of advantage to use a reverberatory in conjunction with blast-furnace practice. I also believe that there are certain mines where reverberatory practice should be the more important process of matting, even if it should become necessary to mix fine or crushed pyritic ores with the concentrates before calcining, and in such cases the blast furnace will be used only in minor part for secondary products, and such small amounts of coarser raw materials as may be available.

The new institute being erected in Vienna by private endowment for radium research work is nearly completed. This institute will be of international character, at the service of scientists from any part of the world. The Austro-Hungarian government has assumed the cost of maintenance.

All Slime Treatment of Ore in Cyanide Plants

No One System Suitable for All Ores. Rough Separation of Slimes and Sands Advocated. Modified Pachuca Tank. Efficiency Index

BY H. A. MEGRAW*

The present methods by which ores are ground to a point where the best results are obtained by agitation of the pulp will stand careful investigation as to whether or not they present the ideal, or even the best possible metallurgical practice. Each metallurgical problem has its own solution and the most practical mode of treatment may not exactly coincide with anything previously done. It seems unreasonable to accept any one system, however widely followed, as applicable to all more or less similar conditions. This applies with equal force to the practice of total sliming, or that which is called total sliming, for cyanide treatment.

Attention has been called recently to the statement that it may not be good metallurgical practice to treat as slime that portion of the finely ground pulp which really is not a true slime. This does not bring up again the old and much argued question of what constitutes a true slime, but makes necessary an entirely new definition, namely, the dividing of the pulp in two portions: That which is best treated by agitation, and that which is best treated by some other means. That portion which is considered treatable by agitation may be called slime and may contain almost any conceivable proportion of sand in different degrees of fineness. The fact that the slime portion contains fine sand does not necessarily interfere with its treatment by agitation. In making this statement, however, it is to be understood that treatment by the most modern methods is implied. If slime is treated by the decantation method and agitated in tanks having mechanically revolved paddles or arms, it is absolutely necessary to exclude even the finest sand, for the fine sand, once settled, is difficult to raise from the bottom of the tank, and is likely to break or bend the agitator arms or cause mechanical damage at the point of greatest weakness. Agitation by compressed air, however, does not present these mechanical difficulties and the sand may be successfully agitated, provided it is ground fine enough to be kept in suspension by the air current.

Degree of Fineness

The degree of fineness to which an ore must be ground to give the best economical results can only be determined by careful experiment on the particular ore in question. E. M. Hamilton has arrived at the conclusion that it may be more economical to separate a portion or all of the fine sand and treat it by leaching. Mr. Hamilton is undoubtedly correct when he argues that equally good results cannot always be obtained by treating different classes of pulp in one and the same way. Coarse material will generally require more cyanide and more time for the proper extraction of its content. In my opinion it is doubtful, at least in some cases, whether leaching of the coarse portions is really the correct or most economical way of treating such pulp. Mr. Hamilton places the weight of his argument on the premise that fine grinding costs more than separation and leaching of the sand. This may be true in some cases where fine grinding is taken to mean the passing of the entire pulp through a 200-mesh screen. However, when it is taken into consideration that fine sand, up to a certain point, may be treated by air agitation, it is questionable if the finer grinding is really more expensive. In some cases, I venture to say, the economical limit reached by fine grinding and agitation of the entire product will not cost as much as classification and leaching the sand.

Treatment of Sands

I believe, too, that the cost of very fine grinding is being reduced rapidly by new machinery devised for that particular purpose. Considering that the leaching process requires additional plant capacity, sand tanks, etc., and involves the use of separate and stronger solutions and introduces the problem of moving sand, it is not by any means certain that it is generally cheaper. Generally the sand is collected in a collecting tank, where it may or may not receive partial treatment. It then has to be transferred to the treatment tank where treatment is finished. After that comes the problem of discharging the waste sand. Where water is scarce this is not a cheap problem to solve. The Blaisdell excavators and distributors offer economies in handling sand, but the installation cost is high, and this means of mechanical handling can hardly compare with the gravity flow of a well designed plant where all the pulp is treated as a slime.

Mr. Hamilton suggests a system of sand-tank filling in which the pulp is delivered to the sand tank at the extreme outside, the pulp falling upon the sides or staves of the tank, thus building up the sand at the outside and allowing the solution and slime to overflow through a discharge in the center of the tank. This system works well where the leaching system is considered necessary. The same idea in slightly different form has been used in several places. Another modification of the same idea has been used at the San Prospero mill of the Guanajuato Development Company. In this case the distributor consisted of two arms only, delivering the pulp at the outer periphery of the tank and overflowing through a central weir which carried off the solution and whatever slime came with the sand. This pulp was the product of cone classification and did not carry sufficient solution to insure the thorough carrying away of the slime, so a sprinkler arrangement was fixed in the center of the tank, similar to an ordinary lawn sprinkler. This furnished a spray of solution, thus assisting in washing away whatever slime might tend to settle in the charge. The sprinkler could be made to throw solution on any part of the charge by raising or lowering it.

It is practically impossible to make a product consisting entirely of true slime, and equally impossible to make one consisting entirely of clean sand; therefore, the problem is to select that process which will give the best results, either by separating the product or treating it all in one class. Some slime must be made, and this cannot be leached; therefore, it is manifestly impossible to have a product consisting entirely of sand or treatable by percolation. There are two alternatives: First, to separate, leach the sand and agitate the slime; and second, regrind the whole pulp to a point where air agitation of the whole is practical and efficient. Generally speaking, a finely divided ore will give a better extraction than one not so finely ground. There are exceptions, but they must be treated as exceptions and their destiny worked out separately. It seems to me that a system might be devised to avoid the unfavorable features both of sand leaching and of agitating several classes of pulp in a way not fitted to one or more of them. With this end in view I am led to suggest the following:

A rough separation with the object of sending the true slime and the finely ground sand (which can be treated in the same way and in the same time) to be treated by agitation in the cone-bottom (Pachuca) tank. The remaining portion, consisting of sand not so fine as in the first class, but which is fine enough to be kept in suspension in the tank, is to be sent to another tank or system of tanks and treated by the same, or slightly stronger, solution for such additional time as may be found necessary to secure the most economical maximum extraction. This would avoid the installation of a separate leaching plant with its necessarily stronger solution and problems of sand handling and have the advantage of a proper treatment of the slightly coarser material.

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*San Luis de la Paz, Guanajuato, Mexico.

PROPOSED TANK

In connection with this I am led to suggest a tank, similar to the Pachuca, which I have designed for meeting the conditions imposed by the treatment of this slightly coarser material. This tank consists essentially of a frustum of a cone superimposed on a conical bottom, instead of the cylinder used in the Pachuca tank. By the use of this design a more constricted space is possible toward the bottom of the tank, allowing less chance for settling. It also allows a lower tank for the same capacity; it fulfils all the requirements of the Pachuca tank, requires less power for agitation and also saves a large amount of excavation for installation where fall has to be considered. The slope of the sides of the frustum may be whatever seems best adapted to the circumstances. This tank has worked well experimentally and can be used for ordinary slime treatment as well, especially where it is advisable to save grade.

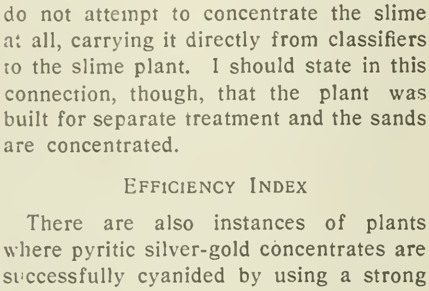
ECONOMY AND EFFICIENCY

It is not altogether a technical question as to the application of the best process but, as Mr. Hamilton has suggested, largely a business proposition and the cheapest process, compared with extraction, is the one which must be used. There are cases where leaching cannot be followed profitably, not only on account of extraction but for other reasons. Edgar A. Collins has called attention to a case at Tonopah, where the slime cake formed in the vacuum filter was impermeable and could not be washed except when it contained a certain portion of fine sand, making the cake more porous. It was also shown that fine grinding was necessary to secure good extraction. Mr. Collins states that the economical limit of fine grinding was determined by two factors, namely, the cost of grinding and the difficulty of concentrating the slime, without which it was impossible to cyanide the ore successfully.

The matter of fine grinding has to be reckoned with, but it is being accomplished at costs which are considered satisfactory and economical. In regard to the difficulty of concentrating the slime it would appear that there might be ways of overcoming the difficulty. There are methods and machines which have been successful in some places, blankets, vanners, etc., and the cement *planilla*, such as used at the Pinguico mill at Guanajuato. However, even in case concentration is not complete, it is not altogether clear why cyaniding should not be successful, unless the ore contains some elements other than sulphides, which oppose successful results. I am at present successfully cyaniding an ore in which all the silver occurs as sulphide and I do not attempt to concentrate the slime at all, carrying it directly from classifiers to the slime plant. I should state in this connection, though, that the plant was built for separate treatment and the sands are concentrated.

EFFICIENCY INDEX

There are also instances of plants where pyritic silver-gold concentrates are successfully cyanided by using a strong solution together with fine grinding and long treatment. However, the plan of treatment will have to be determined with factors of dollars and cents. It is an easy matter to figure it out mathematically. To calculate it in this way, let A equal the cost of treatment, including milling, grinding and cyaniding in all its branches; and X equal the per cent. extraction; then $100 - X = Y$, or the amount, in per cent., left in the tailings. Then we can say that AY equals the index of the process, and the smaller the index the more efficient the process.



TANK FOR SAND TREATMENT

The efficiency may vary from a point where the cost is infinite and the amount left in the tailing is 100 per cent., to a point where the cost is nothing and the amount left in the tailing is 0 per cent. In this way compare two processes, the first with a cost of $4 and an extraction of 85 per cent., and the second with a cost of $3 and an extraction of 70 per cent.

In the first place AY, or $4 \times 15 = 60$, and in the second AY, or $3 \times 30 = 90$, showing that the first process is more economical than the second. All business considerations require economy and efficiency combined, and the process which best gives this combination is the one which will survive.

Mexican Mining Taxes

The reports on the Santa Gertrudis mine estimate the total tax cost on the output as 7 per cent. of the gross. This may be taken as a fair indication of the tax burden on mining in Mexico, presumably calculated from reliable data. The various taxes on mining in Mexico range from 6 to 11 per cent. of the gross output, according to estimates made by engineers. This is less than the Cobalt royalty tax of 10 per cent. on the gross, but is much more than the tax in most of the American mining districts. The levying of what is practically a percentage on the gross output of the Mexican mines is a tax that bears disproportionately on the low-grade properties, and undoubtedly hinders the development of some whereof the margin is small.

There is a good deal of interest in the question of the tax on mining operations in Mexico. It has been figured that the taxes come to 6 to 10 per cent. of the gross output, varying in the different districts. This included the federal coinage tax, or export tax, on the precious metals, the numerous stamp taxes levied on the transaction of business and the local state taxes, sometimes levied as a percentage of the salary roll. In the state of Hidalgo this is as much as 3 per cent. of the salary and pay roll.

In most of the Mexican camps the companies get together and form an *iguala*, which is a division of the tax among themselves, and submit to the government a statement of the gross amount of taxes they propose to pay for the year. On the approval of this gross amount by the authorities the mining companies apportion it among themselves *pro rata*, so the official records do not show what is paid by each company. The *iguala* often results in reducing the taxes, as the government is willing to make some concession in view of the prompt payment and saving in cost of collection.

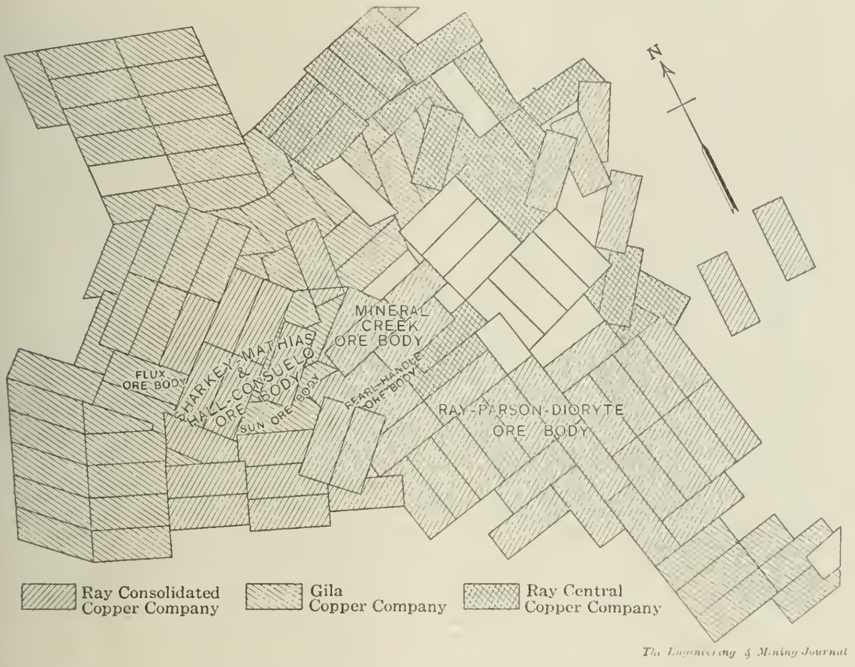
Copper in Panama

Since the Americans have established themselves at Panama in connection with the canal, the country has been more or less explored for minerals. A San Francisco company has discovered a copper deposit north of the canal, which is said to be extensive. The company is planning to explore it further. Some gold properties also have been found, but no definite results have yet been obtained.

Gila Copper Company

In the first annual report of the Gila Copper Company, Ray, Arizona, the operations of that company are reviewed from the date of organization, Feb. 25, 1907, to Dec. 18, 1909. The Gila company was organized to purchase claims in the Ray district which the English owners would not consent to sell to the Ray Consolidated until a certain amount of financing had been done.

A map of the claims of the two companies accompanies the report and is reproduced here. As it is not consistent with economic mining for the Gila to separately equip and operate its detached groups, aggregating about 40 acres, which are partially or entirely surrounded by the Ray Consolidated, an agreement was made with that company for a determination of the extent and value of the orebodies in these areas and their conveyance to the Ray Consolidated either for cash or in exchange for an area adjoining the main body of Gila territory and proved to contain an equal value of ore.


N
MINERAL CREEK ORE BODY
FLUX ORE BODY
SHARKEY-MATHIAS & HALL-CONSUELO ORE BODY
SUN ORE BODY
PEARL-HANDLE ORE BODY
RAY-PARSON-DIORYTE ORE BODY
▨ Ray Consolidated Copper Company
▤ Gila Copper Company
▦ Ray Central Copper Company
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Map Showing Property and Orebodies of Ray Consolidated, Gila and Ray Central

Property and Development

In connection with the above contract, and because of the determinations which can be made in conjunction with the drill holes in Ray Consolidated territory immediately adjoining Gila ground, the principal drilling to date has been done at the points marked Sun and Pearl Handle orebodies, which are the main areas embraced in this contract. Development by drilling has been started on the main territory of the Gila.

The company owns about 950 acres of lode claims adjoining the Ray Consolidated on the north, west and south, except for the groups above mentioned which are more or less isolated and included within the Consolidated boundaries.

The mineralized belt has a northwesterly and southeasterly maximum length of about 2½ miles and a maximum width of about ¾ mile. The ore occurs as the mineralization of a much fractured and silicified schist, and is found as a bed overlain by a capping of leached and comparatively valueless rock. About 275 acres of more or less mineralized schist is included within the Gila territory, classified by Spurr & Cox as 110 acres of ground showing thorough primary mineralization and 165 acres of less mineralized ground. The areas of maximum primary mineralization are said to correspond in general with those of maximum secondary ore formation, and it is assumed that a large proportion of the 110 acres alluded to will develop commercial ore.

Soon after the acquisition of the property 3000 ft. of underground workings and 6000 ft. of churn drilling were done, indicating the presence [not blocking out] of 800,000 tons of ore. Work was stopped until July, 1909, and then renewed, so that at the date of this report there were, in addition to the underground workings, 50 drill holes aggregating over 21,000 ft. of drilling on the property. On Dec. 1, 1909, the data deemed necessary to final valuation was completed on 44 of these holes. Of these, 33 contain commercial ore, but only 29 enter into Mr. Jackling's statement of tonnage developed. No ore is considered fully developed unless the holes representing it can be connected up so as to form completely sounded areas by drawing lines between holes not to exceed 200 ft. apart. In this manner he estimates 12,237,000 tons of developed ore having an average copper content of 2.05 per cent. This is included in 19.7 acres. Of this ore 10,500,000 tons are in the Sun orebody. The average thickness of capping is 306 ft., and the ore is 177 ft. thick.

There is in addition a large tonnage of partly developed ore and developments are still continuing at the rate that has developed ore to the extent of from 1,500,000 to 2,000,000 tons per month for the last four months. In addition to its own work, the Gila company has access by agreement to the results of work on the Ray Consolidated, and can thus direct its policy by the knowledge gained by that company.

Cape Copper Company

The report of the directors of the Cape Copper Company covering the year ended April 30, 1909, as regards the Cape Colony accounts, and the year ended Aug. 31 as regards the London and Newfoundland accounts, has been issued. The net profit amounted to £90,223, as compared with £144,366 of the previous year. The principal factor causing a reduction in the profits was the closing of the company's smelting works in South Wales for 16 weeks on account of labor troubles.

In Cape Colony the output from O'okiep mine was 15,968 tons, containing 246,706 units of copper. The estimate of reserves of mineral in the mine is returned as 10,000 tons assaying 20 per cent. copper. At Nababeep, 54,000 tons of 5.04 per cent. copper ore were sent to the local smelting works. The ore reserves amount to 150,000 tons carrying 5 per cent. copper. At the smelting works, 82,099 tons of ore were smelted. The matte produced averaged 49.5 per cent. copper.

The company is working several "trial" mines in Cape Colony as well as one in India and one under option in America. The suction-gas plant installed at O'okiep has effected a reduction of 46 per cent. in the coal consumption compared with that in the previous year. The operations at the Tilt Cove establishment in Newfoundland to Dec. 31, 1908, resulted in a net profit of £21,323, one-half of which was paid to the Tilt Cove Copper Company and the other half was credited to the Cape Copper Company. The output of the mines was 36,981 tons averaging about 3½ per cent. copper and costing about $1.88 per ton. The shipments for the year were 34,216 tons. The ore reserves are estimated at 33,000 tons.

The Keedy Sizer for Classifying Complex Ores

Diametric Sizing an Essential to Specific Gravity Separations; a Machine Which Aims to Do This at Low Power and Maintenance Cost

BY CARL F. DIETZ AND DYKE V. KEEDY *

One of the most interesting and important problems in ore dressing, and one that has long occupied the attention of many able men, is that of recovering zinc from complex ores. An enormous amount of time and money has been spent in original research work, and much good has been done. Various methods have been tried and some have met with considerable success; notably by first roasting the ore to render the iron sulphide more magnetic than the ferruginous black jack and then subjecting the mass to the separating influence of some type of magnetic machine. In this process there are several difficulties which prevent a full measure of success. One important difficulty is that of securing a uniform roast and another is that of handling the fines; but notwithstanding these deterring factors the results obtained have, in some noted instances, been very gratifying and profitable, especially when the ore was sized before magnetic treatment.

Close Sizing Essential

So far as we know, the most efficient method of making a separation of zinc and iron sulphide is one based upon specific gravity differences and which will hereinafter be described. In the treatment of ore by any process depending upon differences in specific gravity to effect separation, it is well known that the measure of success to be obtained depends directly upon the degree of accuracy and the closeness of the grading by size of the ground ore; and even in the most primitive methods by which materials of the widest differences in specific gravity are to be separated, at least some effort is made in the way of classification by size.

In direct proportion as ore becomes complex and specific gravity differences become narrower, the necessity for close and accurate sizing increases. All millmen realize keenly the advantages to be obtained by having their material closely sized before going further to any kind of a separating machine, and for this purpose there have been devised and put into use a large number of types of shaking, impact, vibrating and belt screens. All of these have met with more or less success, but all operators using machines of this kind have found that their difficulties are greatly increased as they approach the grading of the finer sizes.

The common method of grading ore which is ground too fine to be successfully handled by trommels, is by various kinds of hydraulic and, in some cases, pneumatic classification. The widest stretch of imagination cannot characterize the products of such methods of so-called sizing as being anything better than an approximation to the desired end. These graded products are made only as a result of the difference in weight of the particles (although somewhat influenced or modified by their shape and by their projected areas, offering more or less resistance to settling against the flow of the medium, whether air or water), and for this reason it must be admitted that all hydraulic or pneumatic classification is only an approach to sizing and differs widely indeed from diametric sizing in which the particles are measured by the screen aperture, specific gravity playing no part. A further and more complete discussion of the above is in process of preparation and will appear shortly.

Other things being even (we have here in mind the commercial and practical features), it goes without saying that close and accurate diametric sizing is far preferable to any hydraulic classification (which must, of necessity, be only indifferent sizing), because, assuming that all the particles in any given grade are practically of the same size or diameter, the influence of specific gravity difference, which is afterward employed to effect separation, then has the most free and uninterrupted opportunity to exert itself.

Closeness of Sizing Differs with Ores

Admitting the correctness of the theory that diametric sizing of an ore is necessary as a preliminary step in its concentration and separation, then the questions arise: (1) How far is it necessary to carry this sizing operation? (2) Into how many sizes should the ore be resolved? (3) How wide should be the steps between the various sizes or grades?

Of course the ore must ultimately be ground fine enough to free the mineral particles from each other, and it should be ground in such a way as to produce the minimum of fines. A process of gradual reduction of the sizes, as opposed to a violent smashing of the ore, is in the direction of producing the desired results. With some ores a coarse crushing frees a sufficient percentage of the mineral to admit of a concentration being made to produce commercial results before further or ultimate grinding becomes necessary, and in a few rare instances the ore will break in such a way as to leave the coarser products lean enough to be thrown out as tailings. In some instances the ore will break in such a manner that nearly all the appreciable mineral will report in the sizes coarser than 100 or 150 mesh; but it often happens that a large part, if not the greater part, will report in the sizes finer than 100 mesh and down to 200 or 275 mesh, and in slimes. Hence only upon a study of the screen analysis of the ore can one determine the answers to the first and second questions.

Ratio of Weights Corresponds to Diameters Cubed

Before determining how wide the steps between the grades in sizing should be, one should first consider the character of the ore with respect to the specific gravity difference between the various minerals to be separated, also between the minerals and the associated gangue materials; the narrower these differences, the closer should be the steps between the sizes; the object being to maintain a ratio difference between the sizes as narrow as possible (consistent with good practice and with local conditions), when compared with the ratio differences of specific gravity between the various substances to be separated. In considering the ratio of weights of particles it should be remembered that we are not dealing with perfect cubes or spheres, but we must, for lack of more accurate measurements, consider the particles as having cubical dimensions; hence the ratio of weights will be as the cubes of the diameters.

In every grade there are a number of particles which are only just small enough to permit them to pass through the coarse screen limiting this grade on one side; there are other particles only just a trifle too large to admit of their passage through the fine screen limiting this grade on the other side; but between these two extremes there is an indefinite number of particles of practically identical size.

Ratios of Sizes and Specific Gravities Compared

To be able to make comparison between the ratios of size and the ratios of specific gravities of the particles we must ascertain by accurate measurement the size of the apertures of the screen, and then by taking the cubes of the diameters we can make the comparison desired. To illustrate: We have before us the problem of the separation of zinc blende (sp.gr. 3.9) and fluorspar (sp.gr. 3), ratio 1.3 : 1. Suppose we are screening through 50-mesh screen (size of aperture 0.0146 in.)

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*Consulting metallurgical engineers, 6 Beacon street, Boston.

and on 60-mesh screen (size of aperture 0.0114 in.). The cube of 0.0146 is 0.000003112136, and the cube of 0.0114 is 0.000001481544, ratio 2.1:1. We find here so wide a difference that it is evident we could expect to find a considerable percentage of unsized particles (unsized with respect to gravity ratio) in this particular stock or grade. This unsized material would, in proportion to its percentage by weight, be sufficient to partly nullify or offset the specific-gravity differences, so that this portion of this particular stock would consequently fail to respond to the separating influences afterward brought to bear to produce a separation; and such portion of the stock would necessarily report as a middlings product.

But suppose we are screening through a 56-mesh on 60-mesh instead of through 50 on 60. Here we would have in the 56-mesh an aperture of 0.0125 in., the cube of which is 0.000001953125, which when compared with the cube of 60-mesh (0.000001481544), shows a ratio of 1.25 : 1. In this case the ratio of the largest to the smallest particles to be found in that particular stock, would be less than the ratio between the specific gravities of the substances to be separated and, theoretically, there should therefore be no middlings product on the table.

In the separation of iron pyrite (sp.gr. 4.8) and blende (sp.gr. 3.9) we have a ratio difference in specific gravity of 1.23 : 1, which would theoretically call for a closer sizing than would the ratio 1.3 : 1, referred to above. One should bear in mind that the percentage by weight of these "unsized particles" in the stock is relatively small, as compared with the whole, and the figures given above are purely for illustrative purposes and represent ideal conditions.

In this connection we may consider the minerals which one is often called upon to separate and which are sometimes all to be found in one ore: Galena (sp.gr. 7.25—7.35), iron sulphide (sp.gr. 4.8—5.2), zinc sulphide (sp.gr. 3.9—4.2), fluorspar (sp.gr. 3—3.25), calcite (sp.gr. 2.5—2.8), silica (sp.gr. 2.5—2.8). In the matter of separating galena from zinc sulphide we find the ratio of specific gravity to be 1.86:1. Should this be sized, as before considered, say through 56 on 60, where the ratio of the largest to the smallest particle is 1.25:1, then theoretically an absolutely perfect separation would result from table operations and without a middlings product, and the figures indicate that sizing need not be carried so far for zinc-lead as for zinc-iron separations, which is corroborated by practice.

However, there are practical factors which tend to modify theoretical perfection: the ore will not break in perfect spheres or cubes; and in the screening process some particles will be present which may have one certain dimension which would permit or prevent their passage through a certain mesh aperture, and these particles in consequence will report in one certain grade when, in fact, their respective total cubical content would properly classify them as belonging in another grade.

In the separation of iron sulphide and zinc sulphide we have to deal with a ratio of 1.23:1 in specific gravity; therefore a zinc particle need be only 23 per cent. greater volumetrically to weigh the same as the iron. In this case it is obvious that close and accurate diametric sizing must be done to avoid making an excess amount of middlings or to effect a table separation at all satisfactory.

Accurate Sizing Makes Good Separation

In operating any table, either wet or dry, or any separating device in the operation of which specific gravity difference is the main factor controlling the separation, and when a grade of stock is used in which the ratio of the largest to the smallest particle exceeds the ratio of the specific gravity difference, it means that middlings are absolutely unavoidable. The percentage of middlings made depends mostly upon the difference between the gravity and size ratios. Moreover, the finished products coming from the separator under such conditions will, necessarily, be contaminated by the other constituents of the ore to a greater or less degree, depending upon the ratio of difference in size of the particles in the particular stock which is being treated and will also be affected to some extent by the tendency and ability of the table or other separating machine to indifferently grade by size, an unsized stock. In other words, the requirements of efficient separation and of sizing in the same operation are mutually incompatible, because founded upon opposing principles.

It is the inefficiency of the various hydraulic or pneumatic systems of classification used in lieu of screens, which accounts for the inability of any of the wet mills throughout the country (most of which depend upon some system of hydraulic classification) to satisfactorily separate zinc from iron, and which has caused the building up of huge dumps of zinc-iron middlings. Had the ore been properly sized before passing to the tables, these dumps would have had no excuse for existing.

When the usual hydraulically classified pulp is fed to a table, the difference in size between the largest and smallest particles does not permit gravity differences to become effective excepting where such gravity differences are extremely great, and the inevitable result is a wide zone of accidental middlings such as zinc and iron, or zinc and gangue with an indifferent finished product lying between these middlings zones.

If ore which has been closely sized diametrically is fed to a table, either wet or dry, the immediate effect will be to stratify the minerals of varying specific gravities horizontally into distinct zones, leaving between these zones only a very narrow streak of true middlings.

The capacity of a table thus fed will be almost doubled as a long series of tests has proved, largely due to the fact that so many differently sized particles are not compelled to scramble for their natural positions, but immediately group themselves where their specific gravities would naturally tend to place them. In this we are only, by removing obstacles, materially assisting natural fundamental law.

Graded Screens Impractical for Close Sizing

While all practical millmen keenly realize the advantages to be gained from accurate and close sizing, the efforts they have made to follow their convictions have necessarily been limited by commercial factors. It can be readily appreciated that a battery of shaking or vibrating screens, extensive enough to produce the necessary tonnage of ore, graded into a sufficient number of sizes to be of really marked advantage, would mean adding to milling systems many weak links and a multiplicity of parts, requiring much attention, necessitating many adjustments and calling for almost constant renewals.

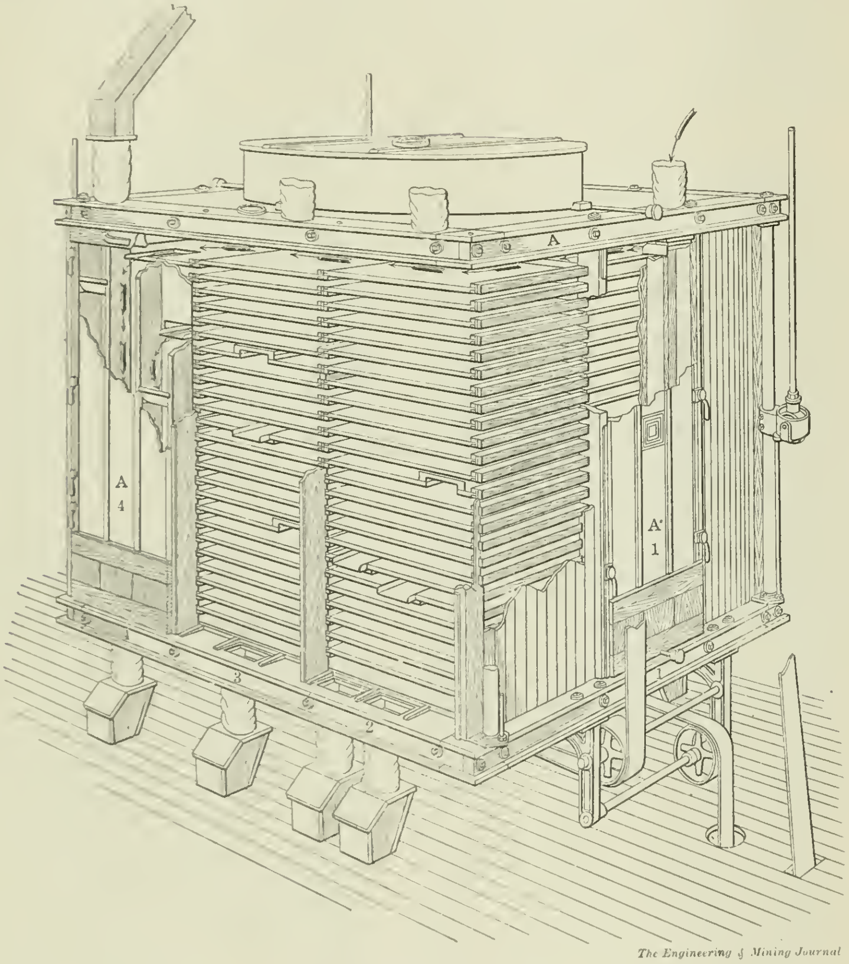
Many such additions have been made and they were found to be impractical and commercially impossible. Some have met with partial success, but in the long run the thousands of screen troubles have served to compel the millmen to try to get along with as small a number of grades of screened ore as possible, or to adopt some hydraulic system of classification as a lesser and therefore more tolerable evil, even though this should result in a lower grade of finished products, a loss of mineral in the tailings and the building up of middlings dumps.

Realizing the general attitude of the milling fraternity on these points and admitting the correctness of its views, when considering the various forms of apparatus offered in the market it is manifest that the above named difficulties should be removed, not merely in the sense of a laboratory success, but keeping in mind the all-important factor of commercial practicability.

About 10 years ago John E. Dwight was engaged in an effort to solve the problem of separating zinc sulphide from a complex ore at Warren, N. H. He was doing this work on a magnetic machine, after first subjecting the ore to a slight roast to render the iron magnetic. After sizing the material the results obtained on the magnetic machine were so much better than before sizing that there was then commenced a long series of attempts which finally resulted in the evolution of the present Keedy ore sizer.

Design and Construction

This machine was developed from the underlying principles of the bolting machine used by flour millers. It was so designed as to meet the much more severe requirements of ore dressing and the severe strain of wear and tear which the machine could be called upon to endure was always kept in mind. All running parts had to be reduced to a minimum in number and those which could not be dispensed with had to be properly protected from dust, yet they had to be easy of access and simple in design.



The Engineering & Mining Journal

THE KEEDY ORE SIZER

In the various sizes in which the machine is built, it contains from 96 to 208 screens, each 20x20 in., so that no waste of screen cloth occurs in cutting screens to the desired dimensions. The screens are placed in layers or rows of 8 on a level, or in one turn around the machine; each screen is slightly lower than the one preceding, so that as a whole they constitute a spiral path over which the ore travels round and round through the machine to the final outlet for the extreme fines, which in some cases is as fine as through a 275-mesh screen.

The ore, on entering the machine, first strikes a coarse or scalping screen to remove the first oversize or debris, then passes to the first coarse-screen series; at the end of this series the oversize, being by this time freed from all undersize, encounters a cutout spout and the finished product passes out of the system and into its own receiving bin below. The next finer grade is treated in the same manner, until finally the extreme fines product passes out. By cutting out the large sizes first, the load upon the finer screens is materially lessened and there is a consequent saving of the wear and tear on the finer cloths. Means are provided whereby the screens are thoroughly kept from blinding.

The machine is about 6x6 ft. and from 4 to 6 ft. deep in its various size numbers; it can be operated in a space 10 or 12 feet square. The machine is automatically balanced and is without a trampot or any other connections with the floor. It is swung from overhead on oscillating rods and there is no jar when starting or stopping. It runs freely and without noise. It is absolutely dust proof.

Excessive wear is averted by a construction providing that ore shall not strike any part of the interior of the machine except when the material is harder than the ore itself, or upon soft rubber (which well resists wear of this sort), or upon a bed of its own material or the surface of the screen. Wire cloth is used for screens down as fine as 90 mesh; for finer sizes, silk bolting cloth as fine as 275 mesh is used if the character of the ore demands such fine screens.

The motion is gyratory; there is no jar, no vibration and no wasted energy as opposed to any and all reciprocating or vibrating motions. The screen frames are placed horizontally, so that the projected areas of the apertures correspond with their actual dimensions.

The travel of the pulp over the screens is a complex series of curves, as opposed to the straight-line travel over inclined screens. The pulp, therefore, travels further over the same given screen area, and as it remains longer on the surface of the screens, the opportunities offered the undersized particles to pass through are vastly multiplied; concurrently, the capacity of the screen area is largely increased. The capacity of the screen area is further relatively increased by reason of the fact that a certain load of pulp is at all times being carried on the horizontal surface of the screen and, though it may be sometimes not over ¼ in. deep, it lies flat on the screens and the overburden thus assists the undersized particles in their passage through the apertures.

Capacity

The Keedy sizer is a machine for which is claimed a maximum of efficiency and capacity, minimum of wear and tear and least expenditure of power in resolving the ground ore at one operation into any desired number of grades by size, up to 20. The screens may range from, say, 12 mesh to 200 or 275 mesh. This work is done with an efficiency so complete that there is no practical evidence of oversize or undersize present when any one grade is being treated, either on a wet or dry table.

The capacity in tons per hour is variable and is dependent upon several factors: (1) The physical character of the ore and the form in which the particles report themselves. Some ores will respond to screening influences far more readily than others. (2) The degree of fineness of the ore has much influence upon capacity. It is obvious that a greater tonnage of coarser sizes will pass a screen in a given unit of time. (3) The number of grades or sizes into which it is desired to resolve the ore. A given area will grade a greater tonnage of ore into 4 sizes than into 16 in a given unit of time.

At Eureka, Utah, one Keedy sizer was operated at the rate of 4 tons per hour; resolving the ore into 10 sizes plus the oversize and undersize, or 12 sizes in all. Repeated tests revealed an efficiency above 90 per cent. At another plant and on another ore, 4 Keedy sizers are regularly running at the rate of 2 1/3 tons each per hour, separating the ore into 15 sizes in all.

Power

Power is an important factor in most cases and it becomes necessary to take this item of the cost into full consideration. The Keedy sizer requires only about 1 h.p. and will handle a greater tonnage of ore per unit of time and with less power than will a whole battery of shaking or impact screens, even though it be granted that each screen unit in the battery will produce two or three sizes at one operation. All such screens depend largely upon a sharp impact or upon a sharp reversal of motion for the passage of particles through the screen apertures.

In the former case impact means noise and noise means loss of power, since the force between two striking bodies must be either taken up by the mass of the bodies or transmitted to springs. The force applied in the form of blows means a shock to the material suffering the blow and consequently aggravating wear and loosening of bolts and screws, resulting in general deterioration and dilapidation.

In the latter case the forces are exerted in bringing the reciprocating mass momentarily to rest, and then reversing the direction of the movement. Such a method produces wear and strains which can be absorbed only by sufficient mass in the parts; it also means a large consumption of energy with comparatively small resulting benefit. The main objections to shaking and impact screens, as a class, are found in the three following reasons:

(1) On account of the inclination of the screen necessary to make the ore travel, the screen aperture does not truly measure the size of the particle passing through or staying on the screen; it is the projected area of the aperture which is the approximate measure.

(2) When considering that the power supply is uniformly of rotary character, it is obvious that transformation into rectilinear motion may result in expenditure and loss of power; it necessitates much complexity of construction, involving the use of ecentrics or some other transforming device.

(3) The ore travels over the screen linearly and has a strong tendency to skip, so that during only a small part of the short time that the ore is traveling over the surface of the screen does it actually come in contact with the screen; hence the invitations received by the undersized particles to pass the apertures are lessened in number and less likely of acceptance.

Cost of Screen Renewals

The cost of screen renewals per ton of crude ore is variable, depending upon several factors: (1) The degree of hardness of the ore and the form of its crystals, when broken; (2) the number of sizes into which the ore is to be graded and the consequent difference in the area of cloth required; (3) the relative percentage by weight of the fine sizes, as compared with the coarser sizes.

In the mill which was operated by the Cactus Ore Company at Eureka, Utah, and where the ore was being graded into 12 sizes and where the ore was extremely hard and sharp, the cost of screen renewals was about 8 to 10c. per ton. In a mill now being operated in Utah, where the ore is being graded into 15 sizes, but where there is a relatively small percentage of sharp-edged, hard quartz or gangue material, the cost for screen renewals for crude ore milled has been shown to be about 5c. per ton.

Operation in Utah

In the operations at Eureka the pneumatic dry tables, manufactured by Sutton, Steele & Steele, of Dallas, Texas, were used for several reasons: (1) There was not enough water available to permit the use of wet tables; (2) we then regarded the Sutton table as the best dry concentrator on the market, and we have yet to find one which will approach it in capacity and efficiency; and (3) we had to deal with an ore whose silver content was largely in chloride form, and which would be mainly lost in any wet system of concentration.

Because of the fact that the ore from the May Day mine had not been thoroughly tried out by this system, and because the mill at Eureka had been rearranged largely for the purpose of carrying on further experimental tests, an elaborate and thorough system of sampling and assaying was established and carried on.

While the first carload of concentrates was being turned out every separate lot of sized ore which went to make up the carload, was carefully sampled and weighed at several points in the system; also the heads, tails and concentrates of each separate lot as they came from the table were carefully sampled, weighed and assayed. There were nearly 90 of these separate lots, ranging in size from 20 mesh to minus 200 mesh, and over 800 chemical determinations were made.

A record of the actual running time of the sizer and of the Sutton table was also kept. The percentage, by weight, of each grade or size from 20 mesh to minus 200 mesh as produced by the sizer was also noted. The dust coming from the plant and caught in the dust collector was also weighed and its value determined. Some of the salient features shown in the record are summarized in the accompanying table.

The percentage of lead in concentrates (56.58 per cent.), as given in this table, was arrived at by calculating the assay value of the several lots which went to make up the carload. The official assay of concentrates as shown by the smelter's settlement sheet serves as a check to prove the correctness of our chemist's assays. It was as follows: Lead, 56.4 per cent.; silver, 35.8 oz.; gold, 0.06 oz.; Fe, 2.4 per cent.; Zn, 4.7; S, 4.2; Insol., 14.2 per cent.

DRY CONCENTRATION RESULTS.

Number of sizes into which the ore was screened	10
Number of separate lots making up a carload of concentrates	88
The capacity of the Keedy sizer per hour (average)..	8000 lb.
Capacity of Sutton table per hour (all sizes)..........	3000 lb.
Cost of screen renewals per ton of crude ore treated, say	10c.
Cost of fuel and labor for drying the ore per ton (coal at $5).....	6 to 8c.
Weight of carload of concentrates	61,359 lb.
Weight of original ore used..	382,776 lb.
Degree of concentration.....	6.23 : 1
Lead in original ore.........	9.77 per cent.
Lead in concentrates.......	56.58 per cent.
Recovery of lead...........	92.77 per cent.
Recovery of silver.........	75.00 per cent.

Other Tests

While in the operations at Eureka the Sutton dry table was used, it should be understood that though the capacity per hour of a good wet table may be less, yet equally good results can be obtained as has been amply demonstrated by a large number of tests we have made on various ores of widely differing characteristics, using wet tables.

Since the operations at Eureka ceased, we have carried out a number of similar tests on various ores at different places and under widely differing conditions. A long series of interesting and successful tests was carried on by Carl F. Dietz at Storfoshei, Norway, in the summer of 1908, treating iron ore; and it was shown in these that the Sutton table equipped with a specially constructed deck to suit the conditions, did excellent work when being fed at the rate of six tons per hour.

A 50-ton test was carried out in Mexico during the closing month of 1908, the final results showing that a 9.5 per cent. fluorspar-zinc was brought down to 1.1 per cent. fluorspar. In the mill at Eureka, Utah, there was carried out a series of tests on concentrating zinc ores consisting of a mixture of carbonate and silicate with satisfactory results.

During the last year we have spent a great deal of time testing out this system as applied to a separation of blende and flaky specular hematite. The results were sufficiently satisfactory to warrant the construction of a mill to do this work.

In this work we have had excellent success with the James wet table, made by the James Ore Concentrator Company, of Newark, N. J. We have lately made some successful tests in separating zinc, fluorspar and calcite coming from Kentucky, in addition to other tests made on similar ores in Mexico. The Keedy ore sizer is owned and controlled by the Cactus Ore Company, 257 Broadway, New York, and is fully protected by patents.

A Typical River Mine in Pennsylvania

In Order to Provide for the Production of a Large Tonnage, a Rather Uncommon System for Hauling and Handling the Coal Was Installed

BY FLOYD W. PARSONS*

The field of coal, consisting of about 4000 acres of the Pittsburg bed, being opened by the Monongahela River Consolidated Coal and Coke Company at its Crescent mine near California, Penn., lies about three miles from the Monongahela river and the same distance from the Pennsylvania railroad.

General View of New Power House Which Supplies Electric Current for Operating the Crescent Mine

In opening up this coal it was found necessary to use either some of the old entries of the Crescent mine or an overland railroad. It was decided to use one of the Crescent main entries which is about two miles in length and extends in nearly a straight line from the bottom of the Crescent slope to the outcrop of the coal in Pike Run Hollow. The accompanying map shows the old entry that was used.

The mode of haulage in the old Crescent mine was an endless line, and the entries had never been graded. It was found necessary, in preparing for motor haulage, to regrade one of the entries practically its entire length. As this work was to be done without shutting down the mining operations, this grading was necessarily done at night. The track was torn up as soon as the mine ceased operation in the afternoon and a section of the bottom was blown up, or the roof ripped, as the case might be, and the track relaid in that portion for the next morning.

From Pike Run to the new coal, a distance of about one mile, 2000 ft. of which is underground, is all new work and no trouble was experienced. All the pit mouths were either concreted or stone arched. There are six main entries in the new coal, three intakes and three returns, two of the intakes being haulage entries and the third a traveling way. The face entries are spaced 1200 ft. centers and on one side of the mine, butt entries are driven in pairs; however, the rooms are to be worked off but one entry, as shown on the sketch. On the other side of the mine, three butt entries are driven, the rooms to be turned off the two outside entries and the middle entry to be used as a return air course.

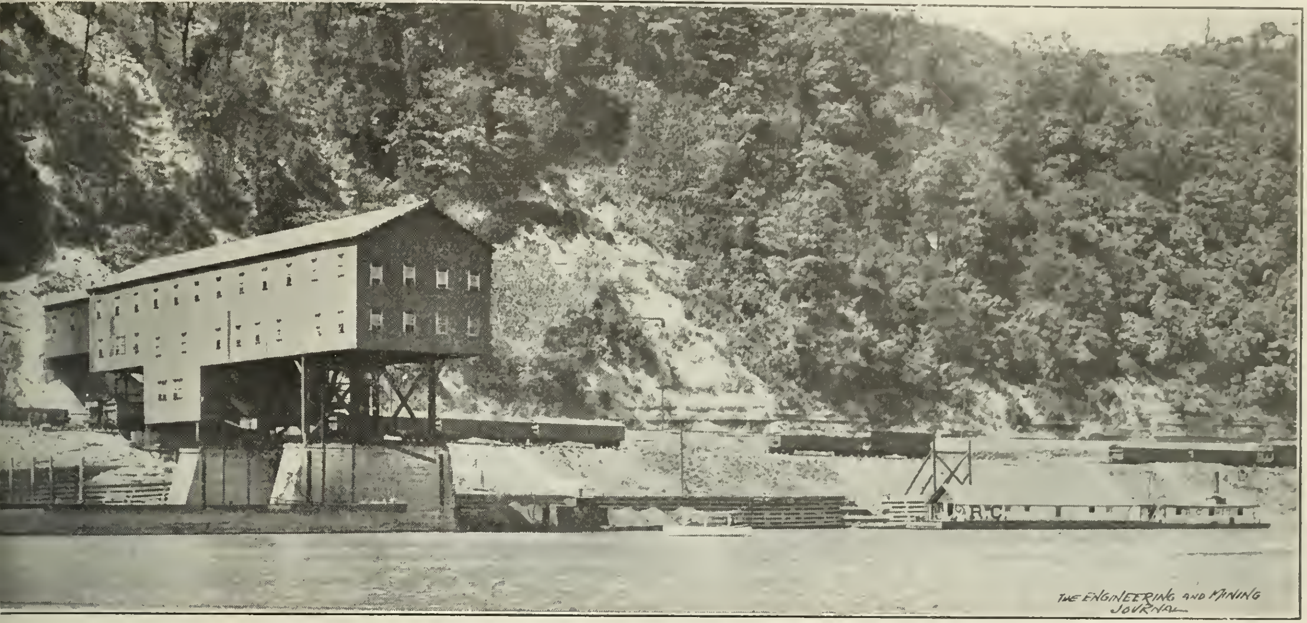
The mining is done by undercutting with chain-breast machines. The coal is gathered with $6\frac{1}{2}$-ton gathering locomotives, the motor not leaving the entry. Where necessary, the cars are pulled into he rooms by the aid of a crab on the ocomotive and a snatch block; and are ulled out of the rooms where necessary y a crab.

Twenty-five pound steel rails are used n all butt entries and in rooms. Room urnouts consist of cast-steel frogs, one st-iron fixed switch point and one rail witch point as shown on the sketch; this switch point is operated by foot. All face entries are laid with 40-lb. iron and the main haulage entries with 60-lb. iron.

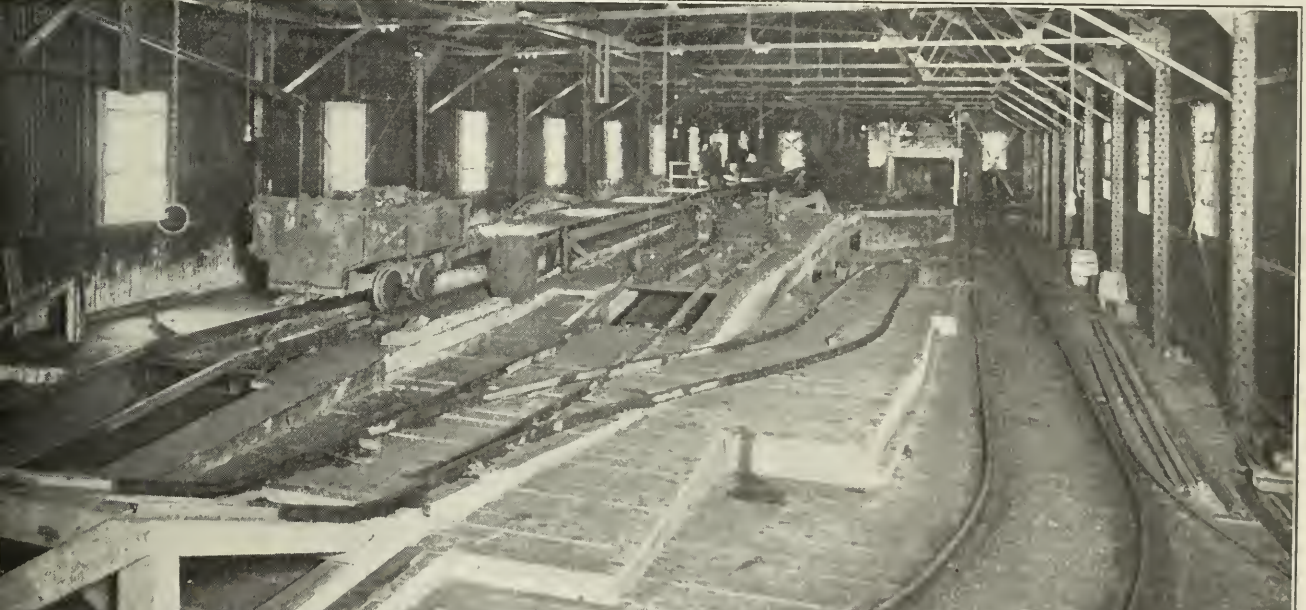
The power plant shown in the accompanying illustration, is situated in Pike Run Hollow, which is about midway between the center of the field of coal and the tipple. There are two 500-h.p. Sterling boilers, two 500-kw. 500-volt d.c. Western Electric generators driven by direct-connected cross-compound Corliss engines.

The Haulage System

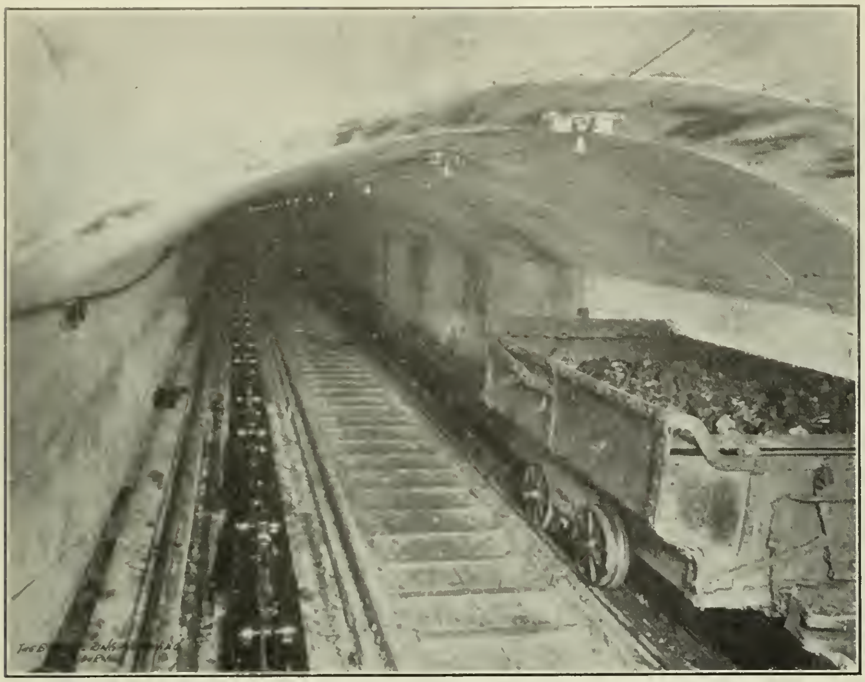
The side tracks at the bottom of the slope have a storage capacity of 150 loaded and 135 empty cars. The cars are steel with cast-steel bumpers and



The River Tipple at the Crescent Mine. The Entire Structure Is Fireproof and Every Modern Convenience Has Been Installed

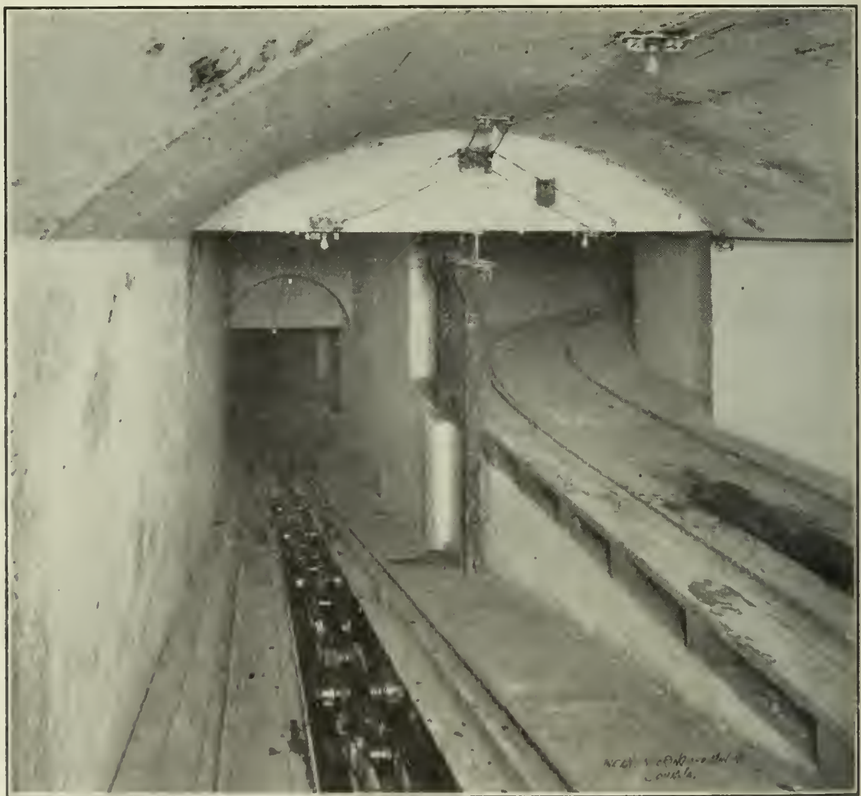


The Tracks and Dumping Arrangements in the Tipple Have Been So Designed That only a Minimum of Labor Is Required spring draft gear, 32-in. wheel base, weigh 3750 lb. and have a capacity of 3½ tons of coal. They are brought to the bottom of the slope from the inside parting by 20-ton motors in trips of from 80 to 100 cars. They are fed on to the up-haul of the slope by a feed haul driven by a 40-h.p. motor. The up-haul has a capacity of 6 cars per minute and the down-haul a capacity of 12 cars per minute. The slope is 15 ft. wide and 8 ft. high, and is substantially lined throughout its length with concrete. The car-feeder above mentioned not only dispenses with all manual labor at the foot of the slope, except a boy to draw coupling pins as the cars reach the head of the feeder, but greatly lessens the wear and tear on the car haul, as the cars are already accelerated when they reach the foot of it. The up car-haul consists of a heavy steel roller chain with cast-steel hooks to engage attachments on the bottom of the mine cars. It is driven by a 250 h.p. motor, the drive being equipped with band and ratchet brakes which set automatically when no power is being delivered to the motor; this arrangement prevents the cars running back.


Showing the Mine Slope with Double-chain Haul for Loads and Empties

The empty mine cars are delivered from the tipple to the head of this slope where they are automatically picked up by the empty down-haul and lowered (62 ft. vertically) and delivered to the trip-maker. This down-haul also consists of a heavy steel roller chain with hooks to engage attachments on the bottom of the mine cars. It is geared to the counter-shaft of the up-haul so that the descending empty cars assist the ascending loaded ones. The entry at the foot of the empty down-haul is driven on a ¼ per cent. favorable grade of sufficient length for 100 cars.

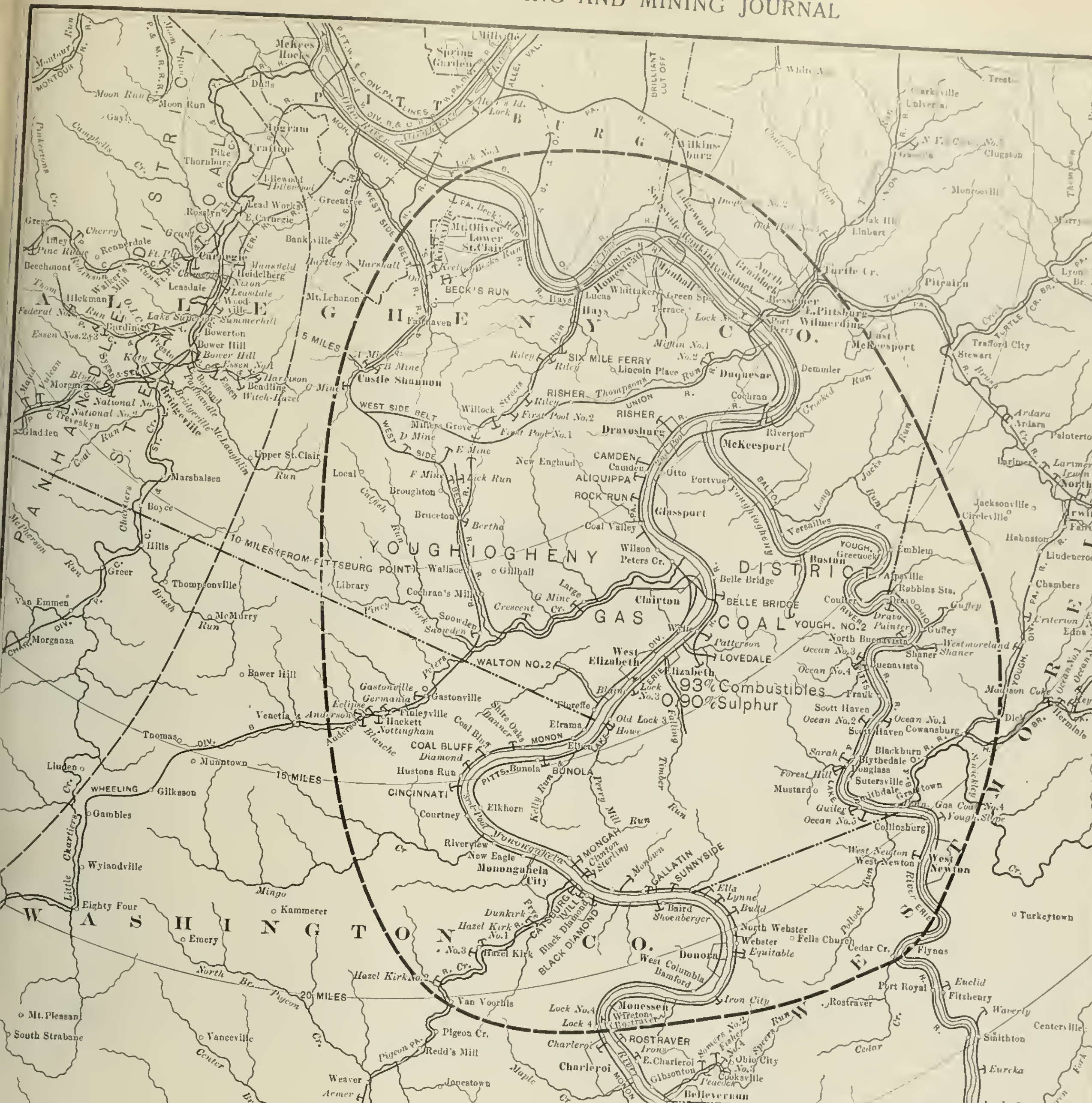
The trip-maker to which the empty cars are delivered at the foot of down-haul consists of an endless steel chain with dogs, driven by a 40-h.p. motor, and automatically receives the empty cars from the down-haul and makes them up in a trip, ready for the mine motor to return them into the mines. The first car reaching the head end of this trip-maker is advanced one car length by the second car reaching this point; the first and second cars are advanced by the third car reaching the point, etc., until 100 cars are in the trip. This car-haulage system, which was designed and built by the Heyl & Patterson Company, of Pittsburg, is notable for the small amount of labor required in its handling of the mine cars.


Foot of Slope Showing Loads at Bottom and Track Where the Empties Run to the Parting

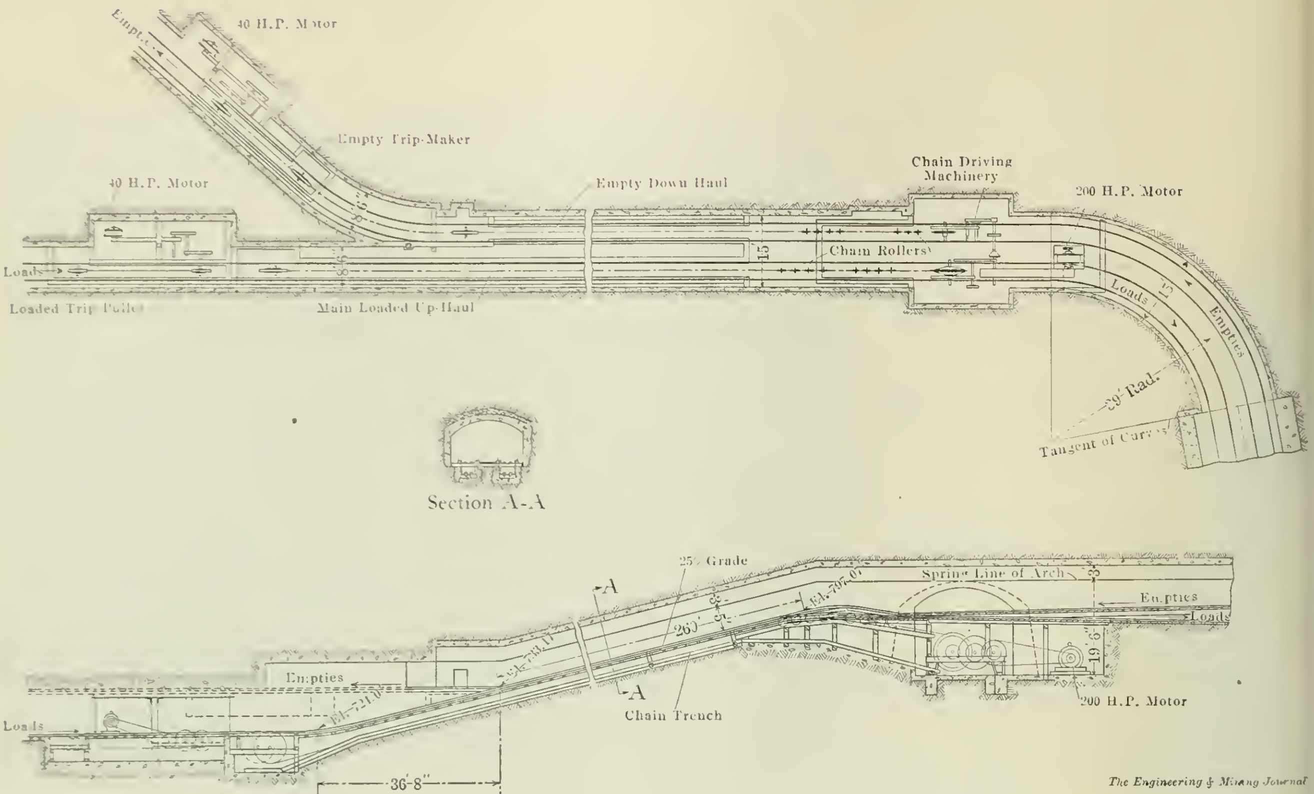
Method of Handling the Coal on the Tipple

After the loaded cars are elevated by the car-haul into the tipple, they are directed by a man who operates the switches and car-haul machinery from an overhead bridge to either one of the three dumps. The cars at the various dumps run into an automatic car-feed regulator which insures their stopping at a point back of the dump; the moving car actuates a pair of horns which are released by the dumper by means of a treadle. The car in the regulator stands on a grade of 6 per cent. which insures a quick start from a state of rest.

The dumps are all Phillips' cross-over dumps, three in number, a railroad dump, crusher dump and river dump. But lump and slack can be loaded on the railroad, and if necessary, nut and slack may be transferred to the river by the aid of the



The Area Included within the Heavy Broken Line Comprises What Is Known as the Gas Coal District. To the Left Are the Steam Coal Mines



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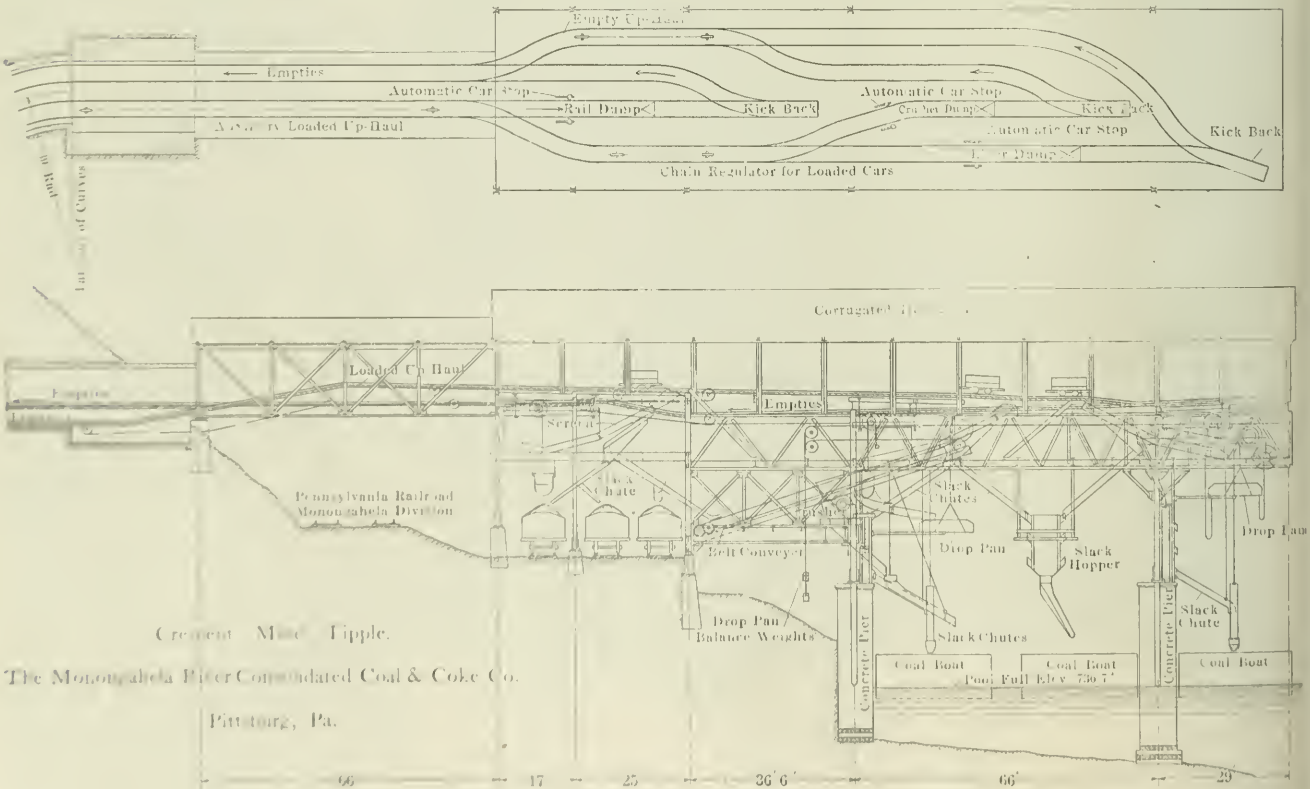
Plan and Elevation Showing Arrangement of Hoisting Slope



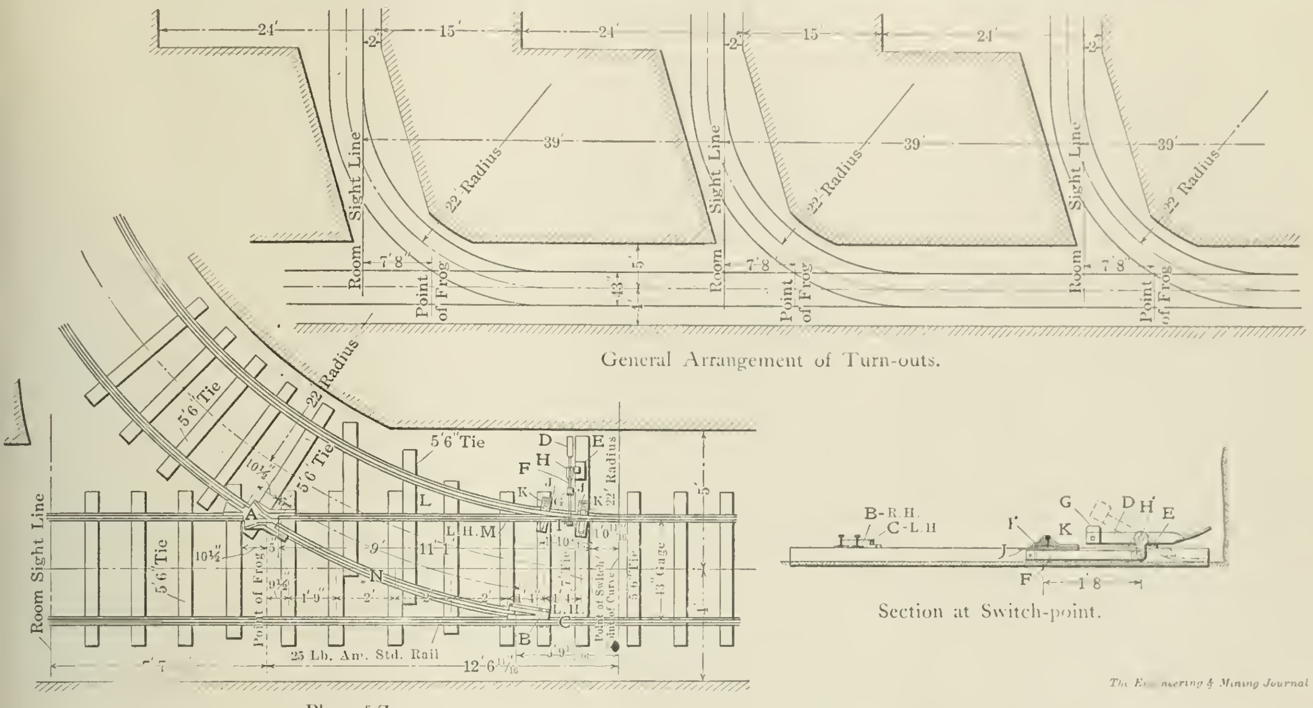
The Engineering & Mining Journal

Notice That the Kick Back at the Outer End of Tipple Is Turned Slightly to Right. This Scheme Has Been Very Successful belt conveyer which deposits it in a slack hopper over the river craft. The crusher dump will deliver lump coal to the crusher or to a drop pan which will deposit it in a boat. The slack from this dump can either be run in the same boat with he crushed coal, or if lump coal is being oaded from this dump the slack is conveyed to the slack hopper by a convey chute.

The outside river dump will load either run-of-mine or inch and a quarter coal. t is hardly probable that the three dumps will be used at the same time, but any wo dumps will give a capacity of 6000 ons per day of 8 hours. The coal loaded on the river is either loaded into coal boats which are 176x26 ft. by 10 ft. deep or into barges and flats. In loading it is necessary to move the boats up and down the river so that the loading is done in streaks, that is, from end to end of the boat. This moving is taken care of by a 6-drum Lidgerwood hoist, driven by a 25-h.p. Crane motor, by which one, two or three boats can be moved in the same or opposite directions at the same time. The capacity of a coal boat is about 1000 tons.

The accompanying illustrations were made especially to supplement this description, and show in detail the general plan of operation. The entire plant has been completed at a considerable expense, and is probably the most modern of river coal-mine installations. The scheme of underground development is similar to the methods used generally in mining the Pittsburg seam, and will be described in a later article.

I am indebted to C. F. Osler, chief engineer of the Monongahela River Consolidated Coal and Coke Company, Pittsburg, for all of the drawings and much descriptive information; also to L. J. Robb, chief engineer of the Heyl-Patterson Company, of Pittsburg, for data concerning the car-haul.

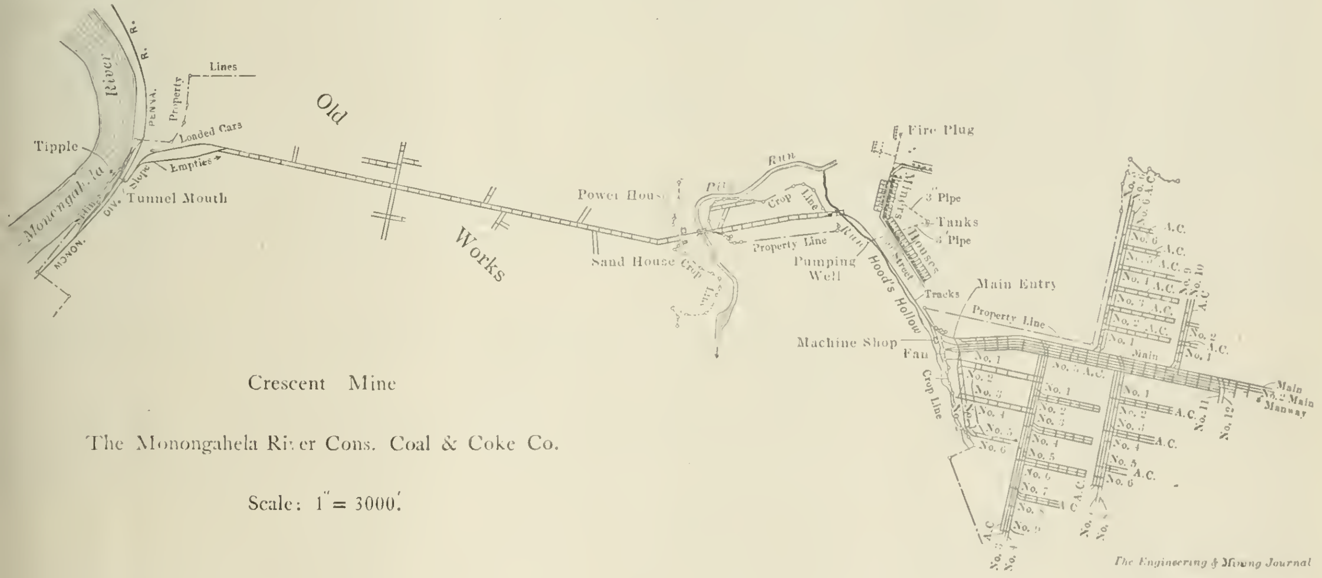


General Arrangement of Turn-outs.

Plan of Turn-out

Section at Switch-point.

GENERAL PLAN SHOWING METHOD OF CONSTRUCTING ROOM TURN-OUTS AT THE CRESCENT MINE



THE NEW WORKINGS ARE FAR BACK FROM THE RIVER AND ARE REACHED BY AN ENTRY THROUGH THE OLD MINE

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. W. Mudd, of Los Angeles, Cal., is in New York.

Charles Butters is inspecting the Porcupine gold area in Ontario.

Edwin E. Chase, of Denver, Colo., is in Arizona on professional work.

Robert Hay Anderson has removed his office to Centro Mercantil No. 31 in the City of Mexico.

John B. Keating, manager of the Bully Hill smelting works, was in New York last week, but has returned to California.

Horace F. Evans has established headquarters at Portland, Oregon. He is making examinations of mines in the southern part of that State.

Charles L. Doyle has been chosen president of the Pickands Magee Coke Company, Pittsburg, in place of the late William C. Magee.

Victor M. Braschi and Juan Cuyas, of Mexico City, are in New York attending a meeting of the managers of the Ingersoll-Rand Drill Company.

Edward Ryan, of Goldfield, has been appointed State mine inspector of Nevada, in place of E. E. Stuart, who has resigned and will go to Mexico.

F. A. Halsey, editor of the *American Machinist*, sailed last week for a cruise to the Mediterranean and Orient, to be followed by a trip through Europe.

E. S. Berry, formerly on the staff of Pope Yeatman, but more recently with John Hays Hammond, has returned to his former position with Mr. Yeatman.

G. H. Perkins, State geologist of Vermont, started Jan. 26 for a trip to Japan, India and other eastern countries. He expects to be absent until the last of July.

Carl F. Dietz, of Dietz & Keedy, Boston, has gone to Magdalena, New Mexico, on professional business in connection with some new complex ore-milling operations.

Frank A. Ross has returned to Spokane, Wash., after an extended trip to Mexico in the interest of the estate of Marcus Daly, which recently bought the Cinco Minas in Jalisco.

Irving H. Johnson, manager of La Eva Coneto Mining Company at Coneto, Durango, Mexico, has just recovered from an attack of typhoid fever, and will make a visit to the United States.

Joseph E. White has been appointed manager of the Quartette Mining Company at Searchlight, Nev., in place of George B. Wilson. Walter A. Hopkins has been appointed assistant manager.

W. Spencer Hutchinson, consulting engineer of the Vulture Mines Company, starts for Arizona this week to arrange for the installation at the mines of a cyanide plant on a plan designed by J. V. N. Dorr.

R. K. Stockwell, has resigned the position of smelter engineer with the Steptoe Valley Smelting and Mining Company and is now construction engineer for the United States Smelting, Refining and Mining Company, being for the present at Eureka, Utah.

Albert L. Waters, of Los Angeles, Cal., has finished his engagement to put into successful operation the new pyritic smeltery at Modern, six miles north of Denver. He has gone to Arizona on professional business and, after visiting Los Angeles, will return to Denver about the middle of February.

A. Kennedy Macfarlane, formerly connected with the San Francisco del Oro Mines, Ltd., of Parral, Mexico, has been elected general manager of the Manta Mining Company, Ltd., of London. This English company, closely allied with the San Francisco del Oro, is operating in the Santa Eulalia district, near Chihuahua.

Thomas R. Stevens, for some time with the milling department of the Guanajuato Development Company at Nayal, also with the Bustos mill, Pachuca and Amparo mine, Jalisco, Mexico, has left for the United States on his way to Russia, where he has accepted a position with the Caucasus Copper Company at Batum.

Obituary

Bernabé Gomez Iribarne, chief engineer of the first class of the Corps of Mining Engineers, and chief of the mining district of Almeria, died Dec. 24 at Almeria, Spain.

Fayette Brown died in Cleveland, O., Jan. 20, aged 86 years. He was born at Bloomfield, O., and went to Pittsburg when a young man. In 1851 he removed to Cleveland and engaged in business. After serving two years during the Civil War, he returned to Cleveland and became general agent and manager of the Jackson Iron Company, which owned iron mines at Negaunee, Mich. He retained his connection with that company until 1887. In 1880, with his two sons, Harvey H. and Alexander E. Brown, he organized the Brown Hoisting and Conveying Company, the name of which was later changed to the Brown Hoisting Machinery Company. To his energy and business ability and the inventive genius of his son, Alexander Brown, the success of this company is largely attributed. In 1883 he was appointed receiver of Brown, Bonnell & Co., of Youngstown, O., and was successful in settling the complicated affairs of that concern. At the time of his death he was president of the Brown Hoisting Machinery Company, chairman of the Stewart Iron Company, Ltd., operator of blast furnaces at Sharon, Penn., and coke ovens at Uniontown, Penn., and a member of the firm of H. H. Brown & Co., commission dealers in iron ore. He had also been prominently identified with other important manufacturing companies in Cleveland.

James McKee Kelley died at East Liverpool, O., aged 75 years. He was born near Bucyrus, Ohio, and was a graduate of Oberlin College. In 1857 Mr. Kelly went to Smiths Ferry, Penn., where he engaged in the oil industry. The oil was sent to Cleveland, where Mr. Hanna was located, and where a market was found for it. A company was formed by the two men, which later, it is said, formed the foundation for the Standard. Mr. Kelly was next associated with Colonel Bedard, of St. Louis, a widely-known oil operator. Following this Mr. Kelly formed a partnership with Joseph Hart, of Frederickstown, and drilled the first wells in Island Run, which attracted to the spot oil speculators from all parts of the country. Later he became associated with Gallagher Brothers, oil operators, whose interests were later absorbed by the Standard Oil Company. Mr. Kelly was one of the three men who conceived the idea of conveying oil to various parts of the country by pipe line, and laid the first pipe line for that purpose. Mr. Kelly was associated with Colonel H. R. Hill, of East Liverpool, the firm name being Hill & Kelly, and they established the first gas line in East Liverpool. Later this concern was taken over by the Bridgewater Gas Company. Until 1897, when he retired from the oil trade, Mr. Kelly represented the Standard company in the Smiths Ferry territory.

Societies and Technical Schools

Rocky Mountain Club—A dinner was given to the members of this New York club by W. B. Thompson, Jan. 29, at the Waldorf-Astoria, at which were present as guests or speakers many prominent mining men.

Canadian Mining Institute—The twelfth annual general meeting of the institute will be held in the city of Toronto, on Wednesday, Thursday and Friday, March 2, 3 and 4. The headquarters will be the King Edward Hotel, Toronto.

Mexican Institute of Mining and Metallurgy—The regular monthly meeting on Jan. 27 was held at the School of Engineers in the City of Mexico. The occasion was a special invitation from the director of the school to the members of the institute to visit and inspect the principal departments of the school.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

Jan. 27—According to Superintendent E. F. Sweeney, of the San Francisco mint, the gold production of California for 1909 was about $19,000,000. There are about 1100 producing metal mines in the State and about 400 of these are deep mines, the remainder being placers of various descriptions. The deep mines are now yielding about 2,500,000 tons of ore annually, of which 2,000,000 tons are of milling ore, with an average content of over $5 per ton. The larger part of the silver production of the State comes from the copper ores and their fluxes of Shasta county. The quartz mines yield more gold than the placers, but the quota from placer operations is increasing yearly, due largely to the dredges, which are estimated to have produced approximately $6,500,000 in 1909. Butte county is in the lead, with an output of over $3,000,000, while Yuba and Sacramento counties yield the larger part of the balance.

Were it not for dredges, the gold production would have gradually decreased during the last 10 years. There are now nearly 75 dredges operating in the State, mostly at Oroville, Marysville and Folsom. Dredges are also in operation in Siskiyou, Calaveras and other counties. The value of the gravel thus mined varies from 10 to 20c. per cu.yd.; and under favorable circumstances, with the largest dredges, the costs are as low as 2c. per cu.yd. The average cost is, of course, higher. Some of the larger dredges handle 250,000 cu.yd. per month. Nevada county continues to lead in gold-quartz mining, with a yield of over $2,000,000, largely contributed by the North Star and Empire mines at Grass Valley.

Shasta county is far in the lead in copper production, while a little known property, that of the Penn Chemical Company at Campo Seco, in Calaveras county, adds an important quota. The Campo Seco Mining and Development Company has recently been organized to open up some copper claims near those of the Penn Chemical Company and farther north in Amador county, 1000 acres of presumed copper land has been secured by the Henrietta Mining Company recently incorporated at San Jose, Cal. and for which E. J. Olsen is the managing engineer. The Champion group of mines at Nevada City is credited with a total production of about $25,000,000 in gold and silver. For the last year this property has been under consideration by eastern and London interests. A corporation, to be known as the Champion Gold Mines Company, has been formed by these interests with a capitalization of $5,000,000. This company on Nov. 20, 1909, made the first payment on the property. A new vein of high-grade milling rock has been uncovered recently in the Champion.

The sensational litigation between the owners of the Sixteen-to-one gold mine at Alleghany has been settled by compromise. A new company was formed to acquire the property, the various litigants receiving shares for their interests. The compromise of the law suit is fortunate as it allows of the reöpening of this valuable property at once.

The controversy between the Kennedy Extension Company and the Argonaut at Jackson is proceeding. Surveyors are now on the ground to make thorough surveys to decide if the Argonaut has abstracted ore from a vein apexing on the Kennedy Extension ground. The Kennedy Extension Company should not be confused with the Kennedy Mining and Milling Company owning the famous Kennedy mine, a little to the north. The Kennedy Extension Company took over the old Muldoon claim lying a little east of the Argonaut, and opened it up. Further trouble is in store for this company as one Phelps has filed on a strip of land 60x100 ft. on the south border of their property. When Phelps sent men to this strip of land to do work, they were driven off by the Kennedy Extension employees.

Denver

Jan. 29—In the case of the Government against Fay, Keitel, Rumsey, and six others, of St. Louis, for conspiracy to defraud the Government out of 5120 acres of anthracite land in Routt county, the jury, after an hour's deliberation, found them not guilty. This and the case against the Union Land Company were the Government's two star cases, and it has lost both within a month.

The Cripple Creek deep drainage tunnel is within a few feet of the 12,300-ft. mark, and now about 2250 ft. from the shaft of the El Paso mine. The tunnel is now under Beacon hill, and the first dike has been crossed. It was altered granite, slightly mineralized, and water is now coming in at this point, it is reported, at the rate of about 100 gal. per min. The lower workings of the El Paso mine will be the first to be drained by the tunnel, and large bodies of the extraordinarily rich ore for which this mine is famed will be then available. In this connection, it is stated that local financiers, who are large stockholders, will in March endeavor to wrest the presidency and management from Allen L. Burris, who represents eastern stockholders. The stock is about evenly held between the two factions, and the struggle will be a close one.

In the Ruby mine on Bull hill, a 2-in. streak of the abnormally rich stuff incidental to the Cripple Creek district has been struck. As usual, the reprehensible practice of publishing assays of specimens has been followed, in this case being given at 1003 oz. silver and 3100 oz. gold. It would be more to the purpose if we could chronicle the marketing of even one ton of such ore. This is worthy of notice, however, from the fact that it was struck at 1365 ft. below the surface, and in view of the drainage by the tunnel of the deepest workings of the district and the existence of rich ore at those depths.

In like manner comes a report from the same district of $1284 ore in the Trilby at a depth of 1200 ft., and, as usual, accompanied by the statement that "the extent of the body cannot be determined at this time, as no development has been done." What happens is this: directly a shot exposes some rich stuff, the owner or lessee rushes off to the assay office with a few pieces of it, and then gives the newspapers the assay. Whereas if he would wait until be could give the return of a shipment, or even of a quartered-down average sample, of say a ton only of the ore, it would be much more satisfactory and less deceptive.

Butte

Jan. 29—A number of property owners along the line of the proposed tramway from the Davis-Daly Company's Colorado shaft to the Great Northern tracks have begun action to enjoin the city council from granting the right to the mining company. The ground on which they base their protest is that the council, in doing the act complained of, would be granting a franchise which they have no right to do without first submitting the matter to the taxpayers. The city attorney has recently submitted his opinion to the council stating that they had this power, but the matter will now be fought out in the courts and should be definitely determined within a short time after the hearing on the order to show cause which will be had next week. In the meantime, the mining company is not shipping any ore.

The Bank of Fergus County recently secured a judgment against the North Moccasin Gold Mining Company for $120,000. The action was brought on behalf of the bondholders and went by default. A serious cave some time ago resulted in a cessation of operations and nothing was done since so the company was unable to meet the interest on the bonds.

A holder of a considerable amount of stock in the North Butte Mining Company has received a letter from the secretary at Duluth in answer to inquiries as to the condition of the property which says:

"We have your letters making inquiry relative to the present condition of this company, on account of the decline of its stock upon the stock market. The rumors which you have heard relative to the mines are very much exaggerated. While it is true that on the 2000 and 2200 levels of the two principal veins of our mines the very rich ore values such as encountered on the 1600 and 1800 levels were not developed, commercial ore of a good grade was shown and large stopes opened up, which insures the continuance of the mines. The cost of manufacturing copper from this lower grade ore is increased. This increased cost of production, together with the low price and unsettled condition of the copper metal during the past year, necessarily has reduced the earning capacity, and probably will cause a reduction in the dividend rate, unless the price of copper advances. The latest advices from the mines show that a much better grade of ore is now being found. The company has maintained a good production and at a profit. It has carried on development work well ahead of extraction. At present it has one operating shaft, and work is now under way toward sinking of a second shaft. There is under consideration a new smelting contract which will be upon much more favorable terms than the one now in existence. The cash surplus of the company is not large at present; it never has been the policy of the management to accumulate a large surplus, but to distribute it to the stockholders as earned. There are no debts except for current operations, which are taken care of promptly each month. We trust this information will satisfy and reassure you that the North Butte mines are not as represented by the rumors now afloat."

Salt Lake City

Jan. 27—The annual meeting of the Salt Lake Stock and Mining exchange was held Jan 22. Two new members were elected to membership in the governing committee, namely, F. C. Dern, and R. J. Evans. The other members of the board are James A. Pollock, W. J. Browning, W. H. Child, W. Nebeker, R. S. Wimmer, James L. Hamilton, and W. H. Tibbals. The board has not elected its officers yet, though it is not conceded probable there will be any important changes from the present. James A. Pollock to remain as president, James A. Shorten, secretary, and W. A. Wasson, caller. Secretary Shorten submitted the annual report, dated Jan. 1, 1910, which showed that the last year had been a successful and prosperous one. The exchange has grown steadily within the last few years from almost nothing to the present substantial organization.

Upon retiring from the active management of the Boston Consolidated Mining Company, Lafayette Hanchett was presented with a silver service of six pieces by the employees of the company's mine, mill and office. Mr. Hanchett has been general manager of the Boston Consolidated for six years. The silver is engraved with the Hanchett monogram, and on the reverse side of the tray is the inscription, "Presented to Lafayette Hanchett, general manager of the Boston Consolidated Mining Company, July 1, 1904, Feb. 1, 1910, by the employees of the mine, mill and office. 'A friend is worth all the hazards we can run.'" Mr. Hanchett has left for a tour of the world and expects to be absent about a year. Until the details of the Utah Copper-Boston Consolidated merger are finally adjusted, Louis S. Cates will act as general manager.

Work is progressing on the new smelting plant of the International Smelting and Refining Company. The new plant is at the foot of the Oquirrh range, 4½ miles from Tooele and about 6½ from the San Pedro, Los Angeles & Salt Lake railroad with which it is connected by the Tooele Valley railroad. The aërial tramway about 4½ miles long, connecting the Utah Consolidated company's properties at Bingham with the smeltery is nearing completion. The plant will cover an area of 60 acres. Some delays have been caused by the severe winter weather and the late arrival of structural steel. The first corps of engineers connected with the building of the new plant arrived in Tooele on Dec. 8, 1908, and began work on the survey for the Tooele Valley railroad which was completed in the latter part of May. Following the opening of this line, actual work on the smeltery construction was started. Since that time operations have been carried on on a large scale, and the construction forces have made good progress. Work on some of the buildings has been affected by lack of steel.

Indianapolis

Jan. 31—The Mine Workers of America are having the most turbulent convention in the history of the association. Efforts have been made on one or two occasions to break up the convention and so persistent have been the enemies of President Lewis that offending delegates were removed from the convention hall.

Plans have been perfected for the confederation of the Mine Workers of America and the Western Federation of Mines. The keynote of the speeches made during the week was the necessity of standing together in the demand of the bituminous miners for an increase in wages of 10 per cent. or more; that no one district organization shall sign the uniform wage contract till all districts shall sign and if a strike is inevitable in one or more districts, all shall strike. The delegates were not satisfied with urging immediate action, following April 1, among the mine workers alone. They insist that between now and that time all organizations should be asked to coöperate; that the railroad organizations should be asked to refuse to haul nonunion laborers or nonunion coal; that the steel workers coöperate in a similar manner, all of the organizations uniting in a general struggle for better conditions. President Lewis and other conservative delegates urged that the organization proceed cautiously. They said the best plan was to continue work after April 1 at the present scale until an agreement is signed covering all the districts. This suggestion aroused some of the radical delegates, who charged Mr. Lewis with having previously played into the hands of the operators and said that he was preparing to do so again.

It is not unlikely that the delegates will go to Toledo in a body to attend the wage conference. It is known that the operators will oppose an increase in the scale and the delegates do not seem willing to trust the strength of the scale committee to cope with the operators in the conference which begins Feb. 2.

The miners went on record as opposed to the use of electricity in coal mines. They declared that the leakage on account of poor insulation caused the sparks to ignite the gas in mines and occasion explosions. They also claimed that the use of electricity was hazardous because of the kind of explosives they are now required to use for blasting purposes.

Cobalt

Jan. 28—The financial statements of the two big Cobalt mines, the La Rose and the Nipissing, show a big difference. The La Rose statement shows cash in the bank, ore in transit and at the smelteries and ore at the mine ready for shipment, to the value of $382,638, while for the Nipissing it is almost $1,000,000 in excess of this, amounting to $1,322,985. The latter company has been showing a steady improvement the last year, and the surplus for that period is about $400,000.

The O'Brien option on the Miller and Gillies claims in the Porcupine district has been abandoned and the diamond drill is being taken out. It is stated that a hitch occurred in getting the option extended and as several other people were after the property, the owners would not extend the option without a large part of the initial payment of $50,000 being paid. It is understood that an option has been given to other people for a larger sum than M. J. O'Brien was to have paid.

At the annual meeting of the Crown Reserve in Montreal, Jan. 26, President Carson announced that the regular dividend of 24 per cent. and bonus of 36 per cent. would be paid during 1910. The surplus at the end of the year amounted to $549,275, while dividends to the amount of $1,238,169 had been paid. The profits on operating amounted to $1,436,398.

At the annual meeting of the Hargrave company the directors were authorized to issue treasury stock to the amount of $1,400,000 for development purposes as might be deemed advisable. President W. N. Ferguson stated that ore was being sacked from two shafts. Manager Neelands reported that good silver contents were found in drifting north from the shaft on No. 1 vein, and that on No. 3 the vein varying from 1 to 6 in. assayed 3000 oz. The financial statement showed a credit balance of $31,273.

Toronto

Jan. 27—The first meeting of the Canadian Commission for the Conservation of Natural Resources, took place at Ottawa. Hon. Clifford Sifton, chairman, in his inaugural address reviewed the circumstances which led to the organization of the commission. He noted that the first great work should be the making of a complete inventory of resources, and pointed out that in spite of the increase of the mineral production of Canada during recent years this development, exclusive of the Yukon, had taken place only in the settled portions of the country, while by far the greater portion of the Dominion remained unprospected. Great bodies of minerals known to exist were at present useless because of the lack of effective measures of treatment. Electric smelting processes promised an enormous development for the iron-ore deposits of Ontario. At Cobalt wasteful methods of mining prevailed, and in British Columbia there was failure to save valuable mineral contents such as zinc, in the treatment of copper ores. The fatality record in mining accidents was one of the worst in the world, and there was urgent need of effort to protect the mining population. The water powers of Canada were roughly estimated as capable of a possible development of nearly 17,000,000 h.p., while the present development was only about 511,000 horsepower.

The remainder of the day was devoted to a reception of the commission by Earl Grey and Sir Wilfrid Laurier, and visits to some of the lumber mills.

Addresses were given by Dr. B. E. Fernow, dean of the faculty of forestry in Toronto University on "Forestry;" Dr. J. W. Robertson on the "Conservation of Agricultural Resources," and Hon. Adam Bock on the Ontario hydroelectric power scheme, which he stated would ultimately extend over the whole of southwest Ontario from Kingston to Georgian bay, while the northeastern portion of the province from North bay to the St. Lawrence would be covered by a similar system.

Dr. Eugene Haanel, director of mines, gave an address on "Possible Economies in the Production of Minerals in Canada." The foremost of these was electric smelting for the utilization of low-grade iron ores. The economical treatment of zinc products was urged. Another important saving could be effected by the development of the 36,000 sq.m. of peat possessed by Canada. Peat mull, a fibrous by-product of the peat manufacture, could then be had in quantities large enough to be profitable in export fruit packing. More enlightened methods in the mining of coal were also recommended, the present system being criminally wasteful. Doctor Haanel gave figures to show the appalling frequency of mining accidents, and urged the safe guarding of Canadian miners. The process of nickel mining was extremely wasteful, and all Canada got out of the nickel mines was the employment of an inconsiderable number of men, as compared with the advantage which would be obtained by exporting the finished product. A more rational treatment of Cobalt ores was necessary in order to reduce waste. Perhaps the best solution of the problem would be the establishment of well-equipped government laboratories for research.

Committees were appointed for the different branches of the work, the committee on minerals being as follows: Dr. H. S. Beland, chairman; Prof. Howard Murray, Halifax, N. S.; Hon. William Templeman, Canadian Minister of Mines; John Hendry, Vancouver, B. C., and the ex-officio members of the commission representing the various provinces.

The committee on minerals presented a report recommending the compilation of statistics; that mining companies be required to furnish an annual report of their output, and that the manufacture and use of explosives should be carefully regulated.

Cananea, Sonora, Mexico

Jan. 29—Approximately $400,000 has been spent by the Greene-Cananea company during the last year for new equipment, betterments and extraordinary repair work. All of this has been charged to operating costs currently, and the year's profit is lessened accordingly. The principal innovations added in 1909 are noted below. At the mines there was a greater amount of prospecting than in any previous year and a signal advance in tunnel work throughout. New ore bins have been put in at the Henrietta mine, near the Pavo Real adit, and the capacity of the Kirk bins was doubled. Steam pumps, with a few exceptions, have been supplanted by electric, as have nearly all the hoists; a 11,000-volt electric line was completed to the Henrietta, a distance of nine miles from the main plant, late in December. The Sierra de Cobre has been opened at three separate points; the arrangements for unwatering the lower levels of the Capote were made, and a pump set up on the 400-ft. level; and the Cobre No. 2, a part of the old Cobre Grande, was put on the producing list as a part of the Kirk mine.

An automatic sampler at the crusher bins, two large pumps in concentrating mill No. 2 for recirculation, a cooling tower for the same mill, a precipitating plant, two additional units of 40 vanners each and an impounding dam were the main improvements at this department. The new vanners are for treating tailings only; and, basing their totals from a normal ratio of concentration, the added capacities make the plant's entire tonnage range near 95,000 metric tons monthly. Mill No. 2 was shut down on Jan. 1 for rearrangement and repairs.

A new crusher at the end of the initial conveyer, an automatic sampler in the sampling mill, and a raising of the conveyer from the sampling mill to the spreading beds in order to obtain a horizontal position, are the main changes in the smelting plant. Additions to the reverberatory-furnace equipment are under advisement.

A marked lessening in power costs has been effected through the two large additions made in the power plant. The 6000-cu.ft. compressor was installed for the benefit of the mines, and the Veta takes practically all its supply. While all electrical-employing points were strengthened by the new 1500-kw. generator, its main purposes are to answer the needs of the mining end. A duplication of each of these units may take place during the present year. A renewal of all transformer stations has been an expensive item connected with the entire rearrangement of electrical power. The advantages of the new rate secured from the Southern Pacific railway will be a noticeable item in the final costs of copper from now on. Dr. L. D. Ricketts is in Cananea for an extended stay and is looking into several details with a view of further cost retrenchment. W. D. Thornton, president of the company, is also on the ground.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

Knights Island—S. A. Hemple, manager of this copper company, reports property in a flourishing condition. Development work has been planned for the coming season.

Bonanza—Freight is en route to the copper property in the Copper river valley. R. F. McClellan is superintendent. Ore bunkers will be built.

California-Alaska—The company, operating a quartz property on Falls creek, has been reorganized and will begin development work early in the spring. John Kapsilmanis, is now the controlling factor in the company.

Gold Bullion—This company, operating in the Willow Creek region, Knik, has purchased an aërial tram to transport the ore from the portal of the tunnel to the valley below, where a mill is placed. The ore treated by the mill last season averaged over $100 per ton. F. McCoy, of Seattle, is manager.

Ellamar—This copper mine has resumed shipments of ore to Tacoma, the last steamer taking 650 tons.

Arizona

COCHISE COUNTY

Calumet & Arizona—Gordon R. Campbell, secretary, says: "The company has over $3,500,000 of surplus funds. It has spent $1,000,000 in the development of outside properties that have been considered valuable and worthy of such development. Development of rich sulphide ores in the lower levels of Oliver shaft gives reasonable basis for the hope that similar ores also will be found at greater depth in the Irish Mag shaft. We are finding good ore now 1000 ft. deeper than it was believed to have existed 10 years ago. The physical and financial conditions of the company are better today and its prospects for the future are brighter than at any time in the past five years. The company will continue to earn and to pay dividends to its stockholders for many years."

GRAHAM COUNTY

The Supreme Court of Arizona refused to grant the Arizona Copper company, of Clifton, a rehearing in the tailings case, and confirmed the injunction that compels the copper company to keep all slimes, tailings and débris from the works out of the river. The company gave notice of appeal to the Supreme Court of the United States.

MARICOPA COUNTY

Vulture—Sixty to seventy men have been kept steadily at work and more than $150,000 has been expended during 1909. The new work by the Vulture Mines Company amounts to 3085 ft., consisting of crosscuts, drifts and raises, practically all of which has been on the Nos. 4, 5 and 6 levels, and in virgin ground below the old workings. The work of timbering the east incline has progressed satisfactorily. It has now reached 275 ft. and will soon be completed, after which this shaft will be sunk. The ore blocked continues to increase as the work progresses and the values are fully maintained, particularly on the No. 6 level, where another rich oreshoot was encountered. The mill has run steadily, meeting operating expenses. The monthly average value is from $8.50 to $11.50 per ton. The production of bullion is $31,393. The production will soon be increased by the completion of the new mill, which will have four times greater capacity. Construction work is progressing rapidly on the new mill. The contract requires its completion before April. The specifications call for stamps weighing 1600 lb. W. Spencer Hutchinson is consulting engineer.

PIMA COUNTY

Twin Buttes—At the annual meeting, Michael Earles was elected president of the mining company and David S. Rose president of the Twin Buttes railroad. A sale of 18 m. of the railroad to the Southern Pacific was authorized. The capital stock was reduced to $2,000,000.

YUMA COUNTY

Little Butte—The shaft of the Little Butte near Bouse has reached 480 ft. R. P. Sharpe is manager.

Blue Slate—This group near Little Butte has a blue-slate formation with iron stringers carrying gold and copper. Two car loads shipped to El Paso gave a return of 18 per cent. copper. Thomas Bouse is one of the owners.

Continental—This company, owning 12 claims three miles west of Planet, has let a contract to run a 150-ft. tunnel with T. J. Hardwick in charge.

California

AMADOR COUNTY

Henrietta Mining Company—This company has been formed at San Jose, to work a copper mine. James Beatty, of San Jose, is president.

Dane-Mitchell Mining Company—This new corporation will work a mine at Pine Grove.

BUTTE COUNTY

Bucket Gravel Company—The "dry land" dredge of this company has commenced operations near Oroville. Water is used only for washing.

Crystal Peak—This company has been organized to operate the Crystal Peak mine near Enterprise.

Bumble Bee—At this mine, Morris ravine, F. W. Kuster superintendent, a chilean mill and concentrators have been installed, and from 12 to 18 tons of ore daily are being milled.

Chico—This company at Chico has 1012 acres of dredging land from 10 to 60 feet deep on the Dan Struter ranch and a dredge will be built. Frank Gilmore, of Red Bluff, is the president.

Mammoth Channel—This company has decided to carry on its prospecting operations for gravel with diamond drills.

Cherokee—The dredge owned by this company has quit work, the ground owned at Oroville having been worked out.

CALAVERAS COUNTY

Union—This mine at Stockton Hill is being reopened by James Maguire and John Varain, of San Andreas.

Utica—Forty of the 100 stamps of the Stickle mill of this company have been temporarily hung up.

Standard Amalgamated Exploration Company—This company, Oliver Reece, manager, has the Economic mine in San Antone district, 11 miles northeast of Angels, and is working also the Cuneo, Kate and Jane claims.

Boston—This mine in Mokelumne River district, three miles from San Andreas and long idle, will be started.

ELDORADO COUNTY

Cedar Creek—This mine at Indian Diggings is now being worked by Sacramento men who are taking out coarse placer gold.

Green Valley—L. J. Strait, owner of this mine at Green Valley, has applied to the California Débris Commission for a permit to work the property by hydraulic process. The tailings drain into Alleghany creek.

Mount Pleasant—From this property at Grizzly flat a $6000 gold brick was the cleanup for December.

Golden Cup—Arrangements are being

made to resume work on this mine at Spanish Dry Diggings.

Pyramid—This mine at Shingle has started operations.

Inyo County

In the Queen Ann, an 8-ft. vein has been found on the 300 level. A small vein has been found in the Meacham & Keys, assaying $60 per ton. On the City the 5-stamp mill will soon begin crushing. The Columbia company is laying a new water-pipe line seven miles long. A reduction plant is on the way.

Graham & Jones—A shipment of machinery for the mine in the Argus range has been received at Searles. This mine was located about one year ago, the discovery encouraging many prospectors to go into that section. A 10-stamp mill will shortly be erected.

New Coso—This company near Darwin, C. T. Fitzhugh manager, is producing from the Lucky Jim. A 70-h.p. gasolene hoist is being installed.

Four Metals—This company is finding new orebodies in the Union mine, Cerro Gordo. Galena is being taken from the 1035 level.

Skidoo—Further details have been learned of the strike at the mine. The ore is now known to be of a better grade than was at first reported, and developments along the vein point favorably to an added production. Fifteen stamps are dropping. E. A. Montgomery, principal owner, is at the mine.

Buckeye—This company, near Fish Springs, L. C. Davis manager, has a large amount of machinery on the way for an electric development and reduction plant. Steam shovels will be installed. When the mill is up a cyanide plant will be put in.

Mariposa County

Greens Gulch—This mine near Mt. Bullion has been closed owing to a disagreement about wages of miners.

Ruth Pierce—The difficulties of this company near Hornitos have been settled and work will be resumed.

Number Nine—A vertical shaft will be sunk to the 800 level and the old incline shaft given up at this mine near Hornitos, Richard O'Brien, manager.

Nevada County

Lily—A. H. Hoge, of Cleveland, Ohio, has bonded this group, east of Grass Valley, and will sink a 300-ft. shaft. C. H. Mallon is president.

Champion—This Nevada City property is now under the management of T. A. Kelley, representing the Champion Mines Company.

Placer County

Crater—The 10-stamp mill and equipment on this mine near Ophir has been completed. The mine is owned by W. P. Hammon, of San Francisco, and 40 men are at work.

Colorado

Lake County—Leadville

A number of lessees are at work on Rock and Iron hills, and at the Dome, Stone and La Plata mines 20 tons per diem are being shipped from each. It is stated that the ore contains enough lead carbonates to enable them to have the ore smelted free of charge. The ore is hauled to the Yak switch.

Ella Beeler—Lessees on the above mine are shipping $10 ore to the smeltery, and the orebody is widening.

Houston—This mine, above the Ella Beeler, is sinking a winze from the tunnel on a 6-in. streak of ore.

Sunday—In a crosscut from a 100-ft. lift sunk 100 ft. below the tunnel level, it is stated that an 8-ft. vein has been intersected, which has 3 ft. of solid ore.

Yak Tunnel—It will be some months yet before the company will be able to lease the ground of the Resurrection No. 1 and 2, and the Sedalia or Silent Friend, but the water is said to be running two feet deep on the floor of the tunnel, and these properties are being rapidly drained. The monthly output from the tunnel is about 7000 tons of ore.

Garbutt—The lessees on this Breece hill mine are outputting 75 tons of good-grade ore daily.

Morning Star Consolidated—The lessees on this company's mines are shipping ore daily.

Gold Basin—The lessees are shipping seven carloads of ore per month.

Routt County

There are now three shipping mines on the Moffat road from the Oak Creek section of the Yampa coalfield the Prentice mine from a 14-ft. seam of clear coal which retails in Denver for $5.25 per ton as against $4.25 for northern coalfield lignites; the Oak Hills mines, S. M. Perry, manager; and the Juniper mines, Mr. Craise, manager. The latter is now in course of being equipped with adequate machinery, tipple, etc. The Oak Hills company is equipped with one of the finest and most modern plants in the West at a cost of $500,000 and heavy shipments are being made.

San Juan Region

Silverton has been suffering greatly from snow blockades and want of coal, and the output of ore has been largely curtailed, and will continue to be until spring opens the trails. The December shipments were 4800 tons.

Camp Bird—This mine in December crushed in 29 days 6791 tons yielding 6487 oz. of bullion and 784 tons of concentrates. The profit for the month was about $100,000.

Teller County—Cripple Creek

Findley—At the 11th level Frank Clay, lessee, has a shoot of ore, of which the screenings will give 2 oz. gold per ton, and the coarse rock one ounce.

Modoc—In the Ocean Wave claim on the saddle between Bull hill and Battle mountain, a crosscut at the 11th level has opened a parallel vein to the main Modoc lode, and in an upraise it is reported that the vein has attained a width of 8 ft. At the 9th level of the main Modoc vein, the lessees are shipping high-grade screenings and ore.

Doctor-Jack Pot—This mine, worked by the General Leasing Company, is again to the fore with a strike of 3 ft. of ore running for 2 to 5 oz. gold per ton. Sherman Bell, manager.

Mollie Kathleen—This mine, which adjoins the Hoosier and Friday, just north of the Gold King on Tenderfoot hill, has sent out two carloads recently.

Trail—The Trail and Blue Bird, adjoining properties but different owners, are under lease to the Humphreys-Thompson Leasing Company. By agreement with the latter mine, which has one of the deepest shafts in the district (over 1300 ft.), a drift on the 800 level was run into the Trail vein, exposing over 8 ft. of payable mill ore.

Strong—Persistent statements come from Cripple Creek that sealed box cars containing ore admitted to yield 10 to 15 oz. gold to the ton, are being sent from the mine. The company is controlled by Lennox & Giddings, of Colorado Springs, who never give out any statements as to what the mine is doing.

Jolly Tar—This mine, which adjoins the Strong, Victor, is shipping again, and has sent out a car of ounce ore from the 100-ft. level. This mine, like the Gold Coin, is in the granite, just outside the breccia area.

Stratton's Estate—Lessees on the Six Points mine on Bull hill have broken into a 2-ft. vein of ore that runs 2 oz. gold per ton. Block 239 of Stratton's Estate has ore that is returning 4 and 5 oz. gold per ton. It adjoins the American Eagle, which is also shipping 2- to 4-oz. ore.

Lucky Corner—This and the Little Clara and Callie mines, operated through the Ophelia, formerly known as the Moffat tunnel leased by the Humphreys-Thompson company, are shipping 10 carloads per week.

Abe Lincoln—This property under lease to John Sharpe has 3 ft. of ore and is outputting about three carloads per week.

Jerry Johnson—Lessee Edwin Gaylord, on the Damon claim of the company, is breaking ore 14 ft. wide, with bulk values of $28 per ton in gold, and this large orebody has been worked for nearly a year, with no decrease in size and values. Present output, two cars per diem.

Savage—The Gold King mine, on Gold hill, owned by the company, is shipping from the recent strike, and the ore averages $25 per ton, and contains sylvanite and free gold. Edward Kimsey is the manager.

Elkton—From the Gregory mine, on Raven hill, steady shipments are being made from a vein 4 ft. wide, said to run from $14 to $33 per ton from wall to wall.

Idaho

Coeur d' Alene District

Vendetta—A crosscut has opened a vein 15 ft. wide carrying lead and silver.

Coeur d'Alene-Vulcan—The lower tunnel has gone 1150 ft. with 1850 ft. to go to get the big shoot uncovered above. Four veins will be cut by the tunnel.

Advance—The company has settled its difficulties and work will resume April 1 on this property near Sandstorm.

Big Elk—The lower crosscut has tapped lode and the drift will be run 1800 ft. to get under shaft at depth of 900 ft. Copper ore taken from shaft and sacked.

Nabob—The long lower tunnel is being driven in 250 ft. with 1700 ft. to go. Work was recently resumed after a long shutdown.

Oreano—The face of the drift is filled with iron carbonates at 600 feet.

Coal Creek—The drift has exposed chalcopyrite for 100 ft. and crosscut from face of drift has gone 20 ft. in high-grade ore.

Monarch—This mine is shipping several carloads of lead-silver ore per month, taken out while driving the 860-ft. raise, which will be completed Feb. 1.

Sterling—Carbonate ore has been encountered by tunnel at 700 ft. The property has the Bunker Hill & Sullivan vein.

Pine Creek—Five feet of good galena and zinc ore has been opened.

Hercules—This company gives the mine employees a holiday every Sunday, a feature unusual in the district. Men must take out enough ore in six days, however, to run the mill seven days.

Indiana

Indiana furnished 54.51 per cent. of the limestone output of the country during the year 1908, and stonemen estimate that when the figures for 1909 are compiled the amount will be much larger. The total limestone output of the State in 1908 was valued at $3,487,039, an increase of $109,039 over 1907. Of this output about 80 per cent. was quarried in Lawrence county.

Pittsburg—Two hundred miners working in the mine near Sanford, demanded that an engineer be on duty at the mine while the shots are being fired. The men declare that under present arrangements they would have no means of escape in case of an accident during the hour which intervenes between the time the day engineer goes off duty and the night man comes on. The entries are now so long that the men cannot get their shots fired in time for the day engineer to hoist them to the surface.

Vandalia Coal Company—A. M. Ogle, president, announces that within a short time two new mines will be opened in the company's undeveloped property near West Terre Haute. The machinery for each mine will cost between $100,000 and $150,000, and 1000 employees will be necessary to operate the two. Drilling has disclosed satisfactory coal deposits in this territory. The new mines will have daily capacities of 2000 tons, and will be equipped with the best machinery and electric power. The company has at present 13 mines in operation.

Michigan

Copper

Mohawk—This mine has reached the hanging wall of the Kearsarge lode in the crosscut from the 1st level of No. 6 shaft and found it to be about 18 ft. wide and well charged with heavy copper. Drifting has been started in both directions and as soon as the shaft house is ready to handle rock, shipments to the mill will be made. Sinking will be resumed shortly.

Ojibway—This property has called an assessment of $2 per share—payable in March and October. This will afford funds to carry on the development. A compressor has been ordered and upon its going into service additional drills will be started. Drifts from the 500- and 650-ft. levels of both shafts are opening a good grade of stamp rock.

New Baltic—No. 3 drill hole has reached 140 ft. This drill is going down 1100 ft. north of No. 2 hole and will reach the lode at about 600 feet.

Oneca—The company has rigged up a drilling outfit 2000 ft. southwest of the No. 5 hole, from which a core was taken showing a mineralized amygdaloid formation. This new drill will cut this lode at 600 ft. The No. 5 hole continues sinking to expose the Oneca lode.

Allouez—In the sinking of the two shafts and the extension of the several drifts good ground continues to be opened. Production is being increased as the first head in the new addition to the stamp mill has gone into commission.

Montana

Butte District

The January output is estimated at 22,867,800 lb. An increase over December of nearly 6,000,000 lb. and an approximation of the normal output.

Butte & Superior—The first shipment of concentrates from the Butte zinc ore was recently made from the Basin concentrator, and consisted of two carloads of 40 tons each. The concentrates average 50 per cent. zinc, and are reduced about three into one. When the spur to the mine is completed, shipments from mine to concentrator will be increased to 400 tons daily.

Tuolumne—The company is running a raise from the 1200-ft. level to the surface to ascertain what rights it has to the part of the Jessie vein now in dispute with the North Butte company.

Jefferson County

Corbin-Copper—A 200-ton concentrator has been ordered and will be in operation by April 1. The water will be taken from Clancy creek.

Madison County

Pritchett—N. J. Beilenberg, W. I. Higgins and others have recently acquired from Steward & Steward the lease and bond held by them. They plan to drive a crosscut tunnel 100 ft. to intersect a lead parallel to that already drifted upon.

Green-Campbell—John Wiant and B. C. Leyson have secured a lease and bond for $185,000 on the property at Silver Star.

Apex—The tunnel is in 520 ft. and the shaft is down 300 ft. On the 240-ft. level the vein was crosscut 70 ft. from the shaft. About 15 tons of ore are being treated daily at the mill.

Nevada

Esmeralda County

Goldfield Consolidated—During December the total production of the company was 20,234 tons containing $741,668, or an average of $36.65 per ton, of which the whole was milled with an average extraction of 93.83 per cent. The net profit to the company was $495,353, or $24.48 per ton. The development work consisted of 4390 lineal feet. Manager J. R. Finlay does not report on developments and mine conditions owing to his unfamiliarity therewith and the fact that Mr. Mackenzie and Mr. Henderson are both absent. He states, however, that the development work accomplished was undoubtedly successful to the usual extent and the amount of work done was unusually large. The mill has been demonstrated to have a daily capacity of fully 850 tons, due to certain additions to the machinery and equipment finished during the month. This increase of capacity has been accomplished without any loss in the metallurgical efficiency of the plant.

Unofficial reports note an important ore strike on the 1000-ft. level.

Goldfield Annex—This mine has made a rich strike on the Poloverde claim at 770 ft. in the latite. A station will be cut at this level.

Humboldt County

Seven Troughs Coalition—The company has acquired the Kindergarten by exchange of stock and will continue development and start the mill soon. L. A. Friedman is in charge.

LINCOLN COUNTY

Occidental—The mill has been completed and will be in operation as soon as the cyanide equipment is finished.

Horseshoe—The mill is finished and will make a test run on ore from the Buck and Snowflake mines.

NYE COUNTY

Belmont—The improvement in the vein at the 1100-ft. level is considered important for the mine and the district.

Montana-Tonopah—This property is continuing extensive development and producing about 1000 tons weekly.

Tonopah Extension—The mill is now in operation, dropping 30 stamps.

Pennsylvania

BITUMINOUS COAL

Injured mine workers, or their dependent survivors—widows and children—are taking full advantage of the employers' liability act in the Circuit and District United States courts. Some substantial verdicts have been brought in by more or less sympathetic juries gainst coal companies, but as a rule, the amages were not excessive relative to he injuries sustained, particularlyly as he Federal judges insist very strictly hat direct contributory negligence must e proved before he permits the case to o before the jury. On the other hand, he coal companies claim that they are ut to great trouble and expense in defending petty and frivolous actions, which ave for their sole purpose attempts to orce the mining corporations to a settlement out of court.

Utah

JUAB COUNTY

A total of 141 cars of ore were shipped y the mines of the Tintic district for he week ended Jan. 21, as follows: Centennial Eureka, 43; Uncle Sam Consoliated, 4; Colorado, 21; Sioux Consoliated, 17; Iron Blossom, 26; Dragon ron, 4; Grand Central, 2; Scranton, 6; agle & Blue Bell, 6; Gemini, 2; Ridge Valley, 2; Chief Consolidated, 1; Yanee Consolidated, 4; Victoria, 2; Mamoth, 1.

Centennial-Eureka—A daily output of 50 tons of shipping ore is being maintained. About 250 men are employed on wo shifts. The 2200-ft. drain tunnel hich will tap the workings at 550 ft. elow the shaft collar has been advanced rom both ends, a total of nearly 1300 eet.

Colorado—About 70 men are employed. he mine is being operated on two shifts ith an output of about 200 tons per day.

Iron Blossom—About 63 men are employed on two shifts. No. 1 shaft is producing about 75 tons per day and No. 3 120 tons. A depth of 455 ft. has been reached in the No. 3 shaft. A second level will be opened below the blanket vein now mined from the 385 level.

Chief Consolidated—A force of 50 men is employed. Sinking from the 1700 to the water level will soon be begun. Some ore is being shipped.

Gemini—The workings below the water level are flooded but pumps will be installed. Shipments are being maintained. J. C. McChrystal is general manager.

SALT LAKE COUNTY

Bingham-New Haven—From 70 to 80 tons of ore are being milled per 24 hours. H. G. Turley is superintendent.

United States Mining—Only one shift of 110 to 120 men is being worked. A daily output of 250 tons of lead ore is being maintained.

Highland Boy—A station is being cut on the 900 level and raising will connect at the 500 level with the vertical shaft. About one-third of the daily output of 800 tons is being produced from below the 700 or main tunnel level.

North Utah—Lead ore, carrying more gold and silver than heretofore, has been encountered in a stope which is being driven above the 227-ft. level of the Butler Liberal section of this property. The gold and silver content is new for this mine as the ore has been principally valuable for its lead. The new orebody which was opened recently on a lower hill is reported to be holding out well. A crosscut is being driven to open this ore north of the shaft.

SUMMIT COUNTY

Park City ore shipments, in pounds, for the week ended Jan. 22, were as follows: Silver King Coalition, 780,380; Little Bell, 269,000; American Flag, 130,800; Daly-West, 1,300,040; Daly-Judge, 844,000: Daly-Judge (zinc) 996,790; total, 4,321,010 pounds.

American Flag—Some of the working force has been laid off recently in the upper levels of this property. Development, however, is being pushed in the lower workings and good ore is reported on the 1100 level.

Little Bell Consolidated—The company paid its first dividend Dec. 22. A report to the stockholders at this time showed that during September, October and November, 1909, there was mined 1239 tons of ore which was sold for $43,935. During December 498 tons of ore were shipped to the smelteries which sold for $20,213. At the present time the production is between 450 and 500 tons per month.

Silver King Consolidated—The main working winze from the 1100 level has been sunk from the 1550 level to the 1600 level, a station cut and drifting begun. Work is being pushed on the 1550 level and considerable ore is being taken out. The ore is being mined from development work only, and a second shipment is now under way to the valley smelteries. The first shipment from the mine several weeks ago carried 65 to 70 oz. of silver, over 40 per cent. lead and about $4 gold. The testimony of the Silver King Consolidated vs. Silver King Coalition is being taken in the United States Court.

Washington

KING COUNTY

The United States Government has established a rescue station at the school of mines of the University of Washington, Seattle, for instructing and training miners in the use of the Draeger oxygen apparatus in mine-rescue work. This includes instructions on the subject of mine gases.

OKANOGAN COUNTY

Multnomah—F. O. Hudnutt, Nespelem, has charge of this property. Development is being done.

SNOHOMISH COUNTY

Red Cliff—P. J. Bardon, of Everett, has been appointed receiver of this property, near Berlin.

STEVENS COUNTY

Krug—The development work on this property is meeting with success. A tunnel is being driven to tap the vein at 300 ft., and the ore has improved. August Krug, Chewelah, is president.

Dead Medicine—This old mine is to be opened by the Clugston company, of Spokane. A 50-ton concentrator will be installed.

Wisconsin

ZINC-LEAD DISTRICT

Traffic conditions have somewhat improved and a number of mining companies forced to close down by lack of coal are again pumping. Prospecting has commenced after six weeks of inactivity. A new company was formed to develop a 20-acre tract northeast of the Klar-Piquette. The Meekers Grove Company has been reorganized under the name of the Jenkinsville Mining Company and will reopen the mine at Cuba City. The Wisconsin Zinc Company has taken option on the Lawrence prospect adjoining the Dall mine; this company will provide a concentrating mill at the Drum shaft, south of Benton.

Canada

BRITISH COLUMBIA

Consolidated—The plant at Trial in December smelted in the copper furnaces 36,094 tons, and in the lead furnaces 4263 tons. The product was 7580 oz.

gold, 186,829 oz. silver, 354,520 lb. copper and 3,332,140 lb. lead; total value, $395,214.

ONTARIO

New discoveries of high-grade ore have been made on the Mann and Bonsall properties at Gowganda.

Reeves-Dobie—Another 30-ton shipment of high-grade ore has been made from this Gowganda mine.

Beaver Lake—Silver has been found in the big smaltite vein at the 135-ft. level at South Lorrain.

ONTARIO-COBALT

For the week ended Jan. 21, 13 mines shipped 26 cars of ore as follows: La Rose, 256,059; Nipissing, 302,939; Drummond, 264,200; Kerr Lake, 182,392; Crown Reserve, 123,353; Cobalt Lake, 132,000; King Edward, 49,952; Buffalo, 47,644; O'Brien, 64,056; Right-of-Way, 64,902; McKinley-Darragh, 50,329; Temiskaming, 60,000; total 1,597,826 pounds.

Black—The big cobalt vein has been cut at the 200-ft. level but the silver contents are low.

Nancy Helen—This property has stopped work.

Right-of-Way—A 2000-oz. vein has been discovered on the 120-ft. level of the No. 3 shaft.

Sagdola—This property in the Gillies Limit has let a contract for a 100-ft. shaft.

McKinley-Darragh—An extension to the concentrator is under way which when completed will increase the capacity to 120 tons per day.

Cobalt Lake—Two carloads of ore were recently taken from the new vein at the south end of the property near the McKinley-Darragh. In one of these veins a decided improvement has taken place, the face showing 5 in. of high-grade ore. Drifting will connect the winze which has been sunk to the 250-ft. level with the shaft and other workings.

Trethewey—In following up the veins of the Hudson Bay property adjoining on the north end five veins of high-grade ore have been found, one of them being from 3 to 4 in. wide. A shaft is being sunk at this point.

Peterson Lake—The action brought by this company at Cobalt against Edward Steindler, David M. Steindler and Jacob A. Jacobs, was settled Jan. 19, Judge Teetzel acting as arbitrator. By his decision the defendants are to return to the company 160,000 shares of stock. Edward Steindler is to pay $50,000 to the company secured by sale of stock, and the company is given two years to repay a loan of $28,000 made by D. M. Steindler with 5 per cent. interest. The suit brought by the Peterson Lake company against the Nova Scotia for the cancelation of the lease held by the latter and $75,000 damages for ore claimed to have been wrongfully taken by the Nova Scotia from an area not included in the lease, is not affected by this settlement and is still in progress.

YUKON TERRITORY

Word has been received at Whitehorse of a rich find on claims owned by H. E. Porter in the Wheaton River valley.

Mexico

The failure of the U. S. Banking Company in Mexico City and the resulting closing of the bank's branches at Oaxaca and Parral, has caused inconvenience and loss to the large number of American mining companies using this institution in the course of business. Payrolls have been held up in consequence and several companies have their funds involved for a time. The bank is in the hands of a receiver and will be reorganized.

CHIHUAHUA

Prieta—The new milling plant will be put in operation during February.

Buena Tierra—An important lead-ore discovery is reported in this Santa Eulalia mine. It is also known that important zinc orebodies are being opened up in the lower levels.

Cienega—This company operating near Moris in the western part of the State recently marketed at Chihuahua one bar of gold bullion. Richard O'Leary is manager.

San Francisco del Oro—This Parral company is to resume on a large scale during March. It has been closed for several months pending the selecting of a suitable process for the refractory ores.

Parral Consolidated Mines Company—This company is shipping weekly to the Cia. Minera de Peñoles smeltery about 15 cars of silicious ore.

La Cruz—This property in the Ocampo section is being successfully opened under the direction of Thomas Williams, superintendent.

COLIMA

Florida—This mine, a short distance north of Manzanillo, is being reopened by R. M. Stadden, of Manzanillo.

DURANGO

Lustre—This Indé property has been sold at public sale for debts and has been bought in by S. H. McKee, of Pittsburg, Penn., representing the creditors. The company is in process of reorganization.

JALISCO

Los Ailes—Shipments of copper ore from 10 to 13 per cent. are being made from these properties in the Ayutla district.

Almoloya—A 3-stamp mill and concentrating plant have been purchased for experimental purposes by the company, recently organized in Mexico City to acquire the Almoloya mine, Ameca district.

Santa Rosa—This company, organized in 1907 to acquire the Santa Rosa, or Chinos group, Ayutla district, is starting operations. A 10-stamp concentrating and amalgamating plant will be placed in commission. G. W. Daines, Columbus, O., is at the head of the company.

SONORA

El Tigre—Construction work has started on a new mill near the site of the old one. It will be a cyanide plant, three times the capacity of the present mill.

Promotorio—Eastern men are negotiating for this property.

North Fortuna—This company, with holdings in the Sahuaripa district, has been granted concessions to install hydroelectric power, and to utilize the waters of the Mulatos river for that purpose.

Santa Rosalia—This company has just finished a wagon road to Cananea at an outlay of $30,000, and has begun to ship ore to Douglas on a moderate scale.

Richfield Copper—A shipment of ore was made from this company's mine at Tuape last week which averaged over 10 per cent. copper and 26 oz. of silver per ton. It was sent to Aguascalientes.

Creston-Colorado—Owing to the possibility of a cave-in, the mechanical shops of this company were moved to a different location and enlarged.

Sunset Development Company—A large force of men has been put to work on the coal lands of this company, near La Barranca. It is allied to the Southern Pacific railway.

ZACATECAS

San Cristobal and Zacatecas—The Zacatecas Mining and Metallurgical Company, capital $1,000,000, has been formed to work the San Cristobal and Zacatecas groups of gold mines in the Zacatecas district and engage in custom milling. The San Cristobal mines are equipped with hoisting, drilling and pumping machinery, a 30-stamp mill, amalgamating plates and vanners. The new company will install electric hoists, improve the milling plant and build a cyanide plant capable of handling 150 tons daily. Bernard MacDonald, of Guanajuato, is planning the cyanide annex.

Africa

WEST AFRICA

Gold production of the West Coast and Ashanti in December is reported by the West African Chamber of Mines at 17,570 oz. For the year ended Dec. 31 the output was 279,386 oz. bullion in 1908, and 235,972 oz. in 1909; a decrease of 61,414 oz. The bullion reported in 1909 was equal to $4,650,750, or 225,000 oz. fine gold.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, Feb. 2—Coal trade in the Vest is active, but is still suffering from ar shortage and poor transportation.

In the East conditions in the bitumin-us trade are improving, though the short upply of cars is still in evidence. Trade enerally is more active. The anthracite rade is steady, with no special changes.

Interest in the West centers on the vage conference at Toledo, O., which be-ins today. The mine workers are ap-arently prepared to insist on their de-nand for a 10 per cent. increase, while he operators seem equally determined to esist any advance. At the United Mine Vorkers' convention in Indianapolis there vas a strong minority in favor of a gen-ral strike if the increase is not granted; ut President Lewis deprecated extreme neasures. It was resolved, however, that no district shall sign any agreement un-il all the district contracts are closed.

Coal Consolidation—A report comes rom Pittsburg that a consolidation is eing arranged of coal companies in the 'oughiogheny district. Pittsburg men, vith Clarkson & Co., of New York, are oncerned. The merger, it is said, will nclude the Huff Company mines, hold-ngs and railroads, the Kutz estate, its oldings and options; all the mineral ights and mines of the White's Creek ranch of A. W. Cook & Co.; the Liston-urg Coal Company, Elk Lick Coal Com-any, Somerset Fuel Company and the mith, Myers & Co. mines at Anspach. t is the intention to build a dam on the 'ough for a large electric plant. In the cheme is the extension of the Ursina & North Fork railroad in a northerly di-ection into Somerset county, opening up virgin coal territory.

COAL TRAFFIC NOTES

Shipments of bituminous coal to Lake orts for two years are reported as elow, in short tons:

District:	1908		1909	
	Tons.	PerCt.	Tons.	PerCt.
ittsburg........	8,700,000	55.2	8,687,305	55.8
hio..............	3,600,000	22.9	3,002,815	19.3
'est Virginia...	3,450,000	21.9	3,874,570	24.9
Total..........	15,750,000	100.0	15,564,690	100.0

The Ohio shipments showed a con-iderable decrease in 1909, and there was corresponding increase in West Vir-inia coal.

Coal tonnage originating on the lines f the Southern railway, 11 months ended lov. 30, was 2,397,640 in 1908, and ,040,841 in 1909; increase, 649,201 tons.

New York

ANTHRACITE

Feb. 2—Business continues good, as the weather has been favorable. Deliveries are easier.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.85@2; barley, $1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Conditions are a little better in the trade generally. Car supply is beginning to improve, though it is still far from what could be desired. Transportation is reasonably good, coal coming through in fair time when it is once loaded.

Demand seems to be improving generally and more coal is being taken, or at least asked for. Deliveries are still uncertain, the stocks at tidewater being low. Prices are about the same, a fair grade of steam coal bringing about $2.60, New York harbor, with better grades up to $3. Gas coal is still scarce.

The coastwise trade is unsettled. Rates are nominally unchanged, but vessel owners are holding back on account of uncertain and stormy weather.

Birmingham

Feb. 1—Coal operations in Alabama are active and the production is at the top notch. There is a demand for every ton of coal that can be mined and efforts are being made to lose no time. The railroads are big consumers. Shipments of coal out of the State are in good quantity and steady

There is a good demand for coke and the production is being kept up to a high mark. The product brings a good price.

Chicago

Jan. 31—Conditions in the local coal market are nearly normal, as a result of the continuance of mild weather. Fine coals, however, continue to command a high price, Illinois screenings bringing $1.90@2.10. Receipts are much better of all kinds of coal, and it can hardly be said that any kind is abnormally scarce. The demand for both steam and domestic continues large and country dealers show a disposition to have good-sized stocks on hand for another cold wave. In the city deliveries are hampered yet by the large amount of snow on streets and tracks, but the situation has steadily improved.

Illinois and Indiana coals bring $2.75@3.30; run-of-mine $2.15@2.35 and screenings $1.90@2.10. Both run-of-mine and screenings are in strong demand for steam purposes.

Coals from east of Indiana show less fluctuation, the supply in most cases being small enough to prevent anything like a slump. Hocking is in good and steady demand, at $3.15. Smokeless is moving more freely and selling at $3.75@4 for lump, and $3.25@3.45 for run-of-mine. Youghiogheny is in good demand at $3.15 for steam and $3.30 for gas ¾-in., and receipts are better. The anthracite market shows steady conditions, with supplies large except of chestnut.

Cleveland

Jan. 31—More bad weather has made coal deliveries irregular and uncertain, and has disarranged car supply at mines. Stocks are short and it is not easy to get coal that is needed. Prices are nominally about the same, but premiums and extra charges are common. There is a heavy demand for slack, which cannot always be supplied, and in some cases it has brought as much as run-of-mine.

Indianapolis

Jan. 31—There is no diminution of the coal-mining activity in this State. The markets are freely taking all that can be produced. Coal traffic on the various railroads continues unusually heavy. Much coal is going to the southern States as well as to northern and northwestern States, and the dealers are having the busiest time in their history.

Pittsburg

Feb. 1—The conference between operators and the United Mine Workers, to be held in Toledo, O., was yesterday postponed from today until tomorrow, as the mine workers' convention at Indianapolis did not get through with its work yesterday. While the conference will last several days it is improbable any agreement will be reached without a second or possibly a third conference.

A possibility which does not seem to have been given any attention is that of attempts being made to organize the miners in the Connellsville region. Coke men thoroughly familiar with the situation there believe there is a strong possibility of the men in the Connellsville district being brought into a strike; that it would take very little to stir up trouble. In the great anthracite strike large tonnages of Connellsville coke and coal went out to relieve the situation and in a contest in the bituminous field the mine workers' leaders would doubtless turn their attention to Connellsville to prevent its interfering with their contest.

The local coal market is strong, but not particularly active. Prices remain quotable at $1.15 for mine-run and nut, $1.25 for ¾-in., $1.40 for 1¼-in. domestic, with slack at 85@90 cents.

Connellsville Coke—The market has continued very dull. Several furnaces have had coke shipments suspended. Coke prices are purely nominal, and quotable roundly at $2.50 for furnace, either prompt or contract, with foundry coke at about $3 for prompt and $3@3.25 for contract.

The *Courier* reports production in the Connellsville and lower Connellsville regions in the week ended Jan. 22, at 471,222 tons, a gain of 14,000. Shipments were 5211 cars to Pittsburg, 8708 cars to points west of Pittsburg and 1124 cars to points east of Connellsville, a total of 15,043 cars.

St. Louis

Jan. 31—The general market conditions on coal seem to be rather the reverse from what they were last week—locally the demand is very firm, while out-of-town trade seems to be slack. The warm weather continued throughout the week. The market would be much better off were it not for the fact that railroads have already begun storing coal against a strike in April, and some very large orders have been placed in the last 10 days. Several of the larger companies are entirely sold out from the present time up to April 1. Several of the larger railroads have been buying coal in lots of 500 and 1000 cars. This also has steadied the market and has taken surplus coal off the market.

The car situation seems to be getting worse and while such roads as the Iron Mountain and Illinois Central were already in as bad a shape as possible, it seems that the roads which are directly tributary to St. Louis and always have plenty of cars, are now also short. Mines on these roads are getting very little better than one-half time. Every mine on the Louisville & Nashville today was shut down on account of no cars.

Screenings have eased off a little, especially for out-of-town shipment. Fine coal of all kinds is still very high. A cold wave is in sight which will very likely bolster up the market again.

Standard 2-in. lump coal is firm at $1.25 at mine, or $1.77 St. Louis; 6-in. lump is bringing $1.75 mine, or $2.27 St. Louis; mine-run is $1 at mine, or $1.52 St. Louis; 3-in. nut is $1.20 mine, or $1.72 St. Louis; 2-in. pea and slack is $1 at mine and $1.52 St. Louis. The premium which was offered on coal that will move out of town is diminishing steadily and is now only about 10 to 15c. per ton above these prices. Screenings are worth 65c. at mine, or $1.17 St. Louis; ¾-in. pea and slack, 50c. at mine, or $1.02 St. Louis.

Staunton, Mt. Olive and Springfield district 6-in. lump is $1.75 at mine, or $2.27 St. Louis; 2-in. lump is now $1.60 at mine, or $2.12 St. Louis. Mine-run is $1.50 mine, or $2.02 St. Louis.

Carterville 6-in. lump is $1.80 and 6-in. egg is also $1.80 per ton, or $2.47 per ton St. Louis; 3-in. nut is $1.75 mine, or $2.42 St. Louis; 2-in. screenings are firm at 90c. mines, or $1.57 St. Louis.

Franklin County 6-in. lump is $2.25 mine, or $2.92 St. Louis; 3-in. nut is $2 at mine, or $2.67 St. Louis; 1½-in. screenings are $1.10 mine, or $1.77 St. Louis.

Anthracite is in strong demand, but dealers in general are buying sparingly as they do not care to carry any coal over for next season. Circular is being maintained, $6.95 for chestnut, stove or egg sizes, and $6.70 for grate.

Foreign Coal Trade

United States Coal Exports—Exports of coal and coke from the United States, year ended Dec. 31, long tons:

	1908.	1909.	Changes
Anthracite..........	2,752,358	2,842,714	I. 90,356
Bituminous.........	9,100,819	9,693,843	I. 593,024
Total coal........	11,853,177	12,536,557	I. 683,380
Coke................	620,923	895,461	I. 274,538

Canada took in 1909 a total of 9,782,574 tons—2,802,361 anthracite and 6,980,213 bituminous—being 78 per cent. of the total exports. The coke went chiefly to Mexico and Canada.

United States Coal Imports—Imports of coal and coke into the United States, year ended Dec. 31, long tons:

	1908.	1909.	Changes.
Anthracite..........	16,483	4,709	D. 11,774
Bituminous...	1,487,416	1,257,629	D. 229,787
Total coal	1,503,899	1,262,338	D. 241,561
Coke.	129,591	170,671	I. 41,080

Canada furnished in 1909 a total of 1,043,419 tons of coal and nearly all the coke: Australia, 182,271 tons of coal; Japan, 14,344 tons coal. Imports are chiefly on the Pacific Coast and in the northwestern border States.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Jan. 22: Best Welsh steam, $4.14; seconds, $4.02; thirds, $3.90; dry coals, $3.96; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.28; seconds, $2.04. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount. Prices have hardened since the first of the year.

Iron Trade Review

New York, Feb. 2—Little by little the iron trade seems to be throwing off its waiting attitude, but progress is slow in most directions.

In pig iron there is more inquiry for basic and foundry iron. Producers now seem to be more willing to accept current prices for second-half delivery. Buyers are not inclined to pay more, and do not seem to be in any special hurry to close contracts.

In finished material there is more doing in structural steel, and inquiries are coming in for plates. The agricultural-implement people are beginning to talk about contracts for bars, and their requirements are expected to be large, as they are coming into the market at an unusually early date.

Pig Iron Production—The American Iron and Steel Association reports the make of pig iron in the United States in the second half of 1909 at 14,773,125 tons. This makes for the year 1909 a total of 25,795,471 long tons; which is 9,859,453 tons more than 1908, and 14,110 tons more than in 1907, heretofore the record year.

Baltimore

Feb. 1—Exports for the week included 4806 tons steel rails and 240 tons rail-joints to South Australia. Imports included 2313 tons spiegeleisen and 1164 tons manganese ore from Rotterdam; 1053 tons ferromanganese from Liverpool; 11,850 tons iron ore from Cuba.

Birmingham

Feb. 1—The new month starts in with a better feeling all around among the Southern pig-iron manufacturers. There is a better inquiry for the product with some sales. The quotations are strengthening, $14.50 being the figure given out. There is, however, still some $14 per ton, No. 2 foundry, iron to be had in this district, on quick delivery. The make in the Southern territory shows no improvement. Basic iron is in steady demand and brings a premium over the foundry iron. The inquiries received by Southern iron makers cover the first half of the year mostly, though a few requests are for prices for the third quarter.

Chicago

Jan. 31—Firmness continues in the iron market, with buying gradually extending into third-quarter needs and an increasing tonnage for the second-quarter contracted for. Malleable interests have continued to buy freely; regular foundry iron is still sluggish although a continuous, if slow, improvement is noted. Buying is mostly in small lots; the occasional sale over 1000 tons occurs often enough to swell the total to an increasing amount week by week. Second-quarter deliveries are most sought by melters; on these Southern brings $14@14.50 Birmingham, or $18.35@18.85 Chicago. Northern holds to $19@19.50, with sales comparatively small, but selling interests satisfied with the situation.

Cleveland

Jan. 31—Ore sales are dropping off, most of the merchant ore for the season having been placed.

Pig Iron—The market is rather quiet locally though inquiries keep coming in. There has been some talk of low-priced Southern iron offered by second hands. No general change in prices is noted.

Philadelphia

Feb. 2—Great activity prevails in the accumulation of supplies of ore for future smelting. It is the policy of blast furnaces in this territory to carry heavy supplies of ore, coke and coal. Inquiries today among the leading brokers and makers show a quiet condition in pig iron. While there is not the slightest symptom of weakness an easier feeling prevails throughout the entire industry. Some weeks ago the possibilities of a further upward tendency were recognized. At the present time no such tendency is apparent. The business of the past week consisted of small orders for foundry iron, two or three large orders for pipe iron, the renewal of some contracts for forge iron, the purchase of a few small lots of malleable iron and negotiations for basic pig which are not yet closed owing to difference over price. Today's quotations are $19 for No. 2X foundry, $18 for forge and $18.50 for basic.

Pittsburg

Feb. 1—The second month of the new year opens with demand for finished-steel products improved in no respect, while during the first month there was a progressive moderation in the tone of enthusiasm with which the trade opened the year. There has been no change in finished-steel prices thus far this year. In pig iron there has been a gradual, though comparatively slight, weakening. In coke and scrap there has also been a slight downward trend.

Pig Iron — It has become known throughout the trade that some time ago, although just when is unknown, the Pittsburg Steel Company bought from a prominent firm of merchants in Pittsburg 000 tons of basic pig iron for second-quarter delivery at $16.25, Valley, and 15,000 tons for third-quarter delivery at $16.75, Valley. It is insisted that the transaction does not accurately represent the market, since a billet trade was involved. It is a fact that the Pittsburg Steel Company has disposed of a large tonnage of billets in the past three months, and that a large part of the tonnage, if not all, found its way to the Jones & Laughlin Steel Company, which all told has taken in excess of 50,000 tons of billets from the outside. That it is to take more is very doubtful. Why there should have been such a storm of protest against the acceptance of the pig-iron transaction as representative of the market is not clear, for the average price involved would figure out $16.56¼, Valley, and it is known, from entirely independent sources, that prior to the news becoming public property basic pig iron was offered at $16.50, Valley, for February, March, April delivery. We quote the market at that price, representing a total decline of 75c. from the high point, reached early in November. Foundry iron is quotable 25c. lower than last week, at $16.75, Valley. Sales are reported to a Pittsburg interest of several hundred tons of No. 3 at $16.50 and a similar tonnage of No. 1 at $17.25. Bessemer remains at $19, Valley. The basic pig-iron average for January is announced at $16.87½ against $17 for December and $17.49 for November, and the bessemer average at $19, the same as in the two preceding months.

Steel—The billet market shows signs of becoming soft. Shipments are being held up and there is probably a larger tonnage of resale steel coming out than the market has yet felt. For the present last week's prices may be named as the apparent market; $27@27.50 for bessemer billets and $27.50@28 for open-hearth billets, with sheet-bars at $28.50 @29. Rods are nominally $33, but it would probably require a cut of $1 or more to effect any sales.

Ferromanganese — The market continues quiet, at about $44, Baltimore, for prompt shipment, freight to Pittsburg being $2.30 per ton.

Sheets—The market is quiet, but with mills so well sold ahead is firm and some mills refuse to sell at the open market, which remains quotable at 2.40c. for black and 3.50c. for galvanized, 28 gage, with blue annealed sheets, 10 gage, at 1.90c., and painted and galvanized corrugated roofing at $1.70 and $3 per square respectively.

St. Louis

Jan. 31—The market for pig iron has been very dull; buyers seem to be backward, so that few inquiries have been received and practically no business closed. Producers seem to have plenty of business to run them over and prices remain unchanged at $15 per ton Birmingham and $18.72 St. Louis.

Iron Ore—The market for Missouri 50 per cent. ore remains good at $3.75 per ton St. Louis. A good deal of interest is being shown in the ironfields of Wayne and Butler counties and a number of new projects are being formed to develop mines in that part of the country.

Foreign Trade in Iron and Steel

Exports and imports of iron and steel in the United States for the year ended Dec. 31 are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1908.	1909.	Changes.
Exports	$151,113,114	$157,680,331	I.$ 6,567,217
Imports	19,957,385	30,516,586	I. 10,559,201
Excess, exp.	$131,155,729	$127,163,745	D.$ 3,991,984

The leading items were as follows, in long tons:

	Exports		Imports	
	1908.	1909.	1908.	1909.
Pig iron	46,696	61,999	92,202	174,988
Scrap	21,834	25,360	5,090	63,504
Billets, blooms, etc.	122,177	104,862	11,212	19,913
Bars	52,105	87,960	19,671	19,206
Rails	196,510	299,540	1,719	1,513
Sheets and plates	104,993	180,048	2,629	4,720
Structural steel	116,881	90,830	3,623	6,146
Wire-rods	7,412	20,142	11,209	10,544
Wire	136,145	149,341	.....	......
Nails and spikes	38,910	48,055	.....	......
Pipe and fittings	114,362	162,140	.....	......
Tinplates	11,879	9,327	58,490	62,593

The imports of wire not given in quantities; value of wire and manufactures thereof was $1,003,973 in 1908, and $1,117,812 in 1909. Quantities of rails and pipe imported are not given.

Iron Ore Movement—Imports and exports of iron ore in the United States, year ended Dec. 31, long tons:

	1908.	1909.	Changes.
Imports	776,898	1,696,411	I. 919,513
Exports	309,099	455,932	I. 146,833

The imports in 1909 included 927,774 tons from Cuba, 464,065 from Europe and 251,550 from Newfoundland and Canada. Exports were chiefly to Canada.

Manganese Ore—Imports of manganese ore into the United States, year ended Dec. 31, were 178,203 long tons in 1908, and 212,765 in 1909; increase, 34,562 tons.

Metal Markets

New York, Feb. 2—The metal markets continue quiet and rather uninteresting; with no important changes in prices to be noted this week.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1909	$10,579,304	$ 2,083,772	Exp. $ 8,495,532
" 1908	7,357,707	5,152,732	" 2,204,975
Year 1909	132,880,821	41,086,966	" 88,793,855
" 1908	81,215,456	50,276,293	" 30,939,163
Silver:			
Dec. 1909	5,297,965	4,167,276	Exp. 1,130,689
" 1908	4,726,289	4,409,454	" 316,835
Year 1909	57,592,309	46,151,282	" 11,441,027
" 1908	51,837,671	42,224,130	" 9,613,541

Exports from the port of New York, week ended Jan. 29: Gold, $270 200, principally to Argentina; silver, $693,231, chiefly to London. Imports: Gold, $94 633; silver, $159,831, from South America and Mexico.

Gold—Prices on the open market in London are 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. The Paris disaster is expected to call for shipments of gold, but probably not for two or three weeks yet. In New York shipments of gold to Argentina continue.

Platinum—Prices are unchanged, and dealers continue to quote $28.50@29 per oz. for refined platinum and $34.50 for hard metal. The market is easy.

Our special correspondent writes from St. Petersburg, Russia, under date of Jan. 20, that the market is a little better. Since Christmas some business has been done. There is, however, no activity. At Ekaterinburg a slow increase of prices is to be noted. The producers and small dealers ask for crude platinum 5.70 rubles per zolotnik—equal to $21.43 per oz. In St. Petersburg the prices are without change at 23,000@23,500 rubles per pood—$22.79 per oz. average.

Silver—The market held steady at 24⅛d. until Jan. 31, when it fell to 24d., and on Feb. 1 suffered a further drop to 23¾d. The market closes steady today at 23⅞d. in London.

SILVER AND STERLING EXCHANGE

Jan.-Feb.	27	28	29	31	1	2
New York ...	52¼	52¼	52¼	52	51½	51¾
London . .	24⅛	24⅛	24⅛	24	23¾	23⅞
Sterling Ex..	4.8630	4.8630	4.8620	4.8620	4.8625	4.8625

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Jan. 20, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.	
India........	£ 216,100	£525,500	I.	£ 309,400
China........	80,000	82,000	I.	2,000
Straits......	61,000	....	D.	61,000
Total..	£ 357,100	£607,500	I.	£ 250,400

India Council bills in London sold at an average of 16.09d. per rupee.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Jan.-Feb.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
27	13⅝ @13⅞	13½ @13⅝	60 11/16	32¾	4.70	4.50 @4.55	5.80 @5.85
28	13⅝ @13⅞	13½ @13⅝	60 9/16	32½	4.70	4.50 @4.55	5.75 @5.80
29	13⅝ @13⅞	13⅜ @13⅝	. .	32⅝	4.70	4.50 @4.55	5.70 @5.75
31	13⅝ @13⅞	13⅜ @13⅝	60¼	32⅝	4.70	4.50 @4.55	5.65 @5.70
1	13¾ @13⅞	13⅜ @13⅝	60 1/16	32¾	4.70	4.55	5.65 @5.70
2	13¾ @13⅞	13⅜ @13⅝	59⅝	32⅝	4.70	4.55	5.65 @5.70

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The price of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has been an uninteresting affair throughout the week. The unsettled condition in the London standard market and the nervousness of the stock exchanges in financial centers has created a feeling of hesitancy among manufacturers, who, while they are busy to the limit of capacity, complain that new orders are not forthcoming freely. As a result, transactions in the metal have been of small volume, and the tone at the close is somewhat easier at 13¾@13⅞c. for Lake copper, and 13⅜@13⅝c. for electrolytic copper in cakes, wire bars and ingots. Casting copper is quoted nominally at 13¼@13½ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is very good.

The London standard market, after advancing on Thursday of last week to £61 for spot and £61 15s. for three months, has been depressed ever since, and closes weak at £59 12s. 6d. for spot, and £60 10s. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £63 10s.@£64; strong sheets, £73 10s.@£74 10s. per ton.

Copper exports from New York and Philadelphia for the week were 6710 long tons. Our special correspondent gives the exports from Baltimore at 542 tons.

The January Market—January opened with electrolytic copper at 13⅝@13¾c. and a fair demand which continued up to about Jan. 10. Since then the volume of business transacted has been small, the decline in the price at London below our parity cutting off the chances of sales for delivery abroad, except at concessions which the producers have been reluctant to make. However, producers freely offered copper at the equivalent of 13.60, cash New York, and did some domestic business at that price until toward the end of the month when there was some tendency to make further concessions, the month closing on the basis of about 13½c. The characteristic of the market during January was inaction.

Tin—Notwithstanding the very unfavorable statistical position which was unfolded the last day of January, the market remains steady. The only redeeming feature which the statistics disclosed was the comparatively large deliveries for consumption in this country. They are estimated to have been 3500 tons, or practically 500 tons more than in previous months. There are no special features reported from London, and the close is steady at £147 15s. for spot, and £149 7s. 6d. for three months.

There seems to be still a scarcity of spot material in this market, but the late arrivals have brought about a reduction in the premium which is asked. At the close, tin is quoted at 32⅝ cents.

Visible stocks of tin on Feb. 1: London, 13,098; Holland, 3015; United States, excluding Pacific ports, 6911; total, 23,024 long tons, an increase of 2106 tons during January.

Tin output of the Federated Malay states is reported at 48,002 long tons in 1909; a decrease of 2435 tons from the previous year.

Lead—The market is unchanged at 4.55 St. Louis, and 4.70 New York.

The London market is slightly lower at £13 7s. 6d. for Spanish lead and £13 10s. for English lead.

Spelter—The market for this metal has been demoralized. Galvanizers are well covered, on the one hand, while smelters are pressing their metal for sale on account of the liberal ore supplies which they are receiving from all quarters. Prices have declined sharply from day to day, and the close is weak at 5.65@5.70c. St. Louis, and 5.80@5.85c. New York.

New York quotations for spelter, Jan. 27, were 5.95@6c.; Jan. 28, 5.90@5.95c.; Jan. 29, 5.85@5.90c.; Jan. 31 to Feb. 2, inclusive, 5.80@5.85 cents.

The London market is unchanged at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc has been reduced ¼c. per lb., and is now $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—Business remains quiet. Prices are unchanged. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7⅝@7⅞c. named for outside brands.

Aluminum—Current quotations are 20@22c. per lb. for No. 1 ingots.

Quicksilver—New York prices are weaker at $50@52 per flask of 75 lb.; jobbers ask 72c. per lb. for small lots. San Francisco, $50@51 for domestic orders and $2 per flask less for export. London price is £9 15s. per flask; jobbers quoting 2s. 6d. less.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 200-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the nited States, year ended Dec. 31, are ported as follows, in the measures sual in the trade:

Metals:	Exports.	Imports.	Excess.	
pper, long tons	312,407	143,661	Exp.	168,746
Copper, 1908....	301,080	97,636	Exp.	203,444
in, long tons....	437	42,567	Imp.	42,130
Tin, 1908........	244	36,832	Imp.	36,588
ad, short tons.	86,077	114,182	Imp.	28,105
Lead, 1908......	76,354	112,074	Imp.	35,720
elter, sh. tons.	2,566	9,670	Imp.	7,104
Spelter, 1908....	2,640	881	Exp.	1,759
ckel, lb........	12,048,737	21,916,182	Imp.	9,867,445
Nickel, 1908....	9,770,248	16,586,423	Imp.	6,816,175
timony, lb.....	6,648	9,652,568	Imp.	9,645,920
Antimony, 1908.	1,763	8,114,651	Imp.	8,112,888
atinum, oz.....	... .	118,851	Imp.	118,851
Platinum, 1908.	....	50,768	Imp.	50,768
icksilver, lb..	510,221	....	Exp.	510,221
Quicksilver, '08	224,692	....	Exp.	224,692
uminum, value	$567,375	....	Exp.	$567,375
Aluminum, 1908	330,092	....	Exp.	330,092
Ores, etc.:				
nc oxide, lb..	29,691,347	....	Exp.	29,691,347
Zinc oxide, '08..	24,016,254	....	Exp.	24,016,254
nc dross, lb....	14,138,898	....	Exp.	14,138,998
Zinc dross, '08..	16,810,259	....	Exp.	16,810,259
nc ores, lg. tons	11,121	47,996	Imp.	36,875
Zinc ores, 1908.	23,311	102,545	Imp.	79,234
tim'y ores, lb.	504	3,386,708	Imp.	3,386,204
Ant. ores, 1908.	9,694	3,282,218	Imp.	3,272,524
rome ore, tons	30	39,820	Imp.	39,790
Chrome ore, '08	....	....	....	....

Copper, lead and nickel (and antimony rom Aug. 5, 1909) include the metal ontents of ores, matte, bullion, etc. The xports given include reëxports of reign material. Chrome ore was not ported separately last year. Zinc contents of ore imported, August-December, 909, were 18,858,044 lb.; not reported rior to date of new tariff.

Zinc and Lead Ore Markets

Platteville, Wis., Jan. 29—The highest rice paid this week for zinc ore was $49 er ton; the base price, 60 per cent. zinc, as $46@47.50. The base price of lead re was $56@57 per ton.

SHIPMENTS, WEEK ENDED JAN. 29.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
ineral Point.........	446,000	....	....
enton...............	315,300	....	....
alena...............	256,700	....	....
ouncil Hill..........	80,000	....	....
uba City.............	79,000	....	....
hullsburg............	75,000	....	....
ontfort..............	70,000	60,000	....
arker...	64,450	....	....
ighland..............	60,600	.....	....
latteville............	86,700	....	493,810
azel Green...........	....	144,700	....
inden................	....	63,360	....
Total...............	1,533,750	268,060	493,810
ear to Jan. 29........	5,199,997	618,229	1,326,680

Shipped to separating plants, 1,728,570 b. zinc ore for the week.

Joplin, Mo., Jan. 29—The highest rice paid for zinc sulphide ore was 49.50, the base $45@47 per ton of 60 er cent. zinc. The highest price paid or zinc silicate ore was $29, the base 24@27 per ton of 40 per cent. zinc. he average price, all grades, was $44.36. hile most of the lead ore shipped this eek was purchased last week at $58 er ton, the price dropped in midweek to 56 and at the week end to $54. The verage price, all grades, was $56.40 per on.

The zinc shipment was a good average, while the lead shipment was heavy, with both ores weak at the close. Good zinc ore sold today on a base of $45, assaying 61 per cent. zinc, and small-lot offerings of producers found no takers at this price. The market was thoroughly demoralized, with some purchasing agents endeavoring to turn ore to other purchasing agents at net cost, in cases where a carload or two had been purchased more than ordered by the smelting company.

SHIPMENTS, WEEK ENDED JAN. 29.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,294,010	1,174,960	$130,100
Joplin................	1,873,360	306,370	52,602
Jackson...............	448,650	465,480	23,351
Miami............. ..	750,310	221,810	20,840
Duenweg...............	517,010	199,490	17,822
Galena................	660,390	99,080	17,534
Alba-Neck.............	402,120	5,990	9,811
Carthage..............	335,040	......	8,040
Quapaw................	316,870	......	6,811
Granby	368,000	10,000	6,430
Badger................	256,170	......	6,019
Cave Springs..........	253,350	......	5,699
Aurora................	266,500	......	4,863
Spurgeon..............	192,080	46,160	4,207
Oronogo...............	27,720	126,340	3,991
Sarcoxie..............	137,980	......	3,039
Stott City............	62,840	......	1,444
Totals	11,162,400	2,655,680	$322,603
The month..........	49,672,670	9,091,840	$1,386,364

Zinc value, the week, $247,597; the mo., $1,125,244
Lead value, the week, 75,006: the mo., 261,120

MONTHLY AVERAGE PRICES

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January.....	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February....	36.94	......	34.37	......	50.50	......
March.......	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May.........	40.06	......	37.42	......	56.59	......
June.........	44.15	......	40.35	......	57.52	......
July....	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September ..	47.70	......	44.87	......	56.11	......
October......	49.50	......	45.75	......	55.02	......
November...	51.31	......	48.29	......	53.94	......
December...	49.45	......	47.57	......	55.26	......
Year.......	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Feb. 2—Business continues steady in most lines, with a tendency to improvement.

The General Chemical Company has increased its quarterly dividend on the common stock from 1 to 1¼ per cent., and has also declared an extra dividend of 10 per cent., payable in new stock.

Copper Sulphate—Prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—The quotations are steady at 2.10c. per lb. for spot and 2.07½c. for futures. Business is not active.

Arsenic—Sales have been light during the week. Quotations are $2.70@2.75 per 100 lb. for white arsenic.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, year ended Dec. 31.

	Imports.	Exports.	Excess.	
Copper sulph. lb.	....	2,965,713	E.	2,965,713
Copper sul., '08	....	7,663,882	E.	7,663,882
Bleach, lb.......	91,390,004	13,964	I.	91,376,040
Bleach, 1908....	74,602,059	121,511	I.	74,480,548
Potash salts, lb..	427,215,696	2,338,414	I.	424,877,282
Potash salts, '08	300,927,536	1,046,689	I.	299,880,847
Soda salts, lb. ..	15,697,637	1,053,410	I.	14,644,227
Soda salts, 1908	11,376,614	838,852	I.	10,537,762
Acetate lime, lb.	....	72,312,173	E.	72,312,173
Acetate, 1908...	....	56,703,015	E.	56,703,015
Nit. of soda, tons	422,593	8,233	I.	414,360
Nitrate, 1908...	310,713	9,955	I.	300,758
Phosphates, tons	11,903	1,058,760	E.	1,046,857
Phosphates, '08	26,734	1,228,989	E.	1,222,255
Sulphur, tons....	26,914	37,142	E.	10,228
Sulphur, 1908..	20,118	27,894	E.	7,776
Pyrites, tons.....	692,385	....	I.	692,385
Pyrites, 1908...	668,115	....	I.	668,115
Magnesite, lb....	84,814,624	880,175	I.	83,934,449
Magnesite, 1908	....	....	....	......

Exports include reëxports of foreign material. Figures for magnesite are for six months, July-December; not reported separately prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1909 were 303,868 tons.

Mining Stocks

New York, Feb. 2—Following last week's flurry and excitement, the general stock market this week has been irresolute and uninteresting. It has been a trader's market of small fluctuations and a tendency to weakness.

There were several sales of Homestake, of South Dakota, 510 shares changing hands at $88.62½@88.50 per share.

The Curb, like the Exchange, was dull and undecided, with small fluctuations and general declines. The copper shares showed the largest business, but there was some trading in Cobalts and Nevadas. Copper share prices closed rather weak.

Boston, Feb. 1—Copper shares have continued reactionary but the forced liquidation in stocks which have lately been boomed so hard has cleared the atmosphere to a considerable extent. Lake Copper found a low at $60 per share, after having made a high at $91.50. The recovery was quite sharp up to $79. In the general reaction, North Lake and Indiana both fell steadily, but recoveries were equally quick, so that net gains are recorded.

Calumet & Arizona recovered $10 during the week, although not all of this was net. Mohawk has been especially strong and made a gain of $3, to $71, ex-dividend. Franklin made a spurt of $2.25 to $20.25 on expectation of striking the Hancock lode. Hancock Mining had a $4 advance on light trading up to $29. Amalgamated benefited to the extent of over $5 by the reports regarding the copper merger.

South Lake and Oneco have been the active Curb features. The latter company has levied an assessment of $1 per share, payable Feb. 15. As there are 75,000 shares of stock outstanding, the company will acquire $75,000 to continue development work.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II. 1909	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I. 1910	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
II 1909	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	....	248,236,800	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	......	23.706	......
March	50.468	......	23.227	......
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52.[illegible]38	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.[illegible]	13.620	14.2[illegible]	13.870	61.198	60.923
February	12.949		13.295		57.688	
March	12.[illegible]87		12.826		56.231	
April	12.[illegible]		12.93[illegible]		57.363	
May	12.[illegible]		13.238		59.338	
June	13.214		13.54[illegible]		59.627	
July	12.[illegible]		13.[illegible]		58.556	
August	13.00[illegible]		13.2[illegible]		59.393	
September	12.[illegible]		13.210		59.021	
October	12.70[illegible]		13.[illegible]		57.5[illegible]	
November	13.12[illegible]		13.[illegible]		58.91[illegible]	
December	13.[illegible]		13.647		59.[illegible]	
Year	12.[illegible]		13.[illegible]		58.[illegible]	

New York, cents per pound. Electrolytic is [illegible] [illegible]. London, pounds [illegible] [illegible] standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	......	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	......	3.868	......	13.313	......
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	......	4.739	......	21.563	......
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

COLO. SPRINGS Feb. 1	
Name of Comp.	Bid.
Listed:	
Acacia	.06
Cripple Cr'k Con.	.02⅞
C. K. & N.	.11
Doctor Jack Pot	.08¾
Elkton Con	.69⅞
El Paso	.67½
Fannie Rawlins	.07
Findlay	.10⅞
Gold Dollar	.10
Gold Sovereign	.03½
Isabella	.19⅛
Mary McKinney	.46½
Pharmacist	.03
Portland	1.02
Vindicator	.77
Work	.06
Unlisted:	
Golden Cycle	1.40
United Gold Mines	.09⅞

S. LAKE CITY Feb. 1	
Name of Comp.	Clg.
Carisa	.50
Colorado Mining	.76
Columbus Con	.77
Daly Judge	4.40
Grand Central	1.77½
Iron Blossom	.85
Little Bell	1.92½
Little Chief	.45
Lower Mammoth	.50
Mason Valley	2.15
Maj. Mines	2.32½
May Day	.19½
Nevada Hills	‡.60
New York	.13
Prince Con	.90
Red Warrior	6.00
Silver King Coal'n	3.50
Sioux Con	.33½
Uncle Sam	.42
Victoria	‡1.50

SAN FRANCISCO. Feb. 1.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	‡.11	Belmont	1.42
Belcher	1.12	Jim Butler	.11
Best & Belcher	.85	MacNamara	.26
Caledonia	.49	Midway	.23
Challenge Con	.31	North Star	‡.01
Chollar	.29	West End Con	.21
Confidence	‡1.35	Atlanta	.12
Con. Cal. & Va.	1.82	Booth	‡.09
Crown Point	1.10	C.O.D. Con	‡.06
Exchequer	‡.30	Columbia Mt.	‡.05
Gould & Curry	.37	Comb. Frac.	.32
Hale & Norcross	.63	Goldfield Belmont	‡.90
Mexican	1.70	Goldfield Daisy	.98
Ophir	2.02	Jumbo Extension	.22
Overman	.68	Oro	‡.03
Potosi	.79	Red Hill	.03
Savage	.17	Sandstorm	‡.04
Sierra Nevada	.73	Silver Pick	.07
Union	.86	St. Ives	‡.12
Yellow Jacket	‡1.[illegible]		

N. Y. EXCH. Feb. 1	
Name of Comp.	Clg.
Amalgamated	81⅞
Am. Agri. Chem.	44½
Am.Sm.&Ref.,com	91⅜
Am. Sm. & Ref., pf.	109
Anaconda	51
Bethlehem Steel	30½
Col. & Hock. C. & I.	14
Colo. Fuel & Iron.	37¾
Du Pont P'd'r, pf.	85¼
Federal M. & S.	‡85
Great Nor., ore ctf.	72
Nat'nal Lead, com.	83¾
National Lead, pf.	109
Pittsburg Coal	21⅞
Republic I&S, com.	35⅛
Republic I & S, pf.	‡100
Sloss Sheffi'd, com.	‡77
Sloss Sheffield, pf.	118½
Tennessee Copper	34¼
Utah Copper	50⅝
U. S. Steel, com.	82⅜
U. S. Steel, pf.	122⅞
Va. Car. Chem.	52

N. Y. CURB Feb. 1	
Name of Comp.	Clg.
Big Vein Copper	8⅞
Bonanza Creek	3
Boston Copper	19¾
Braden Copper	4⅞
B. C. Copper	7⅜
Buffalo Mines	3½
Butte Coalition	26½
Chino Copper	13
Cobalt Central	.18
Combination Fra.	.32
Con. Ariz. Sm.	2 11/16
Cumberland Ely	9
Davis-Daly	3⅜
Dominion Cop.	7
Ely Con	.90
El Rayo	2⅝
Florence	2⅝
Gila Copper	8⅝
Giroux	10½
Gold Hill	1¾
Goldfield Con.	7 9/16
Greene Cananea	9¾
Guanajuato	2
Guggen. Exp.	241½
Kerr Lake	.08 15/16
La Rose	4 7/16
McKinley-Dar-Sa.	.85
Miami Copper	24¾
Mines Co. of Am.	48
Montezu. of C. R.	3
Mont. Shoshone	1
Mont.-Tonopah	.70
Nev. Utah M. & S.	1⅜
Newhouse M. & S.	3½
Nipissing Mines	10⅛
Ohio Copper	4 7/16
Pacific Sm. & M.	1⅛
Silver Queen	.21
Standard Oil	645
Stewart	⅝
Tonopah	6⅝
Tonopah Ex.	.72
Tri-Bullion	1⅛
Utah Apex	5⅛
Yukon Gold	5

LONDON Feb. 2	
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 6
Esperanza	2 19 6
Tomboy	0 17 6
El Oro	1 8 0
Oroville	0 9 0

BOSTON EX. Feb. 1	
Name of Comp.	Clg.
Adventure	9½
Allouez	48
Am. Zinc	31¾
Arcadian	7⅝
Arizona Com	41½
Atlantic	9¾
Boston Con	19¾
Calumet & Ariz.	73
Calumet & Hecla	640
Centennial	29
Con. Mercur	.11
Copper Range	79
Daly-West	8¾
East Butte	10⅜
Franklin	20⅜
Greene—Can.	9⅝
Hancock	25¼
Isle Royal	23
Keweenaw	5
La Salle	16
Mass	8¼
Michigan	7¼
Mohawk	69½
Nevada	23½
North Butte	39⅞
Ojibway	9½
Old Dominion	46½
Osceola	154
Parrot	19⅞
Quincy	84
Shannon	15⅝
Superior	58½
Superior & Bost.	14¼
Superior & Pitts.	14¼
Tamarack	72
Trinity	9
U. S. Smg. & Ref.	47½
U.S.Sm. & Re., pd.	50¾
Utah Con	40
Victoria	4½
Winona	10
Wolverine	140
Wyandotte	2⅝

BOSTON CURB	
Name of Comp.	Clg.
Ariz. Mich	‡.95
Ahmeek	210
Bingham Mines	2½
Boston Ely	3⅞
Calaveras	6 3/16
Champion	.09
Chemung	‡11¾
Chino	13
Corbin	.16⅜
Cactus	5⅝
Crown Reserve	‡5 15/16
First Nat. Cop.	5⅛
Gila Copper	8¾
Indiana	34½
Majestic	.88
Ray Central	3¾
Ray Con.	23⅞
Rawhide Coal	.17
Rhode Island Coal	11
San Antonio	‡8½
South Lake	12½
Trethewey	..
Vulture	9
Yuma	1¾

ST. LOUIS Jan. 29		
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.09	.07
Center Cr'k	‡2.00	‡1.75
Cent.C.&C.	86.00	85.00
C.C. & C. pf.	85.00	84.00
Cent. Oil	110.00	100 00
Columbia.	9.00	7.00
Con. Coal.	20.00	18.00
Doe Run.	110.00	100.00
Gra. Bimet.	.33	.30
St. Joe.	13.00	12.00

‡Last quotation.

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.	....	Feb. 1	$1.00
Arcadian Copper, Mich.	....	Mar. 1	0.50
Argenta, Ida.	Feb. 10	Mar. 10	0.001
Bullion, Nev.	Jan. 11	Mar. 1	0.05
Con. Imperial, Nev.	Jan. 11	Feb. 3	0.01
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Gordon M. & M., Utah	Jan. 15	Feb. 4	0.002
Hancock Min., Mich.	....	Feb. 1	1.00
Maxfield, Utah	Jan. 31	Feb. 19	0.00½
Ojibway, Mich.	Mr.Oct.	....	2.00
Precious Metals M. & M., Cal.	Dec. 27	Jan. 31	0.01
Rexall S. & C., Utah	Feb. 13	Mar. 15	0.01
Savage, Nev.	Feb. 10	Mar. 8	0.10
Seven Bros.-Pioche, Nev.	Jan. 15	Feb. 4	0.002
Sheba Gold & Silver, Utah	Jan. 19	Feb. 23	0.05
Sierra Nevada, Nev.	Jan. 11	Feb. 3	0.10
Silver King Con., Utah	Jan. 17	Feb. 5	0.10
Utah Ideal, Utah.	Feb. 1	Feb. 20	0.00¼
Wabash, Utah	Feb. 21	Mar. 15	0.05
Western Monitor, Utah.	Feb. 1	Mar. 1	0.00½

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Corundum "	.07@.10
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Grains "	.03½@.04
Chester flour "	.01½@.02
Grains "	.03½@.04
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Lump, per quality . . "	.04@.20
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Steel Emery, f.o.b. Pittsburg "	.07½@.07¾
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Acetic 28% lb.	.02⅜
Boric "	.07
Hydrofluoric, 30% "	.02¾@.03¼
" 48% "	.05½
" 52% "	.06
" 60% "	.09@.10
Hydrochloric acid, 20° per 100 lb.	1.15@1.50
Nitric acid, 38° per lb.	.03⅞@.04½
Sulphuric acid, 50°, bulk per ton.	$12 up
60°, 100 lb. in carboys.	.85@1.12½
60°, bulk, ton	16.00@18.00
66°, 100 lb. in carboys.	1.00@1.10
66°, bulk, ton	18.00
Oxalic per lb.	.07¼@.07½
ALCOHOL—Grain 95% gal.	2.61
Denatured "	.42@.44
Refined wood, 95@97% . . . "	.52@.57
ALUM—Lump 100 lb.	$1.75
Ground "	1.85
Chrome Alum "	.01⅜@.04½
ALUMINUM—Sulphate, com'l. lb.	1.50@1.75
AMMONIA—24 deg. lb. "	.04½@.05½
" 26 deg. lb. "	.04¾@.05¾
AMMONIUM—	
Bromide lb.	.28
Carbonate "	.08@.08⅜
Muriate grain "	.05⅜@.06¼
Lump "	.09¼@.09½
Sulphate, 100 lb. "	2.65@2.75
Sulpho-cyanide com.	.30
" " chem. pure . . .	.40
ANTIMONY—needle, lump . . lb.	.04⅛@.04¼
Oxide "	.07¾@.08
ARSENIC—white "	.02½@.02¾
Red, Outside brands "	.07
Saxony "	.07½@.08
ASPHALTUM—	
Barbadoes per ton.	50.00@80.00
West Indies "	20.00@60.00
Egyptian lb.	.11@.16
Gilsonite, Utah ordinary per ton.	32.00@40.00
Trinidad "	20.00@25.00
California per ton.	25.00@30.00
BARIUM—	
Carb. Lump. 80@90% lg. ton.	26.00@35.00
Precipitated, 96@98% "	34.00@36.00
Chloride com'l ton.	35.00@38.00
Nitrate powdered, in casks lb.	.05@.06½
Blanc Fixe, dry, bbl . . . . per lb.	.02¾@.03½
BARYTES—	
Am. Ground sh. ton.	12.00@15.00
Floated "	17.00@19.00
Foreign floated "	20.00@23.00
BLEACHING POWDER—35% 100 lb	1.25@1.50
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.	4.10@4.35
BONE ASH lb.	.02¾@.04
BORAX, sacks "	.03¾@.05
CALCIUM—Acetate, gray, 100 lb.	1.90@2.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton.	65.00
Chloride, f.o.b. N. Y. "	11.00@14.10
CEMENT—	
Portland, Am. 500 lb. bbl.	1.50@1.60
Foreign "	2.25@2.90
"Rosendale," 300 lb. "	.85
In sacks "	.65
Slag cement "	.75@1.25
CHROME ORE—	
New Caledonia 50%, ex ship N. Y. per lg. ton	14.00@16.00
Bricks, f.o.b. Pittsburg, per M.	175.00
CLAY, CHINA—Am. common ex-dock, N. Y. ton	7.00@10.00
Foreign "	10.00@20.00
COBALT—Oxide lb.	.80@.85
COPPERAS—Bulk 100 lb.	$0.55
In bbls. "	.65@.80
In bags "	.60@.75
CRYOLITE (carload) lb.	.06¼@.07
FELDSPAR—Ground . . sh. ton.	6.00@14.00
FIRE BRICK—	
American per M.	30.00@40.00
Imported "	30.00@45.00
St. Louis "	16.00
Extra "	20.00@23.00
Special extra "	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.	
St. Louis, extra quality per ton.	5.00
" ordinary . . . . "	2.50
FLUORSPAR—	
Domestic f.o.b. Pittsburg:	
Lump ton.	8.00@10.00
Ground "	12.00@14.00
Foreign crude ex. dock. "	8.50
FULLER'S EARTH—Lump, 100 lb.	.80@.85
Powdered "	.80@.85
GRAPHITE—Ceylon.	
Flying dust, finest to best . . . lb.	.02@.04
Dust "	.02¼@.05
Chip "	.04@.08
Lump "	.05½@.12
Large lump "	.08¼@.10½
GYPSUM—	
Fertilizer sh. ton.	5.00
Ground "	4.00@7.00
INFUSORIAL EARTH—	
Ground Am. Best lb.	.01¾@.02¼
German "	.02¼@.02⅝
LEAD—Acetate (sugar of) brown, lb.	.07¾@.08
Nitrate, com'l "	.08@.08½
MAGNESITE—Greece.	
Crude (95%) lg. ton.	7.50@8.50
Calcined, powdered . . . sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg M.	160@200
MAGNESIUM—	
Chloride, com'l 100 lb.	.90@1.25
Sulphate (Epsom salt) . . 100 lb.	.90@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide lb.	.01@.01¼
75@85% binoxide "	.01¼@.01½
85@90% binoxide "	.01½@.04
90@95% binoxide "	.06½
Ore, 80%-85% sh. ton.	16.00@32.50
MARBLE—Flour sh. ton.	7.00@9.00
MINERAL WOOL—	
Slag, ordinary sh. ton.	19.00
Selected "	25.00
Rock, ordinary "	32.00
MONAZITE SAND—	
Guar. 97%, with 5% Thorium oxide, normal lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained	.47
Sulphate, single lb.	.10¼@.11
Sulphate, double "	.05⅞@.08
NITRATE OF SODA—	
100 lb. 95%	2.07½@2.10
95% for 1910	2.07½@2.10
96% is 2½@7½c. higher per 100 lb.	
OZOKERITE—best lb.	.14@.17
PAINTS AND COLORS—	
Litharge, Am. powdered . . . . lb.	.06¼@.06¾
English glassmakers' "	.08¼@.09¼
Lithopone "	.03½@.07
Metallic, brown sh. ton	16.50@22.00
Red "	14.00@18.00
Ocher, Am. common . . . "	8.50..9.00
Best "	12.00@15.00
Dutch, washed lb.	.02¾@.03
French, washed "	.01¼@.02
Paris green, pure, bulk "	.17½@.20½
Red lead, American "	.06¾@.07
Foreign "	.08¼@.09¼
Turpentine, spirits bbl., per gal.	.62@.63½
White lead, Am., dry lb.	.05¾@.06
American, in oil "	.07@.07¼
Foreign, in oil "	.09@.09¾
Zinc white, Am. extra dry "	.05¼@.05⅝
French, proc's, red seal, dry "	.06¾@.07½
French, process, green seal, dry "	.07¼@.07½
PHOSPHATES—Acid	55@60c. per unit
*Fla., hard rock 77%	7.00@7.50
land pebble 68%	3.75@4.00
†Tenn., 78@80%	5.00@5.50
75%	4.75@5.00
68@72%	4.25@4.50
‡So. Car. land rock 60%	3.50@4.00
POTASSIUM—	
Bicarbonate crystal lb.	$.07½
Powdered or granulated . . "	.08
Bichromate, Am "	.07⅜@.08
Scotch "	.10¾
Bromide "	.20
Carbonate (80@85%) "	.03⅝@.03⅞
Caustic, ordinary "	.05¼
Elect. (90% KOH) "	.06@.06¼
Chloride (muriate), 100 lb . .	1.90
Chlorate, powdered "	.09@.09⅜
Crystals "	.08¾@.09⅛
Cyanide (98@99%)	
Carloads (30,000 lb.) "	18c.
5-ton lots	18½c.
Less than 5 tons	.19
Kainite, long ton, bulk, 8.50; bags,	8.50
Permanganate lb.	.09¼@.10½
Prussiate, yellow "	.13@.13¾
Red "	.29@.32
Sulphate (basis 90%) . . . 100 lb.	2.18@2.21
PYRITE—	
Domestic, non-arsenical, furnace size, f.o.b. R. R. . . . . per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines	10@10½c.
Imported, non-arsenical, furnace size, ex-ship, per unit	.12½
Imported, arsenical, furnace size, ex-ship, per unit	.11½@.12
Imported fines, arsenical, ex-ship, per unit	.09
Imported fines, non-arsenical, ex-ship, per unit	10½@11c.
Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.	
SALT—N. Y. com. fine 280 lb. bbl.	.72@1.13
N. Y. agricultural . . . . . sh. ton.	3.80@4.50
SALTPETER—Crude . . . 100 lb.	4.00@4.50
Refined, crystals "	5.25@5.87½
SILICA—	
Ground quartz, ord'ry . . lg. ton.	7.00@15.00
Silex, ground "	7.00@15.00
Silex, floated "	35.00@40.00
Lump quartz "	5.00@5.50
Glass sand "	2.75
SILVER—Nitrate, crystals . . . oz.	.33¼@.36¾
SODIUM—Acetate lb	.04½@.05
"Alkali," per 100 lb., 58/48 . . .	.90@.95
Bicarb. soda, per 100 lb	1.00@1.30
Soda, caustic, per 100 lb., 78/60	1.72½@1.85
Soda, caustic, powdered	.02½@.03
Salt cake, per 100 lb., bulk	.40@.42
Salt cake, bbl	.75@.85
Soda, monohydrate, per lb. . . .	1.30@1.75
Bichromate lb.	.05⅝@.06¼
Bromide "	.20
Chlorate, com'l "	.08¼@.09½
Cyanide, 120-130% KCN, per 100%	
Carloads (30,000 lb.) lb.	18c.
5-ton lots "	18½c.
Less than 5 tons "	.20
Hyposulphite, Am. "	1.30@1.50
Phosphate 100 lb.	2.10@2.40
Prussiate "	.08½@.09
Sal soda, f.o.b. N. Y. . . "	.60@.75
Foreign, f.o.b. N. Y. . "	.80@1.00
Silicate, com'l "	.65@1.00
Sulphate, com'l (Glauber's salt) 100 lb.	.60@.80
Sulphate, com'l, calcined	.65@.85
STRONTIUM—Nitrate lb.	.07¼@.08
SULPHUR— Louisiana (prime) to New York lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore "	22.50 up
Roll 100 lb.	1.85@2.15
Flour "	2.00@2.40
Flowers, sublimed . . . "	2.20@2.60
Powdered commercial, bags	1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York lg. ton.	$22.00
TERRA ALBA—Fr. & Eng. 100 lb.	.70@1.00
TALC—Domestic sh. ton.	12.00@20.00
French "	15.00@25.00
Italian, best "	30.00@40.00
TIN—Bi-chloride, 50° lb.	.10
Crystals "	.22½@.24
Oxide, lb. "	.37@.40
URANIUM—Oxide "	2.20@4.25
ZINC—Chloride sol., com. 20° "	.02¼
Chloride, granular "	.04¼
Dust "	.06¼
Sulphate "	.02@.02½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as a matter of private contract.

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**Illustrated.*

The Spelter Market

The price for spelter after rising to 6.25c., St. Louis, has crumbled away since the first of the year and now is a little less than 5.50c. There is no mystery about the cause for this rapid decline.

The revival of business soon after the middle of 1909, together with the scare, excited by the inposition of the tariff on zinc ore, and evidently some misconception on the part of the principal purchasers led to a rise in the price for this metal that was inordinate. The natural effect was a stimulation of production.

However, the situation was miscalculated by everybody—by the producers of ore as to the supply of their product; by the smelters as to the quantity of metal they were producing; and by the manufacturers as to the demand for consumption. Ore supply turned out to be bountiful. The smelters reckoned the production of spelter at about 230,000 to 240,000 tons for the year. The statistics that became available immediately after the close of the year showed 267,069 tons, compared to 210,511 in 1908. Worse than this, the deliveries for consumption appeared to be 288,629 tons in 1909, compared to 216,635 in 1908.

These figures, which exceeded the highest previously on record, were a complete surprise to the producers. It was impossible to believe that consumption had actually increased to any such extent as indicated by the deliveries, and the explanation that manufacturers had overbought could not be escaped. It accounted, moreover, for the absence of buying in December, when the smelters began to find stocks accumulating once more on their hands.

When the smelters awoke to this situation they began to press spelter on the market, with the result that is now known. In spite of this, there has lately been a further accumulation of unsold stock and the price is likely to go somewhat lower although it is now close to what may be considered the normal and is once more in tune with copper and lead.

The recent experience in this metal illustrates the folly of tampering with natural conditions by a tariff for plunder, and the danger that may arise in the absence of frequent, prompt and accurate statistics. We believe that the actual consumption of spelter is going on at a satisfactory and increasing rate, but the market for the metal must continue weak and halting until the excess of production has been absorbed.

The Prospects for Copper

The slight decline in the price for copper this week is no cause for alarm. The liquidation of speculative accounts in London has for several weeks depressed the price in that market below our parity and cut off sales for export except at concessions in price. What this means will quickly appear upon reflection that nearly one-half of the North American production must be exported in the long run. At the same time the long drawn-out catastrophe in Wall Street has caused American manufacturers to become more timid and they have naturally ceased contracting for supplies until the meaning of it all develops more clearly. With both outlets thus cut off the producers of copper stood steadily to their position for several weeks, and in general are still doing so, but it is only natural that some have finally been inspired to make metal move by offering it at concessions. This step will probably be followed by others and we may consequently see a further decline in price in spite of the favorable statistics that are anticipated tomorrow, but we are inclined to think that a rally will soon ensue and that a general improvement will develop during the next three months, by which time it is hoped that the increase in consumption will take care of a resumption of production at the maximum rate of record.

The Situation in the Iron Iudustry

Judging from the statistics of pig-iron production that we reported last week, the situation in this industry at the end of 1909 must have been similar to that existing in spelter and copper, although in the cases of both pig iron and copper the misconception was less, owing to the possession of monthly statistics of production. The production of pig iron in 1909 was 25,795,471 long tons, which was a trifle more than the highest previously on record. Looking at the statistics by semesters, however, it appears that the output in the second half of 1909 was 1,500,000 tons greater than in the first half of 1907 and more than twice as much as in the first half of 1908.

We do not think that anyone dreams that all of the great production in the second half of 1909 was going immediately into consumption. Like everyone else, the producers were anticipating the good times to come, and they, together with speculators, were piling up stocks. This was evidently overdone, with the natural result of a lull in contracts followed by some pressure to sell, but it does not follow from this that actual consumption has been checked.

In pig iron, copper and spelter we experienced too rapid production in the second half of 1909 and the producers have been obliged to wait for the excess to be absorbed. Many persons besides the speculators in Wall Street were under the illusion that the industrial revival was going faster in 1909 than was really the case. The recent upset has been rather of ideas than of actual conditions.

The Coal Wage Conference

The failure of the conference over the coal-mining scale at its first meeting does not necessarily mean that no scale will be adopted; nor does it mean that there must be a stoppage of mining in April. The present situation is due to the refusal of the Illinois operators to enter the conference. They decided to make their own separate agreement, but the miners refuse, claiming that Illinois is one of the so-called competitive States and must therefore be included in the general agreement. As Illinois was not represented, the operators from the other States would not consent to the admission of the Illinois miners. The miners' representatives insisted on their presence, and the result was a deadlock and summary adjournment.

No provision was made for a renewal of negotiations, but there is little doubt that they will be resumed before long. Operators generally are anxious for a settlement, and the leaders of the miners seem to be in a concilatory mood. The first meeting of the wage conference is seldom a successful one, and an agreement is rarely reached until two or more meetings have been held. There is a strong probability that some compromise will be reached before April.

"Prospects"

The term "prospect" applied to a mining venture is sometimes used depreciatingly and contemptuously. This is all wrong, as was pointed out in the very excellent address of Mr. Hammond, published in a recent issue of the JOURNAL. All mines at some stage or other have been "prospects." As well speak disparagingly of boys, since all men, no matter what their present degree of greatness may be, were at one time only boys. It is true that there is apt to be much misconception and also misrepresentation in placing valuations upon prospects. Prospects have a certain value, but it is not of the definite character that a mine has. Mine value is based on measured ore and on probable ore deduced according to accepted and established rules. The tendency of conservative mining operators is to purchase or secure control of all prospects on a development basis, making the payments contingent upon the development that may be shown after a certain amount of exploration has been done. This is fair to the owner of the prospect and is safe to the operating company, and is one of the tendencies in mining negotiations that is to be commended.

A Canadian Steel Trust

Reports come from Montreal and Toronto that negotiations are in progress for a consolidation of Canadian iron and steel interests, somewhat on the lines of the United States Steel Corporation. The leaders in this proposed merger are the Dominion Steel Company—represented by J. H. Plummer, its president—and Robert Fleming, the representative of London interests which recently took a controlling interest in the Lake Superior Corporation. The merger, it is reported, will include the Dominion Iron and Steel Company, the Dominion Coal Company, the Lake Superior Consolidated Company, the Atikokan Iron Company, of Port Arthur, the Montreal Rolling Mills, the Hamilton Steel and Iron Company, and the National Iron Works Company, which is arranging to build blast furnaces and rolling mills at Toronto. Such a consolidation would include practically all the iron and steel makers in Canada except the Canadian Iron and Foundry Company, the consolidation of the Drummond interests in Nova Scotia, Quebec and Ontario, which was formed last year; and the Nova Scotia Steel Company.

While positive confirmation of these reports is not yet obtainable, they appear to have some basis, and an important merger of the kind indicated is altogether possible. Our Canadian neighbors have lately shown an inclination to form large industrial combinations, as in the asbestos and cement industries. The union of the Dominion Steel and Dominion Coal companies seems to afford a basis for further extension, which is aided by the recent changes in the Lake Superior Corporation and the transfer of its control from the United States to Canadian and English hands. That the Mackenzie-Mann interests should come into such a combination is also probable, as they are capable of large expansion, and the needed capital could be best supplied by a large combination.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS AND THE EXPERIENCES OF READERS

Ely Central Copper Company

Since B. H. Scheftels & Co., have seen fit to give me, gratis, a certain amount of objectionable free advertising in their market letters and telegrams sent out in connection with boosting Ely Central stock, I ask that the JOURNAL kindly publish this letter, explaining my connection with that company.

Mr. Herzig, consulting engineer for Ely Central, offered me the managership, which I accepted. At the time arrangements were made, I specifically stated that I did not wish any publicity in "dope sheets" and would only take charge of legitimate mine development. I was assured that this would be the case and that only facts were desired by the stockholders. After five days of active management, I became convinced that daily "dope" was required by certain stockholders for publication purposes and that daily favorable development facts were necessary to their stock manipulation. As I did not wish to be connected with this sort of thing, I have resigned and shall have nothing further to do with the company.

Scheftels & Co's. market letter dated Jan. 29 stated: "On the morning of his first visit, therefore, Mr. Wilmot had a mine turned over to him." I wish to state that it was not a mine but a prospect, and furthermore that the above statement is absolutely unwarranted and misleading.

In a telegram, signed by me, to the New York office, for their sole information, I stated that the last 20 ft. of drill hole was in porphyry similar to that found in Nevada Consolidated's pit. Contrary to my understanding, this statement was sent out and a layman would naturally interpret it as meaning porphyry ore of commercial value, whereas such is not the case, the porphyry being very silicious and low in copper contents.

In closing I would add that the property is yet a prospect and the stock a gamble and not an investment as some people undoubtedly have been led to believe. H. C. WILMOT.

Salt Lake City, Utah, Feb. 3, 1910.

The index to Vol. LXXXVIII of the JOURNAL is mailed with this issue. Any subscriber who fails to receive it is requested to notify us promptly.

Spurious Potassium Cyanide

The communication entitled "Spurious Potassium Cyanide" in the JOURNAL of Oct. 23, 1909, touches on a number of points which are of practical importance to cyanide men, and I may, perhaps, in spite of the time elapsed, suggest answers to some of the questions propounded by the writer.

The difficulties underlying most of these queries seem to me to rest in the analyses of the two samples of "potassium cyanide." The figure given for NaCN, 82.24 per cent., is apparently stated in terms of KCN, because if 82 per cent. by weight of true NaCN had been present, a weighed portion of the mixed salt titrated to the standard for KCN should have shown a value of about 125 per cent. in terms of KCN. It would seem that, in making the analysis, the cyanogen contents were first ascertained in terms of KCN, and then, the sodium and potassium being relatively determined, the cyanogen was apportioned between them, giving a total result in terms of KCN.

If this supposition be correct and if the mixture when titrated to the KCN standard showed only 100 per cent. or a little less, then there would be left a considerable margin in a given weight of the substance for impurities which do not appear in the analysis at all, probably chiefly sodium salts other than NaCN, since the total sodium was apparently determined. On this hypothesis such a sample of the double salt as that mentioned, if on titration it gave a value of about 100 per cent. in terms of KCN, ought to have something like the following composition: KCN, 15.83 per cent.; NaCN, (equivalent to 82.24 per cent. KCN), 61.83; impurities, 22.34; total, 100 per cent. It is possible that the difference in behavior between the old and the new lots, marked 1 and 2 respectively, lies in these impurities not shown by the analysis. Now to take the questions *seriatim* as propounded in the article:

(1) In reply to this I might say that I have long understood that "potassium cyanide" in recent years has become merely a trade name for the double salt containing a varying proportion of sodium cyanide: in fact in many advertisements of "potassium cyanide" the words "double salt" are inserted in brackets.[1]

(2) If my previous explanation be correct, then when a weighed portion of a mixed salt such as that analyzed shows a value of only 100 per cent. on being titrated to the KCN standard, there must be impurities present which are not shown in the analysis.

(3) The answer to this would lie in the fact that the 82 per cent. of NaCN in the mixture which Mr. Ross is comparing with 100 per cent. NaCN, is really not 82 per cent. true NaCN, but only 82 per cent. cyanogen value in terms of KCN. Questions 4 and 5 would turn on the same point.

These things being so, the important matter really is, how are we to get the material we wish for, whether it be NaCN, KCN or the "double salt"? I will not discuss the question here as to the relative merits of these cyanides: I have usually found that, per unit of cyanogen in the stock solutions, there is little to choose between them in regard to extraction, but that on some ores the decomposition of NaCN is greater than when using "potassium cyanide," so that pound for pound the same work is accomplished in spite of the higher content of cyanogen in the NaCN. Also I have found that some brands of NaCN contain a considerable quantity of caustic soda which accumulates in the solution and demoralizes the work of the zinc precipitation boxes.

These are matters, however, for the individual operator to work out in connection with the particular kind of ore he has to treat and the conditions under which he is working. When the brand that gives the best results has been ascertained, then the only recourse seems to be to take careful samples of that lot and preserve them in hermetically sealed tubes, to be used as checks against the analyses of future shipments: each shipment would then be required to conform to a certain specification.

Owing to the fact that many workers are discarding the NaCN in favor of "potassium cyanide," there is likely to be a growing tendency on the part of manufacturers to increase the proportion of NaCN in the "double salt" while keeping the cyanogen contents down to the specified 98-99 per cent., the difference in weight being made up by impurities; and unless detailed analyses are regularly made the average cyanide man will be none the wiser except insofar as he may find a difference in his extraction and precipitation.

The custom has been adopted in South

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[1] Julian and Smart, second edition, p. 107.

Africa of maintaining a special analytical laboratory for a group of companies, which shall test and analyze every material used at the mines. The companies can thus insist on manufacturers maintaining a certain specified grade of goods. Of course, in the case of the Rand, the mines are so closely grouped that such an arrangement is much easier than in this country where the companies are scattered over a wide area, but there must be many instances where some combination for the purpose would be feasible.

I came across an instance not long ago showing the need for something of the kind. The assay office ran out of litharge, and, the mine being situated 7 or 8 days from a railway, a requisition was made on the store for some red lead to tide over the difficulty. This red lead seemed to the assayer suspiciously light when weighing up, and the resulting assays turned out worthless. There were no appliances available for an analysis, but on making a fusion assay of the red lead with excess of reducer it was found to contain only 5 per cent. lead; what the remainder was, of course, was not determined. It is beside the point whether this material answered its purpose in the shops or not; the fact remains that red lead was ordered and this was shipped as red lead and paid for as such. The only protection consumers would appear to have in such cases lies in some scheme like that lately inaugurated in South Africa. E. M. Hamilton.

Ventanas, Durango, Mex., Jan. 15, 1910.

Stamp Drop Sequenee

The communication from Ralston Bell in the Journal of Jan. 22 on stamp sequence is interesting. Nearly all mill men will agree with him so far as concerns the advantage of 1, 4, 2, 3, 5 over 1, 3, 5, 2, 4, and I personally maintain that there are no circumstances where the former is not the better. It appears to me, however, that Mr. Bell's explanation of the cause of the differences and his deductions from what he calls a secondary drop are at least open to criticism if not to gentle ridicule. For example, after evolving this secondary drop from the Homestake sequence, 1, 3, 5, 2, 4, would it not have been equally logical to discover a "tertiary" drop, omitting two stamps, thus getting the series 1, 2, 3, 4, 5, which is the reverse of his secondary? This would seem to upset his theory—or at least 66 per cent. of it. Similarly a quaternary drop is obtained by omitting three stamps (1, 4, 2, 5, 3) which in turn is nothing but 1, 3, 5, 2, 4, read backward, which lands us where we began. This resembles finding a Bacon cipher in Shakespeare to prove authorship.

It is in place here to call attention to the fact that in large mills no two batteries will operate the same, each seeming to have a separate individuality of its own. Take for example a time when new shoes and dies are put on several batteries on the same day. The drop of each battery will be adjusted to the same weight by means of a set of blocks, but within half an hour after starting the batteryman will be raising or lowering tappets on stems to correct the "feel" of the dropping stamp. Slight variations in lengths of cams and of fingers will account for part of this erratic action, while part is also chargeable to differences in conditions of mortar liners, foundations and screens. Mark R. Lamb.

Milwaukee, Wis., Jan. 25, 1910.

A Bureau of Mines?

Much can be said for R. P. Jarvis' opposition, in the Journal of Jan. 22, to the proposed mining bureau, if it means simply a device for extending the present reckless waste of public funds gathered from the people through indirect taxation; but is there not much legitimate service which such a bureau can perform for the nation? That a Government bureau can be administered as efficiently as a private enterprise, provided it is in charge of a trained man unhampered by politicians, is being demonstrated daily by such examples as the Geological Survey or the Panama canal.

It appears to me that the mining bureau can properly confine itself to two lines of work. (1) The administration of the remaining public mineral lands; (2) the regulation of the working of mineral lands already in private hands.

President Taft's excellent plan of leasing the remaining public coal, oil and phosphate lands direct to the operators, will itself require a large force to administer it practically. The inspection of assessment work annually required from the holders of all United States metallic-mineral claims, is at present so imperfect as to permit of extensive fraud, and for this work the mining bureau would also be especially fitted.

The regulation of privately owned mines should be pursued with two objects: (1) The preservation of human life; (2) the conservation of mineral resources. A comparison of the vital statistics of our coal mines with those of the deeper and more dangerous mines of western Europe convinces me that what we need more urgently than any fresh knowledge is the proper enforcement of safety regulations already known to be necessary. Disobedience to safety regulations by unscrupulous operators is made possible by complaisant mine inspectors who are aware of the danger in offending liberal campaign contributors to the party in power. A national bureau could have no direct veto for such State abuses and its only remedy at present would be the force of example. However, the withholding of national grants for education, etc., from such States as refuse to conform to the regulation system of the mining bureau might be made a powerful lever for improving mine inspection.

The regulation of exploitation with a view of preventing waste of mineral will be simple in those mines leased by the mining bureau direct to the operator. Waste prevention in privately owned mines is an innovation in this country, but public sentiment is soon going to demand it, and such prevention would be no more an invasion of individual rights than are other extensions of the police power. Robinson Crusoe on his island or a miner on the frontier can be a law unto himself, but there comes a time in the growth of population when a miner's individual exploitation of the mineral wealth of society must be as firmly restricted as is individual conduct in other directions.

There is a broad field for the investigating department of the mining bureau without any encroachment on the proper field for private enterprise. Research work on problems affecting the preservation of life and of mineral resources would demand the highest class of talent from the bureau's scientists.

Robert B. Brinsmade.

Morgantown, W. Va., Jan. 29, 1910.

[Professor Brinsmade seems to have a misconception of what a Federal bureau may do constitutionally and may not do. —Editor.]

Wanted—A Method of Mining Red Slate

I wish to invite the attention of mining men, through the Journal, to the necessity for improved methods in quarrying red slate. At present a large amount of this valuable material is destroyed or injured by blasting. Owing to the sharp incline of the rock, it is difficult to operate a channeler, and then too the heavy stroke of that machine shatters the slate for a considerable distance on each side of the cut. We have tried patent blasting schemes and a variety of appliances, including plug and feathers, but all have proved either ineffective or too expensive.

A description of conditions is given in the hope that some reader may win fame for himself and an additional profit to the manufacturers by describing a better method for removing red-slate blocks. Red slate lies in beds which are 18 in., 2 ft., 6 in. and 4 ft. respectively in thickness, and tilted at an angle of 45 deg. Between these layers is a serpentine rock, ½ in. thick and about as strong as a hard-finish wall plaster. When the ends and one side of a bed have been freed, the slate can be pried off and removed.

Charles I. Baker.

Middle Granville, N. Y., Feb. 4, 1910.

Coal Mine Explosion in Mexico

It is reported that about 80 lives were lost in an explosion of gas at one of the mines of the Esperanza Mining Company, Las Esperanza, Coah., Mexico. The dead miners are equally divided between Japanese and Mexicans. Very few Americans were caught in the disaster; however, it is stated that at least five foremen were Americans and that they must have met death.

The explosion is thought to have been caused by the ignition of gas from a cigarette smoked by a miner in violation of the company's rules. The accident occurred after the day shift had gone to work. The explosion shook the entire mine, and buildings on the surface were rattled as if an earthquake had occurred.

When the first cageful of searchers descended, they found that the men on the first and second levels of the mine were unhurt beyond being badly frightened. On the third level the bodies were scattered all through the workings; some were crushed by débris and others had been suffocated while trying to escape to the shaft. There being no rescue apparatus available, it was impossible for rescuers to work long in the poisonous atmosphere, and relays were sent on quick dashes into the galleries to bring up as many bodies as possible.

The mine was believed to be one of the best equipped in the country, in regard to its ventilating apparatus, and there will doubtless be an investigation of the cause of the presence of firedamp which is said to have started the explosion.

Mine Explosion in Pennsylvania

Following close upon the recent explosions in various parts of the United States, an explosion of gas occurred in one of the mines of the Jefferson & Clearfield Coal Company, at Ernest, six miles north of Indiana, Penn. The accident happened at 9 o'clock on the morning of Feb. 5; 11 miners were killed and four injured.

Early reports seemed to indicate that the disaster would claim at least 100 lives, but the fact that only a small pocket of gas was ignited, prevented the death roll assuming such large proportions. The men were working in a new heading. Whether or not safety lamps were used has not been determined.

Immediately after the explosion, a rescue party headed by Superintendent William Reed and Foreman John Harrington entered the mine. Several members of this first party were overcome, but were brought to the surface without any resultant fatalities. At a later hour, on the day of the explosion, Clarence Hall and other members of the staff of the Technological Branch of the United States Geological Survey, Pittsburg, arrived at the mine, and have since then worked in conjunction with the State mine inspectors. The Government experts were provided with all necessary equipment for rescue work.

The Precious Metal Production of Mexico

Concerning the precious metal production of Mexico for the fiscal year 1908-1909, the Minister of Finance in his documents accompanying the budget for 1910-11 gives the gold production for the fiscal year 1908-09 at 33,761 kg., valued at 45,014,954 pesos; the silver production is stated to have been 2,292,260 kg., valued at 77,109,742 pesos. Minister Limantour in reviewing these statistics says:

"In calculating the production of gold, the Department of Finance is in the habit of taking the export of gold as bullion, in ore or in other forms, except Mexican and foreign gold coins, and then adding the domestic gold bullion, bought by the Exchange and Currency Commission and not sent abroad by that commission, as well as a small amount of gold used for the arts in the Republic. So that if there is eliminated from the figures in question, the gold that may accidentally come to the country from abroad, and which might be mistaken for domestic gold, it will be easy to arrive at the quantity of gold produced in the Republic.

MEXICAN GOLD PRODUCTION IN 1908-09.

	Kilograms.	Value. in Pesos.
Exportation of Mexican gold bullion	....	36,544,546
Exportation of gold in ore and other forms	....	2,633,145
Total	29,383.306	39,177,691
Difference between the gold acquired and exported by the Currency Commission	4,277.958	5,703,930
Consumed in the arts in Mexico (estimated)	100.000	133,333
Total production in 1908-09	33,761.264	45,014,954

"The accompanying table shows a considerable increase over the production of the preceding year, and a still larger increase over that of earlier years. Up to 1891 the annual production of gold never exceeded 2,000,000 pesos, and not until the year 1895-96 did it exceed 10,000,000 pesos

MEXICAN SILVER PRODUCTION.

	Kilograms.	Value.
Silver exports in the form of ore, cyanide products, etc. and in the form of bars	2,191,200	$73,741,313
Silver bought for coinage	100,060	3,334,784
Consumed in the arts in Mexico (estimated)	1,000	33,645
Total production in 1908-09	2,292,260	$77,109,742

"The quantity of silver produced in 1908-09 was the largest annual production in the history of the Republic. Only since 1902 has the annual production of silver exceeded 2,000,000 kg. The production in 1907-08 reached 2,151,014 kg., but the production for 1908-09 showed a further growth of nearly 140,000 kg. The value of the silver produced in 1909-09 was 77,100,000 pesos, as as against 85,400,000 pesos in 1907-08, being a decrease of 8,300,000 pesos, notwithstanding the fact that there was a gain in the quantity produced. This result is due to the low price of the metal of late.

"Low as may have been the total value of the silver produced during the fiscal year 1908-09, it was nevertheless larger than the value of the production in any of the years prior to 1902-03, and also larger than the value of the production in 1905-06, proving that the momentary reform in 1904 has not stopped the operation of the silver mines and has not impaired the country's power to purchase foreign goods, or meet foreign liabilities with its output of the white metal.

"Silver mining does not pay so well now as when free coinage prevailed, but the operation of silver mining is carried on as actively, or more actively than ever. During the two years in which the price of silver rose above the new legal parity, the owners of silver mines realized profits far in excess of what they obtained before the reform of the currency."

In the JOURNAL of Jan. 8, 1909, owing to a clerical error, the production of gold by weight for the fiscal year 1907-08 was given as the silver output of the country. The silver output for 1907-08 was officially placed at 2,153,014 kg., and for 31 years, including that date, at 40,255,278 kilograms.

January Oil Dividends

The accompanying table gives the amount of dividends paid by a number of California oil companies during January. 1910, together with their total dividends to date, as reported by the California Stock and Oil Exchange, San Francisco.

Name of Company.	January, 1910, Dividend.	Total Paid to Date.
Alma	$ 11,400	$ 159,600
Amalgamated Oil	50,000	1,400,000
American Petroleum	122,785	803,205
Brookshire	5,000	442,500
Caribou	20,175	660,180
Claremont	10,000	305,000
Columbia	4,996	254,811
Euclid	3,500	117,000
Globe	6,000	81,000
Home	2,000	470,000
Illinois Crude	2,000	84,000
Imperial	60,000	1,940,000
Mexican Petroleum	85,616	3,306,010
Palmer	18,020	214,320
Paraffine	3,000	9,000
Pinal	14,992	857,117
Record	7,500	40,000
Rice Ranch	3,000	93,000
Royalty	400	8,000
S. F. & McKittrick	15,000	310,000
Sauer Dough	4,987	507,328
Sesnon	15,000	90,000
Sovereign	5,000	90,000
Traders	14,000	157,186
Union	124,813	6,118,629
United Petroleum	40,375	2,098,208
Wabash	3,000	114,000
Total for January	$652,559	....

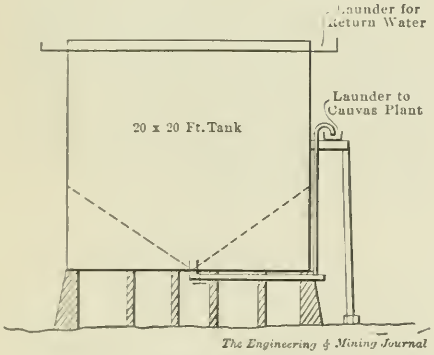
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Saving Lead Slimes

In the milling of lead ores a certain amount is always lost as slime. The fine particles of galena will remain suspended in the moving current of water and finally reach the tailings pile. The following scheme for collecting the lead from the slimes has been adopted by the Federal Lead Company at Flat River, Missouri.



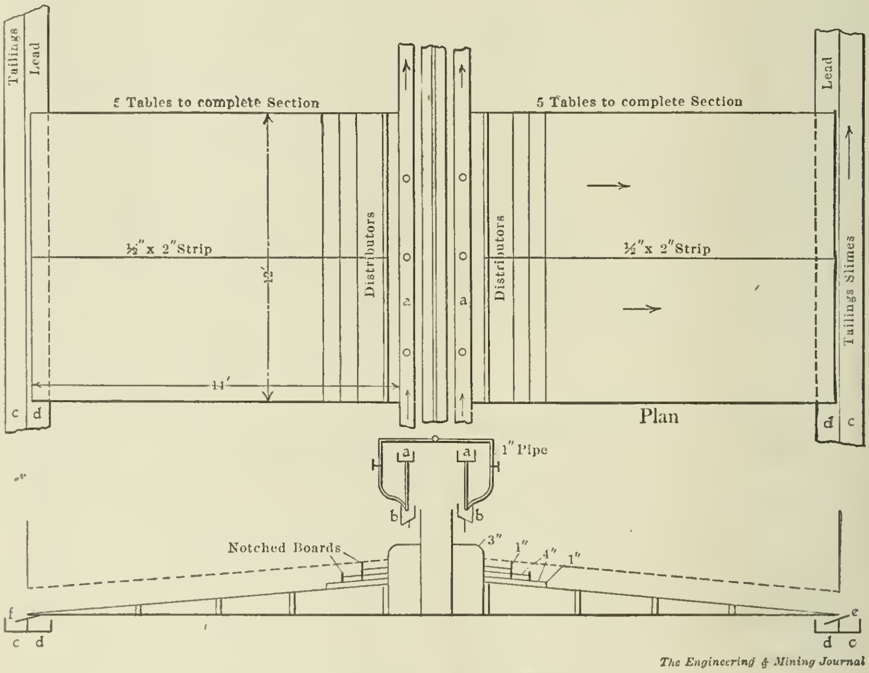
SLIME DEWATERING TANK

The slimes from the concentrating plant are conveyed to 18 wooden settling and dewatering tanks, 20 ft. in diameter and 20 ft. deep, with a conical bottom. In the bottom of each tank is a 3-in. pipe, shown in Fig. 1, and which passes out beneath the tank and then up about 2/3 the hight of the tank. The pipe terminates in a goose neck and in the end of the pipe is a wooden plug, in which is a hole one inch in diameter to reduce the flow of water. The total flow from all the spigots is 720 gal. per minute. Through this pipe the heavy particles pass under a 5- to 10-ft. head and are carried by a launder to the canvas plant. The overflow of 250 gal. per minute from each of these tanks is taken to a concrete tank from which it is pumped back to the mill for reuse.

THE CANVAS PLANT

The canvas plant has eight sets of canvas-covered tables, four on each floor of the building. The tables are 12x14 ft. and there are six in each group. Two rows of tables are placed back to back and slope about 1 9/16 in. per foot, as shown in the accompanying drawing, Fig. 2. The tables are covered with 18-oz. canvas and it is upon this that the fine lead is collected.

The slimes are run to the tables from a launder and distributed by means of a distributing trough *b*, in the bottom of which are ½-in. holes, 3 in. apart. The pulp is further distributed by passing over notched boards. The notches in each board are about one inch deep, 1½ in. apart, and the boards are so placed that the notches alternate. The slimes are allowed to flow over the tables for 30 or 40 minutes. Then clear water is turned on through the distributing trough for a few minutes until the barren sand is washed off, leaving the canvas covered with lead concentrate. While the clear water is flowing over the tables it has a tendency to cut channels in fine sand on the canvas. This is prevented by a boy who works barefooted, and with his foot turns the course of the water, thus preventing the lead concentrates from being washed off.



CANVAS TABLE FOR LEAD SLIMES

The galena is then washed off by water from a nozzle and carried into a collecting tank, by the launder *d*, where it is pumped to a settling tank by a sand pump. All the work is done by boys, one boy caring for 6 to 10 tables. A screen test of the feed to the canvas plant shows:

	Wt. per cent.
On 80 mesh............	1.0
On 150 mesh...........	25.0
On 200 mesh...........	8.0
Through 200 mesh......	66.0

SETTLING TANKS

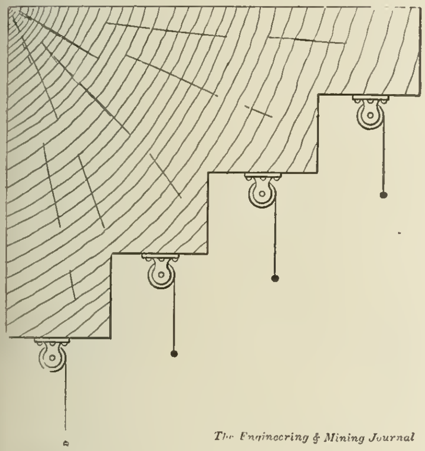
The receiving tanks for the concentrates are four in number, 10x16 ft., and 3 ft. deep. The lead slimes are pumped into one of these tanks and allowed to settle until the tank is full of concentrates, when the flow is diverted to a second tank. The water from each of the four tanks flows over the edge and passes by a launder to a second settling tank, 16 ft. square, where the last of the lead is collected, and the water allowed to run off. The plant has been in operation a number of months and the management is well pleased with the results obtained. There is no machinery to get out of repair and the operating cost is low as it requires only one man and four to six boys. This is the only plant of its kind operated in southeast Missouri.

LAUNDER

One special feature of this plant is a double launder in one side of which, *c*, the waste slimes are carried off while *d* carries the lead concentrates. This is accomplished by means of a board *f* about 8 in. wide, and the length of which is equal to the width of the table. This board forms an apron which while in one position carries the slimes to the slime trough; by means of a small iron hook the board is shifted to act as an apron to conduct the lead to the other compartment of the launder, as shown at *e* in the accompanying illustration.

Method of Exhibiting Mine Maps

An inexpensive and handy method of exhibiting mine maps is to have them mounted on window-curtain rollers set on a notched wooden frame, as shown in the accompanying illustration. The maps or blueprints are first mounted on cheese cloth, then fastened to the curtain rollers and provided with cords or grips by which they may be handled in raising and lowering. This makes an excellent method of exhibiting mine plans and sections. The maps are always at hand and a comprehensive idea of the workings can be had by referring from one map to the other. It is much more convenient to raise and lower maps so mounted than to handle bothersome blueprints which have to be spread out for observation.


The Engineering & Mining Journal

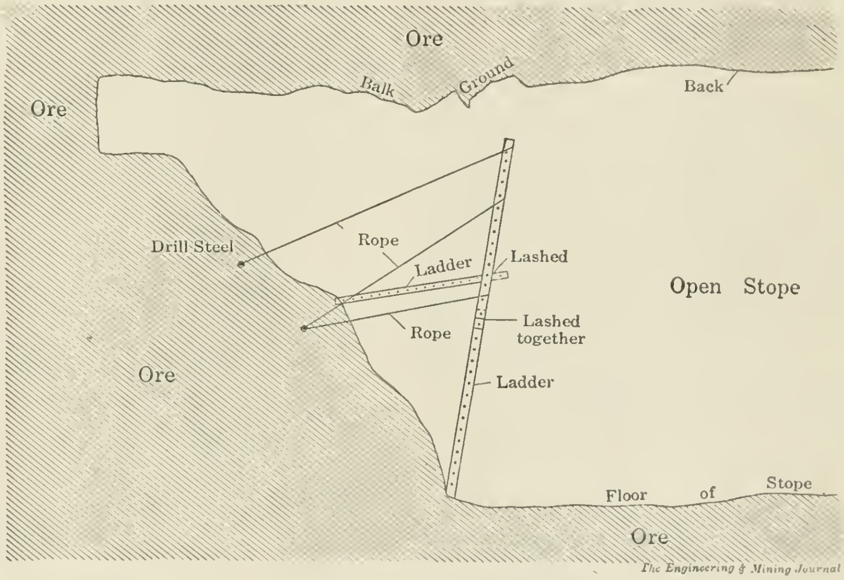
ARRANGEMENT OF CURTAIN ROLLS FOR MAPS

Hoisting Cable Run through a Drill Hole

A 6-in. drill hole from the surface penetrated a body of ore which later was stoped out. Upon sinking the drill hole ore was struck at a lower level and a winze sunk with the drill hole as a center. In order to work the winze to any depth it would have been necessary to install a hoist underground, which was not practical. A hoist was therefore erected at the surface and the cable operated through the drill hole. Ore was hoisted to the main working level and then trammed to the hoisting shaft.

Method of Rigging Ladders to Reach Stope Backs

In the large underhand stopes in the Tennessee Copper Company's mines, where the miners practically never see the back, which in an open stope is frequently from 70 to 80 ft. above them, it is evidently necessary to keep the roof well trimmed of all heavy, or "balk ground." To insure this, a crew of men is continually kept at work, looking after the condition of the roof. This work is extremely dangerous and ready resource is required to enable the men to gain access to the back. The accompanying drawing shows the method of rigging ladders to reach the roof over the benches of an underhand stope, open to its full hight and for a width of from 50 to 150 ft. The ladders are securely lashed together, and, as shown, stayed by ropes secured to the drill steels set into the rock face. A small stoping drill is frequently slung from the ladder and used to put holes in the roof where much balk ground must be slabbed down. Shooting the roof, is, however, a dangerous practice, as shattered rock is apt to be left to fall later, when the face of the stope has advanced and the back is inaccessible.



The Engineering & Mining Journal

LADDER SCAFFOLD FOR STOPES

A great trouble with machine men is their tendency to get cut holes too flat and lifters too steep. Lifters should be as flat as possible.

Methods of Stoping in Use on the Kalgoorlie Field*

By J. Cheffirs†

The three methods of stoping described in this article are known as the "rill," the "flatback," and the "shrinkage." For comparative purposes each method will be applied to a block of ore 500 ft. in length, and opened up by levels 200 ft. apart.

THE RILL SYSTEM

It is necessary in the rill system for facilitating mullocking, to make connections between levels by raises and winzes every 100 or 150 ft. along the orebody. After the leading stope is opened the full length of the drive, the level is timbered. Single stulls are used up to a width of 14 ft. If the span is too great for stulls, set timbers of saddleback stulls are used. Stulls are lagged over with 4-in. poles, and wooden chutes are built at intervals of 50 ft. Ore chutes are cribbed up through the filling and are constructed of 7-in. round timber. The chutes are 4x4 ft. in the clear. Occasionally a double pass or chute may be carried up, one side serving as a manway.

Stoping is commenced off the winzes, and rills or channels are gradually formed, one on either end of each winze. The rills are generally at an angle of 37 deg. off the horizontal. After the rill is cut through, and the ore, which gravitates down the rill to the ore pass, is cleaned up, machines are transferred to another portion of the stope, ore passes built up, and filling is proceeded with. The filling, which usually consists of residues, is dumped down the winzes from the level above and gravitates down the rill into position, although at the extreme points of rills a certain amount of handling is required.

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*Abstract of a paper read at Kalgoorlie meeting of Australasian Institute of Mining Engineers.

†Lake View Consols, Limited.

FLATBACK SYSTEM

The flatback system is similar to the rill, the difference being that the stope is carried horizontally, and not filled as in the previous method. As the ore does not gravitate, but lies where it is broken, it is necessary to have ore passes at shorter intervals. Filling is also more expensive on acount of the extra handling required. This method is usually put in force where the ground is heavy, and bulkheads, etc., are required to keep up the back or walls, as the flat bed of mullock forms a solid foundation for the bulks.

SHRINKAGE SYSTEM

In the shrinkage or "lay" system one connection between levels at about the center of the block is all that is needed. The level is timbered similarly to the rill system, except that the chutes, which are put in every 20 ft., are constructed of ⅜-in. steel. These chutes practically consist of a steel lip protruding into the level, the bottom of the chute being formed by the broken ore itself. Any rocks which are too large to pass through the opening can be blasted without damaging the chute. The stope is rilled at an angle of 23 deg., all waterholes being bored.

Sufficient of the broken ore, approximately 44 per cent., is drawn off to allow comfortable working room between the back of the stope and the top of the broken ore, which acts as filling until the stope is completed. Two ladderways are cribbed up through the ore, one near either end of stope, built of 6-in. half-joggled logs, and measuring 3x3 ft. in the clear. These manways are commenced between two chutes, so that the shrinkage of the ore directly over the chute will not affect them. When blasting, only a few holes are fired in a round, so as to allow the large rocks to be broken sufficiently small to pass through the chutes.

After the stope is opened through to the level above, all ladders and air pipes are removed from passes, and the balance of the ore remaining in the stope is drawn off. The passes then collapse, and the timbers are regained through the chutes, to be utilized in other places. Filling is then a simple matter, as, the stope being open, the mullock may be dumped at whatever point required.

COMPARISON OF METHODS

Where conditions permit of the satisfactory working of the shrinkage system I prefer it. In the rill system in opening up the block of ore, three or four winzes are essential to economical mining, while in the shrinkage system one winze is sufficient. A considerable saving in the cost of development is thus effected. Expensive ore passes, which have to be installed and maintained in the rill system, are entirely dispensed with in the shrinkage system. Loss of time, experienced in shifting machines preparatory to filling, is avoided, because in the shrinkage system the stope is not filled until after it is cut through and the ore drawn off. In the rill system a certain percentage of ore, no matter what care is exercised in cleaning up rills, is lost—embedded in the filling—while in the shrinkage system a certain amount of low-grade material scales off the walls and reduces the grade slightly. This can be reduced to a minimum by strict supervision in the breaking of the stope.

There are certain conditions under which the shrinkage system, if applied, would be unsuccessful, such as in flat veins or in stopes where the walls and backs are bad; but where the lode is at all nearly vertical and the walls fairly good I am satisfied that it is a cheaper and just as satisfactory a method as the rill system. In isolated patches of ore, which probably would not be worth considering if a lot of dead work were necessary to deliver the mullock in the stope, this system can be used to advantage.

Wooden Gate for Mine Shafts

At the Mount Morgan mine in Queensland, the water which trickles down the shaft is extremely acid, due to the oxidation of the pyrite in the ore. On this account the old gates in the mine were always requiring repairs to the hinges and fastenings. A gate was designed and built entirely of wood, and has given satisfaction. Wooden dowels replace all nails and screws; the bottom of the post of the gate is stepped into a block of wood which has a hole bored into it for the introduction of grease, and the top is held by a similar block. Some gates made in this manner are stepped into the inverted bottom of a glass bottle.

A Simple Sampling Device

By FRANZ CAZIN*

Referring to the article, entitled "The Van Mater Sampler," in the JOURNAL of Dec. 25, 1909, I beg to say that I have used the sampler therein described in a number of mills for obtaining a sample of a passing stream of ore, and that on account of its simplicity and the reliability of the device for obtaining a sufficiently correct sample for mill purposes, together with the little head-room required for its installation, the sampler has given entire satisfaction.

The objections which may be raised against the arrangement as shown in the drawing, which accompanies the above mentioned article, viz., that the bucket may not empty itself completely into the sample hopper and that some particles of the sample may drop into the reject, may be overcome by making the sample hopper sufficiently long and by leading the bucket on its return under the reject hopper (or automatic scale), instead of over it, and over a floor on which the drippings would fall and from which they can be brushed up and added to the sample at the end of each shift. This arrangement is shown in Fig. 1 of the accompanying sketch.

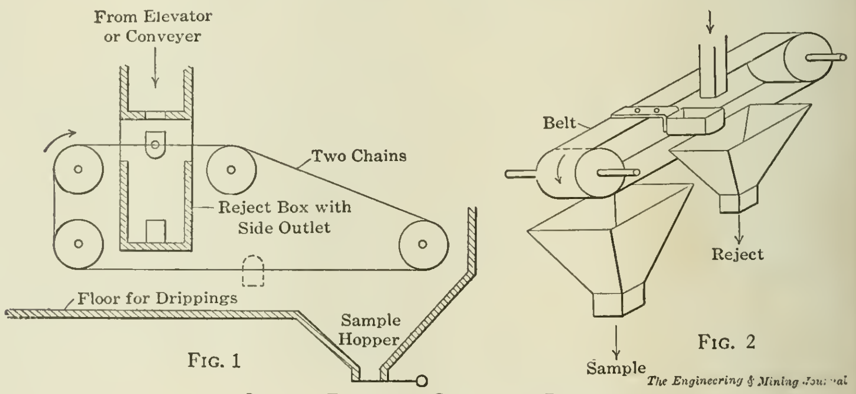

FIG. 1

FIG. 2

SIMPLE FORMS OF SAMPLING BELTS

The Engineering & Mining Journal

I used this sampler in 1901 in the Santa Cruz concentrating mill, Santa Barabara, Chihuahua, Mex.; in 1902, in the Penobscot cyanide mill near Deadwood, S. D.; in 1906, in the copper-concentrating mill of the Penn-Wyoming Copper Company at Encampment, Wyo., and in other instances. So I do not think that this device can be patented now.

I may call attention to a still simpler form of this sampler which I used in the concentrating mill of the Pitt Ores Company near Breckenridge, Colo. In this sampler I replaced the two chains by a belt to which the bucket is fastened, as shown in Fig. 2. This sampler can be easily made at any mill.

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*Consulting mechanical engineer, Denver, Colo.

Dry Placer Mining in California

By Samuel H. Dolbear*

Widespread interest is being maniested by western engineers in the efforts made in the arid portions of the western States to recover gold from placer lands, where water is not available for sluicing and dredging operations. Perhaps the most noteworthy attempt in that direction s that of J. W. Jardine, Jr., and A. W. Patton, at Summit, San Bernardino county, Cal., where the deposits were irst noticed in 1896.

The discovery was attended by the usual rush of prospectors, and for a time 150 men "dry-washed" parts of the deposits. Hand dry-washers of the fan or bellows type were employed, to which work a production of $100,000 is accredited. The grade of gravel from which this amount was extracted is not known. Recent sampling over a large area in Fairy gulch shows an average value of 30c. per yd., while the grade n Phœnix gulch is much better, averagng approximately 70c. per yard. The shallow deposits having become exhausted, most of the prospectors disconinued their efforts. Later on, a reservoir designed to retain rain water was constructed, and sluicing has since been done from time to time as water was available.

Associated with the native gold in this deposit are found magnetic and nonmagnetic black sand. The magnetic sand is found to be valueless, while the nonmagnetic material varies greatly in value. In order to conduct experiments with the mechanical extraction of this gold, Jardine and Patton built a plant of 15 tons daily capacity, which plant has been in operation during the last 11 months. It is not the object of this machine to separate the native gold from the gravel and black sand, but rather to produce a concentrate of sufficient value to permit its shipment to one of the local smelters for treatment.

The gravel is first shoveled into the boot of a chain-bucket elevator, from which it is discharged to a ¾-in. grizzly, the oversize being carried to the boot of the tailings stacker. The material passing through the grizzly is sized over a ¼-in. screen, the oversize in this case passing into the stacker boot while the screenings constitute the material to be tabled. The screening is fed automatically to a table provided with 10 riffles, over which it is forced by the ordinary "bumper" motion. Tailings are conveyed to the stacker boot and the concentrates are delivered from the side of the table into a sacking machine.

Each riffle is provided with a worm extending the width of the table, and set in a 1½-in. groove in the face of the table and in front of the riffles. The duty of the worm is to convey the finer particles to the upper end of the table course, at which point they are discharged over the riffles, moving downward to a given point on the second worm, which point is, of course, determined by the specific gravity of the concentrate.

The best concentrate obtained in the demonstration of the experimental plant was worth $150 per ton, with an approximate extraction of 98 per cent. A plant of 500 yd. daily capacity is in course of construction, and will vary only in a few respects from the experimental machine. Revolving screens are being provided instead of flat screens, and the entire plant is portable.

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*Mining engineer, Johannesburg, Cal.

Pig Iron Production in 1909

The figures collected and published by the American Iron and Steel Association put the production of pig iron in the United States in the second half of 1909 at 14,773,125 long tons. This makes the total production for the year 25,795,471 tons, against 15,936,018 in 1908 and 25,781,361 in 1907; the increase last year over 1908 having been 9,859,453 tons, or 61.8 per cent., while over 1907 it was 14,110 tons. The production for 1909 was the largest ever recorded.

The production of pig iron in the United States for the past 10 years has been as follows, in long tons:

1900......	13,789,242	1905.......	22,992,380
1901......	15,878,354	1906.......	25,307,391
1902......	17,821,307	1907.......	25,781,381
1903......	18,009,259	1908.......	15,936,018
1904.....,	16,497,003	1909	25,795,471

The approximate consumption of pig iron in the country in 1909 appears as follows:

Production..........................	25,795,471
Imports..............................	174,988
Total supplies....................	25,970,459
Exports..............................	61,999
Apparent consumption...........	25,908,460

No account is taken of stocks on hand, as they are not reported. It is probable, however, that they were larger at the end of 1909 than in the previous year.

The division of the iron made according to the purposes for which it was intended was as follows, for two years past:

	1908		1909	
	Tons.	PerCt.	Tons.	PerCt.
Foundry & forge	4,307,734	27 0	6,386,833	24.8
Bessemer........	7,216,976	45.3	10,557,370	40.9
Basic............	4,010,144	25.1	8,250,225	32.0
Charcoal.........	249,146	1.6	376,003	1.4
Spiegel and ferro	152,018	1.0	225,040	0.9
Total..........	15,936,018	100.0	25,795,471	100.0

Bessemer iron in 1909 included 212,615 tons of special low-phosphorus pig. The production of spiegeleisen was 142,831 tons; of ferromanganese 82,209 tons, this total including a few hundred tons of ferrophosphorus. Basic pig does not include a small quantity of basic iron made with charcoal as fuel. A notable point is that while the make of bessemer pig increased 46.3 per cent., that of basic pig more than doubled.

The production according to fuel used was as follows:

	1908	1909.	Changes.
Coke.	15,331,863	21,721,037	I. 9,389,174
Anthracite..	355,009	698,131	I. 343,122
Charcoal.....	219,146	376,003	I. 126,857
Total.....	15,936,018	25,795,171	I. 9,859,453

Coke includes a small quantity made with raw bituminous coal. Nearly all the anthracite furnaces use some proportion of coke; the quantity made with anthracite coal alone in 1909 was only 16,048 tons. Under charcoal iron is included a small quantity made in the electric furnace.

The production by States for the last three years was as follows:

	1907	1908.	1909.
Mass. and Conn.......	19,119	13,794	18,388
New York....	1,659,752	1,019,495	1,733,675
New Jersey...	373,189	225.372	294,474
Pensylvania...	11,318,549	6,987,191	10,918,824
Maryland. ...	411,833	183,502	286,856
Virginia......	478,771	320,458	391,134
Ga. and Tex.	55,825	24,315	26,072
Alabama ...	1,686,674	1,397,014	1,763,617
West Virginia.	291,066	65,551	228,282
Kentucky....	127,946	15,096	86,371
Tennessee.....	393,106	290,826	333,845
Ohio.........	5,250,687	2,861,325	5,551,545
Illinois.......	2,157,768	1,691,944	2,467,153
Ind. and Mich.	436,507	348,096	961,289
Wis. and Minn.	322,083	148,938	348,177
Mo., Colo., Wash. and Cal........	468,486	313,071	382,7 6
Total.. ...	25,781,361	15,936,018	25,795,471 6

The whole number of furnaces in blast on Dec. 31, 1909, was 338, against 258 on June 30, 1909, and 236 on Dec. 31, 1908. The number of furnaces idle, including furnaces being rebuilt, on Dec. 31, 1909, was 131, against 205 on June 30, 1909, and 223 on Dec. 31, 1908.

On Dec. 31, 1909, there were 14 entirely new furnaces in course of erection, all of which will use mineral fuel, as follows: New York, 1; Pennsylvania, 7; Ohio, 3; Indiana, 2; and Michigan, 1. In addition 1 furnace in Pennsylvania and 1 in Virginia were partly erected but work on their construction had been indefinitely suspended.

On Dec. 31, 1909, there were 11 furnaces being rebuilt, 10 mineral fuel and 1 charcoal, as follows: Pennsylvania, three cokes; New Jersey, Virginia, Tennessee, Alabama, Ohio, Illinois and Wisconsin, each one coke; Georgia, one charcoal furnace.

A drive was advanced on the East Rand Extension a distance of 361 ft. in October, a record for the Rand, says the *South African Min. Journ.* Ingersoll-Sergeant 3¼-in. machines were used, working three shifts per day. The average number of holes was 12.7 per round. The average distance of the breast from the shaft was over half a mile, and all the broken ground and supplies had to be transported over this distance.

Iron Ranges of Northern and Northwestern Ontario

Examinations Made in 1907 and 1908 Indicate Little Present Economic Value to Deposits, but Further Prospecting Warranted in Many Cases

FEW DEPOSITS DEVELOPED

Recently numerous explorations have been undertaken to determine the value of the known iron ranges of northern and northwestern Ontario. Dr. A. P. Coleman has investigated the iron ranges of Nipigon district, his recent work being directed toward completing the mapping of the ranges.

The Little Long lake range is east of the Poplar Lodge ranges which are situated along the east shore of Lake Nipigon, previosuly examined, and it is probably an extension of the Poplar Lodge ranges. A number of iron-ore locations have been taken up on or near the western bay. The first suggestion of iron formation is found on the south side of the western end of the lake where low cliffs of Keewatin rocks occur and a few thin seams of banded gray and black material are evidently very low-grade examples of the usual iron formation. They are associated with green schist and irregular masses of coarse arkose. The shore for some distance east and west consists of the same rocks with a little of the iron formation, and, where drift-covered, often exhibits magnetic attraction. Inland in these locations no rock was seen, the country being a succession of swamps or muskegs, and sand plains and ridges.

The most important outcrop is at the east end of a large island where stripping disclosed a width of 24 yd. of iron formation intermixed with schist, some of the bands almost heavy enough to be considered ore. The colors at this stripping are gray and black, and there is magnetite enough to make the ordinary compass useless. Much of the material gives a red powder when pounded, showing the presence of hematite. Another stripping a short distance west shows 40 yd. of lean iron formation without schist and containing some dull-red jasper. The iron mineral here seems to be mainly hematite though the compass is still useless. The greatest width of the banded silica and ore found on the island is 130 yd. and the total length of the outcrops a little over a quarter of a mile.

Along the shore of the southwest bay rock is seen rising in places 20 or 30 ft., chiefly massive greenstone and green schist, but including a lean iron formation. To the west of the lake seven claims have been taken up, but only one of them shows outcrops of any importance, the others being largely covered with drift and muskeg. A steep rocky hill of green schist contains several bands of iron formation, mostly very lean but with some narrow streaks heavy and black with magnetite. The width of rock exposed is about a quarter of a mile. Sections at short intervals to the west show less rock but of the same kinds; in the southern half of the location strong local attraction at many points proves that there is magnetite below the covering of drift. There appear to be two small parallel iron ranges running east and west in this region, the more important including the north half of the island previously referred to and running east; the other is a short distance south of it. There is a gap of several miles between this range and the most easterly one mapped in the Poplar Lodge and Sturgeon river region, in which only indications of iron have been found. Little can be said as to the value of the deposits examined until some work has been done in the way of exploitation with test pits or diamond drills. The iron formation resembles that of the southern range near Poplar Lodge, but so far as known the outcrops are much less extensive and of lower grade. If orebodies of importance should be found on Little Long lake, only about 20 miles of railway would be required to connect them with the nearest point on the National Transcontinental Railway.

Black Sturgeon Iron Region

Doctor Coleman also furnishes a report of his work in the neighborhood of Black Sturgeon lake and river, southwest of Lake Nipigon, where a number of iron locations were taken up some years ago, and some work done in the way of stripping and diamond drilling, principally by Wiley and Marks, of Port Arthur. Some high-grade hematite has been produced in this region, but the observations of Doctor Coleman indicate that so far no discoveries of deposits sufficiently extensive to be of commercial value have been made. The iron locations touch Nonwatin lake at its northeast corner and extend southeastward for some distance and northwestward to Black Sturgeon lake. It was found that no iron formation of Keewatin age existed in the region, the lower ground consisting of drift with a few outcrops of Keweenawan sediments or diabase, and the range of hills of granite, gneiss and certain schists. The iron ore occurs always along or near the southwestern flank of the Laurentian hills, mainly in small fissures. Along Black Sturgeon river between Nonwatin and Black Sturgeon lakes there are considerable exposures of red shale or marl. Some of the locations on which no rock was found were apparently taken up with the idea that iron-bearing rocks might underlie the drift, the red shale giving a suggestion of this sort. The most interesting seams of ore are found on a location southeast of Black Sturgeon lake where a good deal of stripping and diamond drilling has been done. Here rusty decomposed rock shows seams of pure hematite. The ore occupies narrow fissures between small blocks of breccia and is found in the form of soft red hematite, black micaceous or specular hematite, botryoidal concretionary coatings of hematite, and martite. Small veins or fragments of the ore may be selected which are practically pure, but the total amount to be seen is only small. The ore is of admirable quality if enough were present to make it of economic importance. In other locations in this neighborhood where a comparatively large amount of work has been done in sinking pits, trenching and diamond drilling thin seams of ore occur. The bed rock appears to be brecciated coarse granite, much reddened with hematite, but seldom heavy enough to be called ore. Doctor Coleman attributes the source of the iron solutions which have widely impregnated the Archean granite and schist at the edge of the escarpment between the two levels, to Keweenawan sediments, most of which carry enough hematite to be red. So far as known the leaching process went on chiefly along the cliffs or slope of the escarpment The brecciation of the granite and schis suggests that faulting took place after the Keweenawan covered the region, giving an opportunity for the leaching of sediments from above and the deposits o seams of hematite in the fissures in the Archean beneath.

Some iron claims about a mile and a half west of the north end of Fraser lake which lies between Nonwatin lake and the Nipigon river, were also examined The geological relationships and the peculiar little seams of hematite of that neighborhood were found to be of exactly the same character as those of Nonwatin and Black Sturgeon lakes, except that everything was on a much smaller scale The amount of ore seen was quite insignificant.

Bog Iron on English River

In the autumn of 1907, bog iron wa discovered on Little Bear lakes, south

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Note—Abstract of the Eighteenth Annual Report of the Ontario Bureau of Mines for 1909.

st of Selwyn lake, and subsequently on
llow and Greer lakes along the bound-
between the Thunder bay and Rainy
er districts. Similar deposits have also
en found near Niblock station on the
in line of the Canadian Pacific Rail-
y where over 140 claims have been
ked. The latter deposits are about 20
les from those at Little Bear lakes.
S. Moore, reporting on the distribution
d economic importance of these de-
sits, states that the artificial drainage
the lakes of the bog-iron district would
a difficult matter for several reasons.
e iron occurs in both the ferrous and
ric conditions, and as a combination of
two forms. The ferrous form exists
the state of the greenish salt or salts
the protoxide, and the ferric form as
common hydrous oxide, limonite. The
mbination of the two oxides gives a
all amount of magnetite, which cannot
proved to originate in the bog as it
y have been carried in by streams. No
bonate of iron was detected.

The limonite occurs in red, brown and
llow colors, and forms either soft or
rd bedded masses, concretions, slimy
d, or cement in sand. The soft, bedded
llow limonite occurs in the most east-
y of the Little Bear lakes as a layer 4
thick in water about 2 ft. deep. It is
dly mixed with sand and is of low
ade. A partial analysis gave silica,
17 per cent.; metallic iron, 27.34; car-
n dioxide, absent; loss on ignition,
2 per cent. The most frequent occur-
nce of the iron is in the form of con-
tions of various shapes of a dark or
llowish brown color. They vary in
e from ½ to 3 in. in diameter and
m ¼ to ½ in. thick, being smaller
n those found in Quebec and New
unswick. An analysis of some of these
ncretions gave silica (soluble), 8.92
r cent.; silica (insoluble), 4.88; ferric
n (Fe_2O_2), 68.36; ferrous iron (FeO),
6; metallic iron, 49.5. The metallic
n is a little lower than that of the
erage bog ore worked in other
gions.

The most important deposit of the re-
n was found around Hematite lake,
ng practically confined to the northern
lf of the lake. An almost continuous
nd of limonite mixed with sand ex-
ds around the shore, varying in depth
m 1 to 15 in. and in width up to 300

After a careful consideration of the
g-iron deposits of the region the con-
ion is reached that there is not suf-
ient iron in sight to warrant much ex-
nditure in the attempt to work them,
ough some ore might be collected from
larger deposits by washing the sandy
ke-bottom material. The presence of
se deposits, however, shows that pros-
cting in the region is warranted. Should
her deposits exist they will probably be
und within a short distance of the sur-
ce of the sand in the lakes or in peat
gs.

Onaman Iron Range Area

A report on the geology of the Onaman iron-range area is furnished by E. S. Moore from a survey completed in 1908. This region comprises about 70 square miles lying northeast of Lake Nipigon and surrounding the head waters of the Red Paint river, by the name of which it was formerly known. It first attracted attention in 1904, during the survey of the line of the National Transcontinental Railway. A number of claims have been located and some trenching, stripping and diamond drilling done, but no considerable development work is likely to be carried on until the railway is in operation. The rock systems of this area include the Keewatin, Laurentian, Huronian, Keweenawan, Pleistocene and recent formations. The Keewatin consists of an older complex series of basic rocks, cut and overflowed by an acid series, which are in turn overlain by a thin series of pyroclastics grading into sediments. These are overlain conformably by a banded iron formation, which in one place seems to be cut and overflowed by the acid rocks. The iron formation occurs in two bands distinguished as the Northern and Southern ranges, extending nearly east and west across the district, and about two miles apart. The Northern range, beginning below Holliday lake, extends across the hight of land and along Johnson creek nearly to the border of the district, a distance of about 10 miles. The outcrop is not continuous, there being gaps of considerable extent. Local magnetic influences where outcrops do not occur are sufficiently strong to warrant the band being regarded as continuous and lying along a syncline. The width varies greatly from a few feet at the western end to half a mile. Where the hight of land is crossed the outcrop disappears under the drift and reappears two miles to the east, as narrow outcrops on either side of a mass of greenstone which has been faulted into it, again disappearing and coming to the surface three miles further east in a considerable outcrop. The formation at this point can be traced over an area two miles in length by one and one-fourth miles wide and is on the whole pretty lean, much slate and schist being intermixed with the jasper.

The Southern range is more continuous and compact than the Northern. The most westerly outcrop lies along the south side of Castor lake, where a very narrow band of jasper occurs. There is then a break where drift extends for a mile between this small outcrop and the main portion of the range, the formation probably underlying the drift. The main portion of the range is represented by almost continuous exposures for about two miles, with a maximum width of 700 ft. This range, like the Northern one, contains much foreign rock in its widest areas. At the east end it runs under drift but local deflections of the compass in a large swamp and the occurrence of a small outcrop indicate that the range is continuous for at least 1½ miles under the swamp. Outside of the outcrops embraced in the ranges followed, there are two very small patches of iron formation occurring to the southeast of the main ranges, being little ledges of jasper contained in slate and green schist.

On account of the complexity of the folding throughout the area it was impossible to work out the thickness of the iron formation even approximately. Bands of jasper appear, disappear and reappear again and cannot be correlated with any degree of certainty in different portions of the range. The formation, which is composed largely of red jasper, often well banded, and magnetite, does not at present show commercial ore. Many of the bands are rich enough to make ore, but as a rule a great deal of schist and slate is mixed with them. There does not appear to have been much concentration as neither the outcrops nor the drill holes that have been sunk show any bodies of rich ore. The rocks are, as a rule, so hard and close-grained that little percolation of water seems to have taken place. No drilling has been done on the Southern range where the best outcrops of jasper occur.

A number of analyses of specimens were made. One from a band of magnetite and chert a few inches wide extending between bands of slate showed total metallic iron, 50.32 per cent.; iron in ferrous condition, 17.06; silica, 26.85. A specimen of jasper collected from an outcrop in a swamp gave: Total metallic iron, 55.79 per cent.; iron in ferrous condition, 10.94; silica, 37.10. An analysis from a band of distinctly banded red jasper and magnetite occurring in bands a few feet wide lying between strips of slate showed: Total metallic iron, 38.83 per cent.; iron in ferrous condition, 12.9; silica, 50. A specimen secured by diamond drilling on the Miller claims on the Northern range gave 42.8 per cent. of iron. Though there is a large amount of well banded jasper on this range the iron content on the whole is low, but so much of it is covered by drift that it is impossible to say until it has been more fully prospected what some parts of it may produce. The eastern end of the Southern range is better than the western, which gives no promise of producing ore.

The Woman River Area

An examination of a portion of the Woman river iron range was made by R. C. Allen, whose report deals largely with the relation of the iron formation of the region with the associated igneous rocks. This range is a belt of iron-bearing rocks extending from the vicinity of the northeast end of Rush lake in the Sudbury mining division in a general southwesterly direction for about 11 miles, crossing the Woman river from which it takes its name. West of the river the iron formation runs in three belts.

This formation is made up of finely banded cherty iron carbonate rocks, hematitic, magnetitic and pyritic cherts, black and red jaspilites, a unique amphibole-magnetite-chert rock and iron ores. Great variability in character of the iron formation is characteristic of all the belts. In several claims taken up west of the river iron ores occur. These are of low grade, running as high as 43 per cent. iron and as shown by an average of 16 analyses, carrying a phosphorus content of 0.018 per cent. Samples from the most highly ferruginous areas, which coincide with those that are abundantly amphibole-bearing, show an iron content varying up to 43 per cent. with an average phosphorus content of 0.0127 per cent. A small amount of sulphur is present as pyrite: An average of 8 determinations gave 1.184 per cent., but these samples were selected for analysis because of their relatively high sulphur content.

Mill of the Hedley Mining Company

Iron Range North of Round Lake

In order to complete the exploration of the iron ranges of the Nipigon region an examination was made of a small range near Round lake by E. S. Moore. Round lake is an expansion of Mud river, lying about 27 miles up the stream and north of Wendigo bay on Lake Nipigon.

About one-third of a mile north of Round lake some narrow bands of lean iron formation occur, the length of the range being about one mile and its width very indefinite. It occurs in a chloritic, or gray gneissic schist and only shows in a few outcrops. Bands of magnetite and silica varying from 8 in. to 8 ft. in width occur, but gradually grade out into the fine-grained, gray gneiss or schist containing much silica and chlorite. The typical iron-formation rock is composed of a crystallized chert interbanded with magnetite and hematite and containing small amounts of siderite. The magnetite is present in sufficient quantity to affect (very locally) the compass to an appreciable extent.

The Nickel Plate Mine

The properties of the Daly Reduction Company and the Yale Mining Company in British Columbia were purchased by the Exploration Syndicate, composed of a group of capitalists who ordinarily associate themselves with the Cole-Ryan copper enterprises. From April 10 to Aug. 1, a corps of mining engineers worked quietly making exhaustive tests by sampling and diamond drilling, which were of a satisfactory nature. The Hedley Gold Mining Company, a close corporation, was organized and took the property over from the Exploration syndicate at an actual cost of $720,000. I. L. Merrill is president, T. Walter Beam is directing the operations and Gomer P. Jones, the former superintendent of the mine, has been appointed general superintendent of the mines and plants. The property is near Hedley, B. C., on the north side of the Similkameen river near the mouth of Twenty Mile creek. The Victoria, Vancouver and Eastern railroad, which is now building west to the coast, entered Hedley in August.

The orebodies lie in the sedimentary rocks, a large eruptive mass of monzonitic porphyry having been the cause of intense metamorphism in the sediments that it cuts. These sediments are of great thickness, the prevailing dip being westerly about 20 deg. The beds in which the ore occurs were originally limestones, and near the contact of the igneous rocks these have been altered to a rock made up largely of epidote and garnet with quartz and calcite, depending upon the purity of the original beds. The greatest width of pay ore being mined is about 60 ft. thick.

The Yale Mining Company owned 28 claims, water rights, mill sites, etc., the principal mining claims producing ore being the Nickel Plate and Sunnyside. The Daly Reduction Company (a parent company) treats the ore. The mill is equipped with forty 1050-lb. stamps; amalgamation, concentration and cyaniding being the process used. About 85 per cent. of the assay value of the ore is recovered. The mill and power plants are run by water-power. The capacity of the mill is about 4000 tons per month, and about 175,000 tons of ore of an average grade of $12.50 per ton has been treated in less than five years.

Preparations are being made for betterments and enlargements. A complete system will be installed for sliming purposes, with filter presses. Development work will be vigorously prosecuted on all the property with a view of increasing the ore reserves and tonnage treated.

Republic Iron and Steel Company

A preliminary report issued by the executive committee, and covering the half-year ended Dec. 31, 1909, says that the general improvement in business anticipated in the last annual report has been fully up to expectations, and the net earnings for the period of this report show substantial improvement, as compared with the last half of the calendar year 1908. The reduction in profit as compared with the same period in 1907 is due entirely to lower prices on sales of manufactured products. As a result of appropriations and expenditures for improvements and labor-saving devices, cost of production has been largely reduced, notwithstanding the fact that labor rates and cost of general supplies are substantially on the basis of 1907. The reduction in costs, however, have been more than offset by the greater reduction in selling prices, so that the profits per ton shown by this report are necessarily less than for the six months ending Dec. 31, in the previous year.

The income account for the half-year is as follows:

	1908.	1909.
Gross profits	$1,633,534	$2,499,775
Interest account, surplus	27,507	72,212
Total	$1,661,041	$2,571,987
Maintenance and repairs		$598,376
Depreciation and renewals		312,178
Exhaustion of minerals		127,684
Interest on bonds		199,357
Total charges		$1,237,595
Surplus for half-year		$1,334,392

Dividends amounting to $794,798 were paid on the preferred stock. Unfilled orders on the books, Dec. 31, were for 39,995 tons of pig iron and 457,785 tons inished products; a decrease of 54,252 ons of pig iron, but an increase of 65,365 tons of finished products, as compared with Dec. 31, 1908. The new tube works have been substantially completed, and it is expected will be placed in opera- ion not later than March, 1910. Substantial progress is being made on the onstruction of the Haselton steel works; t is not probable, however, that any bene- it from the operation of this department vill be realized during the present fiscal ear.

Rock Filling at Rio Tinto[*]

By Ernest Levy[†]

I was managing for a time a mine ituated on the largest known ore mass n the world—namely, the San Dionisio ode of the Rio Tinto Copper Company, the province of Huelva, Spain. In rder to give you a better understanding f the filling methods employed, it will e necessary to go somewhat into other onnected matters, as, for example, some f the characteristics of the ore mass nd the scheme of ore extraction. The re mass, which reaches a length of bout 1 km. and a maximum width of 20 m., has been developed more or less n the levels from the seventh to the 2d, which are separated by distances of 2.5 meters.

The development has in general taken e form of 4x4-m. headings, 10 m. from enter to center, running both with e length of the mass and across it at ght angles to that direction; conse- uently, the ore left in place between ach two levels may be thought of as a ass or slice of mineral with a thick- ess of 8.5 m. and an area equal to that f the lode at that horizon, supported on illars which are 4 m. high, 6 m. square nd 10 m. from center to center.

I am not sure if, on account of the uge size of the various masses belong- g to the company, it was not originally onsidered that the small percentage of e mass thus extracted would be suf- cient to supply all demands from these ines. However, whether this be so or ot, I am of the opinion that the methods be later employed in extracting the emainder of the ore had not been drawn p.

Method of Stoping

The method later decided upon was commence more thorough extrac- on by means of stopes running par- llel with the width of the ore, approxi- ately 100 m. apart and 15 m. wide. hese stopes are divided into sections of om 30 to 40 m., according to the width f the mass at the place, in order that the rock filling should not have to be carried an exorbitant distance from the stope-filling shafts. It is a characteristic of this mass that where the width is great the ore is soft and heavy, and where small, the mineral is extremely hard and stands well.

Great care has to be exercised when removing the pillars in preparation for stoping, and also when excavating ground in the stopes themselves, that not too much weight has to be borne by the ground above the roof. The weight also becomes more effective when the natural fissures in the ore have become devoid of cementing material; these then form a plane of weakness. Water is a notable factor in effecting weakness along these planes by washing out soluble copper salts deposited in them at some former period. It is therefore advisable to catch up and remove from harm's way all water which may be found running into the mine, so that it can do no damage. A complete system of surface drainage is resorted to in the neighborhood of the outcrop for the purpose of minimizing trouble from this source.

Waste Rock Substituted for Timber

Timber, being scarce and expensive, is used as little as possible. As above mentioned, the spaces formed by removal of the ore are filled with rock in order to support the mass. The rock is procured from the following places: From the overburden, hanging and footwall rocks removed of necessity in preparation for and during open casting, and from any rock afforded by underground workings. This latter source is only a small one, since, as can be well understood with such a huge and continuous mass, but little dead work is called for.

The filling rock is delivered into the mine partly through the main tunnel, which strikes the mass on the 10th level, and partly through main rock shafts, through which it is taken to such levels as desirable. The rock is taken down in mine cars, in which it is distributed from the main shafts to interior rock shafts, which are large enough to form pockets to be drawn from when required. The train loads are dumped directly into interior rock shafts.

The Submarine

The interior rock shafts have overflow ways at such levels as are decided necessary and the rock flows out on to a masonry platform locally known as a "submarine," about 2 m. higher than the floor of the level. The hight of the submarine facilitates the shoveling of the rock direct into mine cars, and thence it is distributed where needed. Each stope section has an individual rock shaft and through this is dumped all the rock used to fill that stope section.

Before stoping, all former excavations made, that is, the 4-m. headings, must be tightly packed, and there must be built in the filling, main passageways formed of side walls and an arched roof about 4 ft. wide by 6 ft. high, in such positions as to enable the ore that is mined and rock that is to be used to be distributed as required, and also as a means of ingress to pillars yet unremoved. Places for manways and stope rock shafts are left in the walls of these arches where suitable, with a view to aiding future work. Arranging the plan for these arches, etc., is a matter which requires careful consideration, in order that the scheme may be as effective as possible.

Removal of Ore

At those places where it is decided to stope, it becomes necessary, first, to fill gradually (if this has not already been done) the spaces formed by the development galleries, in such a manner that the pillars and those sections of the neighboring pillars lying within the confines of the vertical bounding planes of the stope can be removed.

The ore is removed in horizontal sections of about 2 m. thick, as follows: A drift 2 m. wide is run across the center of the section under consideration, and parallel to the length of the lode, which is parallel to the width of the stope. This connects the manways and rock shafts. The remainder of the ore from this layer of the section is removed in contiguous drifts approximately 2 m. wide; they start from the end of the preliminary drift, and run north and south, or parallel to the length of the stope, and extend to the ends of the section under consideration. Before each of these secondary parallel drifts is run, the roof of the previous one is supported by solid rock filling. In placing the filling, a sufficiently strong retaining wall is first built at a convenient distance from the solid rock, and then the intervening space is packed tightly with rock thrown in behind and stamped down.

Varying with the supporting capacity of the ore, more or less ground can safely be left open while being worked; but, as a rule, all spaces are filled at the earliest possible moment. I think it will be understood from what I have said that the ore gradually becomes extracted and replaced by an equal volume of rock, and it is to be expected that some day a rock filling placed by hand will stand in place of a mass of ore which consisted of many millions of tons.

The number and weight of diamonds declared at the Department of Lands and Mines, British Guiana, during the fiscal year 1908-9 were as follows: Number, 56,982; carats, 5189, the largest weight for the last four fiscal years.

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[*] Discussion of D. W. Brunton's paper, ining and Metallurgy in Western United ates," read before the Spokane meeting of e American Institute of Mining Engineers. *ull.* No. 37, A. I. M. E.

[†] Mining engineer, Rossland, B. C.

Recent Developments in California Oilfields

State's Oil Production Exceeds That of Gold; Savings Banks May Loan Funds on Some Oil Stocks. No More Cheap Oil on the Coast

PROGRESS IN VARIOUS DISTRICTS

The value of the output of the oil of California in 1908 and 1909 exceeded that of the gold by several million dollars. It is but a few years since fuel oil was selling for 15c. per bbl., while the price is now 50c. or higher according to the grade and quantity to be delivered. The indications are that lower prices will never again obtain, but that production will be restricted by agreement when necessary, as was done for six months by some of the large companies during 1909. Some contracts as high as 65c. per bbl. are reported recently made with the Standard Oil Company.

Status of Oil Securities Raised

The State bank commissioner of California has declared that the stock and bonds of the Standard, Union and Associated oil companies of California are fit collateral upon which State savings banks may loan their funds. The oil bonds and stocks have been accepted as security by some of the commercial banks of the State, but have not heretofore been regarded as suitable collateral by the bank commissioner.

The Standard Oil Company is credited with the intention of withdrawing from the occupancy of all presumptive oil lands in the State upon which it was not drilling on Sept. 7, 1909, the date upon which the Secretary of the Interior withdrew several million acres from entry. The amount of land so given up amounts to 2400 acres situated to the west and southwest of Buena Vista lake and north of Maricopa in Kern county. The company is said to concede that it does not hold any sort of right to these lands under the changed attitude of the administration toward public lands regarded as oil bearing.

The Standard has been boring in the hills of Tertiary age, near Altamont, to the east of Livermore valley in Alameda county. One bore extended to the depth of 3000 ft. A little showing of oil was encountered at various depths down to 1200 ft., but none deeper. The company has abandoned the district and carted away its plant. The Daisy well, farther east on the slope toward Tracy is still boring. There are healthy seepages in the vicinity of these wells but the formation is declared to be disturbed.

Petroleum Investment Company

Prominent oil men and capitalists have joined hands with John Baker, Jr., in the organization of the Petroleum Investment Company capitalized at $250,000, for the purpose of financing companies for the development of petroleum lands in California. It is stated that a staff of competent men will be placed in the field to secure good properties and that branch offices will be established in other cities to place its securities. Mark L. Requa and F. W. Bradley, well known in metal mining, are among the directors, indicating that the trend of investment in this State for this year is toward oil rather than metal deposits.

In the McKittrick oilfield in Kern county, there has been more or less trouble with water during the last five years, although not of a serious nature. Plans are said to be under way to remove this water by means of compressed air. The Shamrock well at McKittrick has been producing for eight or more years, and it is estimated that, including the original price of the land and all other costs, the cost per barrel has been only one-sixteenth of one cent. This seems incredible but is vouched for by an old operator.

A record for rapid drilling was made by the Overland Oil Company at its No. 12 well, situated about 12 miles northeast of Bakersfield. The drilling was commenced on Jan. 4, and oil was obtained on Jan. 9 at a depth of 365 ft. A Parker pump was installed and production commenced at the rate of over 40 bbl. per day. One of the Santa Fe wells in the Kern River field is notable for the depth attained, 5050 ft., although no oil was found.

Activity in San Joaquin Valley

The region to the west and southwest of Buena Vista lake in Kern county, in the extreme south end of the San Joaquin valley, is now the scene of extensive operations. Here are situated the Maricopa and Midway fields, and a new town, called Taft, has been laid out. A brick hotel is about to be built. The Honolulu gasser has a fine showing of oil at a depth of 2300 ft. On account of the gas pressure some difficulty was encountered in drilling, which was overcome by the use of a rotary drill. Should the Honolulu prove a good producer this may indicate that the whole range of the Buena Vista hills will be profitable oil land, as the formation lies almost unbroken. The Standard, Union, United, Hawaiian, Hamilton and other companies are drilling in this general district. The Standard Oil Company has a contract with the Ethel D. and M. & M. companies for 400,000 bbl. of 19-gravity oil, and with the St. Lawrence for 500 bbl. daily; and it is also said to be getting 2000 bbl. daily from the Santa Fe 2-6 gusher. So far the Standard is in undisputed possession of this field, but the Producers Association has its pipe line all but completed with storage tanks at Maricopa and will be a competitor of the Standard later.

In the vicinity of Maricopa some of the wells are securing oil at a depth of from 870 to 1200 ft. The Ethel D, No. 1 and No. 2 wells are now both flowing, the former with a daily output of 1000 and the latter with 200 bbl. The Eagle Creek well, although not finished, has been flowing. The Carbo Oil Company has two wells each 800 ft. deep with 275 ft. of oil sand. Each well produces about 100 bbl. per day.

The Associated Oil Company is rushing to completion its pipe line from Coalinga to McKittrick. The line will be 60 miles long, and the McKittrick oil, after arriving at Coalinga, will be transported through the Coalinga-Porta Costa pipeline, now building, to tide water.

The experimental well of El Cerrito, which was sunk to a considerable depth in the Kreyenhagen field, 21 miles in an air line southeast of Coalinga, has been abandoned, and the next well will be bored farther to the west.

Well No. 2 of the Unity Oil Company, about 5 miles northwest of Coalinga, struck a gas pocket at a depth of 630 ft. on Jan. 9. The tools were blown out of the bore high into the air and the gas became ignited. After forming a spectacular blaze for 48 hours the fire was extinguished with steam. It is planned to use this bore as a gas well and sell the gas for fuel. The Silver Tip gusher has settled down to a production of 700 bbl. per day.

In the Salt Lake field at Los Angeles, McDor well No. 1 is continuing its daily production of 350 bbl. The Associated Oil Company, in the extreme eastern part of the field, has wells about 1800 ft. deep, each with a daily product of 50 or more bbl. The total yield of the Salt Lake field is about 8500 bbl. daily.

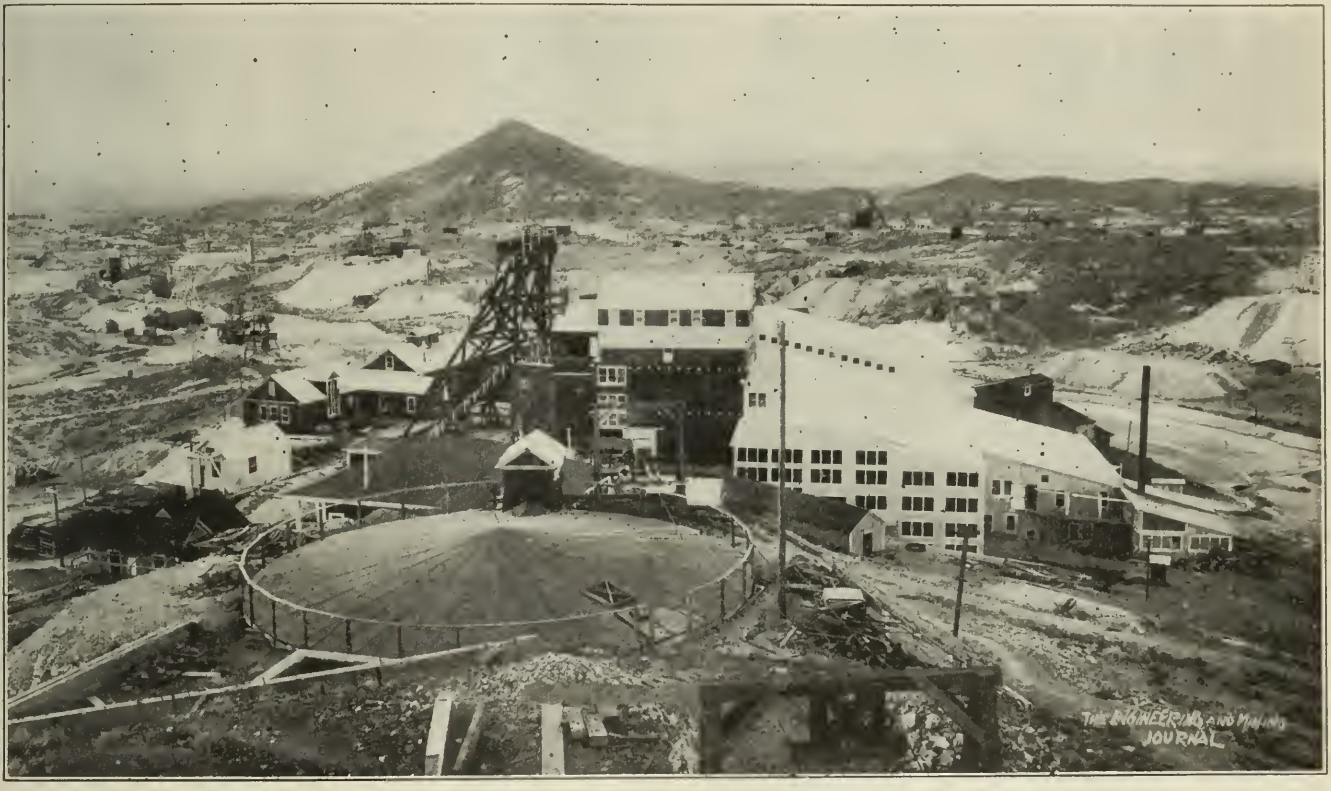
At Whittier in Los Angeles county, the Murphy Oil Company has one flowing and one pumping well, with a combined daily output of 1300 bbl. The Central Oil Company now has well No. 5 down 3200 ft. and is in productive oil sand. Well No. 52 of this company has been cased off, but will be allowed to flow soon. The oil of the Whittier field is of a superior grade for refining.

Equipment and Practice at Florence-Goldfield Mill

Arrangement of Batteries Facing Each Other Not Commended; Carpet Tried in Place of Amalgamating Tables; High Operating Costs

BY H. G. MORRIS*

The ore treated at the Florence-Goldfield mill, Nevada, varies from a sulphide taken from the lower levels to a straight oxidized ore from nearer the surface; the mill at times running entirely on either of the above classes of ore and at other times on a mixture. During the early days of the property almost all mining was done by leasers, who in accordance with the terms of their contracts placed all ore assaying $30 or less in dumps at the disposal of the parent company; these dumps have contributed a heavy tonnage to the mill.



FLORENCE-GOLDFIELD MINE AND MILL, LOOKING TOWARD COLUMBIA MOUNTAIN

The composition of the ore is approximately 55 to 60 per cent. quartz, 20 to 25 per cent. kaolin and 12 to 15 per cent. alunite, with varying quantities of bismuth, antimony, copper and iron sulphides and occasionally a small percentage of copper oxides. Gold is associated with the sulphides and is also free, the free gold varying from pieces as large as a pin head to particles so fine as to be invisible without the aid of a glass. Varying and small quantities of silver also occur in the ore.

MILL SITE AND DESIGN

The complete overhauling and remodeling of the mill was carried out by T. G. Lockhart, general manager, and myself as superintendent and chief engineer. It is situated at the collar of the main working shaft, the ore being dumped directly from mine skips into a 400-ton mill storage bin. A temporary aërial tram from the Little Florence shaft also dumps into this bin. Ores are drawn from this storage bin into cars, weighed and dumped on a 1½-in. grizzly, oversize from grizzly being crushed by a No. 4 Sampson crusher (this crusher has lately been replaced by a No. 4 Gates gyratory crusher). The crushed ore then joins material passing through the grizzly, is elevated and automatically distributed by belt conveyers to two 100-ton storage bins, each of which acts as storage for 20 stamps.

The stamps are installed in two batteries of 20 stamps each, directly opposite and facing each other. Generally speaking, this method of installing stamps is not to be recommended, as it wastes headroom, but as one battery and the foundation for the second was in place, it was not deemed advisable at the time the mill was overhauled to change the arrangement.

The first battery of 20 stamps, made by the Colorado Iron Works, is fitted with Perfect ore feeders, wide inside-amalgamation mortars and 950-lb. stamps having a drop of 5½ in., 108 times per min. The second battery of 20 stamps was made by the Joshua Hendy Iron Works, being fitted with suspended Challenge ore feeders, narrow Treadwell-type mortars, and 1050-lb. stamps having same detail of drop as the first battery. Screens on all batteries are 16 mesh, No. 22 wire, of the rolled slot type, so woven as to make the long way of the slot vertical when tacked on the frames. Each cam shaft drives 10 stamps, each 20 stamps having a separate line shaft driven by a 50-h.p. motor.

AMALGAMATION UNIT OF MILL

Ore from the batteries is distributed over eight primary amalgamating tables, each 5x16 ft., each table being fitted with ⅛-in. copper plates, 48x60 in., electroplated with one ounce silver per square foot. Each table has three drops of ½

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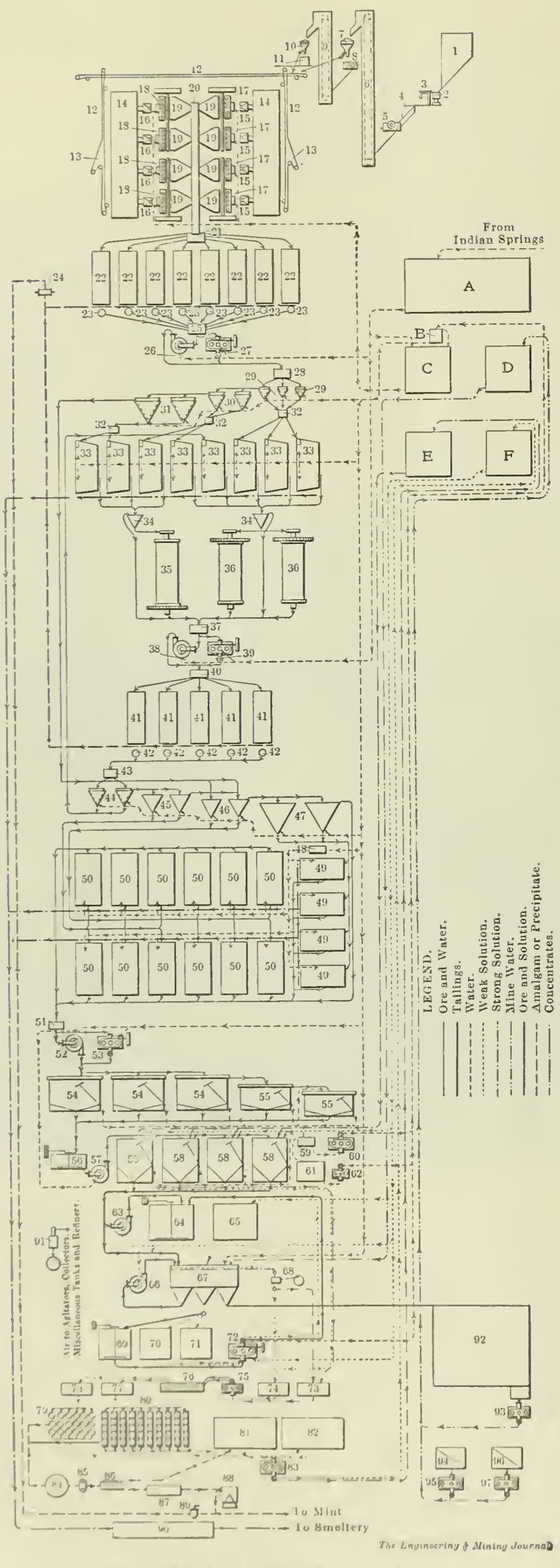
*Formerly mill superintendent, Florence-Goldfield Mining Company, Goldfield, Nev.



FLOW SHEET, FLORENCE-GOLDFIELD MILL

FLORENCE-GOLDFIELD MILL EQUIPMENT.

A—Reservoir, 49x15 ft., cap. 210,000 gal.
B—Equalizing tank, 5x6 ft.
C—Water tank, 18x16 ft..
D—Mine water tank, 20x18 ft.
E—Strong solution tank, 18x12 ft.
F—Weak solution tank, 18x12 ft.
1—Mine ore bin, cap. 400 tons.
2—Mattheson automatic dump car, cap. 18 cu.ft.
3—Fairbanks platform scales, cap. 5000 lb.
4—Grizzly, 4x6 ft., 1¼-in. openings.
5—No. 4 Samson crusher.
6—10x6-in. bucket elevator.
7—Snyder sampler.
8—No. 1 Samson crusher.
9—8x5-in. bucket elevator.
10—Snyder sampler.
11—Sample box and sampling floor.
12—3 18-in. belt conveyers.
13—2 Stephens-Adamson trippers.
14—Butters ore bins, cap. 150 tons each.
15—4 C. I. W. Perfect tappet feeders.
16—4 J. H. suspended Challenge feeders.
17—Four 5-stamp, 950-lb., C. I. W. mortars.
18—Four 5-stamp, 1050-lb., J. H. mortars.
19—Apron launders.
20—12-in. battery launders.
21—Distributing box.
22—8 Amalgam plates, 5x16 ft.
23—8 Mercury traps.
24—Cleanup barrel, 24x36 in.
25—Sump tank, 2x5x5 ft.
26—4-in. Traylor. centrifugal pump.
27—7x9-in. Aldrich triplex ball-valve pump.
28—Distributing box.
29—Three 30-in. hydraulic classifiers.
30—Two 48-in. hydraulic classifiers.
31—Two 60-in. hydraulic classifiers.
32—3 distributing boxes.
33—8 Card concentration tables.
34—Two 60-in. thickening cones.
35—5x15-ft. Abbe trunnion tube mill.
36—Two 5x14-ft. W. S. M. trunnion tube mills.
37—Sump tank, 2x5x4½ ft.
38—4-in. Traylor centrifugal pump.
39—7x9-in. Aldrich triplex ball-valve pump.
40—Distributing box.
41 5 Amalgam plates, 5x16 ft.
42—5 Mercury traps.
43—Distributing box.
44—Two 48-in. hydraulic classifiers.
45—Two 60-in. Callow cones.
46—Two 60-in. Callow cones.
47—Two 96-in. Callow cones.
48—Equaliizing tank with float valve.
49—4 No. 3 Deister tables.
50—Twelve 6-ft. Frue vanners.
51—Sump tank, 4x4x5 ft.
52—4-in. Traylor centrifugal pump.
53—7x9-in. Aldrich triplex ball-valve pump.
54—Three 34x16-ft., 20-deg., cone-bottom collector tanks.
55—Two 34x12-ft., 20-deg., cone-bottom collector tanks.
56—Disintegrating tank, 18x6 ft.
57—4-in. Traylor centrifugal pump.
58—Four 18x16-ft., 45-deg., cone-bottom agitators.
59—Sump tank, 5x2x3 ft.
60—8x10-in. Deming triplex pump.
61—Overflow water tank, 18x6 ft.
62—4x6-in. Deming triplex pump.
63—4-in. Traylor centrifugal pump.
64—Butters pulp storage tank, 24x14 ft.
65—Butters solution storage tank, 16x16 ft.
66—4-in. Traylor centrifugal pump.
67—90-frame, 3-hopper Butters filter box.
68—Two 14x14-in. Gould vacuum pumps.
69—Excess pulp tank, 17x10 ft.
70—Excess solution tank, 17x10 ft.
71—Excess water tank, 14x13 ft.
72—7x9-in. Aldrich triplex ball-valve pump.
73—Strong solution gold tank, 18x6 ft.
74—Weak solution gold tank, 18x6 ft.
75—5x6-in. Aldrich triplex rubber-valve pump.
76—36x36-in. 50-leaf, Shriver filter press.
77—Strong solution gold tank, 16x6 ft.
78—Weak solution gold tank, 16x6 ft.
79—18 zinc barrels, 22-in. diam., 25 in. deep.
80—10 zinc boxes, 24x24 in. x 16 ft.
81—Strong solution sump, 8x24x12½ ft. deep.
82—Weak solution sump, 14x24x12½ ft. deep.
83—5x6-in. Deming triplex pump.
84—6x6-ft. lead-lined acid tank.
85—4x6-in. Knowles belted pump.
86—18x18 in., 40-leaf Shriver filter press.
87—Precipitate drying furnace.
88—Fabré Du Faur furnace.
89—Retort furnace.
90—Concentrate drying room.
91—Leyner compressor.
92—Tailings pond.
93—4x6-in. Deming triplex pump.
94—Engineers' shaft.
95—Mine pump.
96—Rogers shaft.
97—Mine pump

in. each. After passing the primary plates the ore is concentrated, reground in tube mills and passes over five secondary amalgamating tables, having the same specifications as the primary tables.

After exhaustive tests lasting over several months, it was found cheaper to operate and a higher extraction was obtained by spreading Brussels carpets over the amalgamating tables, allowing the nap of the carpets to catch the particles of free gold in lieu of the quicksilver. Every eight hours these carpets are removed and run through a box filled with water and containing a series of rollers which remove all particles of free gold and pulp. The residue from this box is then treated with quicksilver in a cleanup barrel in the ordinary way.

[Since this article was written, advices from Goldfield state that the carpet tables have been abandoned and the practice of amalgamating on copper plates again adopted.—Ed.]

Concentration Unit of Mill

After leaving the primary amalgamating tables the ore is elevated by means of a 4-in. Traylor centrifugal pump to a series of double-cone hydraulic classifiers from which appropriate sizes of pulp are drawn for eight Card tables. The entire tailings from the Card tables are then dewatered by using the tables as classfifiers and also with the aid of cones set between the Card tables and the tube mills. Thickened pulp from the bottom of these cones is then fed into the tube mills by means of spiral feeders. There are three tube mills, two each 5x14 ft., and one 5x15 ft., their function being to grind all pulp so that 80 per cent. will pass a 200-mesh screen.

After passing through the tube mills the ore is elevated, passes over the secondary amalgamation tables into three double-cone hydraulic classifiers. All oversize is returned from the bottom of these cones to the tube mill, the overflow flowing into Callow tanks where the ore is suitably thickened for concentration on 12 Frue vanners and 4 Deister slimers. Tailings from the vanners and Deisters are then pumped into the settling plant contained in the same building. The rate of concentration varies from 23 to 17:1. The concentrates are sold to local samplers, who reship to smelters.

Tailings from the vanners and Deister tables are pumped into settling tanks by means of a specially constructed, vertical Aldrich triplex pump, which has the advantage of requiring the minimum amount of repairs and by actual measurement taken at this place requires one-half the power used by a centrifugal pump per forming the same duties. The special features in the construction of this pump are ball valves, also two rings cut around each pump cylinder just below the packing; these rings are supplied with fresh water which washes all gritty material off the plunger during each upward stroke, thereby preventing the cutting out of packing and plungers. On the fine-concentrator tailings (80 mesh and finer) this pump gives excellent satisfaction, but on coarser material (30 mesh and finer) the results were not so good.

Cyanide Unit of Mill

All tailings, wash water, etc., from the vanners and Deisters are delivered alternately into one of three redwood settling tanks or collectors, each of which is 35 ft. in diameter by 16 ft. high, fitted with cone bottoms, peripheral-overflow launders, leveling strips and adjustable decanters. From the bottom of these collectors the thickened pulp is drawn by means of 8-in. quick-opening valves and delivered to the agitating tanks to be cyanided. The overflow from the three settlers passes by gravity to two clarifying tanks, 35 ft. diameter by 12 ft. high, fitted in the same way as the aforementioned collectors, the overflow from the last clarifier passing into the water sump. Clear water may at times be drawn directly from the collectors into this water sump by means of decanters. From the sump the water is delivered by a direct-connected triplex Deming pump to the general mill-water supply tank.

There are four agitating tanks, each 18x16 ft. fitted with 45-deg. cone bottoms, 8-in. quick-opening bottom-draw-off valves, decanters, 16-in. center pipes and ¾-in. compressed-air-supply pipes. This style of agitator, modelled after the Pachuca, is new to this country and is among the first adaptations of Mexican and Australian practice to be installed. The agitating tanks were originally intended for some form of mechanical agitator and the dimensions do not, therefore, conform to those worked out in Mexican and Australian practice, the diameter being too great for the hight. This difficulty was effectively remedied, however, by placing an apron around the top of the center pipe so that when the pulp boils over its upper end, it is spread out radially and falls back into the agitating tank midway between center and circumference. The level of the agitating pulp is kept about one foot lower than the upper end of the center pipe.

Cyanide is added to the pulp while in these tanks, and agitation effected with compressed air at 30 to 40 lb. per sq.in. Lenth of agitation, specific gravity of charge and strength of solution all vary with the ore from the different parts of the mine. After agitating a sufficient length of time the pulp is drawn off through 8-in. bottom-draw-off valves and sent by gravity to the Butters 90-leaf filter box.

Florence-Goldfield Mill and Tailings Pond

A 14x14-in. Gould vacuum pump draws the gold-bearing solution through the filter leaves forming a cake 1 in. thick. The solution is delivered to the gold tank from which it is pumped through a 36x36-in. Shriver clarifying press (which is taken down and cleaned every 40 days); from the Shriver press the solution is passed through the zinc boxes. The 1-in. cake of ore formed on the Butters filter after washing is discharged to the waste dump. The gold slimes from the zinc boxes are acid treated in the usual way, dried and melted in Faber Du Faur coke furnaces.

SUMMARY OF COSTS AND EXTRACTIONS

The accompanying table gives the monthly costs and per cent. extraction obtained during the first nine months of 1909.

MILLING AT FLORENCE-GOLDFIELD.

	Cost of Milling, per Ton.	Extraction by Bullion Yield. Per Cent.
Jan., 1909	...	90
Feb ..	$3.042	91
March ..	2.694	90.10
April ..	4.099	90.49
May ..	3.085	90.58
June ..	4.47	86.40
July ..	3.90	91.09
Aug ..	4.14	90.31
Sept ..	3.68	93.21

These milling costs would be considered very high for almost any other place except Nevada; in reality, however, they compare favorably with other plants of this type handling the same tonnage in this section. Some idea of milling costs in southern Nevada may be had from the following: Cost of water per ton of ore treated, $0.246; power, $0.796; labor, $1.231. These figures represent an average month.

Recovery of Flue Dust*

By CHARLES W. GOODALE†

The friction system, designed for the recovery of flue dust from furnace gases, which was mentioned by Mr. Brunton as having been installed at Great Falls, Mont., has not been in use long enough to obtain a knowledge of its efficiency, but the following explanation of the system will be of interest.

Screening tests on the blast-furnace charges of smelting ore and on the fine concentrate treated in the McDougall furnaces, show a high percentage of fine material, which would naturally be carried into the flues, and at a high velocity of the furnace gases through the flues a considerable loss in dust would inevitably occur.

ARRANGEMENT OF WIRE BAFFLES

Before deciding upon the friction system, a flue was built 300 ft. long, 4.5 ft. high, and 4 ft. wide, through which the furnaces gases could be drawn in measured volume and temperature, and at varying velocities. Two tests were made, maintaining a velocity of about 500 ft. per min., and with no obstructions or dust arresters in the flue. The amount of dust was determined per unit volume of gas; then similar determinations were made with baffle plates, Freudenberg plates, numerous contractions and expansions, and with wires. It was found that the wires gave nearly as high an efficiency of dust recovery as the baffle plates, and with much less frictional resistance to the passage of the gases. It was then decided to build a dust chamber of such dimensions that the furnace gases would not have a velocity greater than 500 ft. per min., and to fill this chamber with steel wires.

All the furnace gases from the several departments are assembled through individual flues in an uptake in the furnace building. From the top of this uptake a crosstake leads over the buildings and tracks to the dust chamber. The crosstake is 34 ft. wide and 20 ft. high. The main dust chamber is 367 ft. long, 176 ft. wide, 21 ft. high. Steel-wire netting, 1⅝-in. mesh, is bolted to the I-beams of the roof, and at alternate intersections of the netting wires, steel dust-arresting wires, No. 10 gage, are hooked on, weighing about 1 lb. each and reaching nearly to the floor of the chamber. From the entrance to the chamber, and for a distance of about 150 ft., the space is fully occupied by wires; then comes a length of about 50 ft. with no wires, then 150 ft. filled with wires.

CONDENSATION OF ARSENIC FUMES

In the vacant space, air ducts, both from the basement and the roof, are provided, so that the temperature from that point on can be reduced and the condensation of arsenic effected on the wires. The purpose of this arrangement is to collect, as far as possible, the dust which is carried along mechanically by the furnace gases in the first part of the chamber, which leaves the condensable elements to be recovered in the upper part. Experience has shown that at or below the condensing temperature of arsenic, the wires become heavily coated, and it is therefore necessary to shake them. Provision has been made for this, but the arrangement can hardly be clearly described without a photograph or drawing. The dust chamber is divided longitudinally by a partition wall, and dampers placed at the lower and upper ends of the chamber make it possible to deflect all the gases through either half if it is so desired. Leading from the dust chamber to the chimney, which is 506 ft. high and 50 ft. in diameter at the top, is a flue 1200 ft. long, 48 ft. wide, and 21 ft. high.

In the floor of the dust chamber there are more than 1000 steel hoppers, arranged in 22 lines, and a complete system of tracks enables the dust to be drawn from any hopper at any time. The crosstake is also provided with hoppers, and a hopper crane draws off the dust and conveys it to chutes leading down into the bottom of the uptake, where there are hoppers from which the material can be drawn into the charging cars for the reverberatory furnaces.

There are 1,215,000 wires in the dust chamber, weighing about 608 tons, and nearly 3500 tons of structural steel in the flue system.

Recording thermometers and pressure gages have been placed at the entrance and exit of the dust chamber and in the flue near the chimney, so that complete information regarding conditions will be available.

The use of wires as dust arresters was patented in Germany by Rösing, who also took out a patent for it in the United States in 1890. The Freudenberg plates used in our experiments were of sheet iron and were suspended parallel with the direction of the flow of the gases.

Shannon Copper Company

The Shannon Copper Company, operating at Clifton, Arizona, has nearly doubled its output in the last five years, having shown a steady increase from 157,316 tons for the fiscal year ended Aug. 31, 1904, to 307,271 tons mined during that ended Aug. 31, 1909. Of the latter tonnage, 186,453 tons were smelting ore and 120,808 were concentrating ore. The income account is shown in an accompanying table.

INCOME ACCOUNT.

17,553,213 lb. fine copper........	$2,328,467
1,745 oz. gold..............	34,899
87,116 oz. silver.............	44,496
	$2,407,862
Copper inventory, Aug. 31, 1909..	321,337
	$2,729,199
Operation	$2,007,365
Development and exploration....	48,221
Freight, refining and eastern expenses	272,671
Copper inventory, Aug. 31, 1908..	316,604
	$2,644,861
Net profit..................	$84,338

No detailed statements of mine or mill operations are given, but, as the copper inventories of Aug. 31, 1908, and 1909, are practically the same, and basing an estimate on the output quoted at 307,271 tons of ore, the average recovery seems to have been in the neighborhood of $7.80 per ton.

New orebodies were found in ground that had been supposed to be barren, and a good grade of ore was developed below the Ore tunnel. The Shannon & Arizona railroad from the mines to the smeltery, about 10 miles, is expected to be in operation about Feb. 1, 1910, when the Shannon company promises to ship at the rate of 1000 tons per day.

A saving of $45,000 in the item of power was made during the year. A reduction of 32.7c. per ton is reported to have been made in the smeltery, and 14c. in the concentrating plant, but these savings were offset by the fact that 2.57 lb. of copper less per ton of ore were recovered than in the preceding year.

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*Discussion of D. W. Brunton's paper, "Mining and Metallurgy in Western United States," read before the Spokane meeting of the American Institute of Mining Engineers; Bull. No. 37, A. I. M. E.

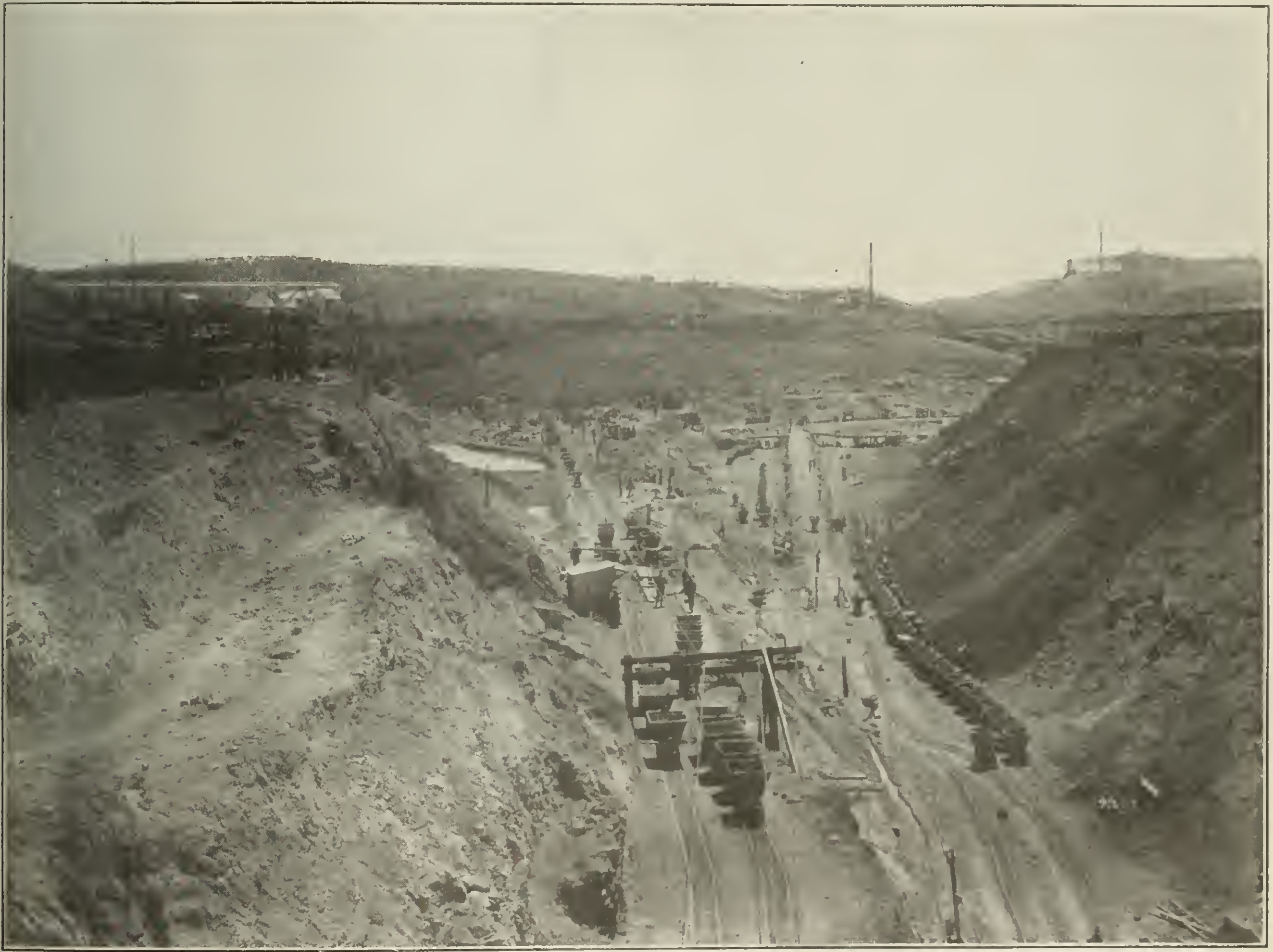
†Manager, Boston & Montana Consolidated Copper and Silver Mining Company, Butte, Mont.

Premier Diamond Mine, near Pretoria, Transvaal

Largest Diamond Pipe in the World Mined by Hand; Estimated That It Can Be Worked by Open Cut to Depth of 1200 Feet

BY E. M. WESTON*

The Premier Diamond mine is situated in the Transvaal, on the high central plateau of South Africa. It is on the farm, Elandsfontein No. 85, about 26 miles east of Pretoria, and near the railway line to Delagoa bay. The original Boer owner evidently named the farm because he saw the eland antelope grazing near a spring (fontein). It lies on the watershed dividing the Elands and Pienaars rivers. The pipe is about 4800 ft. above sea level, and forms the bottom of a large depression, surrounded by hills of quartzite and sandstone of the Pretoria series and not far from the contact of the red granite of the bushveldt. No other really valuable pipes have been discovered in this vicinity.



Open Cut and Gears of the Premier Diamond Mine

Before the war, diamonds had been found in the alluvial bed of a stream leading from this depression; but the owner of the farm, a conservative Boer farmer, refused to allow any prospecting on his farm and would give no option to purchase. He required £80,000 cash. J. M. Cullinan, having reason to believe in the existence of a pipe in the depression, succeeded in convincing others and the farm was purchased. The date of the discovery of the pipe is given as November, 1902.

The pipe is of an irregular oval shape, about half a mile long by one-quarter mile wide, having an area of 3,561,300 sq. ft., about 78 acres.[1] This area has already been excavated to a depth of about 170 ft. The mine is being worked in open-cut terraces, 50 ft. in hight; an accompanying photograph shows the method of working these terraces. Owing to the large area of the pipe and the hard rock forming the rim, it is hoped to be able to carry open-cut operations down to 1200 or 1500 ft. It is estimated that to this depth (1200 ft.) the contents of the pipe will be 500,000,000 loads of 16 cu.ft., giving a life of 40 years treating 1,000,000 loads per month.

Nine bore holes have been put down to depths varying from 300 to 1000 ft., showing diamonds in their cores. Down to a depth of about 80 ft. the blue kimberlite of the pipe was decomposed to yellow ground, covered again by sandy soil and loam. In this upper portion of the pipe a great concentration had taken place, the lighter portion of the gangue having been denuded, leaving a concentrated product rich in diamonds. This, with the fact that some parts of the pipe are richer than others, accounts for the very high yield given at first and the great decline in grade of the gravel shown in the accompanying table.

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*Mining engineer, 20 St. Mary's building, Johannesburg, South Africa.

[1] The areas of the pipes at Kimberley are as follows: Kimberley pipe, 33 claims; De Beers pipe, 22, Du Toit pipe, 48; Bultfontein pipe, 30; as against area of Premier pipe, 3570 claims.

Equipment and Production

The first treatment plant or gear (as it is called in diamond mining) was erected in April, 1903. It consisted of three pans (afterward to be described), one 12 ft. and two 14 ft. in diameter, driven by a 64-h.p. engine. In 1904 was added a second gear of eight pans, 14 ft. in diameter, driven by an 85-h.p. engine. At the end of 1905 the erection of a third gear capable of handling 20,000 loads per 24 hours was begun. This consists of 40 pans, 14 ft. in diameter, arranged in 5 units and driven by two vertical, triple-expansion, condensing engines, each capable of delivering 1500 h.p., one being kept in reserve.

The distribution of the horsepower consumed is as follows: Each unit of pans, 225 h.p.; main haulage line, 250; jigs or pulsators, 50; conveyers, 33; pumps, 160. The electric generating plant consists of two 340-k.v.a. 3-phase alternators, giving a voltage of 5000 to 5300 volts. This current is used for pumping, etc. The No. 3 gear is driven from a main shaft running at 200 r.p.m. The lighting plant comprises two 125-kw. direct-current dynamos. Steam is generated in six Babcock & Wilcox boilers of 3000 h.p., hand fired.

Until the beginning of 1909 these three gears had produced about 1½ tons of diamonds from 24,250,000 loads, treating an average of 27,000 loads per day. The largest diamond found in the world, the Cullinan, weighing about 3025¾ carats was found here. This was presented to the King of England and cut into two brilliants, weighing respectively 516½ and 309 3-16 carats, in addition to smaller stones. Another gear, No. 4, is in course of erection at the side of the No. 3 gear, and this is divided into 7 units, some of which are working. This will enable the two older gears to be discarded and 45,000 loads per day to be treated in one central plant 200 ft. above the level of the surrounding country, thus giving room for the disposal of over 1,000,000,000 loads of tailings without elevating.

Working Face of Blue Ground

YEARLY PRODUCTION OF THE PREMIER MINE

Year Ended Oct. 31.	Loads Treated.	Diamonds, Carats.	Value.	Carats per Load.	Per Carat Value.	Per Load Value.	Cost per Load.
					£ s. d.	£ s. d.	s. d.
1903	76,931	99,208	£137,435	1 29	1– 7–8	1–15– 6	1– 7
1904	939,265	719,653	866,030	0.798	1– 3–1	0–18– 5	2– 7
1905	1,388,071	815,652	994,687	0 609	1– 3–6	0–11– 1	3– 3
1906	2,988,171	899,746	1,277,739	0 301	1– 8–5	0– 8– 6	2– 5
1907	6,538,669	1,889,986	1,702,630	0.290	0–18–0	0– 5– 2	2– 1
1908	8,058,811	2,078,825	1,536,719	0.258	0–14–9	0– 3–10	1–10

Method of Treatment

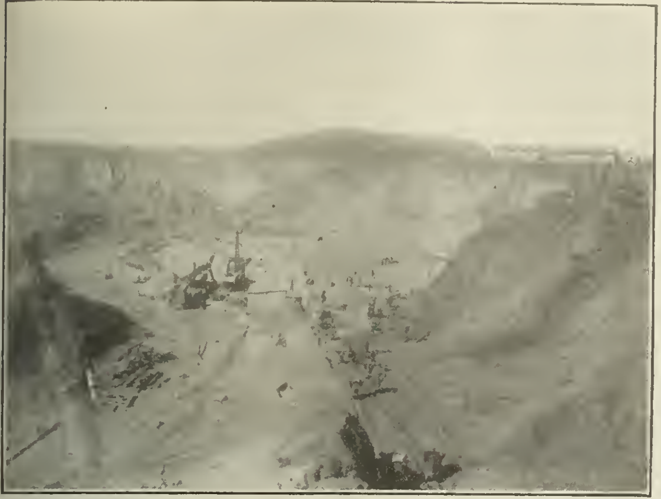
The original method of treating blue ground first practised at the De Beers at Kimberley was to allow the rock to weather in vast floors, several miles square, for from three to six months, when the rock became pulverulent and was readily disintegrated in the pan. Only about 17 per cent. then required to be crushed. The flooring operation is, however, an expensive one, necessitating two handlings and two long hauls, while theft has to be guarded against by fencing and the use of 2000-c.-p. searchlights during the night.

At the Premier mine what is known as the direct double-treatment system is used. By this means the cost of treatment is greatly reduced. Very large diamonds are, indeed, liable to be broken up; but very large diamonds are not always easy to dispose of. The shareholders of the company received only £50,000 for the Cullinan stone which was valued at many hundred thousand pounds. To deal with the enormous daily tonnage raised from the Premier mine would have required floors of a size quite outside the practical limit, requiring a large capital outlay and locking up a large amount of capital in untreated material. The present grade of the mine would not allow of any such scheme.

The ground is broken in 50-ft. benches by drilling long holes as shown in the photograph. The broken ground is spalled by natives working with pick, hammer and shovel, and loaded into trucks running on temporary lines parallel to the working face. This method is evidently preferred to that of using large blasts, steam shovels and heavier trains. Native labor is usually easy to obtain as the work is not underground; about 8000 natives and 800 whites are employed in the mine and works.

Trucks are run to one of the branches of the main haulageway, and when they reach the apex of the incline over the treatment plant they leave the wire and gravitate along the bridge over the hoppers, tip automatically over the grizzlies, right themselves and reëngage the return wire to the mine. Grizzlies are set 2½ in. apart; the oversize goes to gyratory Comet crushers and then joins the undersize which passes direct to two sets of 4-ft. corrugated rolls, crushing to ⅞ in. From the rolls it is elevated and discharges into hoppers having four chutes, distributing to four top pans of each unit. These pans are shallow circular steel tanks having an inner central discharge. In these revolve circular arms, fitted with triangular teeth set in a spiral These teeth and the centrifugal force send the heavier deposit containing the diamonds to the outside rim of the pan, while the lighter material flows over the central rim as slime and particles requiring further grinding.

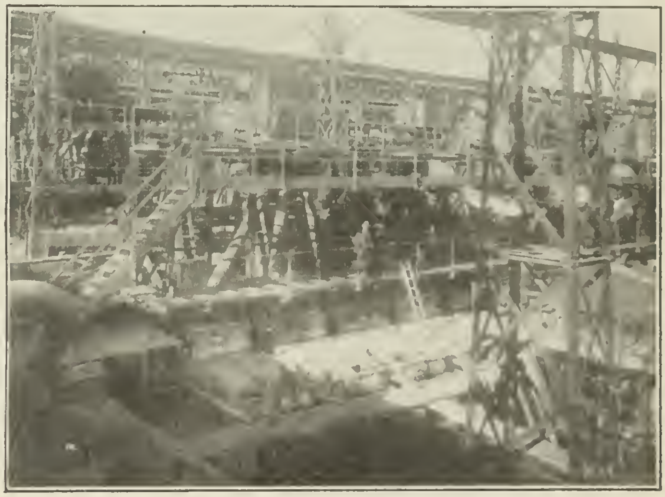
The concentrated material is continuously removed by a patent trap from the outside rim. The concentration effected is about 100 to 1. The central overflow from the top pan passes through a set of 6-ft. smooth rolls set to reduce to 3-16 in., and is retreated in the bottom pans. The tailings pass to elevators and then to the waste dump. The concentrate is carefully classified in trommels, about five classes being made, and then treated on pulsators. These are simply jigs, adapted to deal with this material. These jigs reduce the bulk of the concentrate about 75 per cent., leaving about 70 loads of enriched concentrate per day.



Face of No. 1 Workings

Working Benches and Haulage Station

Washing Pans and Overhead Cranes



View of Gear Showing Pulsators

The Grease Table

Before the invention of the grease table by Kirsten, of Kimberley, this large residue had to be sorted first by whites on tables and afterward by natives. Kirsten's discovery was that grease had a selective affinity for diamonds and other precious stones. To take advantage of this a stepped panning table, having a side panning motion, is employed. The diamond-bearing material is fed to this table and most of the stones adhere to the grease. This is scraped off every few hours and treated first by boiling in water, when the grease rises to the surface and is collected and used again.

The diamonds are cleaned in hot caustic soda solution, sorted into sizes and grades, if necessary, boiled in nitric or hydrofluoric acid, and then go to the valuer. The tailings from the grease table are reground in a tube mill, passed over a pulsator and sorted by hand. As shown in an illustration none of the gears are roofed over, the general mildness of the climate permitting this. Overhead electric traveling cranes quickly make repairs and renewals.

Government Control

Under the diamond ordinance of the Transvaal, the government is entitled to 60 per cent. of the profits of the company, after capital costs have been prepaid. In practice this means that the government owns a controlling interest in the company. The law allows the government to take 60 per cent. of the area of the pipe, but the government permits this company to work the whole mine under the above arrangement. Capital cost has so far been in the neighborhood of £1,750,000, and has included a large water-supply scheme, involving the construction of a concrete weir, 20 ft. high and 900 ft. long, across the Wilge river and the installation of a pumping station containing four triple-expansion pumps, capable of pumping 4,000,000 gal. per day through a line of 20- and 21-in. pipe, 23 miles long, under a head of about 500 ft. The cost of water delivered at the mine is about 2d. per 1000 gallons.

Before the discovery of the Premier mine, the De Beers company had a monopoly of the diamond market and could regulate the production to suit the demand. The advent of the Premier mine, and to a lesser degree of the Voorspoed and Roberts Victor mines in the Orange River Colony, has, however, altogether altered the situation. The 5,000,000 to 6,000,000 carats produced by the Premier, together with the depression of trade in America, has already produced one crisis in the diamond market.

What the future will bring forth is hard to calculate. The directors of the Premier mine have built up a reserve fund of £400,000 and are committed to the policy of large production for the reason that, owing to the low grade of the mine and the low value per carat of the diamonds, averaging now about 12s., the mine must be worked on a large scale to pay. The future yearly production is estimated at about 3,000,000 carats; the bulk of this, however, is composed of stones of poor quality which do not affect the price of the really fine stones to any great extent.

The Voorspoed mine in Orange River Colony has a pipe of an area of 805 claims (30x30 Cape ft.). The yield of diamonds averages 16.60 carats per 100 loads. Two gears are soon to be at work, treating a total of 9000 loads per day at a cost of 1s. 6d. per load, so that this mine alone will yield about 400,000 carats per annum. Large diamond pipes are being developed near Bembesi, Rhodesia, and a large production from marine or aeolian deposits has been started in southwest Africa in German territory; diamonds have also been discovered in Tanganyika near the copper mines. Should certain dredging enterprises in Brazil succeed, the output from South America may increase. All indications point to an enlarged output in the future, and the question must be faced: can the world absorb an increasing production?

Diamonds Always in Demand

Diamonds are almost indestructible and do not suffer from wear, so that the demand must depend on the general state of the world's wealth. This is increasing and must increase, and there is no reason to anticipate that the fascination the gem has always exercised over the feminine mind is going to grow less. Could the public be given any of the benefit of the reduction of price, the diamond would tend to displace some of the cheaper and more popular gem stones. But the price of large diamonds appears to have little relation to the retail price of manufactured jewelry.

Had the grade of the Premier mine remained at a figure near what was at first anticipated, no doubt the company's policy of large production would have brought ruin to the market; but with such a low-grade mine this policy is forced upon the company. Owing to the expansion of the gold industry and the revival of agriculture and other industries in South Africa, even the diamond mines are feeling the shortage of labor and the new gear on the Premier mine is not fully employed owing to this shortage. The gold mines are now 50,000 natives short of requirements, and as much as £5 per head is being offered for natives on a nine months' engagement.

To an outsider the Premier mine seems to offer a splendid opportunity for the employment of modern American methods of handling ground with a minimum of labor, such as are employed in the Mesabi iron ranges, and shortage of labor should not, apparently, stand in the way of any production desired, though perhaps the already large expenditure of capital would be unduly swelled by any such change in methods. A single steam shovel, loading into a truck constructed as a side-discharge hopper, running on the same rails as the shovel and having numerous doors to allow the loading of the present small trucks, would not be a very expensive experiment should labor continue to be scarce.

General View of Open Workings

No. 2 Gear, Premier Diamond Mine

The Sulphide Corporation, New South Wales

The Sulphide Corporation, of New South Wales, reports a profit for the year ended June 30, 1909, of £153,382. The new mill has justified expectations and the tonnages, costs and recoveries in this plant have shown important improvements. The tonnage of crude ore treated was 195,332, from which a production of 42,354 tons of lead concentrates carrying 32.3 oz. silver and 60.1 per cent. lead, and 67,981 tons of zinc concentrates carrying 16.6 oz. silver, 11.4 per cent. lead and 42.5 per cent. zinc were obtained.

The costs were £4 16s. 8d. per ton of lead concentrates, and 18s. 6d. per ton of zinc concentrates; the recoveries being 74.7 per cent. of lead in the lead concentrates and 85.5 per cent. of the zinc concentrates.

Of the total production, 19,464 tons of lead concentrates were smelted at Cockle creek and 20,600 tons were sold locally. Practically the whole of the zinc concentrates was sold. At Cockle creek lead concentrates have been smelted, but the distilling of zinc concentrates has been suspended owing to results (in consequence of the reduced value of the lead and silver in residues) being less favorable than those obtainable by selling.

The directors report that a suit has been commenced against this company by the Ore Concentration company, in which a claim is made for damages, and for an injunction, on the ground that the flotation processes used by the corporation at Broken Hill are an infringement of certain Elmore patents. As the action on similar grounds taken in England against the Minerals Separation Company, whose processes the Sulphide Corporation are using, had recently been decided by the unanimous judgment of the House of Lords in favor of the Minerals Separation Company, the directors of the Sulphide Corporation feel no anxiety about the result of the Australian action, even if it should be further continued.

The new mill treated 195,332 tons. In the lead section the product was 42,354 tons of lead concentrates assaying 60.1 per cent. lead and 9.9 per cent. zinc, and 152,978 tons of byproducts. The zinc section treated 157,907 tons, obtaining 67,981 tons of zinc concentrates carrying 42.5 per cent. zinc and 11.4 per cent. lead, and 89,926 tons residues. The recovery of both sections combined was 94.8 per cent. silver, 97.5 per cent. lead and 89.5 per cent. zinc. There has been a marked improvement in grade of products which was secured concurrently with a considerable reduction in working costs.

The London Copper Market in 1909

In January following the holidays an active business was done with consumers. Similar activity was reported from New York, where cheap parcels of refined were readily absorbed, and producers were at length able to realize the prices for which they had been holding. Predictions of expanding trade had been freely uttered for months past, and the outlook was generally regarded as hopeful. The official market opened Jan. 4, with cash standard at £63 17s. 12d., and three months' at £64 12s. 6d. Disquieting political news, general weakness in the stock and share markets, and some stringency in finance resulted in a persistent decline in copper throughout the month, which completely falsified the hopeful predictions. The month closed at prices lower than had been known since the previous July, £58 5s. for cash standard, and £59, 26s. 6d. for three months'.

February opened inauspiciously, with weakness in the stock and share markets and general depression in trade. Leading producers of the metal, finding the trade unresponsive at recent level of prices, reduced the price of electrolytic without attracting any large volume of business. The immediate result on the London market was a drop to £58 5s. for three months' standard warrants. The American market was further disturbed. In the prevailing discouragement refined copper was offered very freely, but response from the trade was meager and confined mostly to a few German manufacturers. The lowest for standard copper was touched on Feb. 26 when cash warrants were sold at £55 17s. 6d.; and the official market closed on that day with cash warrants £56, and three months' £56 15s.

March started with a sharp advance, prompted by improved political outlook in Europe and recovery in New York from the lately prevailing disquietude. Reports were also current of large quantities of the metal marketed in America. Speculative enterprises subsided, and American producers found it necessary to make some concessions in price in order to attract their home consumers. Late in the month large sales of American copper to Europe imparted additional strength to the London market where—on March 29 — 4000 tons changed hands, chiefly to cover bear sales. Prices then stood at £57 for prompt standard, and £57 13s. 9d. for three months': and the month closed with a firm market thereat.

April on the whole was uneventful. At the outset there was active covering of bear sales, whereby the three months' price was raised to £58 5s. An immediate reaction followed. By April 8 speculative interest had subsided and the tendency was weak in consequence of unsteadiness in the New York markets; values of standard being £57 1s. 3d. for cash warrants and £57 13s. 9d. for three months'. After the Easter holidays increased activity was prompted by publication of the American Producers' statistics, revealing a substantial increase in production but also a greatly increased volume of deliveries. The actual improvement in trade generally was insignificant in Europe, and more particularly in the United Kingdom where consumers remained reserved. The market was dominated by the speculative element and closed strong, in sympathy with bullish advices from Wall Street, at £57 12s. 6d. for cash warrants, and £59 7s. 6d. for three months'.

In May statistics disclosed an unexpected reduction of 1269 tons in the visible supply. The consuming industries in Europe showed some welcome signs of revived activity, chiefly manifest in electrical work in Germany as also in improved demand from English engineers and shipbuilders and substantial orders from India. Prices eased somewhat at the close in consequence of profit-taking coupled with some bear selling, but the undercurrent appeared strong. Final values were £60 17s. 6d. for cash standard, and £61 13s. 9d. for three months'.

June opened with every indication of a strong market, £62 being freely paid for three months' standard, but a few hours sufficed to initiate a pronounced relapse due to selling pressure of a very aggressive character. There was great activity, the speculative interest broadening, while trade orders were on a larger scale than had been seen for a long time previously. The situation, however, was obviously artificial and lacking consumers' support. The turnover on the London market during the month was unusually large, but it moderated toward the close.

In July fortnightly statistics disclosed an increase of 5118 tons in the visible supply, due mainly to heavy imports from Japan, Chile and Spain, and particularly from the United States. Speculators were accordingly encouraged to support the London market, though consumers remained distrustful and several tired holders liquidated their commitments. The tendency in copper was optimistic until July 23 when the three months' price touched £60 13s. 9d., at which point support was withdrawn. The market became listless and closed at £59 5s. for three months'.

In August business was resumed with an initial advance of 10s. per ton which, however, quickly lost 5s; and the market remained thus almost unchanged for several days. European trade was disappointingly dull, but prices were well maintained by optimistic reports from America. On Aug. 12 three months' warrants touched £61 10s., after which values relapsed by about 10s. as a result of realizations which, however, were well absorbed. The market was subsequently weakened by some unsteadiness in American finance, whereby the three months' price was lowered to £60. Closing prices were £59 15s. for cash warrants, and £60 13s. 9d. for three months', the market being rather quiet after recent activity, but with a firm undertone inspired by evidence of improving trade.

In September statistics for second half of August disclosed an increase of 7366 tons in the visible supply, which gave the market a shock, reducing values by about 15s. at the opening: but outside influences were sufficiently favorable to arrest further decline for a while. Speculative interest, however, gradually subsided, and industrial demand was eagerly satisfied by dealers, so that the tendency was gradually downward. The American Producers' statistics revealed an increase of 5625 tons during August, which naturally caused further weakness: lowest prices being touched on Sept. 13 when £58 2s. 6d. was accepted for cash standard. The highest prices of the month were paid on Sept. 22, £59 10s. for cash, and £60 7s. 6d for three months; liberal offerings being well absorbed. At this point a break occurred, prompted by heavy reselling; but consumers' orders were important enough to arrest any serious decline. Closing prices were £59 6s. 3d. for cash standard, and £60 2s. 6d. for three months'.

In October an increase of 3464 tons in the visible supply discouraged buyers at the outset. Prices fell daily until—on Oct. 6—£57 11s. 3d. and £58 10s. ruled for cash and three months' respectively. The reduction brought out some fair trade orders. After some depression sentiment changed, influenced by better support from the consuming industries and by more encouraging advices from America; and speculative interest quickened and broadened up to the end of the month when cash warrants commanded £57 11s. 3d. per ton, with £58 15s. for three months'.

November was an eventful month. Statistics for second half of October showed the visible supply increased to 99,357 tons, which induced heavy selling whereby prices were forced down until three months' standard touched £58 3s. 9d. There was then a slight recovery due to sustained purchases made in view of the persistent reports of favorable negotiations proceeding among the leading American producers, and in spite of equally persistent denials thereof from interested quarters. The advance in price induced a large volume of speculative realization which eased values. On Nov. 22 the advance was suddenly checked by the decision of the court adverse to the Standard Oil Company and to commercial trusts generally, which was thought to be inimical to the projected scheme of the copper producers. A further relapse ensued, but was partly recovered on the last day of the month, when standard stood at £58 12s. 6d. for cash, and £59 15s. for three months'.

December started with a weak market in the absence of active speculation and pending further enlightenment concerning the American situation. Prices were steady, however, round about £58 7s. 6d. for cash standard, and £59 10s. for three months', further fall being arrested by early news of large American purchases for consumption and by an improved demand from European consumers. A revival in the electrical trade in Germany contributed to the general improvement, as also did the publication of the American Producers' statistics. Business diminished in volume as the Christmas holidays approached, but with no diminution of the pervading confidence in the general commercial outlook.

Mining Stocks on Various Exchanges in 1909

In the accompanying tables are given the sales of stock of mining and metallurgical companies during 1909 on the New York Stock Exchange, Boston Stock Exchange and on the Boston curb market, together with the high, low and closing quotations. The table of the Boston curb stocks includes only the most active securities and those not already published in the New York curb market table in the JOURNAL of Jan. 15. The Boston Stock Exchange table does not include those stocks also listed on the New York exchange.

New York Stock Exchange transactions amounted to 19,993,303 shares of mining and metallurgical stocks exclusive of sales of United States Steel; the Boston Stock Exchange recorded the sale of 8,095,071 shares; and on the Boston curb market, 20,176,873 shares of stock and $321,065 in bonds were traded in.

MINING STOCKS ON THE NEW YORK STOCK EXCHANGE IN 1909.

	High.	Low.	Close.	Total Sales.		High.	Low.	Close.	Total Sales.
Amalgamated Copper	96⅛	65	90½	9,344,636	National Lead, pfd	113¾	102¾	110	43,010
Amer. Sm'ting and Ref.	105½	77¾	103⅞	5,244,320	Newhouse Mines and Smelters	6	1½	3½	243,112
American Sm'ting and Ref., pfd	116¾	101	112¼	199,450	Ontario	5⅜	2	2¾	16,504
Amer. Smelters Securities, pfd., B.	92	80	90¾	87,380	Phelps-Dodge & Co	200	200	200	465
Anaconda	54⅜	37¾	54¼	979,815	Quicksilver	9⅜	1⅝	3½	112,246
Batopilas	5½	2⅞	3⅝	71,866	Quicksilver, pfd	10	3	4	33,955
Colo. Fuel and Iron	53	29	49⅞	1,496,670	Tennessee Copper	49	33½	40¼	301,845
Colo. Fuel and Iron, pfd.	115	67	115	4,320	U. S. Red. and Ref.	17½	10	11	17,900
Federal Min. and Sm'ting	95½	55	82	9,610	U. S. Red. and Ref., pfd	39½	24	28½	14,255
Federal Min. and Sm'ting, pfd	94	80	89½	26,792	U. S. Steel	94⅞	41¼	91	34,133,822
Granby Consolidated	110½	91	110½	28,438	U. S. Steel, pfd	131	107	125	1,349,453
Homestake	93	73¼	80⅛	6,854	Utah Copper	67¼	39⅛	60¼	803,403
National Lead	94	71¼	89⅞	883,164	Virginia Iron, Coal and Coke	75⅛	57	73⅞	23,028

MINING STOCKS ON THE BOSTON STOCK EXCHANGE IN 1909.

	High.	Low.	Close.	Total Sales.		High.	Low.	Close.	Total Sales.
Adventure	10½	1½	6¾	78,286	North Butte	85¾	47¼	50	1,211,197
Allouez	62½	33¼	58	49,053	Old Dominion	59¼	47¼	55	88,360
Atlantic	18	8	11¼	96,282	Osceola	170	123½	164	30,508
Boston Consolidated	23½	10½	22	295,276	Parrot	36½	26	20¾	135,698
Boston & Corbin	24	17⅛	23¼	145,134	Quincy	96	83	90½	12,093
Calumet & Hecla	690	585	680	3,260	Shannon	18	13½	17½	171,902
Centennial	41½	28	38	62,455	Superior	67	34	65½	167,073
Copper Range Consolidated	86¾	68½	84¾	218,863	Superior & Pittsburg	18½	12½	16¼	135,844
Daly-West	12	7½	9	29,373	Tamarack	90	62	68	18,027
Franklin	19	13	18¾	151,595	Trinity	17⅝	9¼	11	79,760
Greene Cananea	11⅝	8¾	11⅝	569,605	United Copper, Com.	16¼	7⅜	8	7,894
Isle Royale	33¼	22⅛	28½	176,460	U. S. Oil	39½	28	37½	107,507
Lake	74¼	16	72½	510,202	Utah Cons	49¾	37¼	46	136,782
Mass Mining	18½	4	6¾	206,331	Victoria	6	3	5⅜	30,134
Michigan	13¼	5¾	7½	43,650	Winona	13¼	4¾	12¾	102,413
Miami	28⅛	12¾	28⅛	367,468	Wolverine	158	139	150	3,923
Mohawk	70½	57⅛	69	60,383	U. S. Smelting	59	39	54½	628,243
Nevada Consolidated	30	16½	27	120,023	U. S. Smelting, pfd	54	44	53	186,005

TRANSACTIONS ON THE BOSTON CURB MARKET IN 1909.

	High.	Low.	Close.	Total Sales.		High.	Low.	Close.	Total Sales.
Ahmeek	245	135	225	3,119	Gold Prince	0.05	0.01½	0.05	3,200
Arizona & Michigan	1¾	0.40	0.41	28,497	Gold King	1 1/16	0.06	0.06	10,930
Arizpe	1 5/16	0.10	0.55	108,989	Hancock	14¼	11	11¾	2,590
Barnes King	0.87½	0.85	0.85	1,200	Hassayampa	0.20	0.05	0.10	72,023
Beaver Carbonate	1⅞	1	1	33,920	Helvetia (paid)	7 1/16	4½	6⅞	62,161
Begole Syndicate	21¼	1½	3	26,915	Indiana	9¼	5½	8⅜	46,590
Bingham-Central-Standard	0.45	0.25	0.34	23,385	Keweenaw	5½	4⅛	4¾	2,505
Bingham Mary	0.12	0.01	0.05	1,950	Laramie-Hahns Peak	1¼	0.74	0.99	79,690
Bingham Mines	4⅜	2½	3¾	11,949	Mollie Gibson	0.36	0.18	0.23	70,535
Black Mt	3 5/16	0.50	0.50	49,536	National Mining	0.83	0.26	0.62	1,036,119
Boswyocolo	0.11	0.07	0.08½	281,090	Nevada-Douglas	4⅛	2	2⅞	38,011
Bullfrog Mining	0.20	0.03	0.05	158,980	Nevada-Utah	3 9/16	1	1½	231,293
Calaveras	6	3½	5 1/16	15,640	Ojibway	11⅞	12	13⅞	11,974
Cactus Development	6½	2⅝	6⅝	71,020	Oneco	3¾	0.75	3½	37,040
Calumet & Corbin	3⅛	0.29	1	58,905	Raven (full paid)	0.80	0.56	0.70	32,467
Champion Copper	0.35	0.05	0.12	471,600	Ray Central	4¼	2 1/16	3½	145,940
Chemung Mining ($9 paid)	23¼	13¾	15⅞	11,176	R. I. Coal	12⅞	3⅜	12¼	337,011
Chemung Mining (full paid)	18½	15½	16	2,423	Shattuck & Arizona	23	15½	23	3,185
Chief Cons	2⅞	1 7/16	2 11/16	225,410	Superior & Globe	1½	0.75	1¼	32,723
Corbin Copper	11	4⅞	8¼	117,777	Vulture	9	5	8⅜	236,345
Eagle & Blue Bell	1½	0.50	0.75	5,415	Western Utah	2⅜	1½	1¾	2,000
Ely Consolidated	7¼	1	1	8,215	Yuma	3	1	2¼	118,585

Ore Dressing in the Coeur d'Alene—V

Heavy Construction and More Compartments Recommended for Jigs. Attrition Losses Heavy. Explanation of High Lead Content of Middlings

BY EDWARD S. WIARD*

In the four instalments of this paper reating the subject of ore dressing in he Cœur d' Alene district of Idaho I ave covered the subject up to and hrough the sizing of ore in trom-nels. A discussion of the types of jigs sed in the Cœur d'Alene and the genral jigging practice obtaining, is next in he logical sequence of topics to be conidered.

raming of Jigs Light—Hopper Bottoms Not Used

Fig. 1 shows the usual type of Cœur 'Alene jig. Some criticism of this parcular design can be made. For exmple, the posts and caps are very light nd the mode of securing the caps to the osts is not as good as having a long tie od pass through the cap and sill. In a reat many mills all over the continent ne sills of the jigs are set on the floor, ut this makes a towering construction ne bed of which can only be reached climbing on a foot board secured to ne side. I have introduced Fig. 1 show how the Cœur d'Alene jigs are stalled so as to bring the bed to a conenient hight above the jig floor. The ll timbers of the jig rest directly on the ill timbers and the floor is built about the jig, thus effecting a considerable saving in the floor hights.

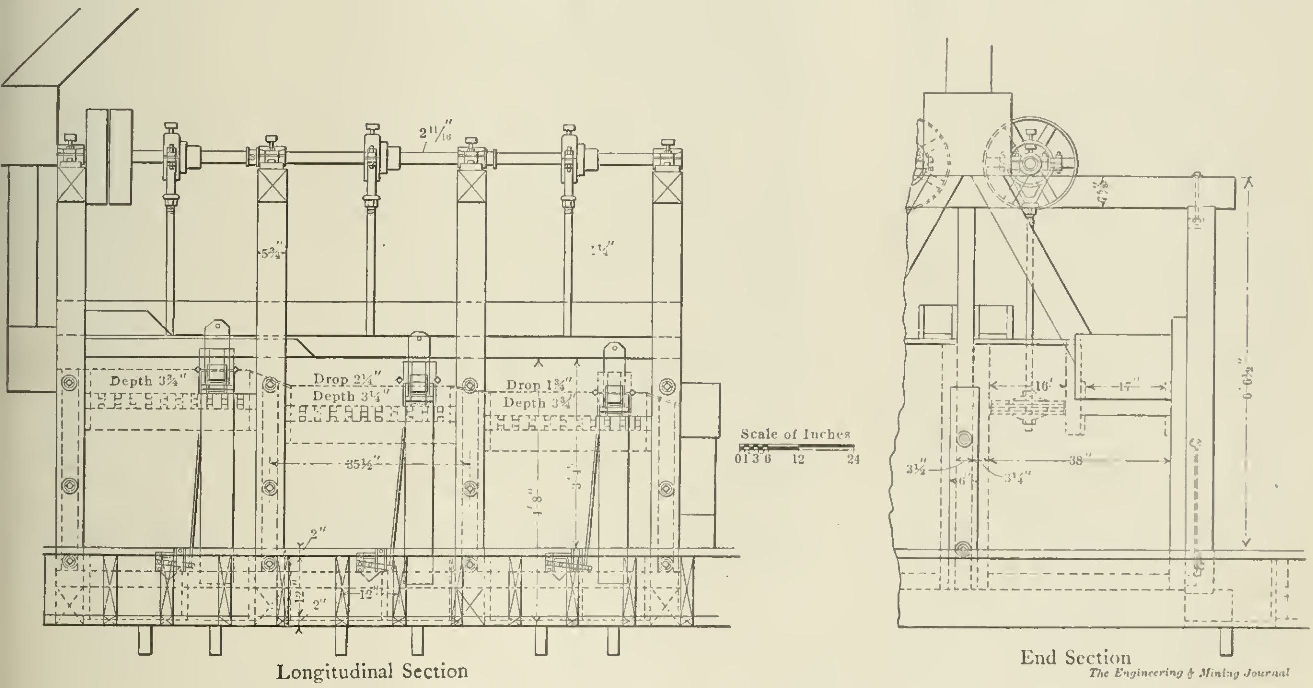


FIG. 1. DETAILS OF JIGS USED IN CŒUR D'ALENE MILLS

Cœur d'Alene jigs are almost universally flat bottomed. When run with the hutch discharging intermittently this product forms a bed of varying depth and with a level top surface. The action of the jig keeps the surface perfectly level. On the down stroke of the plunger the water encountering the flat surface tends to form eddies and rises through the screen with velocities varying from point to point. When foreman of the Last Chance mill I attempted to put in the jig boxes hoppers sloping from the plunger side of the jig to a point near the hutch-discharge orifice, the slope of the inclined boards being between 30 and 35 deg. In putting in these hoppers rods were freely used. Nevertheless the project was a failure, for a few day's operation of the jigs loosened all the false construction and necessitated shutting down the jigs to remove the floating lumber. I concluded that to keep a hopper in place it must be framed in the jig box when the machine is built. In constructing Harz jigs the heaviest and stanchest construction will speedily pay for itself. Punched plate for jig screens is gaining in favor in the district. While the area of opening is less than with screen cloth it is so much stiffer that the slats of the screen frame may be made lighter and more widely spaced, thus compensating somewhat for the loss of area of opening. Furthermore the punched plate does not blind so readily as the cloth, is more readily freed from clogging grains by the scratching tool, and is little damaged in the operation of scratching.

Jigs Have Too Few Compartments

In Richards' work[1] on ore dressing will be found a vast amount of data on the dimensions, fittings and mode of operation of jigs and this includes much information regarding the Cœur d'Alene. It seems unnecessary for me to publish any of my notes on these points, and I will therefore devote the remainder of this section to discussing what I consider a serious fault of the Cœur d'Alene Harz jig practice, i.e., the lack of a sufficient number of jig compartments devoted to making middlings.

The greater part of the work of experimenters in jigging has been done with pure or very nearly pure mixtures of minerals. Jarvis reports in his paper[2] on jigging that "the results indicate that in order to separate sphalerite and quartz, a jig of at least three compartments should be used; since smaller differences in the specific gravity of these minerals require a longer time to effect the separation. In the case of a heavy mineral, such as galena, one or two compartments will effect a perfect separation." I agree to this statement provided the word pure be used before each mineral name, or, in other words, if the test ore comes from narrow seams of pure ore in a pure gangue. Unfortunately ore seldom occurs this way.

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*Mining engineer, Denver, Colo.

[1] "Ore Dressing," Richards. 4 vol. McGraw-Hill Book Company.

[2] *Trans.* A. I. M. E., XXXVII.

At Wardner the orebody is typically an aggregate of fissures the centers of which are nearly pure galena. From the centers out on either side the percentage of galena gradually lessens until finally unmineralized quartzite is reached. The centers of the seams yield ore which could be sorted out underground. Next to this zone is ore which could be sorted out in a surface picking plant or yield coarse concentrates; then follows a jig-middlings zone and finally a tailings zone. The error of too few compartments for middlings is best seen in the two-compartment bull jigs which make middlings as well as tailings.

In Fig. 2, I have attempted to represent the distribution of the lead in 100 lb. of bull-jig feed which assays 8.53 per cent. lead. I have made the curve of the diagram in broken lines for simplicity in calculation. For each per cent. the abscissas show the number of pounds of material; for example, there is 0.25 lb. of 40 per cent. ore, 0.75 lb. of 20 per cent. ore, 0.06875 lb. of 67 per cent. The sum of these abscissas equals 100. The area bounded by the broken lines and the vertical and horizontal axes also equals 100. The area of any particular part of the diagram will furnish the number of pounds of material in that part; for example, there is 5 lb. of material from 40 to 80 per cent. Suppose it is desired on the bull jig to make a 50 per cent. concentrate, then out of the 100 lb. of feed it will be necessary to remove all the ore from 80 to 36 per cent. grade inclusive. This will amount to 6.375 lb. of concentrate having an average specific gravity of 5.7, the original ore having a specific gravity of 3.46.

In calculating specific gravities I have assumed the galena in each piece of ore of a specific gravity of 7.7 and the gangue material of 3. At Wardner the country quartzite is largely replaced by siderite of specific gravity 3.9 to 4.2. Passing into the second compartment there will be 93.625 lb. of ore containing 5.7 per cent. lead and having an average specific gravity of 3.30. The specific gravity of the heaviest grain entering this compartment will be 4.9. By making the concentrate of little lower grade it would be possible to make the richest grain passing into the second compartment of a specific gravity of 4.2 which according to Dana is the specific gravity of the purest sphalerite. I feel inclined at this point to make the statement that if three compartments are necessary for sphalerite four are necessary for galena. At the bottom of the diagram I have cross hatched an area which shows graphically the material of 2 per cent. and lower grade. The average grade in this block is 0.78 per cent. lead and the weight as shown by the diagram 50.092 lb. I will assume that out of the original 100 lb. of feed this weight and grade of material is the tailings or rather that it is desired to work to this limit.

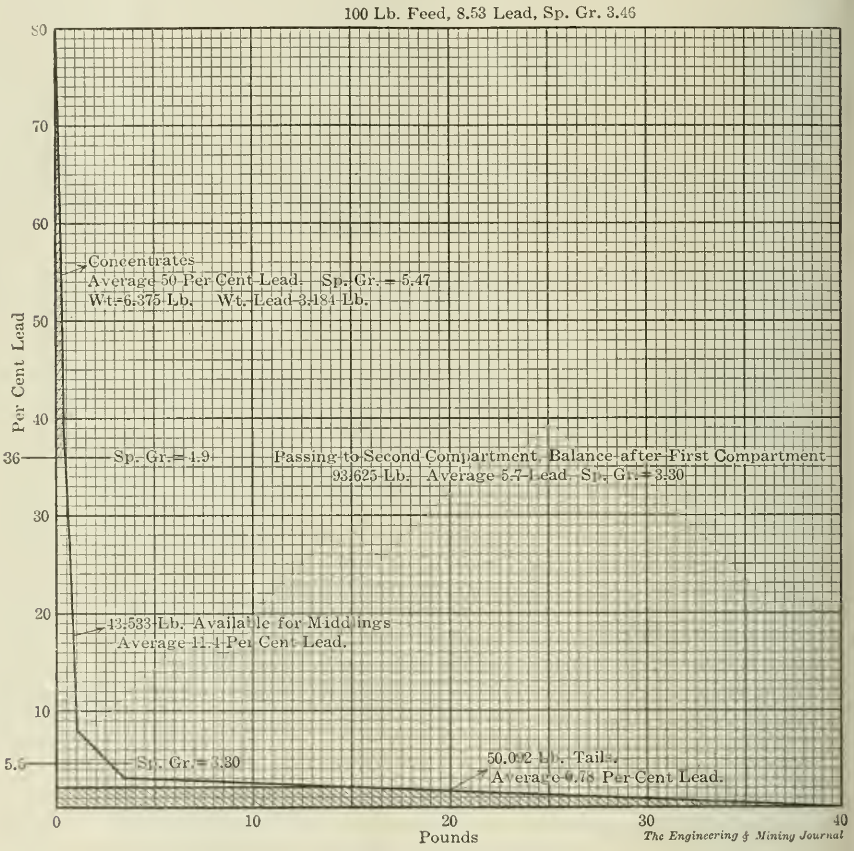

FIG. 2. DIAGRAM SHOWING DISTRIBUTION OF LEAD IN JIG PRODUCTS

PROGRESSIVE SETTLEMENT OF GRAINS LIMITS JIG SEPARATION

This would be extra good work for a jig of any number of compartments and with good close sizing. It could not be done in a two-compartment jig because there must be progressive settlement of the grains in the order of their settling power. If the ore be closely sized the 36 per cent. grains would settle first in the second compartment and by the time the grains of about 3 per cent. grade began to settle to an appreciable extent they would be so far forward in the compartment that they would be carried over the tail board by the current of ore and water in the compartment. If the jig had three compartments, grains ranging in percentage of lead from 36 to 5.7 could be removed in the second compartment. The latter figure is the average percentage of the material entering the second compartment. In the third compartment, or second middlings compartment, the 5.5 to 2 per cent. grains would reach the screen much more quickly than if there were but two compartments; and once on the screen they would be in the positions least affected by the forward motion of the ore and water in the compartment. There is of course a creep of the lower or middling layer toward the tail board in both the two- and three-compartment jigs. This creep with the ore under discussion would be greater in the latter case, but not much so, because of the comparatively small difference in specific gravity between the second-compartment middlings of a three-compartment jig and those of a two-compartment jig. I would judge that loss from this action would be greater in the two-compartment jig because the middlings would be richer than the second-grade middlings from the three-compartment jig.

One way of considering the discharging actions removing concentrate and middling is to regard the columns inside the dam as balancing the column in the compartment outside, and to assume that motion producing discharge is caused by the continuous entry into the compartments of material which will form concentrate or middling and which would destroy the equilibrium of the columns did it not produce flow. Under this conception, where *d* and *d'* equal the depth f material in the dam and compartment espectively and *s* and *s'* the correspondig average specific gravities of the two olumns, *ds* would equal *d's'*. In the œur d'Alene an average figure for the epth of ore in the first compartment of bull jig is about 5½ in. The concenrate stands 1½ in. lower. In the second ompartment the depth of the bed of ore on an average 5 in. and the middlings i the dam 4½ in. I have taken these ieasurements with the water drained om the sieves. The above conception f the mode of discharge would only be ossible so long as the specific gravity f the discharging middling or concenate remained unaltered.

There is a distinction to be observed ere. If tests were being made with a ixture of pure galena and quartz the roportion of galena might be varied idely without requiring any change in e setting of the gate of the discharge. i this case there would be decided ianges in the grade of the feed withit any change in the specific gravity of e concentrate. In the actual practical ork of jigging, the specific gravity of oncentrate is constantly changing and here a uniform grade of concentrate is esired the jigman must frequently iange the hight of the gate to meet the iifting conditions. If for the sake of rgument it is assumed that the thickness the concentrate and middling on the reen is 1 in., and that the average width the section in approaching the disarges is equal to the width of the comrtment, then the velocity of the miding and concentrate approaching the scharges in a two-compartment jig will respectively 1.6 ft. and 0.14 ft. per in.; providing the compartment be 18 wide, the rate of feed be 100 lb. in 2 in., and the ore of the character shown the diagram. In making these calcutions I have assumed that the moving yers were 50 per cent. water. I have rther assumed that all the material beeen 2 and 36 per cent. could be reoved as middlings averaging 11.4 per nt. lead.

Rounded Grains in Concentrate

This explains why Cœur d'Alene coarse ncentrates show so many grains unded by the jigging action. One has ly to remember that the difference in lume between a sphere and the smallt inclosing cube is 42.5 per cent. to preciate how serious may be the attrion loss. However, I do not believe at the elimination of the suction factor ould be especially helpful in preventg attrition losses. In the Richards lsator jig the compartments are small, e tonnage treated large and the rate of avel of the bottom grains toward the scharges must be much greater than the Harz jig. I believe that the comratively short time the concentrate grains are being jigged in this machine is a more helpful factor in preventing loss by attrition than the elimination of the suction action.

In the first section of these articles I stated that I would explain my reason for assigning the high lead content to the jig middlings. A sizing test of the feed of a Cœur d'Alene mill taken below the No. 1 rolls would disclose the fact that there is an increase in the lead and silver content as the size diminishes. This ore on passing into the trommels yields oversize products for the jigs, the leanest passing to the bull jig and slightly richer oversizes to the other jigs. A reference to Fig. 2 will show that the middlings from the bull jig are richer than the original feed. This is due to the fact that only the richest portion of the feed is removed as concentrates. If a low-grade concentrate were made the reverse might be true, i.e., the jig middlings might be lower than the feed. This middlings product being returned to the original stream of ore flowing through the trommels enriches it. By these successive enrichments the feed to the Wifley tables and vanners becomes notably higher than that of the ore entering the mill.

Roller Mills

In the mills of the Cœur d'Alene district 5-ft. Huntington mills are exclusively employed for regrinding the finest material from the rolls. At the Bunker Hill mill, roller mills of this type 6 ft. in diameter have been successfully employed for grinding high-grade material of about 2-in. size.

El Rayo Mines Company

The first annual report of the El Rayo Mines Company contains a clear description of the company's properties in Chihuahua, Mexico, the work done to Nov. 20, 1909, and balance sheet and profit and loss account as of Oct. 31, 1909. The production for the year ended Oct. 31, was 43,008 tons having a value of $14.03 per ton, $603,427 gross, from which $507,455 was recovered. Operating costs were $341,729, leaving a net profit of $165,726. The operating costs were apportioned as follows, the figures in brackets being per ton costs: Mining, $72,749 ($1.69); development, $39,529 ($0.92); milling, $59,870 ($1.39); cyaniding, $72,289 ($1.68); general, $38,124 ($0.88); bullion expense, $19,262 (0.45); concentrate expense, $39,906 ($0.93); total cost per ton was $7.94. An extraction of 84 per cent. was obtained.

George A. Schroter, the consulting engineer, estimates the actual ore reserves, blocked out on at least three sides, as 50,000 tons averaging $15.70 per ton, a total of $785,000. In this estimate he includes nothing beyond the visible limits of the orebodies. In addition, he notes ore underfoot in the lowest workings of the Descubridora 125 ft. long and 4 ft. wide assaying $30; in the upper workings of the Adela a body of ore 175 ft. long and 4 ft. wide assaying $20 has been opened and still shows in the face; in the lowest workings, the Pettit tunnel, six orebodies are shown, totaling 746 ft. in length and of an average width of 3 ft. assaying $24. There is much virgin ground above this tunnel. There is a total of about five miles of workings on the property, 8462 ft. of which were driven during the year.

In regard to ore occurrence the country rock is a rhyolite traversed by fissure veins. The main vein is traced over 7000 ft. The ore occurs in large, irregular lenses in the vein, and may become barren and again enriched at distances of 50 to 200 ft. either above or below the stopes. The average content of pyrite is given at 4 per cent., and the approximate proportion of gold to silver is 85:15 in value.

The mill is connected by a 3000-ft. surface tram to the Descubridora and El Rayo tunnels, and by one 1250 ft. in length to the Pettit tunnel; an aërial tram, 2600 ft. long, carries the ore from the San Jose tunnel. In the mill the ore is passed through a rock breaker, and from there is crushed by rolls in cyanide solution; from the rolls it goes to Huntington mills, and from there to classifiers. The coarser portion of the pulp is passed through Australian grinding pans. The pulp is concentrated in Frue vanners, and from the vanners it goes to the cyanide plant.

In the cyanide plant, the pulp is cone classified to sands and slimes, which are cyanided separately. The slimes are agitated and sent to a Butters filter. Zinc-dust precipitation is employed. A new method of feeding zinc dust by an automatic feeder was designed by J. S. Colbath, the manager, which reduced the zinc-dust consumption from 3000 to 1000 lb. per month.

Arkansas Diamond Fields

Progress in diamond mining in the Arkansas field in 1909 was slight. Development consisted of experimental and testing work in a small plant erected last August. No attempt has been made as yet to work the mines on a commercial basis. Plans, however, have been drawn for a plant to handle the diamond-bearing dirt on a commercial scale. There has been more or less delay on account of the lack of capital to invest in these new fields. Up to the present time, possibly 1000 diamonds have been obtained, ranging in size from mere fragments to 6 carats. The diamond-bearing areas are found in Pike county, only a short distance from Murfreesboro.

A European Electric Colliery Railway

A Plan Whereby Isolated and Distant Coal Seams May Be Economically Worked without the Installation of a New and Expensive Plant

BY J. B. VAN BRUSSEL*

The accompanying photograph and diagrams refer to a European electric colliery railway, which presents several points of interest both for traction engineers and for colliery owners and managers. The line connects a colliery with a new opening situated at about 2¼ miles distant. The coal at this new opening is loaded into cars which are made up into a train of 36, and hauled by means of an electric locomotive to the screening plant installed at the colliery. In this way the installation of a large amount of new and expensive stationary plant is avoided, and it is possible to work new isolated seams economically, which would otherwise be a doubtful commercial undertaking.

The most interesting feature of the installation is the electric locomotive. The difficulty of constructing a suitable locomotive may be appreciated from the following conditions:

Length of line	about 2¼ miles
Maximum gradient against the load	1 in 21
Length of maximum gradient	about 720 yd.
Average gradient against the load	about 1 in 47
Gage of the track	26 in.
Load to be hauled (exclusive of loco.)	25 tons
Time allowed for each journey of two miles	10¾ min.
Frequency of service	2 double journeys per hour.

From these conditions it will be obvious at once that a powerful locomotive is necessary, and at the same time that the narrowness of the gage imposes severe restrictions on the motors if suspended on the bogies in the usual way. Under the conditions stated above, the largest motors that could be got in between the wheels would have a capacity of about 20 h.p. for one hour. A locomotive with four such motors would not perform the required service, and it was necessary to adopt some different arrangement by which larger motors could be employed.

The design of the locomotive actually supplied is shown in the accompanying drawing, Fig. 1. The body is supported on two bogie trucks, each of which is equipped with a single 56-h.p. 500-volt Siemens-Schückert railway motor, the aggregate capacity being, therefore, 112 h.p. The two axles of each bogie are connected together by side rods, in order to utilize the whole weight of the locomotive for adhesion (see Fig. 2), and one of the axles is driven through spur gearing by the motor.

This gearing consists of two equal gear wheels and one pinion, the pinion being fixed on the motor axle, one gear wheel on an intermediate shaft, and one on the driving axle. In this way the motor is not restricted axially by the narrowness of the gage, but only by the distance between the side frames of the bogie. As the motor occupies the space in the center of the bogie, the usual arrangement of center pin and bolster is in this case impossible. The center is mounted on an arch built of steel plates and beams which rests on the top of the side frames, and the center pin is carried by crossbeams rigidly fixed to the locomotive body. There are also fixed to the body, side-rubbing blocks which bear upon similar blocks supported on the bogie by means of helical springs, not shown in the illustration. There is thus as much flexibility in this construction as in the standard bogie with bolster and bolster springs. The center pins are spherical in shape, and work in cup-shaped centers, so that ample bearing surface is provided for transmitting the tractive force from the bogie to the frame of the locomotive body.

CONSTRUCTION OF THE LOCOMOTIVE BODY

The locomotive body is built up on two main longitudinal steel girders, which are themselves supported by crossbeams from the bogie centers. The space between the bogies is utilized for the lower part of the driver's compartment. In this way the hight of the locomotive is reduced so that the line can be taken under a roadway without excessive excavation. On the roof of this compartment is fixed a frame, forming the base of two current collectors of the Siemens bow type, which are of such a length as to allow of a considerable range in the hight of the trolley wires. The movable portion of the collector is made in two parts, viz., the main frame of light steel tubes hinged at the bottom to the fixed base, and the small bow carried by this frame. The action of the various springs tends to raise the main frame and to keep the small bow in a vertical position. The pressure of the trolley wire balances this spring action in such a way that both the small bows are always trailing at a small angle in whichever direction the locomotive may be running.

The electrical equipment includes, in addition to the two 56-h.p. motors and the current collectors, one series-parallel-brake controller of the Siemens standard pattern, and the usual controlling resistances, automatic circuit breaker, etc. The controller is fixed in the driver's compartment so that the driver has no difficulty in operating it in either direction of running. There is also provided the usual equipment of hand brakes.

The cars used for carrying the coal are of the ordinary colliery type, and it is, therefore, necessary to arrange the draw-gear on the locomotive at a suitable

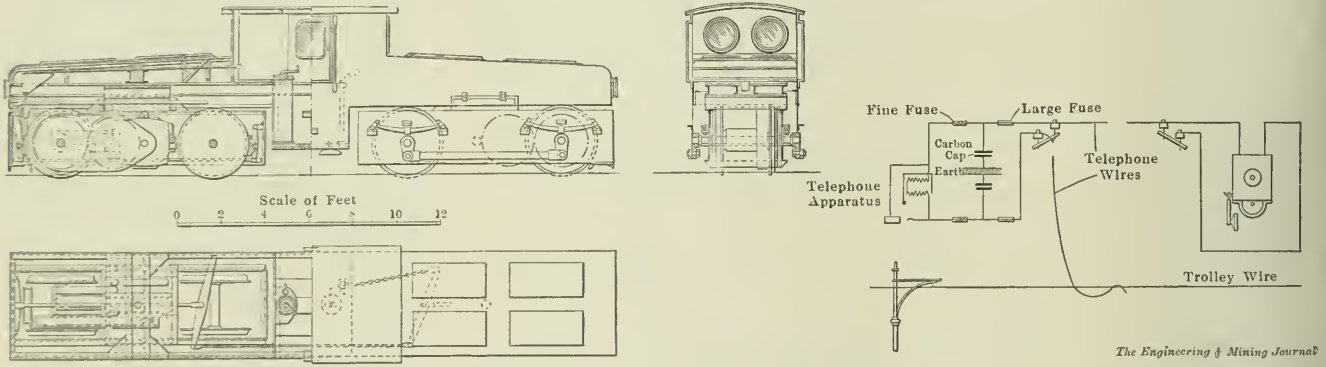

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FIG. 1. PLAN AND SECTIONAL ELEVATION OF LOCOMOTIVE, ALSO DIAGRAM OF PROTECTIVE DEVICE FOR TELEPHONE CIRCUITS

ight above the rail level. This is done y fixing a central buffer with hook and iain on the end frame of the bogie, the uter ends of both bogies being utilized or this purpose, so that the locomotive double-ended. With this arrangement ie tractive force transmitted by the rame of the locomotive body is only iat due to one motor.

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*P. O. Box 157, Brussels, Belgium.

Dimensions of the Locomotive

The particulars and leading dimensions f the locomotives are shown in an acompanying table. Some interesting trials ave been made to ascertain the tractive esistance of the locomotive and of the ars. The tests were made by allowing train to start from rest on a down grade, nd measuring the distance passed over efore coming to rest again on the next scending grade. The following results ere obtained: For a train of 10 cars one at an average speed of 5.8 miles r hour, the tractive resistance was 36 . per ton. For the locomotive alone at an average speed of nine miles per hour, the tractive resistance was 15.5 lb. per ton.

LOCOMOTIVE DIMENSIONS.

otal weight, including about 4 tons of ballast	14 tons
ige	26 in.
erall length	27 ft. 9 in.
erall width	4 ft. 11 in.
ght to top of driver's compartment	7 ft. 4½ in.
nimum hight of trolley wire	8 ft. 0 in.
ximum hight of trolley wire	14 ft. 6 in.
stance between bogie centers	14 ft. 9 in.
heel base	9 ft. 7 in.
ameter of wheels	2 ft. 11½ in.
ot equipment	Two 56 h.p. motors
ht of drawgear above rail	10½ in.
ght of buffer above rail level	15 in.

The track consists of Vignole rails weighing 50 lb. per yd., the gage being 26 in. The line is a single track for most of the distance. The overhead line consists of two trolley wires of hard-drawn copper wire of 80 sq.mm. cross-section. These wires are supported by means of side brackets bolted to lattice poles, which are set in concrete foundations beside the track.

A telephone line is installed by means of two wires supported by insulators on the tail ends of the brackets. This line is tapped at six points between the colliery and the distant opening, and the driver of the locomotive carries with him a portable telephone with which he can make connection through the plug boxes fixed on the poles.

On each of these points at which the line is tapped a protection device is inserted to guard against the danger of shock if either of the telephone wires has come into contact with the overhead wires supplying the locomotive. This device consists of two large fuses, two carbon gaps, and two fine fuses arranged as shown in the diagram, Fig. 3. The large fuse melts with a current of 3 amp., and the fine fuse with 0.3 amp. In the event of either wire being subjected to any voltage greater than 350 volts, the corresponding carbon gap arcs across to earth and the current immediately blows the large fuse; in case the gap does not discharge, and there should be any leakage to earth in the telephone apparatus, the fine fuse will melt and cut off the connection with the overhead wire. These devices, which are made by Messrs. Siemens & Halske, of Berlin, are used in large quantities on the Continent.

Power is supplied to the locomotive from a 200-kw., direct-current, compound Siemens generator, giving 500 volts on no load, and 550 volts at 120 kw. coupled direct to a Belliss engine running at 375 r.p.m. The power house is situated about 600 yd. from the railway near the colliery and is connected to the overhead line by means of two positive and one negative insulated feeders run through earthenware pipes in a trench.

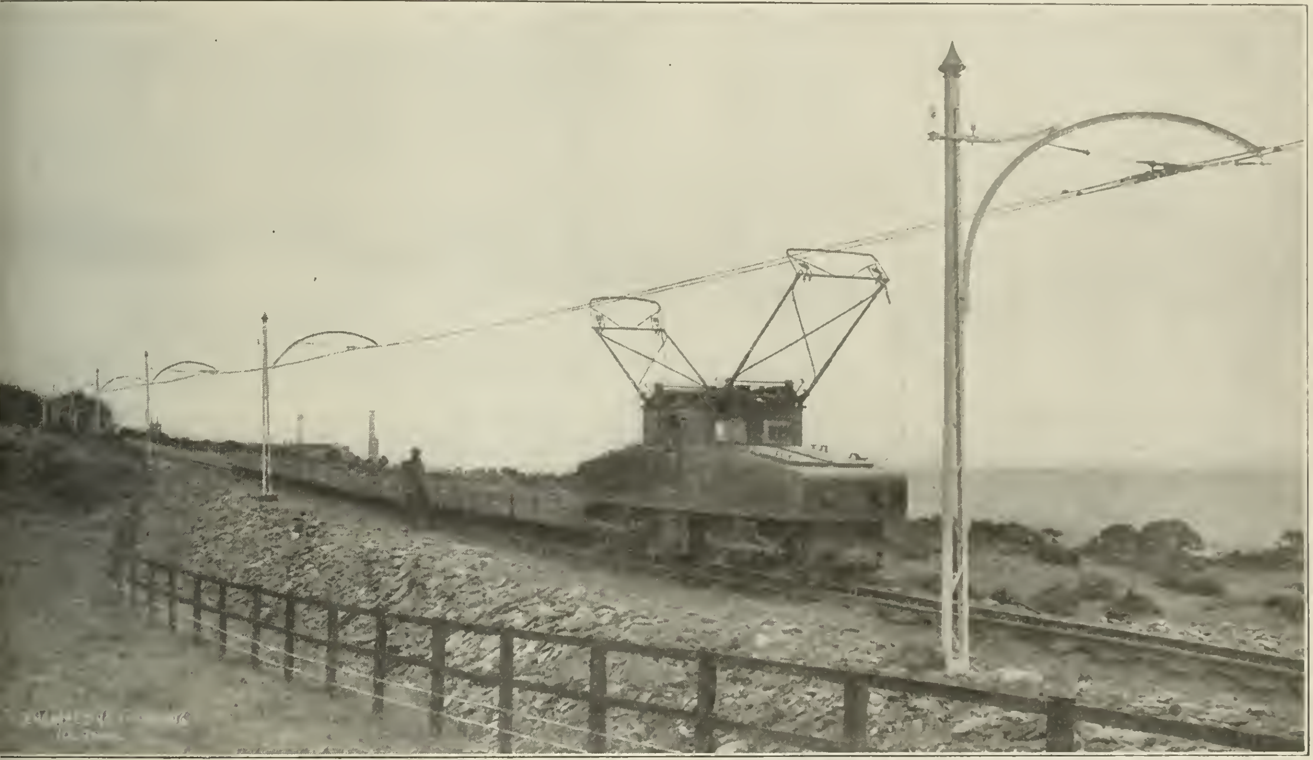


Fig. 2. Showing Locomotive with the Two Axles of Each Bogie Connected Together by Side Rods, in Order to Utilize the Whole Weight of the Locomotive

Gas Engines in Africa

One firm in Africa has supplied over 100 suction-gas-engine plants during the last two years. The largest was of 230 h.p. and the smallest of 6 h.p., with an average capacity of 40 h.p. Charcoal is the fuel in the majority of plants though producers are furnished and guaranteed to operate on semi-bituminous coals. The charcoal consumption per brake horsepower-hour varies, depending on the per cent. of full load carried by the engine and its size, but the consumption rarely exceeds 2 lb. While the cost of a gas-power plant complete is about twice that of a similar steam plant, the power cost per hour is 5:8 in favor of the producer plant and gas engine.

The Longwall Mines of Illinois

Coal Undercut in Fire-clay Beneath; Overlying Shale Produces Sufficient Pressure to Force Down Coal without Use of Powder

BY W. F. PELTIER*

The first discovery of coal in the United States was in Illinois in 1689. Father Hennipin, one of the early explorers of the Mississippi valley, found coal near the city of Ottawa, Ill.

The area of the coalfields of Illinois is nearly 35,000 square miles, or about 60 per cent. of the area of the whole State. The coal measures of the State consist of 16 coal seams, ranging from 1 to 12 ft. in thickness, and are numbered consecutively from the bottom upward, and belong to the eastern interior coalfields.

The exact date of the first coal that was mined is not to be found, but there are records which show that coal was mined in Jackson county in 1810. The Illinois coal report of 1908 shows that the total product for the year was 49,927,452 tons, of which 5,267,671 tons were produced in the longwall fields, or about 12 per cent. of the total output.

Most of the longwall mining is done in Grundy, Bureau and La Salle counties, but this method of mining is carried on in different sections of the State, especially at Assumption, Ill., which is the deepest coal mine in the State, measuring 1004 ft. from the surface to the bottom of the coal.

In writing this article I shall confine myself to the longwall mines in Bureau and LaSalle counties. The coal seams located in this locality are remarkable, not only for their variety in quality, but they are free from horse-backs, faults, jumps and other irregular formations that are encountered in other seams. Overlying the coal is a flexible shale or soapstone, and underlying it is a bed of fire-clay ranging from 6 in. to 2 feet.

There are two distinct methods of extracting coal by longwall, known respectively as, "longwall retreating," and "longwall advancing." The former may be left out of consideration, for it is not in use anywhere in this State, but it could be used to great advantage in many fields. The other system is known as the Scotch longwall, and is used throughout this district and is best adapted for thin seams. This method means extracting out all the coal in the first operation, commencing at the extreme end of the shaft pillar and mining out the whole seam toward the property limits. The entries and haulageways are maintained by building walls or packs of rough material obtained from the roof and floor of the mine. This system is also used to good advantage where coal is found at a great depth, as it would be unprofitable if not impossible to work it by the room-and-pillar method, from the fact that the enormous weight of the strata immediately above the seam would have a tendency to either crush the pillars or force them into the floor of the mine, resulting in closing up the entries and haulage-ways entirely.

The mines in this district vary in depth from 350 to 600 ft., and are developing what is known geologically as the No. 2 seam which is 3 ft. 6 in. thick, and is known commercially as *"third vein coal."*

METHOD OF OPERATION

Before commencing to mine away the seam there is a pillar of coal left around the shaft to prevent subsidence, also to keep the shaft in alinement. Great care is taken to keep the pillar as solid as is practical, and only roads that are absolutely essential are driven through it. The main headings are driven 10 ft. wide away from the shaft, and when they have reached the limits of the shaft pillar, the side main entries are turned off at right angles to the main headings. Off these latter entries are turned the main cross entries, 225 ft. apart, at an angle of 45 deg., from which the rooms are turned with 60-ft. centers, running in a direction of 45 deg., leaving 42 ft. of ground from the center of each room at the coal face. (See accompanying map.) The rooms are driven 225 ft., then are cut off by another cross entry. The main entries are turned 1200 ft. apart.

As the headings advance, the face gets longer and longer, and the excavated space is filled up completely with all refuse and slate that is brushed from the top, with the exception of roads left for the conveyance of coal to the shaft bottom. There is also a narrow space left open for ventilation as the workings advance along the entire face line. Overlying the coal seam is a flexible shale, which after the coal is undercut in the fire-clay by hand to a depth of 3 or 4 ft., produces sufficient pressure to force down the coal without crushing it. This pressure breaks down the coal without the use of powder, thus producing a large percentage of lump coal.

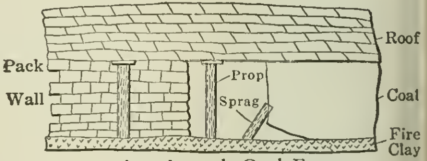
Most all the mines in this district are laid out with the primary object of regulating and controlling the pressure of the roof strata, keeping just sufficient weight on the face to obtain the greatest amount of large coal, with the least expenditure of labor and at the same time preserving the roof with a small amount of timber.

Great care is taken to keep the space between the pack walls and face well propped, to assist in protecting the roof parallel to the general face line. Some of the advantages gained by this system as compared with room-and-pillar, are:

(1.) The recovery of the whole seam.

(2.) A greater recovery of large coal by obviating the necessity of cutting ribs and the fact that powder is not used to bring down the coal.

(3.) The ventilation is more easil controlled and more effective, for the ai courses are shortened by driving the ai along the face, which greatly reduces the friction on the air and requires les power to drive the fan.



Section through Coal Face showing Coal Undercut.

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SHOWING METHOD OF SPRAGGING THE COAL FACE

LONGWALL CONDITIONS IDEAL

The conditions of this field for longwall are ideal, the roof being flexible shale, fire-clay bottom, and more than a sufficient amount of gobbing material at hand, to fill in and build up good pack walls. Most of the mines are perfectly dry and free from firedamp. Some o the disadvantages of longwall are:

(1.) The high mining rate which is nearly set off by a cheap freight rate.

(2.) Large amount of timber used by the miners; in fact, for every ton of coal produced it requires one and one-half 4-ft. props.

(3.) Large amount of rock handled by company men, that is hoisted to the top and dumped to the surface at the rate of one car of rock to every 7 cars of coal.

Undercutting the coal is done entirely by hand. Mining machines are not considered in this locality. Haulage is done exclusively by mules, although mechanical haulage would prove itself of material advantage in this field.

The shafts throughout this district are double compartments, though there are eral that are arranged to handle two s end-to-end, or tandem fashion. The bles are built mostly of steel and ipped with all modern appliances to ndle and screen the coal with the least ount of breakage, for commercial pur- es. In fact, one of the first steel bles that was erected in Illinois was lt by the Spring Valley Coal Company 1895. This company possesses over square miles of land and operates mines. The engine houses are mostly lt of fireproof material, and contain t-motion hoisting engines of the Cor- type. The boiler houses are built fireproof material, and contain from r to six tubular boilers, 150 h.p. each. hoisting is done entirely with steel es, running on 60-lb. steel rails used guides. Most of the shaft bottoms 14 to 16 ft. wide and 250 to 400 ft. g. The roof is protected by 12-in. steel I-beams spaced 4 ft. apart and supported by masonry walls.

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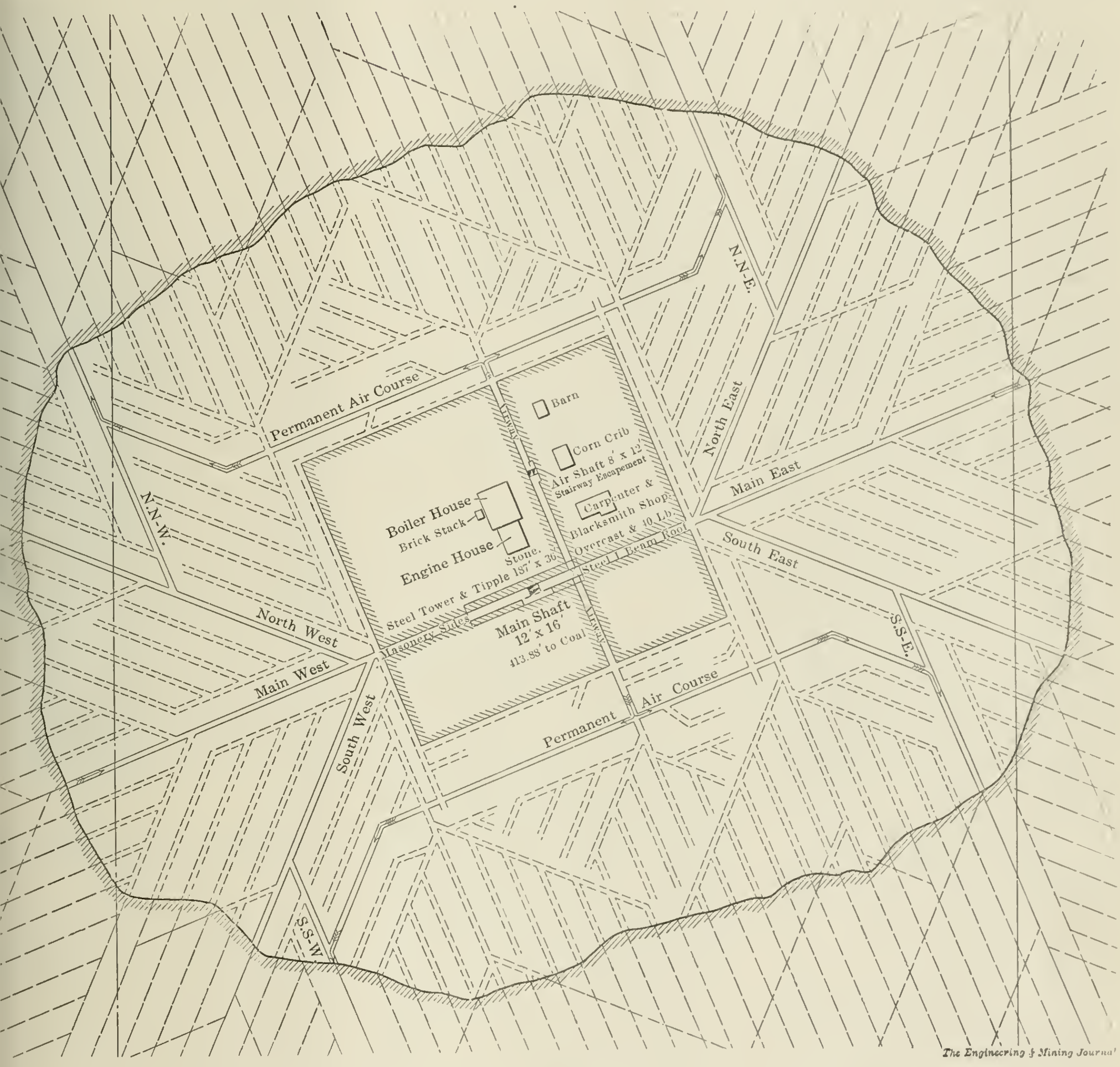
*Mining engineer, Peabody Coal Company, [illegible] South Park avenue, Chicago, Ill.

Coal washing in this field is not carried on very extensively, except by the Spring Valley Coal Company which has a washer that has a capacity of 1000 tons per day; also the Illinois Third Vein Coal Company has a similar washer, but of a smaller capacity. The mines in this field make only about 12 to 15 per cent. of fine coal in mining.

One of the most important elements which bears upon the success of longwall advancing, is that it is highly essential that the whole face line should advance at the same time, and the faster the face can be advanced, the sooner it is under strong roof. This means the weight of the roof will more gradually settle upon the pack walls and props, also allowing sufficient pressure to break the coal after it is undermined.



General Plan Showing Method of Working an Illinois Longwall Mine

New Experiments on Coal Dust Explosions at Lievin

By E. Walch*

The experimenting station of Liévin, lately described in the Journal has now increased its main gallery to 230 m. long. Those in charge have recently completed many experiments on the efficiency of the advertised means of preventing dust explosions, viz., water sprinkling and schistification. Researches have been conducted on new lines with interesting results. The experimenters placed at a point in the gallery, a sufficient volume of fireproof materials, able to be moved by the violent drafts that precede and accompany the flame of a dust shot, and obtained some interesting results.

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*Paris, France.

The most characteristic test was carried on, Nov. 3, as follows:

The deposit consisted, as in previous instances, of clayey materials disposed in a heap 10 m. long and 62 cm. high, its volume being 9.6 cu.m. and the free cross-section of the gallery being thus reduced from 2.8 sq.m. to 1.84 sq.m. This deposit was placed at 170 to 180 m. from the start of the dust shot. The dust was made of crushed Liévin coal with 30 per cent. volatiles, giving 35 per cent. refuse on a 200-mesh sieve. Dust was evenly deposited on the ground at the rate of 450 grams per cubic meter of gallery. The same proportion was placed on the clayey heap and doubled, further to increase the chances of the shot spreading to the mouth of the gallery, which is 230 m. long. The dust shot was caused at the closed end of the gallery by firing 210 grams of gun dynamite in a 55-mm. steel mortar.

The following result occurred: The flame did not spread beyond the heap and did not light up the dust deposit laid on the last 50 m. of the gallery. Besides the shot was considerably slower than usual, spending about 2 sec. to run the 180 m., while it would not have taken more than 1½ sec. to reach the mouth of the gallery under normal conditions.

Results of Other Tests

Other tests carried on in placing the 10-m. heap at the mouth of the gallery, with the same proportion of coal dust showed similar results. The flame which would have been otherwise voluminous and would have extended some 60 m. outside, was but a short dart-shaped one about 5 m. long. The behavior of the shot was also quite different, its speed being about one-half the usual speed when the gallery is free from noncombustible material.

In one case only, when the heap occupied only one-quarter of the gallery area, was the shot able to resume its travel on the second part of the gallery with the violent and extra-rapid character it possessed. However, the flame was blown out by the earth heap.

Mr. Taffanel, chief engineer of the station, suggests the following interpretation of these results: The change in the behavior of the dust shot is in connection with the change of nature of the waves that reflect themselves near the end of the gallery, a change which influences on the formation of condensed and impact waves, that are characteristic of the violent period of the explosion.

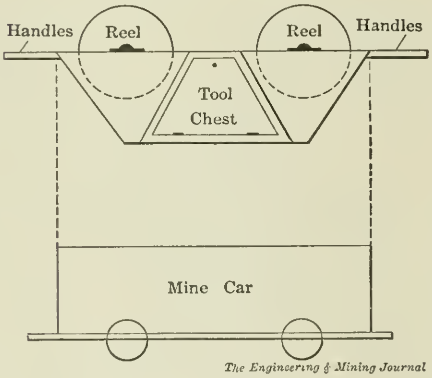
The extinction of the flame is due to the swelling of the heaped materials by the gases that precede and accompany the flame. It is noticed that, out of the 10 cu.m. of clayey materials, about 5 cu.m. are blown away and projected to as far as 60 m. as well as on the walls of the gallery. It is natural that the combustion cannot continue in a medium which is so full of fireproof materials.

The experiments are not yet numerous enough to allow for a generalization. Tests are to be carried on to see if the same effects can be obtained in placing the heaps on the sides of the gallery so as to admit of hauling. However, these results are interesting owing to the simple contrivances used and in view of the uncertainty of the methods advertised up to now.

A Portable Telephone Equipment

By Henry M. Payne*

There are few large mines today that are not equipped with telephones, at least along the main haulways. Operators have realized that saving of time underground is even more important than on the surface, and many mine fires have been promptly extinguished by aid summoned by telephone.



The Engineering & Mining Journal

Diagram Showing Arrangement for Portable Telephone

In most of the large mines of England and Germany the "inter-ringing" system is used, and the general manager's office and house may be at all times in immediate communication with any part of the workings. Not only in times of disaster may such an equipment be of advantage, but whenever a miner is injured, arrangements may be made on the surface for his immediate care upon arrival at the top of the shaft. (In this connection, a small air-tight can of sterilized bandages and a tourniquet should be kept easily available, in each district of the mine.)

It sometimes happens however, that the telephone lines are broken down, by an explosion, or that it is desired to establish communication to a part of the mine not so equipped.

For such service, an apparatus similar to that shown in Fig. 1 is easily made, simple in operation and easily portable. It should be so built as to fit over the top of, and down into the mine car, with handles on the ends, at each corner, by which it may be quickly lifted out and carried, in similar manner to a stretcher, to any location in the mine.

The two reels should hold at least 2000 ft. of heavily insulated telephone wire, with the inner end passed out at the center of the reel for instant connection with a portable telephone set.

One end of the axle should project slightly, and have a square shoulder on which a crank may be placed to wind up the wire. In the center is a small tool chest for wire cutters, tape and the usual paraphernalia, and the portable telephone set. Such an apparatus can be constructed at home by any company and will prove very efficacious in any underground emergency.

Coal Consumption in San Francisco

Special Correspondence

J. J. Moore, of San Francisco, estimates the monthly consumption of coal in that city at 100,000 tons per month, but the Western Fuel Company and the Pacific Coal Company estimate less than 50,000 tons. In this connection the accompanying table of imports of coal and coke, from January to November, inclusive, is interesting.

IMPORTS OF COAL AND COKE AT SAN FRANCISCO, JAN. TO NOV. INC., 1909.

Country of Export.	Coal, Long Tons.	Coke, Long Tons.
Australia	74,316	17,968
British Columbia	167,316	......
Japan	7,011	......
Chinese Empire	506	20
England	700	7,928
Scotland	....	10,115
Germany	....	32,052
Belgium	....	5,260
Italy	....	6,313
France	....	220
Total	249,801	79,876

Volumetric Determination of Tungsten

A volumetric assay for tungsten is described by E. Knecht and E. Hibbert in *Proc.* Chem. Soc. The process is based on the fact that tungstic acid is reduced by zinc and hydrochloric acid to tungsten dioxide, which, in presence of excess of acid, yields a clear, light brown solution. If now a solution of a ferric salt be added, the dioxide is oxidized to the trioxide. The end point is perceived by the disappearance of the intense blue color of the intermediate compound corresponding with tungsten pentachloride, the reaction

$$Fe_2O_3 + WO_2 = 2FeO + WO_3$$

being quantitative. It is thus possible to determine tungsten volumetrically in the presence of iron.

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*Mining engineer, Morgantown, W. Va.

? QUESTIONS and ANSWERS

Inquiries for information are answered in is department as promptly as possible, but ore or less delay is often unavoidable. Many quiries involve a good deal of investigation nd these can be answered only when the eneral interest in the subject is conceived justify the expenditure for the time re- uired. Correspondents should refrain from sking for advice that ought to be obtained professional consultation with an engineer. e will not answer questions pertaining to e value of specific mining enterprises. In- iries should be framed concisely.

Zinc Salts Direct from Ore

I own a property in New Mexico from hich I am thinking of producing zinc hloride and sulphate direct from the ore the mine. Can you inform me as to the arkets for these products; also as to ny publications treating of their manu- cture and uses?

G. H. U.

The markets for zinc chloride and nc sulphate are too limited to make worth while to consider the pro- uction of those substances at a mine the far West, quite aside from e questions of transportation and the fficulty of making good commercial oducts (especially zinc chloride) di- ctly from ore. The manufacture of zinc lphate is described in THE MINERAL IN- USTRY, Vol. IV, p. 83, "Production of nc Vitriol from the Zinc-Lead Ores of e Harz," by Bruno Kerl. As to zinc loride, the literature is too scattered for sy reference.

ectrolytic Treatment of Copper Ore

Can you give me some information ith reference to treatment of copper rites? I am told that there exists a eatment by which the copper ore is st burned and then treated by electro- sis for the extraction of the copper and ould ask for information on the subject d approximate data regarding amount power required for an output of 300 of copper per day.

A. S. G.

There are numerous processes for the traction and electrolytic precipitation of pper, but none has been a distinctly mmercial success. There is only one ace in the world, in Poland, where such process is in use at the present time. e ore occurs in a belt of limestone con- ining copper ore interspersed in strips th calcspar and some quartz. The ineral is almost entirely copper glance. The product of the mine is divided into h ore with 50 per cent. of copper, hich is separated underground, and ixed ore with 16 to 20 per cent. copper, ntaining calcite and pieces of lime- one, and which is improved by hand- cking at the surface. The ore as ought from the mine is crushed by lls, mixed with 5 per cent. of damp ick earth and molded into blocks. ese blocks are dried by the waste heat the furnace and subjected to a partial asting in a low kiln fired from the outside, with a free access of air, which converts the copper into sulphate and oxide.

The roasted ore is crushed fine and lixiviated in lead-lined tanks, with the spent liquor of the electrolytic baths containing about 5 per cent. of free sulphuric acid. A liquor containing about 5 per cent. of copper and 1 per cent. of free sulphuric acid is obtained. After passage through a filter press, this is electrolyzed in vats of about 35 cu.ft. capacity. Insoluble anodes of lead plates in cloth bags, and thin copper cathodes are used. A current of 1000 amp. at 2.5 volts, corresponding to a density of about one ampere per square decimeter of cathode surface, is used, producing metallic copper, free sulphuric acid and oxygen. The deposited copper, about 1.1 gram per ampere-hour, is nearly equal to the theoretical amount.

The power consumed per kilogram of copper is 2.28 kilowatt-hours or 3½ horsepower-hours. The liquor is exhausted in about 35 hours, when it is returned to the extraction vats for the treatment of fresh ore. The cathodes remain in the bath for about a month, when the deposit (1 to 1¼ in. thick) is removed and sold. It is of greater purity than ordinary electrolytic refined copper. The four baths are served by a Siemens dynamo furnishing a current of 1000 amp. at 12 volts.

The whole process is so simple that the entire plant is supervised by a single man in the mill. We understand that a similar plant is being erected in Central Asia.

Value of Cobalt Mining Property

I have some stock in a Cobalt property, which is apparently under excellent management and which is economically and intelligently developing and operating its property. The property has paid moderate dividends and, presumably, will pay more, yet the stock does not seem to be as high as I think it should be in comparison with the other stock on the market, both mining and industrial, considering the earnings and also what myself and the management of the company consider the probable future earnings of the property. What is the basis for a critical judgement on such mining-stock investments as this?

D. E. M.

Mines like those at Cobalt seldom have large ore reserves developed, and those ore reserves are seldom in accord with the market price for the stock. This is characteristic of many good but speculative mines. For instance, the Batopilas mine in Mexico, which has earned large profits for the past 22 years has as many times been absolutely without reserves. The deposits occurred irregularly, but with sufficient frequency in a large area to bring the average output to a profitable amount. So with the Cobalt mines the work in the district has demonstrated that there are many veins, some of which do not appear on the surface, and the companies having a large area there have an opportunity and a reasonable expectation of developing a large amount of rich ore to the area unit. In general it may be indicated that the veins are not likely to go to great depth, but inasmuch as they have been so very rich and there have been so many of them in the mineralized belt of the district, the camp and the individual properties in it may be said generally to be good speculative mines. In a stock of this kind the investor should look for a high rate of dividend, higher than he does in mines where there are large reserves blocked out and ore in sight sufficient for 20 or more years ahead. Such mines as the latter may well sell on a 10 per cent. basis, whereas a mine at Cobalt for instance should have 15 to 20 per cent. or more yearly income on the market price. It would seem that the Cobalt stocks have in the past sold too high, as the public placed a speculative value on these high-dividend stocks far in excess of the actual value indicated by the ore reserves, and without recognizing the strong speculative element in properties of this character.

Some of the conservative companies operating in the Cobalt camp consider it sufficient, under the conditions there existing, to have an ore reserve equal to one-third of the market value of their stock. This would hardly be safe for mining companies in districts less rich and without the peculiar persistency in distribution which characterizes the Cobalt area.

In this connection, applying not only to the Cobalt stocks but to other mining stocks, particularly in developing properties that have an element of the speculative character, it is well to add the further axiomatic caution that the general public should not invest in such stocks more money than it can afford to lose.

Market for Bismuth Ore

Can you tell me where to find a market for bismuth ore, and the approximate price per unit at that market?

A. B. H.

The only possible purchasers of bismuth ore in the United States is the United States Metals Refining Company of Grasselli, Ind., and the Monsanto Chemical Company, of St. Louis, Mo. Probably any of the metal houses in New York would negotiate sales for export. In Europe, Johnson, Matthey & Co., of London, are the chief buyers. The market for bismuth is closely controlled by the European combination. It is impossible to state open quotations. In a general way, ore containing 10 per cent. bismuth is now worth $90 to $100 per metric ton. Ore containing 15 per cent. is worth 1.7 times as much; 20 per cent., 2.3 times; 30 per cent., 3.7 times.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. F. Shaw is returning to New York from Costa Rica.

F. M. Kurie, of Philadelphia, has gone to Arizona for a month on mining business.

Walter Harvey Weed has returned to New York from a professional trip in the West.

William M. Brewer, who has been in New York some time, left for Victoria, B. C., last week.

E. A. Wall, of Salt Lake City, Utah, who has been in New York recently, has sailed for Europe.

Edward S. Wiard left Denver, Colo., last week for Sonora, Mexico. He will be gone about a month.

A. B. W. Hodges, general manager of the Granby Consolidated mines in British Columbia, is in New York.

H. W. Hardinge has returned to New York from an investigation of the Porcupine district goldfields of Canada.

A. E. Drucker has been appointed consulting metallurgist of the Oriental Consolidated Mining Company in Korea.

J. Yeandle has been placed in charge of the Barron mine of the Real del Monte y Pachuca Company at Pachuca, Mexico.

Hallet R. Robbins, of Seattle, Wash., is in Denver, Colo., after having spent several weeks in Boston on professional business.

George P. Hyde, of Detroit, Mich., is in charge of operations for the Bisbee Extension Dexelopment Company, near Bisbee, Arizona.

Leopoldo Salazar has been appointed secretary of the Mexican Institute of Mining and Metallurgy in place of Kirby Thomas, resigned.

Frederick H. Morley left Denver, Colo., Feb. 2, for Hermosillo, to spend several months in professional work in the state of Sonora, Mexico.

A. F. Dick-Cleland will take charge of the San Carlos Gold Mines, Ltd., an English syndicate operating at Mezquital del Oro, Zacatecas, Mexico.

William E. Ellis has returned from a trip to the United States and has again taken charge of the Guebeshe mill at Ocotlan, Oaxaca, Mexico.

Henry Valle y Cumbre is in charge of the operations and the erection of the 30-ton concentrating mill of the Almaloya company at Ameca, Mexico.

S. H. Brockunier, of Wheeling, W. Va,. has just completed an examination of the coal underlying the J. B. Ford tract in Wetzel county, West Virginia.

Filipe Gomez de Campo, recently with La Esmeralda, is now superintendent of Santa Maria de la Paz mine at Matehuala, San Luis Potosi, Mexico.

Joseph A. Durfee has been appointed superintendent of the new open-hearth steel plant of the Maryland Steel Company, at Sparrows Point, Maryland.

Dr. B. E. Joseph, of Chicago, who is connected with the Copper Range Company, has been inspecting mines in the Autlán district, western Jalisco, Mexico.

Julian Kennedy, of Pittsburg, has been appointed engineer to supervise the building of the new blast furnace plant of the Rogers-Brown Iron Company, at Buffalo.

Juan Felix Brandes, of Denver, Colo., has returned from Mexico and Colorado, and will spend several weeks in Boston and New York on professional business.

Albert Spies has resigned his position as editor of the *Electrical* Review to become managing director of *Foundry News*, a new paper published in New York.

Prof. A. P. Coleman, of Toronto University, has been awarded the Murchison medal by the Royal Geological Society of London, England for distinguished geological investigation.

Dura B. Andrews, recently of Oaxaca, Mexico, but now with the Milan Mining & Milling Company, of West Milan, N. H., has been made superintendent of the mines and mill of that company.

A. J. Condee, mining superintendent for the Rindge estate, has left Los Angeles, Cal., for the Rindge properties in Colombia, South America. He will return to Los Angeles in time for the first boat in the spring to Nome, Alaska.

Andre Weill, of Paris, France, is in Ottawa in the interests of the Creuzot Steel Company, which contemplates establishing an electric smelting plant in Canada. Mr. Weill has inspected a number of water-power sites in the district.

Henry B. Nedham has been chosen president of the Maryland Coal Company in place of J. E. Knapp, resigned. He has been secretary and treasurer for a number of years and is thoroughly acquainted with the affairs of the company, besides being an authority on all matters connected with the seaboard bituminous trade.

R. C. Gemmell, general superintendent of the Utah Copper properties, has been made assistant general manager of all of the companies of which D. C. Jackling is general manager, these including Utah Copper, Ray Consolidated, Gila and Chino. F. G. Janney, mill superintendent of the Utah Copper company, will have general charge of the milling operations of all of the companies. John M. Hayes, cashier of the Utah Copper Company, will have direction of the consolidated offices of that company and Boston Consolidated.

Obituary

George H. Caldwell died at Foley, W. Va., Jan. 20. He was born in Virginia, but for a number of years lived in Nebraska. About 10 years ago he returned to West Virginia and become general manager of the Dingess Run Coal Company; he had held that position since.

Robert Marshall died at Pittsburg, Feb. 1, aged 83 years. He was born in Ireland, but came to Pennsylvania when a young man, and became a contractor. He opened several important coal mines in western Pennsylvania, and was also prominent in the early development of the Lima oilfield in Ohio.

A. F. Wuensch, of Denver, Colo., died suddenly at Albuquerque, N. M., Jan. 22, aged 54 years. He was born in Marietta, Ohio. When 25 years old he went to Colorado, settling at Leadville, where he invested in mines, which formed the foundation of the estate which he had accumulated. He was a member of the American Institute of Mining Engineers, Colorado Scientific Society and for years was identified with mining interests as engineer, mine manager and writer on mining subjects.

On Feb. 6 an automobile going from Kelvin, Arizona, to the Ray copper mines ran close to a heavy charge of dynamite, the fuse of which had just been lighted. The explosion of the charge shattered the car, and killed the six passengers, who were R. P. Coleman, of Salt Lake City, W. H. Freeland and Walter C. Frenz, all mining engineers; A. S. Bieber, J. C. Griffin and J. B. Joyce, civil engineers. The motorman, who was also killed, had been warned, but probably supposed he could pass before the charge exploded.

Societies and Technical Schools

Scranton Mining Institute—The annual meeting was held at Scranton, Penn., Jan. 20. Papers were read by Col. R. A. Phillips, J. P. Jennings, A. H. Welles, William Allen and Dr. B. B. Mahon, the topics being mine explosions, the education of the miner and aid to the injured. J. P. Jennings, district superintendent of the Pennsylvania Coal Company, was chosen president for the ensuing year.

Engineers' Society of Western Pennsylvania—The 30th annual meeting was held in the Fulton building, Pittsburg, Jan. 18, E. K. Morse presiding. The annual report of the directors was read, indicating the general prosperity of the society. The membership of the society at the close of the year was 835. The following officers were elected for the ensuing year: President, E. K. Morse; vice-president, J. O. Handy; treasurer, A. E. Frost; directors, A. R. Raymer and Willis Whited.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Feb. 4—The State mineralogist of Calornia has issued a circular to the proucers of mineral substances, asking for ore coöperation in reporting the amount nd value of the products and calling atntion to the value of such statistics to e public. Realizing that the producers ften do not desire to have the output nown, it is stated that any information nt will be kept secret and used only compiling the total production by unties.

The first water from the new Governent dam on the Colorado river, near the e Yuma Indian reservation, will be rned into the canal March 1, on which ate a portion of the reservation will be rown open to public entry. The charges r the building of the irrigation system nount to $55 per acre, payable in 10 early instalments.

As a result of representations of proucers, it is possible that the gold output the Yukon and British Columbia will reafter be sent to the mint in Ottawa. e charge of ⅛ of 1 per cent. now acted by the Dominion assay ofe, will, however, need first to be abolhed, as the San Francisco mint does not ake this charge and shippers to that int get the full value of the gold with trifling charge for the copper added r coinage. Most of the gold of the acific coast finds its way at present to e San Francisco mint, either directly through the refiners.

The Butte Lode Mining Company, Kern ounty, has notified leasers whose terms pire on February 1, that the leases ll not be renewed. This mine has been rgely developed by leasers. The mangement has, however, adopted a new licy, and will hereafter supervise the ining and extraction of ore, while delopment work will be carried on under e contract system.

Butte

Feb. 4—The hearing of the order to ow cause why the city council of Butte ould not be enjoined from granting the avis-Daly company the right to run a amway through the streets of Butte om the Colorado shaft to the Great orthern tracks resulted in the dissing of the injunction proceedings by e local district court.

Manuel H. De Hora, late general manger of the **British-Butte Mining Company**, has begun suit against that company for $22,000, alleged to be due him as a salary for 22 months. It is the contention of the company that there was no agreement with De Hora about his compensation and that the sum he claims is out of proportion to the reasonable value of his services.

The monthly report of the government assay office at Helena shows that $109,860 in precious metals was received during January, which is somewhat smaller than the amount received for the same month in 1909. Fergus county lead in Montana production with $51,951.

Salt Lake City

Feb. 5—The United States smeltery, at Bingham Junction or Midvale, as it is now known, is running a full capacity and treating a large tonnage of lead ore. About 1100 tons of charge are smelted by the furnaces per day, of which approximately 800 tons represent ore. Since the closing down of the Knight plant at Silver City the United States company is receiving the ores of the Colorado and Iron Blossom, as well as from other mines of the Tintic district. At the present time the lead furnaces are the only ones in operation, as the copper plant is being redesigned to meet the requirements of the Federal court, which will allow the smeltery to operate as long as the percentage of sulphur dioxide escaping with the fumes does not exceed 0.75 per cent. by volume. The lead plant with its baghouse and treatment of the fumes by zinc oxide comes well within the limit set by the court. The success of this treatment has caused the United States company to design a plant along similar lines for its copper furnaces. This plant will be separate from the lead plant and will have its own baghouse. The fumes will be neutralized here as from the lead furnaces by zinc oxide. This is produced in a separate furnace in which the dust from the zinc mill is mixed with coke and burned to zinc oxide. The zinc-oxide fume is led into the roaster flue near the roasters, and travels about 1500 ft. before reaching the baghouse, mixing with the gases on the way. An excess of zinc oxide is used to neutralize the acid fumes and protect the bags which would otherwise be quickly destroyed.

The United States zinc plant, situated near the smeltery, is producing about 45 tons of concentrates per day. These are from the company's mill and are largely from Bingham ores. The Huff electrostatic separators make a clean separation of the zinc and iron. Little or no change has been made in the process since the mill started in October, 1909. Experiments are now being carried on with a new Huff process for the wet separation of zinc.

The testimony in the case of the Silver King Consolidated vs. the Silver King Coalition is being heard daily in the United States court. This case involves an accounting for ore taken from the Vesuvius claim, which is owned jointly by both companies. The time in which the defendant company can testify in support of their account expires Feb. 15; the examination of their witnesses is now in progress.

The Great Salt lake has lately risen above the western end of the Southern Pacific trestle, known as the Lucin cutoff, and threatening passing trains. The lake is now higher than at any time within the memory of white men. The west end of the cut-off, being 6 ft. lower than the rest of the causeway, is the chief danger point. If the lake continues to rise, it will necessitate elevating most of the piling, and in the meantime trains will have to be sent around by the old Promontory route. When the Lucin cut-off was constructed the track was about 20 ft. above water level.

The large mines of the Park City district are now operating with full forces, the Silver King Coalition, Daly-West, American Flag and Little Bell being regular shippers. Prospecting is being carried on at a number of other operations. Since the recent elections an open town has been declared and gambling in all its forms are being practised openly. This makes Park City one of the few camps where gambling is still openly permitted. So far the winter has not been unusually severe, but all transportation about camp is by means of sleds.

Indianapolis

Feb. 7—The miners and operators failed to reach an agreement at their joint wage-scale conference at Toledo. It was apparent from the start that the two sides were so far apart on the question of admitting the Illinois miners to seats in the conference in the absence and refusal of the Illinois operators to participate that they could not reach an agreement. The miners insisted on the Illinois miners being seated and the operators were equally insistent that they be excluded. In the final Friday night session the miners still insisted that the Illinois miners be seated asserting that it was not their fault that the Illinois operators had refused to participate. "The convention adjourned with everybody in good humor," said President Lewis. He says that it is the understanding that another conference will be called before April 1. The time will be removed somewhat from the influence of the recent convention, and possibly Illinois will be left out.

Under the Indianapolis convention decision no district has the right to sign a scale of wages with the operators until all districts have conferred and signed. In the opinion of some of the leaders the wishes of the mine workers can be ascertained by referendum vote. If so, a convention may not be called.

The operators have issued a statement of their view of the case.

In this they state that the insistence of the miners that the Illinois miners be seated was in the hope of forcing the Illinois operators into the joint conference. In their statement the operators further express the "hope that another convention may be called in which we can participate," declaring themselves to be in favor of settling affairs with the miners by means of joint district conferences and exonerating themselves from all blame for the failure of the present effort.

The Indianapolis miners' convention grew more and more turbulent to the end. At times the scenes on the convention floor were almost riotous. There is little doubt of an attempt to disrupt the convention and only the courage of President Lewis guided the deliberations to the final adjournment.

Birmingham

Feb. 7—Investigations as to mineral lands, coal in particular, in Fayette county, Ala., about 65 miles west of Birmingham, have brought about a discovery of natural gas and a company is being organized by Dr. G. B. Crowe, to use this gas for commercial purposes. A plan is on foot to pipe the gas to Birmingham, Columbus, Miss. and Memphis, Tenn. The borings went through some valuable coal deposits, though a little distance down. There are no coal operations in Fayette county at present.

Scranton, Penn.

Feb. 5—There have been a series of mine squeezes at various collieries throughout the Lackawanna valley during the last week. None of these have been of a serious character as far as the surface was involved, but they covered an extensive area. One of these squeezes occurred in the 5-ft. vein of the Leggett Creek mine, belonging to the Delaware & Hudson. The squeeze occurred at night and extended out a large area in a thickly populated suburb of Scranton. It roused all the people in the neighborhood from their beds in a bitterly cold night, although as a matter of fact there was not the slightest danger either to life or property. The ground was riven in various places by the partial subsidence of the roof of the vein, but the cave was insignificant in depth.

There was a squeeze at the Marvine mine a few days later, which, at first was thought would lead to serious results. The workings of the Leggett Creek and the Marvine mines run above or below each other where they came in contact and in some instances parallel. When the squeeze occurred, the inside foremen thought it advisable to remove all the mules that were in the colliery. The disturbance fortunately was of a very slight character, and the officials of the mine are now of the opinion that the worst is over in both mines.

The situation caused by the wholesale cancellation of miners' certificates in Luzerne county has led to an extraordinary situation. It is stated authoritatively that over 90 per cent. of the miners who have had their certificates cancelled will not be able to pass the prescribed examination and that all of them who fail to do so will be thrown out of work or have to seek positions as miners' laborers. It may be recalled that some weeks ago there appeared an article in the JOURNAL which stated that during the past 20 years, miners' certificates were bought and sold wholesale all through the anthracite regions to foreigners with little or no experience in the mines beyond what they were able to acquire as laborers during a few months and, in not a few cases, in the space of a few weeks. Many of these men never saw a mine until they arrived in the anthracite regions. They are generally ignorant, addicted to drink and disinclined to learn the English language, although the law prescribes that before a certificate is issued to a coal worker, he must have worked two years as a mine laborer and be able to answer 12 questions in English, together a few other tests which depended upon the applicant's knowledge of English, his intelligence and his general experience in the coal mines.

These certificates could be purchased in any saloon owned by a foreigner in the neighborhood of a mine. The price of a certificate varied. The cost depended upon what the traffic in these forgeries would bear, the cost of the certificate bearing a definite relation to the ignorance of the purchaser. Things have been going on in this way since the law went into effect 20 years ago. Protests against the existence of this public scandal passed unheeded. So long as the coal in the surface veins was unexhausted, and the production of coal from the lower veins became increasingly hazardous, foreigners were instrumental only in bringing about their own death by scores, and these accidents affected public opinion but slightly. Now, however, as the mines are becoming more gaseous, and as an accident brought about by the ignorance of one miner may bring disaster to all men and boys working in that particular mine and has done so in a limited extent in some mines, public opinion has become aroused and demands that the scandal shall cease.

The first attempt in this direction was made in Lackawanna county. Bad as the state of affairs was there, it was infinitely worse in the neighboring county of Luzerne, where it has come to light that not only were 90 per cent. of the miners holding certificates not entitled to them according to the provisions of the law, but that these men are absolutely unable to qualify by passing the simple examination. Some time ago, the judges of Luzerne county court wiped out several district mine-examining boards that were accused of graft and incompetence. A new board was appointed, the divisional boards being abolished. This new board in the discharge of the duties which are imposed upon it by law, insists that those who have applied to it for certificates must pass the examination that is prescribed by the Chief of the State Bureau of mines, and the consequence is that most of them are likely to be turned down in this particular county, one of the most extensive and productive in the anthracite regions.

Toronto

Feb. 4—A. P. Turner, president of the Canadian Copper Company, gave evidence before the House of Commons committee on mines and minerals, Feb. 2, as to the operations of the International Nickel Company. He stated that it was in no sense a trust. It had simply included under one management the mining company, the refining company and the selling company, which, prior to its formation, had been separately engaged in exploiting the Canadian product. The two other great outside companies, the Mond and the French Nickel Company, were in so sense allied, but were competitive. The refining of nickel was now done to the extent of 82 per cent. in Canada. In the early state of the industry they could refine a little above 10 per cent. About $5,000,000 was invested in the Canadian plants, employing from 1500 to 2000 men, and the company had spent at least $250,000 in experiments with the object of enabling them to complete the refining in Canada. The company had no sentimental reasons for incurring the expense of freight in shipping the worthless part of their matte to New Jersey, but owing to the chemicals they had to use, including more than ton for ton of salt cake, a by-product of factories near the New Jersey plant, any further refining done in Canada would render them unable to compete with the New Caledonia ores. The profits were very small. Wallace Nesbitt, speaking as a stockholder, protested against the treatment accorded the industry by the newspapers, which had apparently entirely misconceived the facts. It was only recently that investors had got any return for their money, and at present they only receive 6 per cent. An export duty on the ore would undoubtedly result in the closing of the works in Canada.

The construction of the peat-testing plant at Ottawa, undertaken by the Mines branch, has been completed and nearly all the machinery which is to be installed, has arrived. Over 50 tons of peat has been stored for demonstration purposes, and it is expected that the plant will be in operation in the course of a few weeks.

It is announced that the Wilson claims in the Porcupine goldfield, eleven in number, about 2 miles southwest of Porcupine lake, have been sold to McCormick Brothers, of New York, for $1,500,000. Their representative, Mr. Geddes, spent two weeks in making an examination of the properties.

Mexico

Feb. 1—The American Smelting and Refining Company is making overtures for the acquisition of the smeltery of the Compañia Metalurgica Nacional of Matehuala. Sixty pesos is being offered per share of 100 pesos, par value. Since the Dolores y Anexas copper property of the American Smelters Securities Company has discontinued shipping its low-grade self-fluxing ores to the local smeltery at Matehuala, the operations of the smelting company have been discouraging. The copper mines of Matehuala are producing between 8000 and 10,000 tons of self-fluxing copper ores of an average tenor of 6 per cent. to 8 per cent. copper, and preparations are being made at the Dolores y Anexas property to produce in the next few months at least the above amount monthly.

A trial run has been made of the 20-ton Lane mill and concentrating plant of the Certuchena y Anexas mines in the Ahuacatlan district, Tepic. An accident to the flywheel of the engine has delayed for a few weeks the first regular campaign. There are 14 mines in the group, and 30,000 ft. of workings of which the larger part date back several decades. The principal metal is gold.

The investigations of the house of John Taylor & Sons, of London, in the Sierra Juarez district of Oaxaca have been completed, and the probabilities are that the district will not be entered. This house was the first foreign interest to enter Mexico, and about 85 years ago its engineers were scattered throughout Oaxaca, Zacatecas, Hildago, and other states. The broad wagon roads being used in the Pachuca camp today were built during the first half of the 19th century by John Taylor & Sons.

There is considerable friction between the foreign employees of the National Railways of Mexico and the company. The policy of the company is to educate and work up Mexicans to positions of responsibility such as conductors, despatchers, and engineers; but the Mexican is somewhat adverse to starting in at the bottom and by hard work and faithful service work up to the positions now held by foreigners and obtained only by graduating from this practical school of experience. The foreigners threaten to leave in a body unless the Mexicans work into their positions by beginning at the bottom.

London

Feb. 1—There has been so much activity lately in West African mining ventures that the annual reports of the Taquah and Abosso mines, the publication of which has been this year somewhat later than usual, have been received with much interest. These two mines are the principal mines on the banket goldfield and the Taquah mine is one of the oldest mines in West Africa. According to one of the government reports the title to this property dates back nearly 30 years when it was acquired by a Mr. Bonnat, a Frenchman, who was the first to discover the richness of the Taquah main reef. The mine is on one of the best oreshoots so far discovered, and its record is looked forward to with great interest by the owners of other properties in this belt. The present mill commenced crushing, September, 1907, and for the first 10 months a yield of 60s. per ton was obtained or 67.5s. including gold from trial runs. Either of these was a satisfactory yield and gave promise of profitable operations. The working costs during this period were, however, high, amounting to about 42s. per ton or 48s. when depreciation of plant is included in the costs. For the year ended June 30, 1909, less satisfactory results were obtained, the yield being 55s. 7d. per ton, and the costs about 48s. excluding depreciation. If depreciation is included in the costs, there was no profit earned. The ore reserves, which are now being computed on a new basis, namely, that of milling tonnage, show a considerable reduction over the previous year. From the figures given in the 1909 report, it appears that the estimates of the previous year were considerably exaggerated. The value of the ore reserves at the end of June, 1908, less the value taken out of the mine during 1909 is in excess of the value of the ore reserves at the end of June, 1909, a discrepancy which is the more noteworthy when taking into consideration the amount of new development that has taken place during the interval. With regard to the schedules of working costs, exception may well be taken to the exclusion of development expenditure from working costs. This custom, which is by no means peculiar to the Taquah mine, of speaking of working costs from which one of the main items of expenditure is omitted is both misleading and absurd. Whether the actual cost of development is charged or a computed charge on the development-redemption system, the amount should always be included when working costs are discussed. The company has had an unfavorable year, but the general manager expects to do much better in the future, concluding his report by saying that both as regards development and treatment an improvement has set in.

As regards the Abosso mine the financial results for the year ended June 30, 1909, are much the same as during the preceding year. The tonnage treated is somewhat larger but the yield has come down from 50s. to 45s. per ton, a decrease which is offset to some extent by reduced costs. The cost of working at this mine which produced 60,702 tons was 33s. 3d. per ton, including development and London expenses. If depreciation is added the costs came to nearly 38s. The development of the mine has been so satisfactory that the directors have decided to enlarge the production plant to treat 200,000 tons per annum. The capital of the company has been increased so as to provide funds for this extension. The ore reserves on June 30, 1909, are estimated at 350,888 tons averaging 14.4 dwt. or 60s. per ton. This grade, it must be remarked, is considerably higher than that milled during the last two years.

The working results of these two mines and especially the costs will for reasons mentioned above receive close attention from those interested in West African mining. The indifferent results obtained by mining that ground, acknowledged to be the richest portions of the banket goldfield, are not encouraging to the owners of poorer sections. A considerable reduction in operating expenses is needed before profitable mining can be spoken of with confidence and until such reductions have been demonstrated it would be well for the public to leave speculation in West African mines, especially in the banket mines, alone. If they do wish to speculate let them at all events figure out the capital and the profits required for an adequate dividend on this class of security or better still let them take advice of some engineer of standing and not trust to their own or their stock broker's optimism.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY · INSTALLATIONS · DEVELOPMENT WORK AND PROPERTY TRANSFERS · THE CURRENT HISTORY OF MINING

Arizona

GILA COUNTY

Inspiration—A 60-h.p. hoist is being installed at the Joe Bush shaft. Raises are being put up from the 400-ft. level, for the purpose of blocking ore. All advance work on this level is in ore. At the Scorpion shaft, the crosscut southward on the 275-ft. level is 200 ft. long and continues in ore. The 185-h.p. compressor at the tunnel will be installed as soon as it arrives. The tunnel is 80 ft. long and in granite-porphyry. T. R. Drummond is general manager and Thomas Tighe superintendent.

Cordova—The churn drill is about 400 ft. south of the third drill hole started on the Miami and 300 ft. southeast of the nearest one on the Inspiration. The first sulphide was encountered by this hole at 40 ft. and continues to the present depth of over 200 ft. Granite-porphyry is the formation. Underground, the drifting from the 475-ft. level of the Sullivan shaft, several hundred feet south of the drill, is in schist carrying copper. The length of the drift is 440 ft., and it is now being driven northeast toward the Miami southern boundary. M. E. McCarthy is general manager and A. Ball superintendent.

Miami—Three churn drills are in operation at the southwestern part of the property. These are 400 ft. apart and are drilling at three corners of one of the 400-ft. squares. The third hole is 400 ft. north of the drill at work on the Cordova ground and the ore was encountered by this hole at 20 ft. deeper than that by the latter drill. At 90 ft., the copper content is about 2 per cent. The depth of holes Nos. 1 and 2 is 500 and 383 ft. respectively and the ore has nearly a 2 per cent. content. About 2500 tons of waste and ore are being hoisted through the No. 1 and No. 4 shafts, a week. Preparations are being made to begin the steel erection at the concentrator.

Arizona-Michigan—On Feb. 2, the company paid to the original owners of its property, 10 per cent. of the purchase, amounting to $15,000. A payment of 25 per cent. of the balance is to be made Feb. 1, 1911, and 55 per cent. on Feb. 1, 1912. The workings to date consist of a 500-ft. shaft, with crosscuts running north and south on the fifth level for distances of 460 and 440 ft. respectively. The south crosscut is in quartzite and the north crosscut is in diabase. Drifts have been driven from this crosscut for 82 ft. east and 38 ft. west, but work has now been discontinued in them. The company has about 640 acres.

Arizona-Commercial—During the temporary shut down of the smeltery, while the water jackets are being repaired, a small force of men has been kept at work in the two sixth-level winzes and in the two crosscuts on the 700-ft. level. In the drift running west from the winze located 550 ft. from the Eureka shaft, between the sixth and seventh levels, an 8-in. streak of ore assaying 56 per cent. copper and 26 oz. to the ton in silver was struck Feb. 1, about 450 ft. from the Eureka shaft. The Black Hawk vein at that place is 6 ft. wide and the grade of the ore is improving slightly as drifting continues. The company is planning to enlarge its furnace to double its present capacity of 500 tons and also to install a converting plant in the near future.

Globe Mining Company—The crosscut on the 400-ft. level of the shaft of the Mineral Farm group has been driven 60 ft. in diabase and is now opening up a sulphide vein showing some chalcopyrite. The lode which the crosscut is to open lies over 30 ft. farther west. President J. F. Hechtman is in charge.

MOHAVE COUNTY

Golconda—The 1909 zinc output of this mine was 7100 tons, netting $136,000 and averaging 46 per cent. zinc. This is a ten-fold increase over the previous year. It is expected that the Tub mine of the same company will output an amount equal to this for the year to come. The Golconda output has been entirely from above the 235-ft. level, and the mine is only opened to 337 ft. with a strong oreshoot in the bottom. Work is under way on the Prosperity tunnel, which will cut the vein 165 ft. below the present bottom.

Gold Bug—O. B. Amsden, superintendent, reports the cutting of the oreshoot on the 400-ft. level. Crosscutting on the 500-ft. level is under way. H. J. Marmein is manager.

YAVAPAI COUNTY

The Columbia district is half way between Prescott and Phœnix, seven miles east of Castle hot springs. The district has been neglected for many years, but recently has come into attention by reason of the good gold content of the ores. The Columbia company has a lease on the American mines and 10-stamp mill, and is preparing to operate and develop. The company also has a bond on other properties in the district and expects to be able to operate the mill from ore taken out in development. The Cary claim has been sold recently to a Phœnix company, and the Crescent mine has been placed under bond to a New York company. Both are developing. On the Uncle Sam mine a small force is at work taking out ore, which is of a high grade. A number of individual operators are at work in the district. The ore is on a contact between eruptive formations.

YUMA COUNTY

Shamrock—This property, 8 miles northwest of Vicksburg, is developing on a wide copper vein. T. J. Prescott, Phoenix, is manager.

California

AMADOR COUNTY

South Eureka—The orebody encountered in this Sutter creek mine at the 2700 level, appears to be the same size and quality as that met on the levels above. Twenty stamps are being added to the mill.

Bunker Hill—In the last six months the mill at this mine crushed 18,439 tons of ore which yielded $155,873. Eight dividends were paid during the period.

INYO COUNTY

The New Coso company has installed new machinery and is shipping 90 tons of ore weekly. At Fish Springs the Commettii property is regularly producing and extensive development is planned for the Buckeye company.

MARIPOSA COUNTY

1909—This company, near Hornitos, is to sink 100 ft. deeper before milling.

Champion—From this mine, at Coulterville, under lease to Bagby, Willburn & Quinn, a pocket yielded $7444 recently.

Mariposa Commercial—This company, at Mount Bullion, is about to pump out the Princeton mine to the 800 level and start drifts toward the Green Gulch claim.

MENDOCINO COUNTY

Kemppe & Man, of Fort Bragg, are opening a new quartz mine below Noyo, and have put in a hoist and a tramway. At the Jacobsen mine, at Mitchell creek, a number of men are at work.

MODOC COUNTY

White Quartz—Broaches & Brown, operating a lease on this mine in Hoag district, have found a rich vein in a shallow shaft.

MONTEREY COUNTY

Los Burros—Several carloads of machinery have been sent to King City for these mines and will be carried in by teams.

NEVADA COUNTY

Erie—The Dublin Bay shoot near Graniteville, has been encountered in the tunnel at a vertical depth of 200 ft.; the "pay" is 6 ft. wide and mills $50 per ton. R. G. Eckis is superintendent, and S. H. Brockunier consulting engineer.

Colling—Machinery is being put on this mine at Rough and Ready.

Grover-Murphy—Work has been started in earnest on this Nevada City mine; machinery has been installed, including a compressor.

Champion—Tributing has been stopped in these Nevada City mines. The company is to reopen the Providence mine and sink the shaft deeper. The Nevada City mine will be reopened by tunnel and electric machinery will be installed. George E. Fitzgerald is general manager and T. A. Kelley is superintendent.

PLACER COUNTY

Davenport—On this mine at Auburn, a 5-stamp mill has been installed. N. E. Davenport is owner.

PLUMAS COUNTY

Engels—A smeltery will soon be erected on this copper mine, Taylorsville. Machinery has already been delivered. Henry Engels, 15 Liberty street, San Francisco, is manager.

SAN BERNARDINO COUNTY

Orange Blossom Extension—This gold and copper mine is 10 miles north of Amboy. Operations have been resumed after nine months close down, during which time, through President J. A. Hodgman, an indebtedness of $54,034 has been obliterated. Over 3000 ft. of underground development and a depth of 715 ft. (water level) has been made, with every level showing low-grade ore. By continuation of the work outlined, it is expected the mine will become a producer. Where the orebodies above the water level remained unleached values are $10 to $50 per ton in gold. Where the ore has been leached the values are $3 to $4. In development and improvements the company has expended over a quarter of a million dollars.

SHASTA COUNTY

The Mount Shasta Power Company filed articles of incorporation at Redding Jan. 4. This company has a water right of 200,000 in. of water at the Big Bend of the Pitt river and proposes to divert all of this through a tunnel seven miles long delivering the water at a sufficient hight to allow of the generation of 250,000 horsepower.

The use of fire arms in holding mining claims received a check at the Sybil mine in French gulch, Shasta county, recently. A man after being put off by a deputy marshal by order of the Federal court, returned later with a gun to dispossess the keeper. The court decided it was time to restrain the offender and he was fined $200.

Victor—This Red Bluff corporation will erect a 5-stamp mill on the Bonanza mill at Knob, in Harrison gulch district. P. H. Coffman, of Red Bluff, is secretary.

Climax—This mine, near Igo, is to be reopened by H. W. Robinson, and a cyanide plant built.

Mad Mule—This mine, at Stella, is under bond to Arizona men and is being worked under superintendence of Albert Egerton.

Happy Jack—Two Nissen stamps will be placed on this group near Shasta. The mine is under bond to Charles J. Paige.

Uncle Sam—This mine at Kennett, owned by J. O. Jilson and I. A. McIntosh is being equipped with electrical power.

SIERRA COUNTY

Wisconsin—This drift mine, north of Forest, owned by V. C. Slattery, of San Francisco, has been bonded to John W. Greenbanks, of Forest, and will be put in operation again. There are three tunnels.

Omega—This drift mine, west of Forest, is running its gravel mill steadily.

Alleghany Quartz Channel Company—This company at Alleghany has obtained control of the Gold Star mine and extensive improvements will be made.

Golden Fraction—This mine on Chips flat has been bonded by George Taylor to Los Angeles men.

SISKIYOU COUNTY

Homestake—This property, at Etna, John Boyle, manager, has been sold by F. H. Osgood, of Seattle, to the Pluto Mining Company and new machinery will be installed.

Carter Tunnel—J. W. Pickard is superintending operations at this mine and has ordered a new 5-stamp mill.

SONOMA COUNTY

Big Ledge—This company, on Pine mountain, near Melitta, R. Kluepfer, manager, will install a mill.

Oom Paul—This mine at Oro Fino has been purchased by Mr. Pickard, of Seattle and a 10-stamp mill will be installed.

Zarina—An electric plant has been put in on this mine at Etna Mills.

TUOLUMNE COUNTY

Tarantula—A compressor with drills has arrived for this mine at Chinese camp.

Draper—A large electric motor is being installed at this mine for running the mill.

Dondero—This mine, Yankee hill, has been purchased by P. M. Baumgardner, of Chicago.

Knight's Creek—In this section of the county, Collier & Herbert have struck a new shoot of ore, and are working the rock in an arrastra.

Colorado

TELLER COUNTY—CRIPPLE CREEK

The January output in the Cripple Creek district was 59,964 tons, the gross bullion value of which is placed by mill and smeltery officials at $1,290,440. Unfavorable weather conditions restricted the production. The month's profits include $112,500 in dividends, $40,000 earned by lessees, and $65,000 distributed among shareholders in close corporations, a total of $222,500.

Three important Cripple Creek mining companies have just issued their annual reports for 1909. Total receipts of $895,848 are reported for the Vindicator Consolidated Gold Mining Company on a net production of 31,644 tons. Treatment charges amounted to $228,810, mine expenses to $321,632; paid to lessees, $213,351, leaving a gross profit of $132,054. Dividends to the amount of $112,500 were paid by the company in 1909. Total receipts of the Findley Consolidated Gold Mining Company for the year were $76,796, after deducting treatment charges and lessees' share from the total production of 6819 tons valued at $155,664. The company cleared its indebtedness during the year, leaving a balance January 1 of $16,406. The annual report of the Gold King Mining Company states that the total production from 1892 to 1909 amounted to 67,715 tons with a gross bullion value of $1,460,362; for 1909, 2895 tons with a value of $56,681. The total valuation placed on the resources of the company is $1,253,928.

Golden Cycle—Announcement has been made by President John T. Milliken that an option has been granted to a British syndicate on the stock, the option running until Feb. 28. The corporation has already made examination of the property which includes the Golden Cycle mine at Victor, the mill in Colorado Springs, and the coal lands east and north of Colorado Springs. It is unofficially stated that the company holding the option is the Goldfield Consolidated Mines Company, now operating at Johannesburg, South Africa. In his letter to stockholders, Mr. Milliken states that should the sale be consummated, the shippers of the district will be protected from a monopoly of the milling interests.

San Juan District

Tomboy—The returns for January are as follows: Mill ran 28 days; crushed 8800 tons; yielding bullion, $34,000; concentrates shipped, $39,000; expenses, $47,500; profit, $25,500.

Idaho

Boise County

Gold Hill—The mine is now pumped out and a large force is working on the lower levels. A new 100-ton mill has been completed. E. E. Carter is manager and W. L. Bowron superintendent.

Idaho County

Penn-Dixie—The company at Dixie, has completed its 25-ton mill and is continuing development successfully. The ore is gold bearing. S. R. Gayton is manager.

Indiana

Clay County

Rosebud—Fire broke out in the mine west of Cloverland, Jan. 27. The fire is supposed to have started from an explosion of gas setting fire to the timbers. The mine is the largest in the Seeleyville district, loading 30 cars of

Greene County

Florence Coal Mining Company—This company has been organized to open coal shafts. The office will be Jasonville. The directors are: J. W. Graham, H. L. Doney and J. H. Persons.

Vigo County

Fairmount Coal Company—This company has filed articles to operate near Fairmount. The office will be in Terre Haute. Hugh Shirks is president.

Kansas

A. O. Ihlseng has secured a lease on 220 acres of the Murphy land in North Empire and he will develop the deep ore in the dolomite formation. He will sublease all the ground above the 160-ft. level.

Kentucky

Elk Valley Consolidated Coal Company—This new company has purchased four coal mines in Muhlenburg county, with a large tract of coal land adjoining. C. D. M. Greer, of Memphis, Tenn., is president and manager. The properties purchased and merged are: Wickliffe mine, at Browder, from the Wickliffe Coal Company; the Elk Valley and Diamond Block mines, at Elk Valley, from the Elk Valley Coal Company, and the Louisville & Atlanta mine, at Drakesboro, from the Drakesboro Coal and Coke Company. The combined properties have a frontage of two miles on Green river, a navigable stream, and extend from that river to the Louisville & Nashville railroad. The mines last year produced about 5500 tons of coal per day.

Michigan

Copper

Hancock—The winze, or sub-shaft sinking on the No. 3 lode adjacent to No. 1 shaft is down to the 18th level, at this point it will be intersected by the second working crosscut from No. 2 shaft. Drifts from the 10th to 17th levels continue opening a good grade of stamp rock and it is estimated that fully 700,000 tons of rock is blocked out, enough to keep two modern heads in operation for two years. No. 2 shaft is sinking at a depth of 2100 feet. and is nearing the point where it will cut the No. 2 lode. It is estimated that this shaft will cut No. 1 lode at 2150 ft. and the Quincy or Pewabic lode at 3500 feet.

Oneco—No. 5 drill hole has reached the Oneco lode at 978 ft. The lode found to be about 30 ft. wide, 15 ft. of it carrying copper and 8 ft. of this highly mineralized. This lode was exposed in the No. 3 hole at a depth of about 13 ft. with practically the same results. The second drilling outfit has been started to cut the new amygdaloid formation that was exposed in No. 5 hole at 356 ft., at 1900 ft. southwest of No. 5 hole.

Keweenaw—Drilling to the north from the bottom of the Medora shaft has been discontinued without revealing anything important. The drill is now operating in the opposite direction to cut the Calumet, Osceola and other lodes to the south. Shaft sinking on the Kearsarge lode continues with the copper contents of an encouraging nature.

Lake—Rock shipments averaging 100 tons daily are being made to the Franklin mill, from the openings of the 2d, 3d, 4th and 5th levels. All the levels continue to open ground of about the same characteristic richness as noted. Sinking has been resumed in the shaft below the 6th level at which point the crosscut is nearing the lode.

Franklin—Sinking is going forward in the two shafts sinking on the Pewabic lode. No. 1 is to the 28th level and the lode opened by the crosscut at 27th level is well mineralized. No. 3 shaft is below 1400 ft. but lateral openings have not been started. Drilling is being done to expose the Hancock Lodes.

Bohemia—This company has been organized with a capital of 100,000 shares at $25 par value, of which 75,000 shares have been issued, 45,000 shares being sold for the treasury at $8. The tract comprises 960 acres, known as the Henwood tract, ½ mile northwest of the Indiana. A small amount of exploratory work was done on the western portion by the former owners, but it is planned by the new company to direct attention to the eastern portion in view of striking the various formations exposed by the Indiana and the Lake.

Missouri

Joplin District

Moore—A strike has been made on the land southeast of Cave Springs.

Falls City—This company has secured the Black Cat lease in the West Joplin sheet-ground district and will build a 300-ton mill. This mine was worked with a small mill without success as the small ore content required a large mill.

Fullerton—This company has sold the 80-acre tract at Porto Rico to Mr. Frederick for $70,000.

Montana

Butte District

Tuolumne—At 20 ft. below the surface a drift is being run on the footwall side of the main vein to ascertain its apex so that more information may be obtained for the settlement of the controversy with the North Butte company. On the 1200-ft. level, stoping is being done and the management states that the ore will average 15 per cent. copper. The 1000-ft. level is also being opened up and it is the intention of the company to explore the vein every 200 ft. from there to the surface to prove the apex. The Tuolumne management states that it believes about $8,000,000 worth of ore has been taken by the North Butte.

British-Butte—A special meeting of stockholders has been called for March 3, for the purpose of authorizing a mortgage on the company's property for $226,000 to Shirley H. Jenks, representing the British stockholders. It is hoped that by this means the present indebtedness can be taken care of. The diamond drill on the property recently reached a depth of 1205 ft., but bedrock was not reached so it was decided to suspend operations with the drill. J. W. Murphy, one of the local stockholders, has been elected president.

Butte Central—Rumors continue that operations will soon be resumed at the Ophir mine. A meeting of stockholders has been held at Wilmington, Del., to consider plans.

Butte Copper and Zinc—The Emma mine which has not been operated in a number of years, is now being sampled by experts in the interest of Eastern capitalists. A contract has been let for the unwatering of the shaft and when this is completed the mine will be sampled for the purpose of ascertaining its zinc content.

Deer Lodge County

Southern Cross—Ten 4-horse teams are handling the company's ore. No stoping is being done and all of the ore is taken out in the course of development.

MADISON COUNTY

tella—In an action brought by D. R.
der against Mike O'Conner an in-
ction has been served on the latter
tting down the mine pending the ac-
l.

onrey Placer—Manager Kammerer
es that a new gold dredge will be in-
lled in the spring. The dredge will
e a capacity of 200,000 yd. of gravel
nthly and will dig to 60 ft. It will
operated electrically. By means of
new dredge much of the property can
worked over.

YELLOWSTONE COUNTY

oundup—This coal company has re-
tly purchased 1000 acres of coal lands
t of Roundup from J. C. Lohman, W.
Strait, Alexander Roy and J. W. New-
. A shaft 190 ft. deep will be sunk.
chinery has been ordered. L. J. Cake
l be in charge.

Nevada

ESMERALDA COUNTY

perations in the Goldfield district
side the proved zone are increasing
ably. The Yellow Tiger has resumed
h ample capital, work has been started
the Atlanta leases by J. A. Houlahan
l by J. O. Buckley. The strike in the
mpbell lease on the Diamondfield-
ck Butte is improving. The C. O. D.
nsolidated and Gold Bar have dis-
sed ore at 300 ft. Several operators
working in the dacite belt south and
theast of the camp. The Davenport,
niles southwest of Goldfield, is prom-
g.

NYE COUNTY

hloride Cliff—This Bullfrog mine will
tall a mill. J. Irving Crowell and
nald Findley have recently completed
ampling of the property.

ohnnie—The control of the company
passed to A. D. Meyers and T. A.
nson and the mine will be extensively
eloped. The property is equipped
h a mill with Nissen stamps and a
e mill. The mill capacity will be in-
ased to 200 tons daily.

onopah Extension—The new 30-
mp mill is about complete and is be-
operated at a reduced capacity while
final repairs, etc., are being com-
ted. J. G. Kirchen, general manager,
gone east leaving his brother, Charles
chen, in charge. Dr. Walter Techow
nill superintendent.

onopah Mining—About 270 men are
ployed on two shifts and an output of
ween 400 and 500 tons per day main-
ed. Records for the 10 months past
w an average of about 14,000 tons
month, of an average content of gold
14 oz. and silver 28.15 oz. It is
ted at the company's mill at Millers,
. A depth of 80 ft. has been reached
he new, two-compartment shaft being
k on the Sand Grass claim, west of
the Red Plume. Ore is being hoisted at the Silver Top and Mizpah shafts, while only waste is raised at the Red Plume.

Ohio

Goshen Coal Company—This recently organized company has acquired the properties formerly owned by the Philadelphia, the Goshen, the East Goshen, the Beaver Dam, and the Cleveland & Tuscarawas coal companies. These include seven mines—which produced 510,000 tons coal in 1909—and 6600 acres of unmined coal, covering over one-half of the Tuscarawas county coalfields. C. L. Cassingham, of Cleveland, O., is president and general manager. The company is now issuing $525,000 in 6 per cent. mortgage bonds, for the purpose of improvements and extensions at its mines.

Oklahoma

A strike has been made about 3 miles southwest of the Miami camp that bids fair to start a new camp. The ore was struck at 70 ft. and is rich and free from iron.

Mission—The 500-ton mill at the Mission mine, Quapaw camp, has started.

Lolita—This company has bought the Omaha mill at Quapaw and is moving it to Miami.

Quapaw Gas Company—The company is installing its line through Oklahoma as fast as possible. The line will be completed in 60 days.

Pennsylvania

ANTHRACITE COAL

Lehigh Valley Coal Company—This company has purchased the Stevens colliery owned and operated by the Stevens Coal Company, of West Pittston. The colliery is in Exeter borough. The opening of the Stevens mine took place 60 years ago, when a man named Price drove a drift into one of the veins and sold the product of his enterprise to the farmers in the neighborhood. In 1888, the late A. B. Stevens of Scranton, leased the lands upon which the colliery is and began to operate it on an extensive scale. Later the lease was transferred to the Lehigh Valley Coal Company, which owned the adjoining lands. Later on, it was again transferred to the Stevens Coal Company, together with 250 acres of the adjoining coal lands. In 1891, the control of the Stevens colliery passed from the hands of the Scranton people to J. Amherst Wisner, of Brooklyn, N. Y., and several other capitalists. The company has been managed for a number of years by H. W. Kingsbury, of Scranton. The colliery. produced 168.000 tons of excellent coal in 1907, and employs over 300 men and boys. It is estimated that over 1,000,000 tons of coal remain in the tract.

South Dakota

Homestake—The company is receiving about 30 to 40 men per day to work on the property. They are coming largely from Joplin, Missouri, Wisconsin and Colorado, and seem to be a good class of men, with few foreigners. It appears probable that the management will refuse to employ the Slavonians who are the only ones of their old employees still maintaining the strike. They make good workers, but the leaders of the federation found it easy to deceive them as to the chances of winning the strike. About one-half of the men in Terry on the first of the year have left and it is anticipated that many of those in the camp will be ready to go to work when the other companies decide to start up. The Homestake has two mills running with ample ore supply and will start the third as soon as mechanics can get it in shape. It appears probable that the mine will be running at full capacity in a short time.

Utah

JUAB COUNTY

Yankee Consolidated—This company expects to mill its dump in the near future to secure funds for pushing development. It is estimated that there are $20,000 or more in the dump. Milling arrangements may be made with the Godiva company.

Chief Consolidated—This company has offered to take over the stock of the Eureka City company on the basis of one share of the Chief for five shares of Eureka City.

SALT LAKE COUNTY

North Utah—The crosscut which was being driven north of the shaft in the Butler-Liberal section of this property is reported to have struck 2 ft. of solid galena. The company is now taking ore from four places in the mine. W. D. Bohm is manager.

Utah Apex—The first shipment of 55 tons of ore made by the Utah company to the American Smelting and Refining Company under the new smelting contract is reported to have carried 41 per cent. lead, 11.8 oz. of silver, 1.6 per cent. copper. The gross value per ton was $32.33. The 107 tons of concentrates which were treated under the old contract carried 32.2 per cent. lead, 8.4 oz. of silver and 1 per cent. copper, with a gross value of $23.29 per ton.

SUMMIT COUNTY

New York—The shaft has been sunk to 1000 ft. and a crosscut is being run to the southeast to intersect ore encountered on the 850. Fifteen men are being worked in two shifts.

American Flag—Regular shipments are being made. The purchase of the Constellation group was recently effected.

Little Bell—Shipments are being made and a dividend of $15,000 was paid last month. Good ore is being mined from the incline from the 700-ft. level.

Ontario—With the connection of the Ontario tunnel and the 2100-ft. level of the Daly-West all work ceased through the old No. 3 Ontario shaft. Crowther holds a lease on the workings above the 700-ft. level and is taking out some ore.

Uintah-Treasure Hill—Prospecting work is in progress.

Grasselli Mill—About 70 tons of zinc middlings from the Daly-Judge are being treated daily. A bid is being made for similar material from the Silver King Coalition.

Wyoming

CARBON COUNTY

West Virginia-Wyoming—The company is installing new machinery at Rambler and will sink to 1000 feet.

Wyoming Coal Mining Company—The company will install a locomotive-haulage system next April, at Monarch.

Canada

ONTARIO

Preparations are being made to sink several shafts on the claims owned by McArthur & Co., of Glasgow, Scotland, at Porcupine. Free gold has been found on Stewart and Harper properties in Shaw township.

ONTARIO-COBALT

Shipments of ore from Cobalt for the week ended Jan. 28 were as follows: Cobalt Central, 41,299; Colonial, 63,660; Crown Reserve, 123,071; La Rose, 123,500; McKinley-Darragh, 46,027; Nipissing, 306,852; Trethewey, 65,000; total, 769,409 pounds.

Trinity—This mine has been sold under liquidation proceedings to Henry E. Jungling, of Buffalo, N. Y., for $12,500.

Beaver—The shaft is being enlarged and timbered and several new buildings are in course of construction, the mine in the meantime being closed down.

Bailey—The power plant to operate six drills has been installed and is in readiness for development work on a large scale so soon as a supply of electric energy is available.

Mexico

CHIHUAHUA

Esmeralda—The Parral Mining Company, operating the Esmeralda properties, Parral, is planning a 100-ton milling plant. Tests are now being made. Wade Armstrong is manager. W. P. Fairman and Dr. H. P. Leopold, of Philadelphia, are interested.

Alvarado—James I. Long has been appointed manager, succeeding F. C. Morehouse, resigned. Mining has been suspended pending the readiness of the mill of the Palmilla Milling Company, which is an affiliated concern.

San Enrique—This property, in the Almaloya section of the Parral district is showing encouraging development, under the direction of V. C. Joslyn.

Dolores—Recent reports show the production of this mine for three years to have been over $3,000,000. Dividends of 18 per cent. per annum are now being regularly distributed.

Capuzaya—The new management will start extensive work at the Parral mine. It is claimed that the explorations in the Palmilla have shown an extension of the orebody into the Capuzaya ground.

HIDALGO

Cortez Associated—This Boston company has extensive properties near Jacala. Development will be undertaken.

JALISCO

Philadelphia Copper and Gold—A 25-ton experimental plant, for direct cyanidation of gold-silver ores, will be placed in commission on Feb. 15. The gold deposit, discovered in connection with the development of the company's San Vicente copper veins, Ameca district, is being opened by 4 tunnels, 150 ft. apart, giving a depth of 600 ft. In the lowest tunnel the vein has been crosscut 35 m. The ore runs from 12 to 15 grams gold and 2 oz. silver.

Magistral-Ameca—The 100-ton concentrating plant, using the Elmore process, will be ready for operation in April. Crushing equipment is for a capacity of 200 tons. Reverberatory smelting furnace will be built later. The company announces blocked out 35,000 tons running 7½ per cent. copper, and 150,000 tons running 4 per cent.

SONORA

Green-Cananea—The January output is reported as 1750 tons of copper bullion containing 464 oz. gold and 85,132 oz. silver. The annual meeting will not be held until June.

Yaqui River Smelting and Refining Company—Plans for blowing in this company's smeltery at Toledo are under way. A. E. Klauser, president, is at the property.

Cerro de Plata—This company is working an antiqua near Imuris, with 30 men and has found ore below the old workings.

Palomas—A $10,000 instalment has been paid by English purchasers of the Palomas placer fields.

Chicago Exploration Company—This corporation has purchased the Mina Mexico in the Sahuaripa district. Little development work has been done recently.

ZACATECAS

San Carlos—Arrangements are being made to use direct water power in the operation of the 50-stamp mill, which will be soon placed in commission after long idleness.

Africa

RHODESIA

Gold production in December is reported at 55,446 oz., making for the year 1909 a total of 623,389 oz. fine, or $12,885,451. This total is an increase of $609,057, or 4.96 per cent., over the previous year. There were 208 mines in operation in December. Other production reported for December includes 19,845 oz. silver, 13 tons copper, 72 tons lead and 1120 tons chrome ore. Coal output was 13,584 tons.

Australia

NEW SOUTH WALES

Broken Hill Proprietary Company—The refinery in the four weeks ended Jan. 19 produced 295,820 oz. silver, 5553 tons lead and 44 tons hard or antimonial lead. Of this 247,687 oz. silver and 5089 tons lead were from purchased ores. There was also produced 4985 tons zinc concentrates, containing 61,585 oz. silver, 321 tons lead and 2318 tons zinc.

Dutch East Indies

Ketahoen—This company, in Sumatra, mined and treated during 1909 by crushing, amalgamation and cyaniding 48,020 tons of ore, the yield being 26,033 oz. gold and 37,820 oz. silver. The profits were $145,926, or $3.04 per ton. Ore reserves Dec. 31 were 144,000 tons, averaging $12 per ton.

Redjang Lebong—Ore mined and treated in 1909 by this company, the largest in Sumatra, was 94,500 tons, the yield being 77,777 oz. gold and 429,160 oz. silver. The gross profit was $1,138,866, or $12.05 per ton. Ore reserves Dec. 31 were 307,000 tons, of an average assay value of $18 per ton.

South America

BRAZIL

Brazilian Goldfields Ltd.—This British company operating in southern Brazil has formed three development organizations and is operating extensively. André P. Griffiths, London is the mining engineer for the company.

BRITISH GUIANA

Exports of gold from the colony for the year ended Dec. 31 were 73,089 oz. bullion in 1908, and 64,977 oz. in 1909; a decrease of 8112 oz. The bullion reported in 1909 was equal to $1,129,811, or 54,660 oz. fine gold. Exports of diamonds in 1909 were 5646 carats, valued at $39,060; an increase of 679 carats over the previous year.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Feb. 9—In the East the biuminous coal trade is working under etter conditions. Car supply is still iregular, but transportation conditions are etter. Demand continues to improve radually. The anthracite trade is withut incident.

In the West demand is good, and there s beginning to be some rush to put in upplies, in order to prepare for a posible stoppage of mining in April. The ar supply is reported to be improving, ut there are delays in moving coal, owng to bad weather and deficient motive ower on many roads. The wage scale ontinues to be the chief point of discusion; the general feeling seems to be hat some settlement will be reached beore April.

The Wage Scale Conference—The conerence over the mining scale which bean at Toledo, O., Feb. 2, was in ession only one day. The Illinois operaors refused to send delegates, and the perators from the other States voted hat the miners' delegates from Illinois, hould not be admitted. The miners inisted that as Illinois is one of the cometitive States, its delegates ought to ake part, whether the operators were resent or not. On this point neither side would give way, and the conference djourned without day. It is generally elieved, however, that another meeting will be arranged before long.

Pittsburg Coal Company—The proposed voting trust for this company was not formed, as holders of sufficient stock to give the trust control did not assent. The position of the company seems uncertain, and will probably remain so until the annual meeting next month, which will show where the controlling interest is held.

COAL TRAFFIC NOTES

Coal shipments by districts over Norfolk & Western road, six months of fiscal year from July 1 to Dec. 31:

	Commercial.	Company.	Total.
Pocahontas ...	4,767,400	602,495	5,369,895
Tug River	751,625	61,528	813,153
Thacker	742,070	261,942	1,004,012
Kenova	319,864	95,444	415,308
Clinch Valley	279,216	28,517	307,733
Total	6,860,175	1,049,926	7,910,101

Pocahontas district shipments were 68.5 per cent. of the total.

Alabama coal production in 1909 is reported by State Mine Inspector Flynn at 12,567,000 short tons, with several smaller mines still to report. This shows an increase of 1,044,000 tons over the previous year.

Anthracite shipments in January are reported as follows, in long tons:

	1909.	1910.	Changes.	
Reading	1,056,104	1,185,122	I.	129,018
Lehigh Valley....	895,401	873,640	D.	21,761
N. J. Central......	630,085	617,009	D.	13,076
Lackawanna......	762,636	829,786	I.	67,150
Del. & Hudson....	566,052	489,290	D.	76,762
Pennsylvania	484,682	550,272	I.	65,590
Erie................	548,077	547,125	D.	952
N. Y., Ont. & West.	240,308	214,374	D.	25,934
Total.............	5,183,345	5,306,618	I.	123,273

Three companies—the Philadelphia & Reading, the Delaware, Lackawanna & Western and the Pennsylvania—show increases; the others small decreases. The total gain for the month was 2.4 per cent.

New York

ANTHRACITE

Feb. 9—Cold weather has supported and increased the usual steady demand, and business has been good. Though cold, the weather has not been stormy and coal is moving with less difficulty.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.85@2; barley, $1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Car supply is still a vexing question in the seaboard bituminous trade. There has been some improvement on the Baltimore & Ohio; notably the Fairmont and Somerset districts are getting more cars. On other roads also the car situation is better. On the other hand, transportation is bad, coal being delayed by storms and zero weather. Seaboard supplies, therefore, are still irregular.

Buying is better for New York harbor and the Sound, but it is mostly the low-priced coals that are wanted. The far East is out of the market at present. Prices are unchanged; fair grades of soft coal can be had about $2.60, f.o.b. New York harbor, with better grades bringing up to $3. There is not much demand for the higher grades. Gas coal is still in only day-to-day supply.

In the coastwise vessel market rates have an upward tendency. Medium sized boats ask 80@85c. from New York to points around Cape Cod; while 90c.@$1 is paid to some of the smaller ports.

Birmingham

Feb. 7—Coal operations in Alabama are steadily improving and the railroads are being urged to furnish more and more cars. The demand for coal promises to hold up through the year, in fact business coming in from outside the State appears to be of a lasting nature, the contracts covering a long period.

There is a steady demand for coke in this State and the ovens in operation are not keeping up with the demand.

Chicago

Feb. 8—The coal market has practically resumed its normal state, owing to the continuance of mild weather and the consequent relief from railroad congestion. Screenings still continue high, but this is in part due to increased use of this size. Steam coals in general are weak, and domestic coals are by no means strong, in the absence of zero weather anywhere in Chicago territory. Lump and egg from Illinois and Indiana mines bring $2@3; run-of-mine sells for $1.75@2 and screenings are held at $1.60 @1.85 per ton.

Of the coals from east of Indiana, Hocking is steadiest, selling well at $3.15 and not troubled with overshipments. The same can hardly be said of smokeless coal, which is beginning to show its old condition of too large supply for the maintenance of prices. Lump smokeless brings $3.75@4; run-of-mine sells for $3.20@3.45. Youghiogheny is steady at $3.30 for gas and $3.15 for steam. Anthracite is lagging, the trade being scattering, with nut still in comparatively large demand and small supply.

Cleveland

Feb. 7—Interest is centered on the wage scale conference. The preliminary failure, it is generally believed, will not prevent a renewal of the negotiations between operators and miners.

Locally trade is good. Car supply is better and transportation is much improved, so that deliveries are more freely made. The demand for slack continues.

Prices are a little off, owing to better supply. Quotations are, f.o.b. Cleveland, for Middle district $2 for 1¼-in.; $1.85 for ¾-in.; $1.75 for run-of-mine; $1.65 for slack. No. 8 district $2.25 for 1¼-in., $2 for ¾-in., $1.90 for run-of-mine and $1.85 for slack. Pocahontas is $3.10 for lump and $2.45 for run-of-mine. Massillon domestic, $2.95 for lump and washed nut.

Indianapolis

Feb. 7—No sooner had the Toledo conference adjourned than there began a scramble on the part of consumers and big coal dealers to make contracts for coal for March delivery. Operators who have a production of free coal received offers of high prices, but so far as known no contracts were made. On a second thought Indiana operators believe that they can get more money than now offered for free coal in case of a strike; though the purchasers under such contracts will be able to buy for less if there is no strike.

Pittsburg

Feb. 8—The only question at Toledo was what the miners and operators would disagree upon, as no approach to a settlement of the wage scale to date from April 1 could be expected at so early a date. The local coal market is firm but not particularly active. Prices are unchanged, at $1.15 for mine-run and nut, $1.25 for ¾-in., $1.40 for domestic 1¼-in. and 85@90c. for slack.

Connellsville Coke—The market has gone to pieces, and coke is offered at very low prices, while there are no buyers. The Connellsville coke industry pays the penalty of its excess of optimism last fall, when it pushed prices up and up until the lowest asking prices on furnace coke on contracts for this year were about $3, and some operators were holding out for $3.25 or even higher. Since then the market has been declining, but only slowly, and a number of consumers have gone elsewhere for their coke, to West Virginia and the various Pennsylvania districts outside of Connellsville. It has been the rule in the trade, that in periods of dullness, certain blast furnaces seek cheaper coke, and in periods of prosperity, return to Connellsville. This time the usual quota did not return to Connellsville. The iron industry promises no increase in consumption, but rather a decrease, and the only solution for the Connellsville coke trade will be the idleness of some of the plants making second-grade coke.

Prompt furnace coke is offered at well below $2.25 at ovens, and could probably be had at $2, but there is no market. A week ago a sale was made for delivery over February, March and April, about 5000 tons monthly, at $2.30. This week a contract could hardly be made at less, but there is no inquiry along this line. Some good grades of 72-hour foundry coke have been offered at $2.60@2.75, for prompt shipment, and the market is quotable approximately at that range. There is no talk of contracts.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 29 at 474,498 tons, and shipments at 4958 cars to Pittsburg, 8954 cars to points west of Pittsburg and 979 cars to points east of Connellsville, a total of 14,891 cars.

St. Louis

In spite of the fact that the weather has remained mild all week, the market for lump coal has rallied and prices are better now than they have been for the past two weeks. The demand from dealers throughout the country is very light, but the railroads are beginning to store coal heavily, which is having a steadying effect on the market. The storage movement has not become general with manufacturers, though a large number of industries are beginning to figure on storage coal and a few of them have begun to snap up any cheap coal they could obtain.

The car situation is getting worse in every direction. The Illinois Central operators have been practically out of business for some time. One to 1½ days' work is all they have been able to get in a week. Not only do cars seem to be short, but motive power is lacking. Indications are that after next week the Illinois Central will take all coal that is mined on the road. The differential that has prevailed on coal that will go out of town has entirely disappeared.

The market on screenings has ceased off a little owing to the fact that so much railroad lump is being made. High-grade coal is still bringing good prices, though very little domestic coal is being made, owing to the railroad demands. High-grade screenings have come down in sympathy with low-grade coals, and are not bringing within 50c. per ton of what they were several weeks ago.

Quotations current are given as follows, the first price named in each case being at mine, the second, f.o.b., St. Louis: Standard 6-in. lump, $1.75 and $2.27; 2-in. lump, $1.30 and $1.82; mine-run, $1.10 and $1.62; 3-in. nut, $1.10 and $1.62; small nut and pea, $1 and $1.52; screenings, 65c. and $1.27.

Springfield, Mt. Olive and Staunton, 6-in. lump, $2 and $2.52; 2-inch lump, $1.50 and $2.02; mine-run, $1.40 and $1.92; screenings, $1.10 and $1.62.

Franklin County, 6-in. lump, $2.25 and $2.92; 3-in. nut, $2 and $2.67; 1½-in. screenings, $1.25 at mine.

Carterville, 6-in. lump, $2 and $2.67; 3-in. to 2-in. nut, $1.90 and $2.57; 1½-in. screenings, $1 and $1.67.

Anthracite is in good demand and the supply seems to be much better than heretofore. Even chestnut seems to be coming forward more freely and trade is brisk in spite of the fact that dealers are buying cautiously on account of the season being so near the end.

Scranton, Penn.

Feb. 8—Work at the anthracite mines is excellent at present. The breakers are working full time and in a great number of cases overtime. Upon their January wages the miners obtained an increase of 7 per cent. on the sliding scale, the largest increase that they have had since it went into operation. There is no trouble at any of the mines throughout the anthracite districts, certainly not in the neighborhood of Scranton, Wilkes-Barre, Carbondale or Hazleton. The demand for anthracite is exceptionally good. The cold weather that set in at the beginning of December has continued uninterruptedly since, eating up the last of the coal that the the operators had stored up in anticipation of a strike 12 months ago.

Foreign Coal Trade

Nova Scotia Coal—Shipments from Nova Scotia mines, year ended Dec. 31, long tons:

	1908.	1909.	Changes.	
Dominion	3,243,007	2,469,493	D.	773,514
Nova Scotia Steel	644,638	785,015	I.	140,377
Acadia	320,122	278,131	D.	41,991
Intercolonial	244,897	249,218	I.	4,321
Inverness	256,910	230,752	D.	26,158
Cumberland	362,339	216,325	D.	146,014
Smaller Cos	300,565	368,743	I.	68,178
Total	5,372,478	4,597,677	D.	774,801

The total decrease in 1909 was 14.4 per cent. The loss was due to the strike at the Dominion Coal Company's mines.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Jan. 29: Best Welsh steam, $4.14; seconds, $4.02; thirds, $3.90; dry coals, $3.96; best Monmouthshire, $3.66; seconds, $3.54; best small steam, $2.34; seconds, $2.10. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

Iron Trade Review

New York, Feb. 9—The iron and steel markets show but little activity generally; many buyers seem to be discouraged by the upset in Wall Street.

There is some movement in structural steel and a number of small contracts have been placed, besides a few larger ones. Some large rail orders have been placed, the Baltimore & Ohio taking 78,500 tons, divided between Steel Corporation plants and the Bethlehem works. Other companies have placed a total of 68,000 tons. It is to be noted that over a third of the orders call for open-hearth steel rails, from the Bethlehem and the Maryland Steel companies and the Gary works of the Steel Corporation.

Pig iron in the West has been quiet, but in Eastern territory there has been fair buying of foundry and basic pig. Virginia furnaces have been actively in the market and have taken most of the Eastern orders, making, it is said, concessions of 50c., and in a few cases 75c. a ton to secure them.

Some buying of heavy steel and other scrap abroad is reported. This has been helped by the new Treasury decision, which admits practically all scrap at $1 per ton duty.

Lake Iron Ore—Receipts of Lake Superior iron ore at Lake Michigan ports n 1909 reached a total of 6,929,831 tons. The larger deliveries were 4,673,810 tons at South Chicago and 1,921,818 tons at Gary.

Baltimore

Feb. 7—Imports for the past week included 502 tons manganese ore from Antwerp; 4195 tons cupreous pyrites from Huelva, Spain; 17,150 tons iron ore rom Cuba.

Birmingham

Feb. 7—While pig-iron buying in outhern territory has not been as active s it was expected, conditions are still onsidered satisfactory. There is a teady operation of blast furnaces, hough some have been turned from oundry iron to basic, for which there is good demand. The quotations are ardening a little around $14.50 per ton or No. 2 foundry, delivery during the second and third quarters of the year. here is a little immediate delivery iron eing sold at $14 per ton, but the amount not great. The books for the first uarter of the year are well covered hile the aggregate for the second uarter is not bad. There is no iron accumulating worthy of comment; the ocks on hand have been reduced materially since December. All companies n this section of the country are right p in delivery of iron.

There is no change in steel, cast-iron pe and foundry and machine-shop con-tions all being good.

Chicago

Feb. 8—The iron market continues rm, with foundry buying still light, ut well distributed, and malleable in-rests largely furnishing the activity of e market. There is no depression of ices; $14 Birmingham continues to be e lowest figure on Southern No. 2, hich means $18.35 Chicago. Southern gents are optimistic, expressing the opinion that buying is bound to increase eadily, though perhaps slowly, and orthern furnaces are closely sold up r first-half output. There is little dis-sition to enter into third- and fourth-uarter contracts at current prices, on e part of furnace agents, and melters re running rather closely to current eeds, though inquiries about future sup-ies are increasing. Northern No. 2 ntinues to bring $19@19.50. Some eakness appears in Lake Superior char-al iron, which brings $19.50 and is in tter supply than demand.

The condition of the market for iron and steel products is very satisfactory to producing and selling interests. Coke is rather dull, being in large supply, but the price holds to $4.50 for the best Connellsville.

Cleveland

Feb. 7—Ore buying seems to be over for the present, and there is little or nothing doing. Eastern furnaces have been light buyers and may come in later.

Pig Iron—There are rumors of concessions made by furnaces, but no definite information. Quotations are $19.50@19.75 for bessemer; $18 for basic; $17.50@17.75 for No. 2 foundry; $17@17.25 for gray forge.

Finished Material—More inquiries are reported for bars, and some for structural material. Mills are rather conservative about taking orders for delivery later than June.

Philadelphia

Feb. 9—There is much less anxiety to purchase pig iron for future delivery than even a week or two ago. There is something in the air that keeps buyers back and indifferent. No one can give a strong reason for the slackening in demand, as much iron is being melted. Prices are strong and outside of several proffers from Southern furnaces there is no iron offered on the market. Several additional lots of malleable have been taken for immediate delivery. Basic iron is easier to get for forward delivery but the old quotations are not so strongly adhered to. Basic is $18.50; No. 2 X foundry $19; while $18 is asked for gray forge.

Steel Billets—Makers are showing a disposition to accommodate prospective buyers for late delivery on more reasonable terms.

Bars—Sales are up to average both at stores and mills.

Scrap—Scrap has not developed the activity which numerous recent inquiries indicated as probable. Dealers are holding all their stock at top prices and are not seeking customers.

Pittsburg

Feb. 8—A chill has come over the whole iron and steel trade since the first of the month. The quietness in January was expected, but not that the second half would be quieter than the first half of the month. As for February, some slight improvement at least was looked for, whereas the market from being quiet has turned dull. Prices of finished steel products show a slight weakening tendency at points, unimportant perhaps in itself but important by reason of the contrast furnished with a period of over six months of continued improvement. The weaknesses thus far apparent comprise only a return to the 1.45c. price on steel bars on contract, a price which was understood to have been withdrawn Jan. 1 in favor of 1.50c., and a willingness on the part of some wire mills to book some additional tonnages on old low-priced contracts which were supposed to have been worked out. There are definite reports of cutting in fabricated steel.

Apparently the causes of the trouble are unrest over the situation at Washington and the stocking up by jobbers and manufacturing consumers in the closing months of last year.

Pig Iron—There has been a decrease in production, but it is due to furnaces not working as well as in December, rather than to the blowing out of any considerable number. Exact prices are not quotable, there not being enough business to test the market. We quote nominal prices, f.o.b. Valley furnaces—90c. higher at Pittsburg—unchanged from last week at $19 for bessemer, $16.75 for No. 2 foundry and $16.50 for basic. Virginia furnaces have dropped 50c., to $15, furnace, on No. 2 plain, 2 to 2½ per cent. silicon. Southern pig iron is held by most sellers at $14, Birmingham, but for balance of this quarter $13.75 can be done, representing a slight further weakening.

Steel—The market for unfinished steel is very quiet, there not being enough inquiry to test prices, which are nominally unchanged at $27@27.50 for bessemer and $27.50@28 for open-hearth billets; $28.50@29 for sheet bars and $35 for rods. Plates and shapes are 1.55c., Pittsburg.

Ferromanganese—The market is quiet with prices quoted at $44, Baltimore, for prompt delivery, freight to Pittsburg being $2.30 per ton.

Sheets—New business is rather light, but the mills are comfortably sold ahead, chiefly on contracts made before the latest advance. There has been relatively little business placed at the present prices of 2.40c. for black and 3.50c. for galvanized and these prices therefore have not been seriously tested. Electrical sheets bring full prices without any trouble, while blue annealed remain firm at 1.90c. Corrugated roofing remains at $1.70 per square for painted and $3 for galvanized.

St. Louis

Feb. 7—The market for pig iron has been a little more active this week than last, though still slow. More interest is being shown, however, as a good many inquiries for both large and small lots have been received. A few buyers are now venturing into the second half. Not much business has been actually closed this week, though indications are that tonnage will improve from now on. Prices remain unchanged at $15 per ton Birmingham or $18.75 St. Louis for No. 2 foundry.

Metal Markets

New York, Feb. 9—The metal markets have been generally quiet, with a weaker tendency on some lines, and no special incident to report.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1909..	$10,579,304	$ 2,083,772	Exp. $ 8,495,532
" 1908..	7,357,707	5,152,732	" 2,204,975
Year 1909..	132,880,821	44,086,966	" 88,793,855
" 1908..	81,215,456	50,276,293	" 30,939,163
Silver:			
Dec. 1909..	5,297,965	4,167,276	Exp. 1,130,689
" 1908..	4,726,289	4,409,454	" 316,835
Year 1909..	57,592,309	46,151,282	" 11,441,027
" 1908..	51,837,671	42,224,130	" 9,613,541

Exports from the port of New York, week ended Feb. 5: Gold, $142,676, chiefly to Panama; silver, $588,721, principally to London. Imports, $89,963; silver, $80,330, from the West Indies and South America.

Foreign trade of the United States for the full year, as reported by the Bureau of Statistics of the Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports................	$1,752,835,447	$1,727,383,128
Imports................	1,116,374,087	1,475,520,205
Excess, exports......	$ 636,461,360	$ 251,862,923
Add excess of exports, silver..........		11,441,027
Add excess of exports, gold...........		88,793,855
Total export balance................		$ 352,097,805

The gold and silver movement in detail will be found in the table at the head of this column.

Gold—Quotations on the open market in London are unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. Supplies arriving were divided between the Bank of England and Paris.

Platinum—Business is reported steady and prices are unchanged, dealers asking $28.50@29 per oz. for refined platinum, and $34.50 for hard metal.

Silver—The market has continued steady around 23¾d. China has been both a buyer and a seller. On account of the Chinese New Year the market is likely to continue dull for the week.

SILVER AND STERLING EXCHANGE

Feb.	3	4	5	7	8	9
New York....	51½	51¼	51½	51½	51⅜	51¼
London .	23¾	23⅝	23¾	23¾	$23\frac{11}{16}$	$23\frac{11}{16}$
Sterling Ex..	4.8625	4.8625	4.8625	4.8625	4.8605	4.8610

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Jan. 27, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£ 456,100	£590,500	I. £ 134,400
China........	80,000	127,000	I. 47,000
Straits......	61,000	....	D. 61,000
Total......	£ 597,100	£717,500	I. £ 120,400

India Council bills in London sold at an average of 16.09d. per rupee.

The work of the British mint in 1909 is reported as follows, in number of pieces struck:

	British.	Colonial.	Total.
Gold........	16,167,814	....	16,167,814
Silver.......	22,846,050	2,750,072	25,596,122
Bronze......	36,748,544	525,000	37,273,544
Nickel......	....	34,102,000	34,102,000
Total.....	75,762,408	37,377,072	113,139,480
Total, 1908	91,921,993	34,561,049	126,483,042

In 1908 there were 12,134,058 Colonial coins of aluminum; but no coins were made from that metal last year.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Feb.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
3	13¾ @13⅞	13¼ @13½	59½	32½	4.65 @4.70	4.50 @4.52½	5.60 @5.65
4	13¾ @13⅞	13¼ @13½	59⅜	32½	4.65 @4.70	4.50 @4.52½	5.55 @5.60
5	13¾ @13⅞	13¼ @13½	....	32½	4.65 @4.70	4.50 @4.52½	5.50 @5.55
7	13⅝ @13⅞	13¼ @13⅜	59⅜	32⅝	4.65 @4.70	4.50 @4.52½	5.47½ @5.52½
8	13⅝ @13⅞	13¼ @13⅜	$58\frac{15}{16}$	32⅝	4.65 @4.70	4.50 @4.52½	5.47½ @5.50
9	13⅝ @13⅞	13¼ @13⅜	$59\frac{7}{16}$	32¾	4.65 @4.70	4.50 @4.52½	5.45 @5.50

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The further break in the stock market at New York was again reflected by a decline in standard copper at London. Moreover some large lots of refined copper in the hands of speculators were thrown over. The conditions finally led some of the selling agencies here to make concessions in their prices, and electrolytic copper has been freely offered at 13½c. delivered 30 days, to domestic manufacturers and at the same price, c.i.f. for delivery in Europe, these terms being equivalent to about 13.30@13.35c. net cash, New York. At the lower level more interest was shown by domestic consumers, but the business transacted was of relatively small volume. Sales for export have also been small. Business in Lake copper has been quite insignificant. The market closes unsettled at 13⅝@13⅞c. for Lake copper, and 13¼@13⅜c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13⅛@13⅜ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill.

The standard market was depressed throughout the week, sales of both spot and future taking place for several days below £59 and £60 respectively. On Wednesday, the market reacted slightly in anticipation of the statistics which are to be published on Feb. 10, and which are expected to make a most favorable showing. The close is cabled as firm at £59 8s. 9d. for spot, and £60 6s. 3d. for three months.

Refined and manufactured sorts we quote: English tough £63; best selected, £63@£63 10s.; strong sheets £73@£74 per ton.

Copper exports from New York and Philadelphia for the week were 5815 long tons. Our special correspondent gives the exports from Baltimore at 2961 tons.

Tin—Transactions in the London market during the week under review have been particularly small. Neither the bull nor the bear party displayed any interest and therefore the market presented a very dull appearance. The close is steady at £147 15s. for spot and £149 7s. 6d. for three months.

With the exception of a little more activity among dealers toward the end of last week, the domestic market remains as dull as it has been right along. Spot tin seems to be more plentiful and the premium is gradually disappearing. At the close tin can be bought at 32¾ cents.

Lead—Due to liberal offers from St. Louis, the market is somewhat weaker and closes at 4.50@4.52½c. St. Louis, and 4.65@4.70c. New York.

The London market is unchanged at £13 7s. 6d. for Spanish lead, and £13 10s. for English lead.

Spelter—On account of the entire absence of buying of any kind, the market is in very bad shape. Sellers have been reducing their prices daily, without being able to interest consumers. At the close the market is weak and nominal at 5.60@5.65c. New York, and 5.45@5.50c. St. Louis.

New York quotations for spelter Feb. 3 were 5.75@5.80c.; Feb. 4, 5.70@5.75c.; Feb. 5, 5.65@5.70c.; Feb. 7, 5.62½@5.67½c.; Feb. 8, 5.62½@5.65c.; Feb. 9, 5.60@5.65 cents.

The London market is unchanged, the close being cabled at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc on Feb. 7 was again reduced ¼c. per lb., and is now $7.50 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The A. B. Cockerill Smelting Company, which owns works at Bruce, Gas City, Laharpe and Pittsburg, Kan., and Nevada, Mo., has passed into the charge of the bondholders; represented by the National Bank of Commerce, of St. Louis, and George E. Nicholson, of Kansas City. Only the Altoona and Gas City plants are in operation at present.

Other Metals

Antimony—The market is dull, with sales only of small quantities. Prices are unchanged. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7⅝@7⅞c. named for outside brands.

Aluminum—Current quotations are 21@22c. per lb., for No. 1 ingots.

Quicksilver—The market is easier. New York quotations are $50 per flask of 75 lb. for large lots. Jobbers ask 70c. per lb. for small quantities. San Francisco, $49@50 for domestic and $2 less for export orders. The London price has been reduced to £9 10s., with jobbers selling at £9 7s. 6d. per flask.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 200-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, 10 months ended Oct. 31; reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.	
Pig and manuf. iron	25,064	50,345	I.	25,181
Copper	11,745	14,139	I.	2,394
Copper precipitate	16,879	14,839	D.	2,040
Lead	158,000	155,986	D.	2,014
Zinc	1,886	1,584	D.	302
Quicksilver	1,805	1,490	D.	315
Minerals.				
Iron ore	6,339,310	6,460,604	I.	121,294
Manganese ore	18,843	10,782	D.	8,061
Copper ore	986,708	934,067	D.	52,641
Lead ore	2,603	3,185	I.	582
Zinc ore	98,745	106,119	I.	7,374
Pyrites	1,228,576	1,141,758	D.	86,818
Salt	495,842	486,294	D.	9,548

Imports of phosphates, 140,163 tons in 1908, and 147,417 in 1909; increase, 7254 tons.

Zinc and Lead Ore Markets

Platteville, Wis., Feb. 5—The base price of 60 per cent. zinc ore opened at $47 and closed at $45 per ton; lead ore $56@55 per ton.

SHIPMENTS, WEEK ENDED FEB. 5.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	690,000	....	....
Platteville	617,780	....	230,300
Benton	370,850	....	....
Harker	320,353	....	....
Highland	249,800	...	....
Council Hill	160,000	....	....
Rewey	66,000	....	....
Montfort	60,000	....	....
Cuba City	......	88,000	....
Total	2,534,783	88,000	230,300
Year to Feb. 5	7,734,780	702,229	1,556,980

There was also shipped during the week to the separating plants 2,461,820 lb. zinc concentrated.

Joplin, Mo., Feb. 5—The highest price reported paid for zinc sulphide ore was $48 per ton, the assay base ranging from $45 down to $40 per ton of 60 per cent. zinc. Zinc silicate ore sold highest at $28, the general base being $22@26 per ton of 40 per cent. zinc, but some scrap lots were picked up on a $20 base. The average price, all grades, was $41.46. Lead ore sold as high as $55, with some ore selling at $53@54. A few bins of ore shipped this week brought as high as $57, being sold before the decline in price. The average price, all grades, was $54.22 per ton.

Demoralization of the zinc ore market continued up to the week-end, but the closing down of a number of mills tonight brought the downward trend to a sudden end, and today's market indicated more strength than has been apparent this year.

SHIPMENTS, WEEK ENDED FEB. 5.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,058,720	1,257,090	$119,488
Joplin	1,755,390	223,550	46,409
Duenweg	840,000	91,660	40,137
Alba-Neck	547,750	......	12,598
Aurora	416,300	83,770	10,351
Galena	418,120	54,240	10,231
Carthage	381,400	......	8,772
Granby	378,770	7,600	6,240
Badger	240,080	35,460	6,238
Miami	149,940	152,560	5,692
Spurgeon	266,830	37,320	4,475
Cave Springs	162,630	......	3,496
Quapaw	104,970	39,350	3,161
Jackson	116,180	......	2,439
Carl Junction	96,090	......	2.113
Totals	10,033,170	1,982,600	$261,840
6 weeks	59,705,840	11,074,440	$1,648,204

Zinc value, the week, $208,072; 6 weeks, $1,333,316
Lead value, the week, 53,768; 6 weeks, 314,888

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56 99
February	36.94	......	34.37	......	50.50	......
March	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Feb. 9—There is little change in the general market, which continues steady, with some tendency to improve.

Copper Sulphate—The market is firm and there is no deviation from recent prices, which are $4.10 per 100 lb. for carload lots, and $4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—Quotations are steady at 2.10c. per lb. for spot and 2.07½c. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on Feb. 1 as below, in long tons:

	1909.	1910.	Changes.	
Stocks, Jan. 1	9,140	14,000	I.	4,860
Imports Jan	14,800	31,200	I.	16,400
Total supplies	23,940	45,200	I.	21,260
Deliveries Jan	18,890	26,800	I.	7,910
Stocks, Feb. 1	5,050	18,400	I.	13,350
Afloat for U. S. ports	99,300	106,500	I.	7,200

Quantities afloat include all cargoes due to arrive at United States ports by May 15 next.

Arsenic—Domestic production is said to show a slight increase; foreign dealers are unable to sell at as low a price as American dealers offer. Quotations are easier, at $2.62½@2.75 per 100 lb. for white arsenic.

Mining Stocks

New York, Feb. 9—The general stock markets have been depressed and the break of last week continued, with heavy declines in quotations on trading largely professional. Amalgamated Copper, Steel common and American Smelting were leaders in the decline, touching the lowest prices made for some time. At the close there was a rally, but the turn was not heavy.

On the Curb also there was depression and general losses in quotations. The copper stocks were weak, led by Miami and Nevada Consolidated. Other stocks shared in the general fall, which seemed to reach all divisions of the market.

Boston, Feb. 8—Copper shares have been weak and at times the market for them was demoralized in sympathy with the erratic movements of Wall Street stocks. Through it all Lake and North Lake shares have held fairly firm. Quotations might have been wide at times but any attempt to buy these shares always caused sharp advances in price. Indiana has been much in the same position. This specialty has been taken from the Curb and put on the unlisted department of the Stock Exchange, as has Ray Consolidated.

North Butte is behaving better and no attempt is being made to force the price. Severe declines have been recorded in Amalgamated and other copper stocks, due to forced selling and lack of support, which has given them the lowest prices for a long period.

Arizona Commercial after a very pretty spurt to around $44, broke to below $40. This decline was due to the conversion of bonds into stock and the marketing of the stock in anticipation of the exchange. There has been some exchanging of Calumet & Arizona into Granby Consolidated stock although there has been little price variation in the former, while the latter has broken some $8 per share.

Oneco and South Lake have shown sympathetic weakness on the Curb. The feature of the week's trading on the Curb was the break in Eclipse Oil from $1 to 25c. on the selling out of loans.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II, 1909	103,700,81	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
II, 1909	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	....	248,236,800	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1909.	New York. 1910.	London. 1909.	London. 1910.
January	51.750	52.375	23.843	24.154
February	51.472	......	23.706	......
March	50.468	....	23.227	......
April	51.428	...	23.708	......
May	52.90	...	24.343	......
June	52	...	24.166	......
July	51 [illegible]	...	23.519	......
August	51.125	...	23.588	......
September	51.440	......	23.743	......
October	50.923	....	23.502	......
November	50.703	......	23.351	......
December	52.226	.. ..	24.030	. ...
Total	51.502	....	23.726	....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1909.	New York. Electrolytic 1910.	New York. Lake. 1909.	New York. Lake. 1910.	London. 1909.	London. 1910.
January	11.893	13.620	14.280	13.870	61.198	60.923
February	12.919		13.295		57.688	....
March	12.387		12.826		56.231	
April	12.56[illegible]		12.93		57.363	
May	12.893		13.238		59.338	
June	13.214		13.548		59.627	
July	12.880		13.363		58.556	
August	13.007		13.296		59.393	
September	12.870		13.210		59.021	
October	12.700		13.030		57.551	
November	13.125		14.354		58.917	
December	13.298		13.647		59.9[illegible]6	
Year	12.982		13.335		58.732	

New York, cents per pound. Electrolytic is [illegible] or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	......	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York. 1909.	New York. 1910.	St. Louis. 1909.	St. Louis. 1910.	London. 1909.	London. 1910.
January	4.1[illegible]5	4.700	4.025	4.582	13.113	13.650
February	4.018	......	3.868	......	13.313	......
March	3.986	......	3.845	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	... ..	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1909.	New York. 1910.	St. Louis. 1909.	St. Louis. 1910.	London. 1909.	London. 1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	......	4.739	......	21.563	......
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

COLO. SPRINGS Feb. 8

Name of Comp.	Bid.
Listed:	
Acacia	.05⅞
Cripple Cr'k Con.	.02⅞
C. K. & N.	.10
Doctor Jack Pot.	.08⅜
Elkton Con	.69⅝
El Paso	.66¾
Fannie Rawlins	.06
Findlay	.10⅞
Gold Dollar	.10
Gold Sovereign	.03¾
Isabella	.19¼
Mary McKinney	.46
Pharmacist	.03⅛
Portland	1.04¾
Vindicator	.76
Work	.06¼
Unlisted:	
Golden Cycle	1.40
United Gold Mines	.09½

S. LAKE CITY Feb. 8

Name of Comp.	Clg.
Carisa	.48
Colorado Mining	.79
Columbus Con.	.92
Daly Judge	4.40
Grand Central	1.72½
Iron Blossom	.85
Little Bell	‡1.92½
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	2.02½
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.60
New York	‡.13
Prince Con	.80
Red Warrior	‡6.00
Silver King Coal'n	2.75
Sioux Con	.36
Uncle Sam	.43
Victoria	1.00

SAN FRANCISCO Feb. 8.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Atlanta	16
Belcher	1 25
Best & Belcher	75
Caledonia	.46
Challenge Con	28
Chollar	26
Confidence	1 15
Con. Cal. & Va	1.77
Crown Point	1 25
Exchequer	30
Gould & Curry	35
Hale & Norcross	57
Mexican	1 70
Ophir	2 00
Overman	65
Potosi	73
Savage	45
Sierra Nevada	72
Union	80
Yellow Jacket	1 25

Name of Comp.	Clg.
MISC. NEVADA	
Belmont	1.27
Jim Butler	.11
MacNamara	.26
Midway	22
North Star	01
West End Con	21
Atlanta	.14
Booth	.10
C.O.D. Con	.05
Columbia Mt	.03
Comb. Frac	.31
Goldfield Belmont	.90
Goldfield Daisy	‡.98
Jumbo Extension	.23
Oro	03
Red Hill	03
Sandstorm	.05
Silver Pick	07
St. Ives	.12

N. Y. EXCH. Feb. 8

Name of Comp.	Clg.
Amalgamated	70⅜
Am. Agri. Chem.	40½
Am.Sm.&Ref.,com	76½
Am. Sm. & Ref., pf.	105⅝
Anaconda	45¾
Bethlehem Steel	28
Col. & Hock. C. & I.	17¼
Colo. Fuel & Iron.	33⅝
Du Pont P'd'r, pf.	85
Federal M. & S.	78
Great Nor., ore ctf.	65
Nat'nalLead,com.	75⅛
National Lead, pf.	108
Pittsburg Coal	19
RepublicI&S,com.	33¼
Republic I & S, pf.	99
SlossShelli'd,com.	73
Sloss Sheffield, pf.	116⅛
Tennessee Copper	30⅜
Utah Copper	44¼
U. S. Steel, com.	75¼
U. S. Steel, pf.	117⅝
Va. Car. Chem.	47⅞

N. Y. CURB Feb. 8

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	16⅞
Braden Copper	4½
B. C. Copper	6⅞
Buffalo Mines	3½
Butte Coalition	23½
Chino Copper	11¼
Cobalt Central	.18½
Combination Fra.	.27
Con. Ariz. Sm.	2 1/16
Cumberland Ely	9
Davis-Daly	3⅛
Dominion Cop.	7
Ely Con	.81¼
El Rayo	2½
Florence	2⅝
Gila Copper	7¼
Giroux	9⅜
Gold Hill	1¾
Goldfield Con	7 1/16
Greene Cananea	9⅛
Guanajuato	1¾
Guggen. Exp.	230
Kerr Lake	.08⅞
La Rose	4¼
McKinley-Dar-Sa.	.79
Miami Copper	22
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	1 1/16
Mont.-Tonopah	.70
Nev. Utah M. & S.	1 5/16
Newhouse M. & S.	3½
Nipissing Mines	9¾
Ohio Copper	3 13/16
Pacific Sm. & M.	1⅛
Silver Queen	.21
Standard Oil	635
Stewart	½
Tonopah	6⅜
Tonopah Ex.	.67
Tri-Bullion	1⅛
Utah Apex	5⅛
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4 13/16

LONDON Feb. 9

Name of Com.	Clg.
Dolores.	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 8 3
Esperanza	2 18 9
Tomboy	0 17 6
El Oro	1 8 0
Oroville	0 9 6

BOSTON EXCH. Feb. 8

Name of Comp.	Clg.
Adventure	[illegible]¼
Allouez	42
Am. Zinc	50½
Arcadian	7
Arizona Com	37½
Atlantic	8¾
Boston Con	17¼
Calumet & Ariz.	70
Calumet & Hecla.	623
Centennial	22½
Con. Mercur	.10
Copper Range	75¾
Daly-West	8½
East Butte	9½
Franklin	19
Greene-Can.	9
Hancock	24½
Isle Royal	20⅛
Keweenaw	4½
La Salle	15¼
Mass	7
Michigan	6½
Mohawk	64
Nevada	20¾
North Butte	34
Ojibway	9¼
Old Dominion	40
Osceola	145
Parrot	20
Quincy	80
Shannon	14½
Superior	50
Superior & Bost.	13¼
Superior & Pitts.	13¼
Tamarack	71
Trinity	8⅝
U. S. Smg. & Ref.	42¾
U.S.Sm. & Re., pd.	49½
Utah Con	35¾
Victoria	4½
Winona	9½
Wolverine	136
Wyandotte	2½

BOSTON CURB Feb. 8

Name of Comp.	Clg.
Ahmeek	200
Bingham Mines	2¼
Boston Ely	3¼
Calaveras	5⅝
Champion	.08
Chemung	10½
Chief Cons	2⅛
Chino	11¼
Corbin	.09
Cactus	4¼
Crown Reserve	3⅝
First Nat. Cop.	4⅝
Gila Copper	7¼
Indiana	‡34½
Inspiration	8 1/16
Majestic	.85
Ray Central	2⅞
Ray Con	20⅜
Rawhide Coal	.14
Rhode Island Coal	9½
San Antonio	6½
South Lake	11¼
Trethewey	1½
Vulture	9
Yuma	1⅜

ST. LOUIS Feb. 5

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	.06
Center Cr'k	2.00	1.75
Cent.C.& C.	85.00	84.00
C.C. & C. pf.	84.00	83.00
Cent. Oil	105.00	100.00
Con. Coal.	20.00	19.00
Doe Run	110.00	100.00
Gra. Bimet.	.32	.30
St. Joe	13.00	12.00

‡Last quotation.

Assessments

Company.	Delinq.	Sale.	Amt.
Adventure Con. Cop., Mich.	....	Feb. 1	$1.00
Arcadian Copper, Mich.	....	Mar. 1	0.50
Argenta, Ida.	Feb. 10	Mar. 10	0.001
Bader, Cal.	Feb. 24	Mar. 14	0.10
Bullion, Nev.	Jan. 11	Mar. 1	0.05
Caledonia, Cal.	Feb. 16	Mar. 9	0.10
Challenge Con., Cal.	Feb. 17	Mar. 10	0.10
Hancock Min., Mich.	....	Feb. 1	1.00
King Philip Copper, Mich.	Mar. 10	....	1.00
Maxfield, Utah	Jan. 31	Feb. 19	0.00½
Mexican, Cal.	Feb. 21	Mar. 17	0.15
New Arcadian, Mich.	Mar. 10	....	1.00
Ojibway, Mich.	Mr.Oct.	....	2.00
Oneco, Mich.	Feb. 15	....	1.00
Rexall S. & C., Utah	Feb. 13	Mar. 15	0.01
Savage, Nev.	Feb. 10	Mar. 8	0.10
Sheba Gold & Silver, Utah	Jan. 19	Feb. 23	0.05
Utah Ideal, Utah	Feb. 1	Feb. 20	0.00¼
Wabash, Utah	Feb. 21	Mar. 15	0.05
Western Monitor, Utah	Feb. 1	Mar. 1	0.00½
Winona, Mich.	Mar. 10	....	1.00

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CIRCULATION STATEMENT

During 1909 we printed and circulated 34,500 *copies of* The Engineering and Mining Journal.

Our circulation for January, 1910, was 10,000 *copies.*

February 5	11,000
February 12	9,500
February 19	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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The Copper Statistics for January

If the stocks in the hands of American refiners are to decrease by 43,300,000 lb. per month, as they did in January, the incubus upon the market would soon be removed. We are not, however, under any illusion as to the meaning of the last statistics, which are far from being as favorable as they appear; although even after they have been correctly interpreted it must be conceded that they are sufficiently good to satisfy a pessimist.

Production decreased a little, as was anticipated, owing to the same refinery troubles that occurred in December. Domestic deliveries increased largely and foreign deliveries surprisingly. Neither of these figures measures actual consumption. Of the domestic deliveries probably 10,000,000 lb. went to swell the stocks in manufacturers' yards. In the foreign deliveries speculative and arbitrage transactions played a large part, and acceptance of some large shipments having been forced, much of this metal will appear in the European stocks, visible and invisible. But notwithstanding all this there was a substantial diminution of the accumulation in January by the drafts for actual consumption and upon this the trade is to be congratulated.

The production in February and March will probably be curtailed by the troubles that the smelters have been experiencing from the wintry weather. With consumption going on apparently at an increasing rate the stocks should show a further decrease, and it is hoped that consumption will attain such a rate by spring as to absorb the production at full rate and cut further into the surplus on hand.

The Ely Central Promotion

We have been sued by B. H. Scheftels & Co., a corporation, for $750,000; and by B. H. Scheftels for $100,000. According to a statement in a daily newspaper, purporting to have been given at the office of the complainants, these suits are brought on account of alleged libel in an article in the Journal of Nov. 6, 1909; also in previous articles.

The Journal is a newspaper, and as such its duty is to tell the truth. The Journal is especially the newspaper of the mining industry and it speaks for the best interests of that industry. The industry suffers from the machinations of loose promoters, whose purpose is to foist upon the public mining property at fictitious value, by misrepresentation and false statements. The scandals and loss of money that arise from such operations, with their trail of misery, hurt legitimate mining, and in defense of legitimate mining we have spoken and shall continue to speak, fearlessly telling the truth. The Ely Central promotion was a flagrant case and we told the truth about it.

Ely Central was a raw prospect represented as a mine. Two days before these suits were brought we received a letter, which we published in the Journal of last week, from H. C. Wilmot, a reputable engineer, telling of his resignation from the managership of the company in the following words: "After five days of active managament I became convinced that daily 'dope' was required by certain stockholders for publication purposes and that daily favorable development facts were necessary to their stock manipulation. As I did not wish to be connected with this sort of thing, I have resigned and shall have nothing further to do with the company."

Several weeks ago the company put down a drill hole from the bottom of the shaft that it is sinking and it has been reported that this drill hole disclosed good ore and proved the property to be a mine. About this Mr. Wilmot said the following:

"Scheftels & Co.'s market letter dated Jan. 29 stated: 'On the morning of his first visit, therefore, Mr. Wilmot had a mine turned over to him.' I wish to state that it was not a mine but a prospect, and furthermore that the above statement is absolutely unwarranted and misleading.

"In a telegram, signed by me, to the New York office, for their sole information, I stated that the last 20 ft. of drill hole was in porphyry similar to that found in Nevada Consolidated's pit. Contrary to my understanding, this statement was sent out and a layman would naturally interpret it as meaning porphyry ore of commercial value, whereas such is not the case, the porphyry being very silicious and low in copper contents.

"In closing I would add that the property is yet a prospect and the stock a gamble and not an investment as some people undoubtedly have been led to believe."

Mr. Wilmot has told the truth, as we told it. If the truth be libel, let them make the most of it!

Prospecting by Churn Drilling

Churn drilling is now the fashionable method of exploring ore deposits lying approximately flat, which, of course, is the only class to which it is adapted. This, and its analogue—diamond drilling—were introduced into the Rocky mountain region from Missouri, but neither in the southeast nor southwest of Missouri were they ever relied upon as showing more than the existence of mineralization. The character of the mineralization remained for the old-fashioned methods to determine. Actual stoping to the drill holes showed too many cases of a rich hole being so because it had chanced to intersect an uncommonly good patch or a poor hole where the drill had happened to go through a mere lean spot. Moreover, in the assaying of low-grade stuff the errors of the analyst, perhaps the errors of his methods, may amount to a large percentage, whereas they would be comparatively insignificant on high-grade stuff. Particularly is this the case with zinc and lead ore. The danger is less with copper ore, but nevertheless should not be dismissed from consideration. The development of the copper deposits west of the Rocky mountains by churn drilling has led to many improvements over the art practised in Missouri, but even so, when we think of the millions of tons of definite assay that are regarded as proved by one little hole in a tract of 200x200 ft., we are inclined to hesitate and wonder if stoping results will really be so good and if the old-fashioned methods of development may not have been discarded too soon in the desire to "get rich quick."

The Connellsville Coke Situation

Since the end of 1909 the Connellsville coke market has been in a condition anything but satisfactory to the operators. In the fall production was pushed, and quotations were run up to high figures, cokemakers relying on the great activity at the furnaces, and believing that the ironmakers would be obliged to buy their supplies at any price that might be asked. The event has proved that they overestimated the demand. It also showed that an old rule in the trade still works; in periods of dullness a number of furnaces will look for cheaper coke, buying from West Virginia and from Pennsylvania ovens outside of the Connellsville district. This year the high prices kept many of these furnaces from returning to the Connellsville makers.

In 1907 the highest weekly production of Connellsville coke was 425,000 tons; in November and December, 1909, the weekly average was about 450,000 tons, and this was enough to meet all demands. In January many furnaces began to have the usual winter troubles, reducing the coke consumption, while during those months also much coke was stored in furnace yards. This was not unusual, as coke is piled up in order to avoid danger of short supplies in case of delays in transportation from snow and other incidents of the winter. This time the stocking was greater than usual, because many furnaces had contracts expiring with the year, which could be renewed only at a considerable advance. Thus there was less coke needed in January; nevertheless the weekly production was pushed up to an average of 475,000 tons. Even this is below the capacity of the region; with the new ovens built since 1907 500,000 tons weekly can be made without difficulty. Coke is being piled up at many plants, and makers are seeking for customers.

The result has been a heavy fall in prices. In December, $3—in some cases $3.25—at ovens was asked for furnace coke on contracts. In the last five weeks the contract price has declined to about $2.25, and stocked coke for early delivery has been offered as low as $2. This indicates a fall which is serious for many plants, especially as wages at mines and ovens were advanced last month on the strength of the November-December boom.

The result will probably be the closing down of some of the plants. There is talk of a general curtailment of output, but such agreements are always difficult to secure. The Frick company controls the greater part of the coke ovens; but its production depends chiefly on the demands of the Steel Corporation, of which it is a subsidiary. The question of regulation depends on the outside companies, and they can seldom be united in any policy. The only way in which contraction can be enforced is by the continued fall in prices making it unprofitable for certain plants to run. The present prospect is not favorable, especially as the iron industry promises a decrease rather than an increase in consumption.

The margin between the prices for spelter and zinc in ore have lately been favorable to the smelters, who have found it profitable to sell spelter at the decline to such extent as the market would take it and cover their sales by purchases of ore. The smelters have had a lean business for upward of two years and it cannot fairly be denied that they are entitled to their turn to have some of the milk and honey. The fact that a better margin now exists is evidence that supplies of ore from other quarters than the Joplin district are abundant, notwithstanding the duty on foreign ore.

Metallics

In the present pyritic smelting practice f the Tennessee Copper Company at :opperhill, Tenn., coke forms 4 per cent. f the total charge fed the furnaces. A oncentration of 4.5 to 1 is made in the rst smelting.

Mine surveyors are beginning to apreciate the use of loose-leaf notebooks or mine surveying. The loose-leaf book llows the surveyor to carry only such ata as he may need and to carry in the ne book the notes for any number of orkings. Further, an accident does not ivolve a great number of notes, and the ecessity of copying notes is avoided.

The management of the El Oro comany in Mexico is planning by the use of lditional tube mills to increase the stamp ıty so as to be able to dispense with the ompany's No. 1 works, crushing with o. 2 works all of the ore that was ormerly crushed by both works. The ractical outcome of this arrangement will watched with interest in connection ith the problem of maximum mill capaty.

At Austinville, Va., the cinder from the nc-oxide furnaces is used on the dam oove the power plant. This material has een found to hold fairly well, for as it ecrepitates it mixes with the mud or diment carried by the river to form a mpact watertight mass. Six men are le to put from 30 to 40 tons of this marial on the dam each day, and besides rving to keep up the dam facility is proded for disposing of the cinder.

The importance of good blacksmithing a mine cannot be overrated. Where drills do not follow they are bound to ck in the holes, and this means that drillman will endeavor to right mats, and also give vent to his feelings, by mmering the steel. This practice works voc with the machine besides bending steel. Also improperly tempered ills besides being a source of constant noyance, greatly reduce drilling effincy and increase the cost of sharpen the steel.

Calaverite, sylvanite and krennerite are best defined gold-bearing tellurides. laverite carries the highest percentage gold, containing gold, 39 to 44 per cent., d silver, 1 to 3½ per cent. When telides are heated on charcoal they give white coating and color, the reducing me green. When heated in a thin glass e they give a white or grayish sublite of terrurium dioxide, which may be sed to a pale yellow or colorless liquid. finely powdered and heated with contrated sulphuric acid tellurium gives eddish violet color. Upon cooling and uting the color disappears and a dark cipitate of tellurium will form.

By the Way

The Journal was unable to publish a certain company report lately on account of the lack of a sufficient number of letters to form the words "we hope" in the quantity required.

This is paraphrased from the Philadelphia *Record*: "See here, you swindler," exclaimed the investor, "when you sold me this mining stock you said that in three months I wouldn't part with it for $10,000." "Well, you haven't, have you?" retorted the promoter.

How times change! But a few short moons since for an engineer to use the word "porphyry," except he burdened it with descriptive terms, was to make his associates look askance at him and shun him as one who smacked of the "practical miner." But since the rise of the "Porphyry Coppers" to social prominence, no mining man should be without one.

A trammer asked the boss for some powder to open a hung-up chute. "No," said the boss, "You fellows are blowing too many of our chutes into the drift. Use a bar." Some hours later the boss visited the spot and found the trammer cheerfully smoking "Peerless" at his car under a hopelessly (as far as a bar was concerned) clogged chute. "I didn't break no chute," said the trammer.

W. H. Cutten says, *Min. Journ.*, Dec. 4, 1909, "The commercial ill fortune which has been the portion of so many gold-dredging companies of London origin may be put down to several causes; first, overloading of capital of companies to an extraordinary degree; gross ignorance in management and administration, and last, but not least, utterly unsuitable machines." Why "London?"

We abstract a plaintive wail from the *South African Min. Journ.* "Sir,—I notice, on looking through my article in last week's issue, that the 'intelligent comp.' has been 'at it again.' Please correct a few of the errors: 'Silicia' should be 'silica,' 'fluxible' should be 'fusible,' 'Ziermogel' should be 'Ziervogel,' 'silicerous' should be 'siliceous,' 'antimonites' should be 'antimonite,' 'Omalia' should be 'Omaha.' No doubt my wretched 'fist' has had something to do with the matter." And echo answers, "No doubt."

Someone has defined a "practical miner" as one who practises the errors of his predecessors. The beauty of sayings of this kind, like proverbs, is that one can be hatched up to fit any desired circumstances, and it will carry more weight by its very brevity and terseness than should really be attached to it. The practical miner, like some who are not so practical, has his limitations and is extremely apt to possess a lop-sided view point, but in the general scheme of industry he fills a place that is all his own and that is of first importance. In other words, he is the man that digs; and while some mines have been made without digging, the promoters of several of them are in jail.

The report of a certain mining company reached our desk this morning, and if this report is allowed to roam at large it may upset many pet theories as to the functions of the consulting engineer. Listen, all ye who have marveled over magmatic segregations, endogenic movements, feldspathic constituents, etc. The consulting engineer of this company did absolutely nothing but tell what was on and in the property in question, and what was done during the year covered! And he told it plainly!! And when he spoke of the future of the property, he gave his reasons and his words evidenced that he had faith in his own conclusions!!! Deep down in our heart the feeling grows that perhaps that is what his company paid him for after all.

Colliers Weekly says that Artemus Ward, after insisting upon Mark Twain's drinking a whisky cocktail, discoursed on mining as follows: "You know the vein, the ledge, the thing that contains the metal, whereby it constitutes the medium between all other forces, whether of present or remote agencies, so brought to bear in favor of the former against the latter, or the latter against the former or all, or both, or compromising the relative differences existing within the radius whence culminate the several degrees of similarity to which——."

To which Mark replied as follows: "Oh, hang my wooden head, it ain't any use!—it ain't any use to try—I can't understand anything. The plainer you get it the more I can't get the hang of it."

By seeing both sides and the middle of discussions as they pass through our hands, we, on the Journal, acquire the habit of perspective that often enables us to note phases of a question which are not apparent to a partisan. For instance, should a mining enginer report for the vendors? It is a pretty question of ethics with much (oh, very much) to be said on both sides. But the mining industry, to flourish, must have mines, and we venture to suggest that many present-day producers would still be prospects if it depended upon the investor to pay for professional advice at the outset. Public opinion to the contrary, we have met several promoters who are not crooks, and hope to meet some more. Does not the general good of the industry count in such questions? And isn't it better for a vendor to have a report from a reputable engineer (for he will have a report) than to be forced to call to his aid someone to whom the fee is the only point to be seriously considered?

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS AND THE EXPERIENCES OF READERS

The Strength of Wire Ropes

Referring to the article in the JOURNAL of Jan. 29, entitled "Wire Ropes in Colliery Practice," by R. H. Rowland, I have read this with much interest and can indorse his observations with regard to the comparative merits of the plow-steel and milder steel ropes for hoisting purposes.

The wear of such ropes from "fatigue" resulting in crystallization of the wires, to which Mr. Rowland refers, I think is not due so much to excessive bending as to the constant and sudden additional stresses due to acceleration in starting and retardation in stopping, although I am ready to admit that the sheaves used are frequently too small.

In regard to the statement that at many mines hoisting ropes are made of steel, of 160 tons per sq.in., and even upward, I presume that this must be an error, as 160 tons per sq.in. is about the limit of tensile strength of wire used in the construction of wire ropes.

There are three standard grades of steel rope listed as cast steel, extra strong cast steel and plow steel, and which are composed of wires having an ultimate strength varying according to the size of the rope from 160,000 to 190,000 lb. per sq.in. for the cast steel, from 200,000 to 220,000 lb. per sq.in. for the extra strong cast steel and 225,000 to 275,000 lb. per sq.in. for the plow steel. Other steel ropes, listed with fancy names, are made of special grades of steel wire of higher tensile strength than that used for plow steel, but seldom over 150 tons per square inch.

Mr. Rowland states that the ultimate strength of a wire rope of seven-wire strands is 95 per cent. of the aggregate ultimate strength of the wires, and that the ultimate strength of a rope composed of wires laid in three planes is 90 per cent. of the aggregate ultimate strength of the wires. By the latter we understand that Mr. Rowland means the standard hoisting ropes of six strands of 19 wires each (12 around 6 around 1), and ropes of the Seale construction, which are also made in six strands of 19 wires each, in which the wires are of two sizes (9 large around 9 small around 1 large wire).

The test of wire ropes made by the United States Government and others, however, indicates that the ultimate strength of a wire rope of seven-wire strands is 90 to 92 per cent. of the aggregate ultimate strength of the wires, and for ropes of 19-wire strands from 80 to 85 per cent., the latter having a wider range corresponding with the wider range of the sizes made.

LOCKED-COIL ROPES NOT USED FOR HOISTING

In comparing ropes of the locked-coil construction with the ordinary ropes of the cast-steel and plow-steel grades, Mr. Rowland would lead one to infer that such ropes are used for hoisting purposes, which is not the case. What is known as the locked-coil cable is a special form of cable made by the Trenton Iron Company expressly as a track cable for aërial tramways of the Bleichert type, in sizes varying from ⅞ to 1½ in. in diameter, and is never used as a running rope under any circumstances. Mr. Rowland doubtless intended to refer to what is known as the patent locked-wire cable, which is used largely as a track cable for cable-hoist conveyers such as are built by the Lidgerwood Manufacturing Company. These cables are similar in construction to the locked-coil cables as far as the outside wires are concerned, but they are made of comparatively finer wires, and in sizes up to 2½ in. in diameter. The use of these ropes or cables for hoisting purposes, however, is not advocated.

Mr. Rowland cites an example of a plow-steel rope of 4-in. circumference, or about 1¼ in. in diameter, which he says one rope maker lists as having an ultimate tensile strength of 90 tons. I do not know who this maker may be, but the lists of the rope makers in this country place the ultimate tensile strength of 1¼ in. plow-steel rope at 67 tons, the same as the patent locked-wire rope, which is considered too high by many.

It is now proposed to put the ultimate strength of plow-steel rope at 58 tons, which would correspond to an ultimate tensile strength of the wires of 110 tons per sq.in. Assuming, however, that the rope has an ultimate tensile strength of 67 tons and the area is 1.227 sq.in., the ultimate strength of the rope would be equivalent to an ultimate stress of 54.6 tons per sq.in. of the rope's sectional area, not 73.3 tons.

Mr. Rowland assumes the tensile strength of plow-steel wire as 110 tons per sq.in., and then comparing this with the ultimate tensile strength per sq.in. of the rope's sectional area, arrives at the conclusion that there is a loss of efficiency of 33.4 per cent. in plow-steel ropes. This is misleading, as no account is taken of the hemp core which adds little or no strength to the rope. The aggregate area of the wires of 1¼-in. standard hoisting rope of 19-wire strands is 0.617 sq.in., or about one-half the rope's sectional area. An ultimate strength of 67 tons, therefore, would correspond to an ultimate strength of 108.6 tons per sq.in. of wire. The ultimate tensile strength of the wires in such a rope will be about 128 tons per sq.in. The loss of efficiency, therefore, would be about 15 per cent., and not 33.4 per cent.

The patent locked-wire cable has no hemp in its construction, but is made entirely of steel wires having an ultimate tensile strength of 140,000 lb. per sq.in., and has a wire sectional area of about 95 per cent. of the area of a solid bar; it is evident, therefore, from this, that Mr. Rowland's conclusion as to the loss of efficiency for the locked-wire cable is far from correct.

WILLIAM HEWITT.

Trenton Iron Company, Trenton, N. J., Feb. 7, 1910.

Gowganda Ore Shipments

Permit me to correct a statement which appeared in the JOURNAL, page 286, Jan. 29, relative to the first shipment of ore from Gowganda camp which was made on Jan. 1 by the Millerett mine, formerly known as the Blackburn. The Cobalt correspondent states that this shipment consisted of 20 tons high-grade and 10 tons medium-grade ore, the latter assaying about 500 oz. These figures and assays must have been invented by some person in Cobalt as the shipment in question contained approximately 35 tons of ore, averaging over 3300 oz. in silver. There was no medium-grade ore at all. I might add that the Millerett mine also shipped, on Jan. 20, about 30 tons of ore slightly lower in grade than the first shipment and a third shipment similar to the second will be made the latter part of this week.

G. M. COLVOCORESSES.

Superintendent, Millerett Silver Mining Company, Ltd.

Gowganda, Ont., Feb. 8, 1910.

Amortization in Mine Finance

With reference to J. Parke Channing's ble address, "The Safety of Judicious lining Investments," which appeared in ie JOURNAL of Jan. 22, permit me a ew remarks on that part of the adress which deals with amortization. I gree with Mr. Channing that it is not roper for a company to start a fund to eturn the capital represented by the sued shares. This principle can hardly e applied in practice, as correctly pointed ut by Mr. Channing, nor can it be conidered sound finance. The share is not bond, i.e., an obligation on the part of ie debtor (government, city, railroad or ther corporation) to pay both principal nd usually a fixed rate of interest to ie holder.

When sharing in the business of a orporation, every investor must decide or himself whether his shares will yield ufficient interest and return the original rincipal. In mine finance, where the ining property frequently represents he most valuable asset, and companies re capitalized in proportion to that aset rather than to the actual cash reuired to put the property on a paying asis, it would be decidedly unfair to he stockholder to burden the company vith a return fund, which properly beongs to the stockholder as a dividend.

The amortization principle, however, hould be applied to all capital exenditures for plant and equipment, and uch expenditures should be charged vith 5 per cent. interest. A longer life han 10 years should not be given reluction works, as even in cases where he life of a plant is longer than that, he works are apt to be obsolete at the xpiration of this term, due to the rapid rogress in the art.

Applied in this manner, amortization nd interest charges may easily be igured and become a fixed portion of he operation costs for each ton of maerial treated. This charge per ton is btained by dividing the cost of plant by the number of years of its life multiplied by the average annual capacity, and this charge can be fixed once for all for a certain plant. It should not be applied on works in their entirety, but on each department of such works separately, to obtain the true costs of operation in each department.

For instance, in copper mines and reduction works it should be applied to the mine equipment, the railroad and rolling stock, the concentrating mill, roasting, reverberatory smelting, blast-furnace smelting, converter departments, etc., as frequently not every department can be alloted the same life, and the cost of each department bears a different relation to the tonnage and particular product treated therein than the cost of the entire works bears to the total tonnage treated.

On a basis of 10 per cent. amortization and 5 per cent. interest on the capital invested, we have the following approximate charges in some of our largest and most modern copper-reduction works:

	Amortization.	Interest.	
Concentrating ..	15c.	7½c.	per ton of ore milled.
Blast furnace, smelting	12c.	6c.	per ton of neutral charge smelted.
McDougal furnace, roasting.. ...	8c.	4c.	per ton of concentrates roasted.
Reverberatory, smelting.......	10c.	5c.	per ton of charge smelted.
Power plant (20 years).........	4c.	2c.	per ton of neutral charge smelted.
Converting.......	34c.	17c.	per ton of matte treated.
Converting.......	3c.	1½c.	per ton of neutral charge smelted.

The above principle is not so easy of application in the mine itself, and can be met only by accumulating a cash reserve and keeping development work and ore reserves ahead of requirements. The tonnage of such reserves is naturally subject to great variations, depending mainly on the character of the ore deposit, whether this is uniform and its continuation can be counted upon with a fair degree of safety, or whether it is subject to fluctuations and variations in quality and quantity. This is a point every mine management must decide for the individual case in question.

Since it has become the practice to create ore reserves mainly to create market values for the shares, this practice has in many instances reached a point where its economy is questionable, involving as it does a large outlay of capital. I speak, of course, from the standpoint of the investor who buys mining shares as an investment and holds them for their earning capacity, and not for the purpose of profiting by liquidation when the shares rise in market value. To do the first, he must know what he is buying and be convinced that he has become part owner of a mine which is ably managed and holds every promise of returning his capital investment with a fair interest. To him the market value of the share should be of secondary importance. To the man who buys in the spirit of the gambler, the market value is the main thing.

This, unfortunately, is still the *ordre du jour* rather than the exception, and will not be abated so long as we have not more stringent laws as to the duties directors owe to their stockholders, and as to the enforcement of publicity, giving the essential facts in reference to the condition of the company's property and business.

Where amortization charges are not included in the operating costs, and as a consequence the stockholder receives a larger dividend distribution (frequently done to "enhance" the value of the stock), it can truly be said that he is getting more than he is entitled to, or the company can afford to pay him. Sooner or later the company will be called upon to make heavy cash outlays with a possible total cessation of dividend payments, and occasionally companies have experienced difficulties for want of such conservatism and had to cease operations. The safer plan is to pay smaller but steady dividends, and conduct the enterprise so that it is self supporting.

It goes without saying, that as these amortization and interest charges accumulate, the company can invest them in railroad, government or other bonds, or other securities which can be readily marketed whenever this cash has to be expended to keep the enterprise at the required point of efficiency.

These remarks refer only to the original outlay on plant in launching an enterprise. An increase in the size of such works in order to yield larger earnings, being a capital outlay, should be covered by a further issue of shares or bonds, and should not be paid out of the earnings of the intial establishment, these belonging properly to the subscribers of the initially issued shares.

HERBERT HAAS.

San Francisco, Cal., Jan. 31, 1909.

The Temple Iron Company

I want to take exception to the statement in the JOURNAL of Feb. 5, 1910, page 310, in which a correspondent summarizes the Government's brief in the anthracite trust suits. It is stated as an explanation to paragraph 7 that "The Temple Iron Company is a small concern, owning a blast furnace and one or two small collieries."

As a matter of fact, and of record, the Temple Iron Company has a capital of $2,500,000, and a bonded indebtedness of $1,250,000 or more. Besides its blast-furnace business near Reading, it operates five collieries directly, and two more by ownership of controlling interests in the Sterrick Creek Coal Company and the Lackawanna Coal Company, Ltd. These collieries are as follows, the production given being for the year 1907, from the last published report of the Department of Mines of the State of Pennsylvania:

North West colliery, production, 120,529 tons; Edgerton, 73,467; Mt. Lookout, 209,613; Forty Fort, 282,298; Harry E., 299,957; Sterrick Creek, 538,599; Lackawanna, 270,248; total, 1,794,711 tons.

R. V. NORRIS.

Wilkes-Barre, Penn., Feb. 14, 1910.

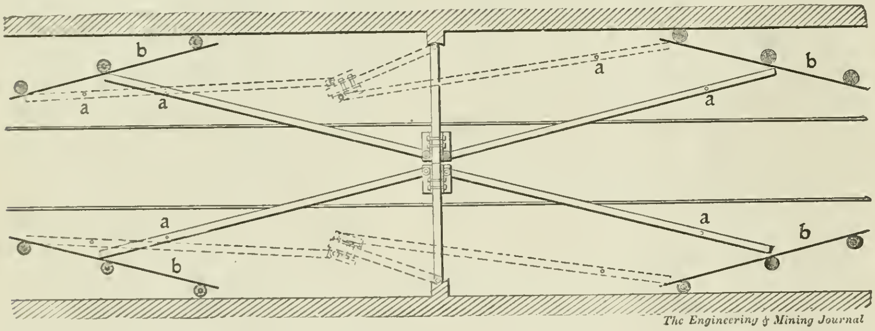
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES ◆ THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Automatic Mine Doors

A self-closing mine door which may be automatically opened by the train coming from either direction is described in *Glückauf*, Nov. 20, 1909. Referring to the accompanying sketch, the doors have lugs fastened on each side at a hight of about 1 m. from the floor. To these lugs are hinged iron bars. The free ends of these bars are suspended by chains attached to the roof of the drift and fastened to the bars at *a a*. When the train comes in contact with the bars, the ends of the bars slip along the oblique iron plates *b b*, forcing the doors open as shown by the dotted lines. After the train passes the weight of the chains draws the doors shut.



SELF-OPENING AND-CLOSING MINE DOORS

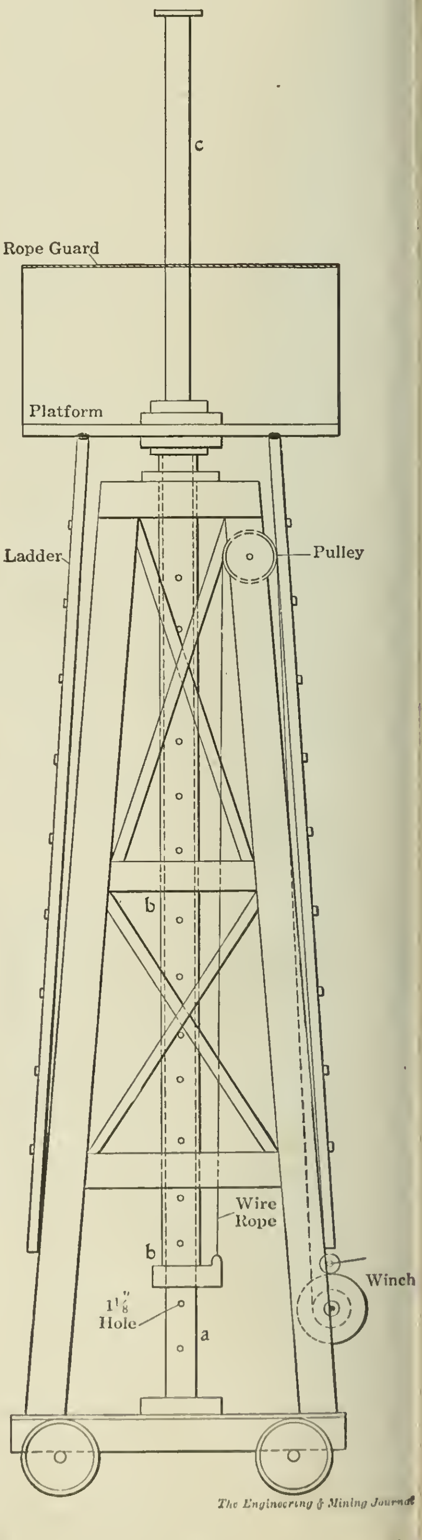
Dressing Plates without Hanging Up

A system which permits the dressing of plates without hanging up the stamps is in use on the Langlaagte Estate, South Africa. It consists of placing a board across the top of the table which diverts the pulp over the back of the table to a launder which runs beneath the plate. This launder carries the pulp to a separate plate table kept for the purpose. Ordinarily the pulp is prevented from flowing over the back of the table by a strip of wood, the pulp overflowing this strip when the "dam" is put in place.

Portable Scaffold for Mine Use

A portable scaffold for barring down loose rock in mines with high roofs is shown in the accompanying illustration and has been in use a number of years at Desloge, Mo. It is the invention of Thomas Fisher, who has applied for a patent on same.

In the lead mines in southeast Missouri, the roof is, in many cases, 30 or 40 ft. high and the examining and barring down of the roof is a difficult matter. In many cases a wooden scaffold is built temporarily for use at any desired place. This, however, is expensive, and the moving from place to place is a hard task. The scaffold referred to here is built upon an ordinary mine car truck. The wooden scaffold is 4 ft. square at the bottom and 2 ft. square at the top. The posts are 2x6 in. and 2x4 in., nailed together to form a 6x6-in. angle. The hight may be varied to suit the conditions. A steel plate, 4 ft. square, forms a base to which the derrick is fastened. In the center of the plate is a flange, securely bolted, to which is fastened a 4-in. pipe *a* that extends to the top of the derrick. A 5-in. pipe *b* is placed over this one and on top of the 5-in. pipe is a flange to which is bolted a platform, 4x4 ft. On top of the platform and in the center is another flange to take a 3-in. pipe *c*, which is 6, 7 or 8 ft. long as the case may require. The upper end of *c* has a cap which is similar to the one used on an ordinary drill bar. The entire top platform is lifted by means of a windlass with a ½-in. wire rope which runs over



MINE SCAFFOLD USED AT DESLOGE, MO.

a pulley and is attached to the bottom of the pipe *e*. The bar *c* is forced against the roof by means of this windlass and held in place by a 1⅛-in. pin through the pipe *a*. To make it still more secure wedges are occasionally driven in between the pin and the flange on *b*. In the bottom of the upper platform are two manholes through which the men climb from the adders.

With this arrangement the roof may be barred down 10 or 12 ft. on each side of he track. The apparatus may be constructed so that a roof 40 ft. high can be horoughly examined. The car is easily moved by either horses or men, as it is not exceedingly heavy and is on the regular tracks upon which the ore is transported.

Liquid Assay of Gold

By Robert De Luce*

The following wet process for the assay of gold enables the mining man to carry a portable outfit to the remote mine or prospect. The necessary apparatus can be carried in a suit case and need not weigh over 15 lb. The process is as ollows: Make up a solution of 100 parts water, two parts iodine resublimate, and our parts potassium iodide. This solution is a rapid solvent for gold. Weigh out one assay ton of pulp, and transfer o a porcelain mortar. Add 50 cc. of the odine solution, and grind for 10 minutes. Allow the mixture to stand for one hour o insure the solution of all gold in the ore. Should it turn clear in the meantime, there is an excess of reducing agent in the ore and more of the solvent must be added till the brown color of he solution remains permanently.

Next filter and wash iodine solution rom the pulp; add three grams of mercury to the filtrate and shake vigorously n a glass-stoppered bottle till the solution clears. The gold will be precipitated rom the solution and amalgamated with he mercury. Transfer mercury to a porcelain evaporating dish, wash with clean water, add 10 cc. of nitric acid and warm gently till vigorous action commences. The mercury will collect in one globule and then finally all dissolve, eaving the gold in a compact bead. Pour off the nitrate of mercury and wash the old bead with distilled water if available; if not, ordinary water slightly acid with nitric will do. Finally dry over lamp. The bead can be weighed as soon as dry f a balance is available. Where there is no balance available there are a number of other methods that can be used. Harkorts ivory scale for blowpipe beads may be used; also the microscope method described by Beringer in his text book of assaying. But for the ordinary prospector the following method is probably accurate enough. A number of beads of different values are made and weighed on a delicate balance. They are then mounted on a card with glue and used to compare in size with those obtained in assaying with the above process.

This method is adapted to all ores that can be successfully treated by amalgamation, cyanide, or chlorination processes. With certain variations it may be adapted to almost any ore. For an ore rich in copper, a preliminary treatment with nitric acid to remove the copper is suggested.

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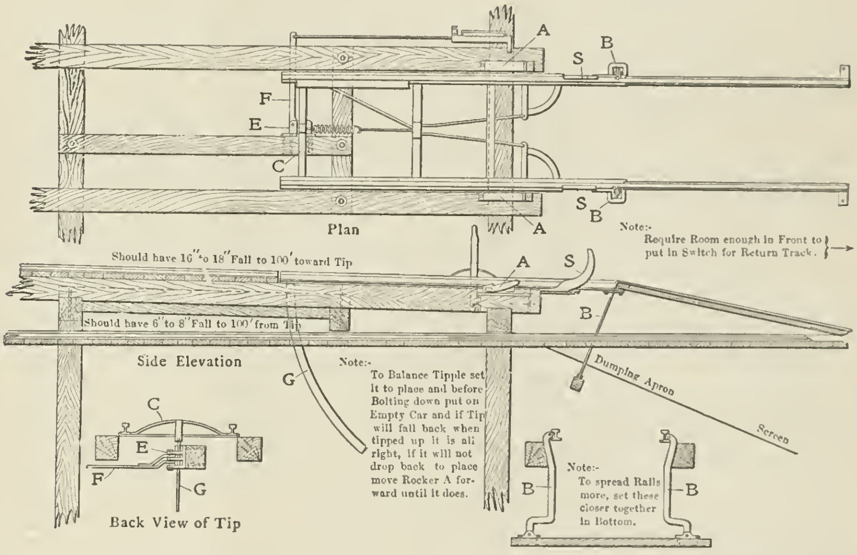
*Manager, Castle Dome Mining and Milling Company, Dome, Yuma county, Arizona.

A Satisfactory Coal-Mine Tipple

There are a great number of different designs for coal tipples. In many European mines and in some American plants revolving tipples are used. One disadvantage of the revolving type is due to the fact that the coal is thrown harder and therefore is broken more than with the ordinary dumping type of tipple. A simple and satisfactory design for the latter style of dump is shown in the accompanying drawing. The drawing is complete and the parts are so lettered that the diagram is easily understood.


A
S
B
F
E
C
S
B
A
Plan
Note:-
Require Room enough in Front to put in Switch for Return Track.
Should have 16" to 18" Fall to 100' toward Tip
A
S
B
Should have 6" to 8" Fall to 100' from Tip
Side Elevation
G
Note:-
To Balance Tipple set it to place and before Bolting down put on Empty Car and if Tip will fall back when tipped up it is all right, if it will not drop back to place move Rocker A forward until it does.
Dumping Apron
Screen
C
E
F
G
Back View of Tip
B
Note:-
To spread Rails more, set these closer together in Bottom.
B
The Engineering & Mining Journal, N.Y.

Design for a Coal Tipple

Concrete Water Column

At one of the shafts of the Continental Zinc Company, Joplin, Mo., the water contains so much sulphuric acid that an iron water column will not last more than 30 days. The amount of water to be pumped is about 800 gal. per min. The water contains ¼ oz. sulphuric acid per cubic foot and 3¼ oz. soluble sulphates. A hole 16 in. in diameter was drilled from the surface with a Star No. 23 drill, to a depth of 208 ft. A 10-in. casing was then inserted, leaving an annular space of 3 in. between the pipe and the solid ground. This annular space was then filled with neat cement and allowed to set, making a solid concrete tube from the surface to the pump station. The pump used was a 12x24-in. Scranton lined with brass. A flexible joint with brass discharge connected with the bottom of the cement column. The cement column was used for several months until a cave in the mine destroyed it.

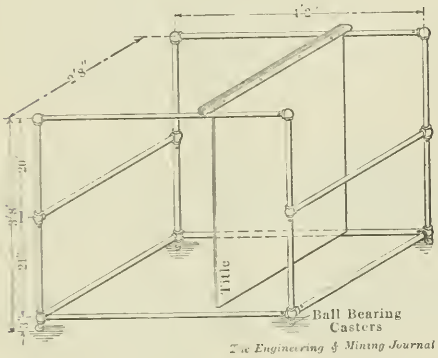
A Convenient Rack for Holding Drawings

In many engineering offices it is necessary to have on file a large number of drawings which can be referred to easily, and the method of filing the drawings so that they are readily and quickly accessible is one of great importance. The scheme here referred to was described by John H. Gregory, in the *Engineering Record*, Dec. 25, 1909. It should be stated that the method is hardly suitable for tracings or brown-paper drawings, as those are best filed flat in cases having shallow drawers. It is especially applicable to the filing of blue prints or other reproductions which do not exceed a certain prescribed maximum size or which can be folded so as not to exceed this size.

A movable rack, in which the blue prints could be filed vertically, was constructed in accordance with the details shown in the accompanying illustration. As will be seen, the rack was constructed of 1-in. standard-weight wrought-iron pipe, put together with malleable-iron railing fittings, with right- and left-hand threads as shown. Unions or right- and left-hand couplings are not desirable, as they would mar the appearance of the rack, and on the upper rails would be an inconvenience.

For binding a set of drawings together hickory strips were used, the strips being all bored to a templet so as to be interchangeable. Care should be taken to have the heads and nuts of the machine screws countersunk in the strips a little more than flush so that they will not scratch or mar the tops of tables or desks when moved around.

One length of screw can be used, but it will be found more convenient to have three lengths kept in stock, ½-in., ⅝-in. and ¾-in. A supply of pressboard fillers, punched to fit the binding strips, should also be kept on hand to fill out the space between the strips so that the nuts will not project.



The Engineering & Mining Journal

TUBULAR RACK FOR DRAWINGS

The rack shown in the cut was designed to hold drawings having a maximum size of 30 in. wide by 40 in. long. Small drawings are easily held if they have a binding edge at least 10 in. long. It is preferable, however, to have the sheets all of the same size. If it becomes necessary to file larger prints, they should be folded from the top or right-hand side, or both, as the case may be, and held with strong paper fasteners. In making prints for this method of filing it is well to have a little extra margin on the left-hand edge so that none of the drawing will be concealed when bound in a set.

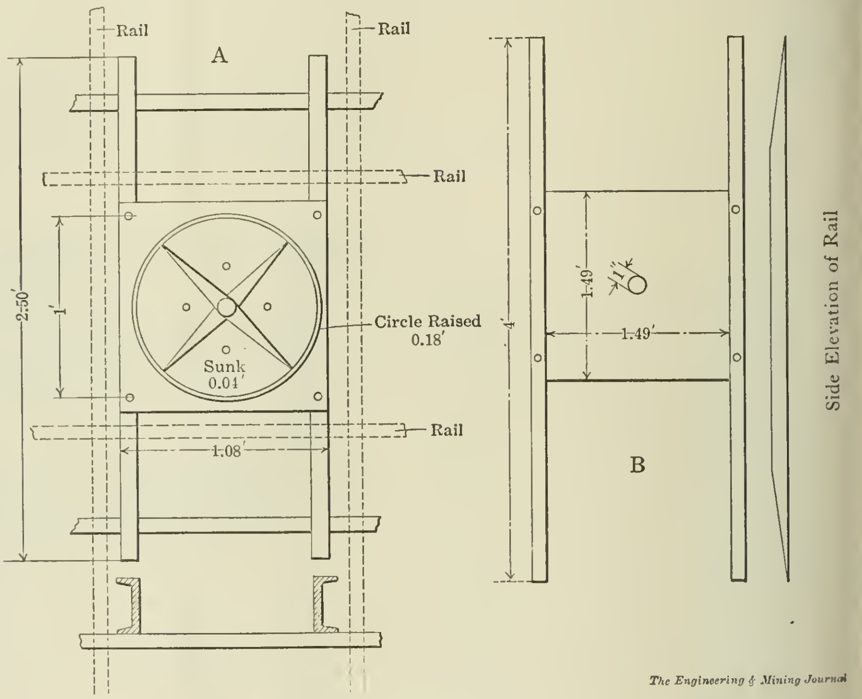
Each set should be numbered or marked at each end so that it may be readily picked out. Small brass fittings for holding marking cards could be countersunk in the ends of the strips, but it will be found to serve the purpose sufficiently well if the identification marks are lettered on heavy paper and affixed with shellac and then coated over with shellac.

A. F. Crosse has invented a new slime process briefly described as a combination of air agitation and decantation in a pair of concentric cones. Mr. Crosse has worked out the process experimentally and a working-scale test was made recently at the Robinson mine, Transvaal.

Turntable for Mine Cars

By Fred T. Williams.* . . . .

A turntable of temporary or movable nature which is convenient for use when driving short headings off the main haulageway, is illustrated in the accompanying sketch. When the heading is known to be of sufficient value to justify a switch the turntable is supplanted and moved to another part of the mine. It is also valuable in close quarters in heavily timbered ground when it is not safe to remove timbers to make room for a switch.



The Engineering & Mining Journal

TURNTABLE FOR MINE CARS

The bed *A* is bolted to channels and the whole sunk so that the top of the raised circle is flush with the top of the rails. The turning part of the device, *B*, consists of a plate, 0.03 ft. thick, to which 4-ft. sections of rails are bolted and the bolts countersunk. When needed, *B* is placed on the bed *A* and held by a bolt through the center. Thus the rails of the table are superimposed on the rails of the crossing tracks, and a car run upon them may be swung in any desired direction.

Storing Compressed Air in a Natural Rock Receiver

At one of the mines in the Rossland district there are two electrically driven compressors with a combined capacity of 7500 cu.ft. of free air per min. These machines, described by C. Sangster in *Power*, Dec., 1909, are equipped with automatic unloading devices which operate when the pressure reaches 100 lb. per sq.in. The idea of sealing up an unused crosscut in the mine and making of it a large underground air receiver was successfully carried out. The crosscut was roughly 9 ft. high, 6 ft. wide and 400 ft. long and was driven through solid rock which showed no cracks nor seams. The bulkhead was built of concrete, 10 ft. thick and carefully pointed on the inner side with strong cement. A 6-in. pipe connection and a manhole were built into the bulkhead; the manhole being sealed the same as a manhole in a boiler. When tested, it was found that this natural receiver lost only 10 lb. in 18 hours; one or two very small leaks around the bulkhead no doubt accounted for this loss.

The capacity of this crosscut is not less than 22,000 cu.ft. In free air compressed to eight atmospheres, it will hold 176,000 cu.ft., or the entire output of the compressors for 23 min. Allowing that one-third of this air is available at a working pressure, as cited, ten drills could be operated for 50 or 60 min. after the compressor was stopped.

The advantage of such a large storage is noticeable in the engine room. It tends to balance the rapid fluctuations in the load, the compressor and rope drive run more steadily and the unloaders cut out less often. The motors are not subjected to the strains of the load being constantly thrown off and on. In the mine, a hoisting engine or a group of drills may be thrown on or off without seriously affecting the air pressure. In short, it stores and restores the air, piling up a reserve when a machine is stopped and giving it back when a sudden call is made.

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*Mining engineer, Park City, Utah.

The California Oil Situation

SPECIAL CORRESPONDENCE

The output of oil from California has, in the past, been largely controlled by the Standard Oil, Associated Oil and Union Oil companies. According to a former high official of the Associated, this company was originally formed by producers of the Kern River district at a time when the Standard was offering 12c. per bbl. for oil. After the association was formed it was found impossible to get sufficient capital to provide transportation facilities, and thus finally the Southern Pacific Company absorbed a controlling interest under a pooling agreement with the stockholders which kept the Southern Pacific out of control insofar as the board of directors was concerned. It afterward became necessary to obtain large financial help to build additional pipe lines, and at that time the Southern Pacific asserted itself, dissolved the pool agreement and is now in absolute control of the Associated Oil Company.

Thus the first attempt of the producers to obtain reasonable prices by marketing the oil themselves came to naught but several years ago when oil was again at a nominal price, only 15c. per bbl., some of the best posted producers got together for their own protection and formed an agency which, with frequent accessions, grew to be what is now known as the Independent Agencies. About three years ago, the contracts with the Associated and Standard having expired, the Standard refused to submit any offer and the Associated became the sole buyer. It was then that the Union Oil Company stepped in with an offer which compelled the Associated to pay the price asked by the Agencies, and a three-year contract was made which has just expired. The Union Oil Company is a large producer and appears to be working in harmony with the Independent Agencies.

To the Standard, cheap oil from the producer means more money from the refined product; to the Associated, cheap oil from the producer means cheap oil for the Southern Pacific; to the Union and the Agencies, high prices for oil mean dividends for both. At the present time, out of the daily output of 165,000 bbl., the Standard is producing only about 5000 barrels.

The Producers Transportation Company, affiliated with the Independent Agencies, is now building a pipe line to Port Harford and expects to be ready to transport oil from McKittrick and Coalinga to tidewater by the last of February. This company has storage facilities for 2,000,000 bbl. or more and advocates having a large permanent supply of oil on hand so as to do business with large consumers. The United States Government has a board of inquiry on the coast with a view of adopting oil as the fuel for government vessels, and the Japanese have men in the field with the same end in view. Not much can be done, however, until it can be shown what can be depended upon in the way of a permanent supply. A meeting of the independent producers is scheduled for March 1 at Bakersfield. There have recently been many accessions to the Independent Agencies and it is daily growing stronger.

The pipe line of the Associated Oil Company from Coalinga to Monterey has been clogged up for some weeks owing to the cool weather. In consequence, oil has accumulated at Coalinga to the amount of several hundred thousand barrels. After the month of February, much of this oil will be transported by the Producers' Transportation line to Port Harford. The Associated has, however, recently closed a contract with the Claremont Oil Company for 70,000 bbl. per month for 5 years, at 50c., and is reported to have a contract with the American Petroleum Company for 7000 bbl. per day for about 3 years at 60c. per barel.

The town of Santa Barbara is driving a long tunnel for its water supply through the Santa Inez range about 4 miles northwest of the town. Oil sand was struck recently in this tunnel, 5000 ft. from its north portal and 1400 ft. vertically below the surface. Miners and other employees have since filed many oil claims covering the surface above.

Reverberatory Furnace Practice[*]

By W. A. HEYWOOD[†]

Mr. Ricketts' paper on the reverberatory-furnace practice at Cananea is particularly valuable to all interested in copper smelting, as he gives the costs of smelting, not only with the more favorable oil fuel but with coal. Costs of reverberatory smelting have been difficult to obtain. The large American works that have done so much to improve the size and efficiency of the reverberatory furnace and have so generously given the details of construction and operation to all interested, have, for business reasons, published little concerning the actual cost of smelting.

The cheapest reverberatory smelting I am familiar with was accomplished at the Highland Boy smeltery, in Utah, at a cost of $1.40 per ton. In blast-furnace smelting in Tennessee, the cost was 96c. per ton of ore, with coke costing $3.85 to $4.30 per ton and including the cost of about 20 per cent. of barren quartz necessary for flux. At Granby, the cost of smelting self-fluxing ore, with coke costing about $5.75, was $1.20 per ton of ore smelted. I have no doubt that recent improvements in automatic feeding and increasing the size of the furnaces have still further reduced this remarkably low cost for blast-furnace smelting, notwithstanding their high costs for coke and labor.

FAVORABLE CONDITION OF MATERIAL SMELTED

Much has been written as if there were a rivalry or competition between the blast furnace and the reverberatory. Each furnace has its own province, and is superior under certain conditions. Mr. Ricketts' paper shows clearly some of those conditions. That the cost of smelting in a reverberatory at Cananea is less than in a blast furnace is due to the fact that the material smelted is largely in a fine state of division, either concentrates or flue dust. The paper does not state the cost of smelting coarse ore alone in the blast furnace. For low cost of installation, large tonnage smelted, simplicity of operation, low fuel consumption, thermal utilization of the sulphur, more powerful oxidation annd low cost of smelting, the blast furnace presents many advantages over the reverberatory on ores for which it is suitable, i.e., the greater proportion of the world's copper ores.

It hardly seems possible that the warmest advocate of the reverberatory furnace would take coarse sulphide ore, pay the cost of crushing, and 35c. for roasting in McDougal furnaces, and then smelt in reverberatory, using 20 to 25 per cent. of fuel, when the ore could be smelted with 5 to 10 per cent. of fuel at a much lower cost in a blast furnace. Yet I have seen this practice followed.

On the other hand, the modern blast-furnace plant at Cerro de Pasco, Peru, has given unsatisfactory results principally on account of the large proportion of fines in the ore causing small tonnage and heavy flue-dust production. With roasting in McDougals and reverberatory smelting, using the blast furnace for the coarser ore, the Cerro de Pasco plant is now producing a large quantity of copper at a remarkably low cost (reported at 6c. per lb.). Many works that started as blast-furnace plants have found the economy of adding a reverberatory for the treatment of fine ore and flue dust. The field of economic superiority of the blast furnace has been increased by the use of the different sintering processes for concentrates and fine sulphides.

EFFECT OF BASIC-LINED CONVERTERS

The field has also been increased by the basic-lined converter. Roasting in McDougal furnaces and smelting in reverberatories will give a matte of the tenor desired for the converter plant. Blast-furnace smelting of unroasted ore often gives a matte of too low grade for converting by the former methods with silicious linings. With basic lining 10 per cent. copper mattes were successfully converted in Butte, in 1905, at the plant of the Pittsburg & Montana Copper Company, and the process has now been adopted in the Garfield plant of the American Smelting and Refining Company.

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[*] Discussion of L. D. Ricketts' paper on "Reverberatory Practice at Cananea." read before the Institution of Mining and Metallurgy.

[†] Metallurgist, 4 Broad Street place, London, Eng.

Notwithstanding these improvements, the reverberatory furnace will always have a sphere of usefulnes and be superior to blast furnaces under certain conditions.

The Innoko Placer District, Alaska

The latest report[1] on Alaskan placer mining by the Geological Survey covers the Innoko gold-placer district, with accounts of the central Kuskokwim valley and the Ruby Creek and Gold Hill placers. The new Haiditarod district is also mentioned.

The Innoko is a tributary of the lower Yukon and the Haiditarod is a tributary of the lower Innoko. The Kuskokwim is, next to the Yukon, the largest river in Alaska. Most of the placers considered in the report are on small streams in areas that drain into the lower Yukon or the lower Kuskokwim, and their occurrence is interesting because it proves that the formations of the upper Yukon gold belts extend much farther southwest than has generally been supposed and that they are gold bearing at many scattered localities throughout their extent.

The Innoko district has attracted much attention during the last two years and produced $300,000 in gold in 1909. The other areas considered in the report are now being exploited, though with less prospect, apparently, of large results.

Placers of Haiditarod Valley.

The newly found gold placers in the Haiditarod district, which were discovered in the summer of 1909 but have not been visited by a representative of the Geological Survey, may prove to be more important than those on the headwaters of the Innoko. Placer gold has also been found on Otter creek, which flows into the Haiditarod. Sufficient prospecting appears to have been done in this region to indicate the presence of a pay streak 50 to 70 ft. wide, in which the gold is rather uniformly distributed.

The information at hand indicates that these placers lie in what would be an extension of the Innoko auriferous zone. So far as they have been prospected the gold seems to be more evenly distributed than on the Innoko. The above information appears to form the basis for the stampede to the Haiditarod which took place from Fairbanks and other points in Alaska late in the summer of 1909. The fact that gold has been found also on the Toluksak, a tributary of the Kuskokwim, in what appears to be an extension of the same belt as that of the Innoko and Haiditarod, makes this general field attractive to the prospector.

The report gives an account of the routes of travel, outlines the geology and describes the placer-gold localities, and states the source of the gold.

The Crown Reserve, Cobalt

The Crown Reserve Mining Company, of Cobalt, Ont., owns 23 acres of mining property and leases the adjoining property of the Silver Leaf Company, comprising 35 acres. The report of the company for the year ended Dec. 31, 1909, states that 4,034,325 oz. silver were produced, of a gross value of $2,080,156. This was obtained from 756.9 tons of high-grade ore with an average content of 4784.7 oz. per ton, 2332.3 tons of low-grade ore carrying 148.4 oz. per ton, and 3093 oz. bullion which was 869 fine. This production was about one-sixth of the output of the Cobalt district.

Dividend Policy Unchanged

Five dividends, amounting to $1,238,170, were paid and the company closed the year with a surplus of $549,275. Reduced to terms of days, Crown Reserve is earning $4000 and paying nearly $3500 in dividends every day in the year. The president says that the policy for 1910 will be to continue the regular 24 per cent. dividend and 36 per cent. bonus, and to gradually increase the surplus. The company is producing silver at a cost of 10⅓c. per oz., and has a complete plant, $65,403 being spent in equipment in 1909. The total amount of development on the property is 4932 ft. and about 12,500 sq.ft. of vein have been stoped. About one-fifth of the property has been developed.

COSTS AT CROWN RESERVE.

Smelting charges and deductions	$184,671
Ore handling and marketing	39,984
Mining and development	97.718
Power and light	29,827
Maintenance	13,664
Mine, general expense	19,389
Superintendence	12,332
Head office	4,226
Depreciation (20 per cent.)	14,330
	$416,141

PROFIT AND LOSS.

Income.	
Balance from 1908	$347,117
Ore production	2,080,156
Interest	3,929
	$2,431,202
Disbursements.	
Mining	$265,813
Freight and treatment	184,671
Bonus to employees	12,612
Net royalty	180,661
Dividends	1,238,170
	$1,881,927
Surplus	549,275
	$2,431,202

The operating costs are subdivided in an accompanying table, and the balance sheet and profit and loss accounts are also given herewith.

The most important vein is the Carson, but a total of 24 veins has been discovered. The Carson vein has been opened by two winzes which penetrate the Keewatin at about 175 ft. The manager, Mr. Cohen, states that this vein became smaller, more shattered and somewhat lower in grade when it entered the Keewatin, but still contained rich ore although "it cannot be said that the vein at this level is as phenomenal as it was in the conglomerates above." The east winze is being sunk to the 300-ft. point.

The No. 2 vein, about 25 ft. north of the Carson, is about 3 in. wide and has produced about 70,000 oz. silver from a stope 115 ft. long and 15 ft. high at the 100-ft. level. No. 14 vein is about 3 in. wide and the ore is spotty. One small stope yielded 30,000 oz. silver.

BALANCE SHEET, DEC. 31, 1909.

ASSETS.	
Mining lands, minerals, mining rights, buildings, plant and equipment	$2,085,015
New buildings, plant and equipment (1909)	65,403
Stores and supplies on hand	9 287
Ore on hand	50,000
Due from smelter	395,983
Cash on hand and in bank	313,401
Acconnts receivable	1,715
	$2,920,804
Liabilities.	
*Capital stock	$1,999,957
Royalty accrued and accruing to government	87,549
Accounts payable, current	18,701
Dividend No. 7, due Jan. 15, 1910	265,322
Surplus	549,275
	$2,920,804

*231,143 fully paid up shares of $1 each of this amount are held by trustees for the benefit of the company.

Next in importance to the Carson vein is the No. 17 vein. This vein is better at the 200-ft. level than at the 100, and shows 150 ft. of rich ore from 1 to 6 in. wide at this level. It has yielded 250,000 oz. silver from development work. A winze is being sunk on the No. 24 vein below the 100-ft. level. This vein produced 150,000 oz. silver from a drift 130 ft. long and a stope 5 ft. high above the drift.

Cannot Measure Ore Reserves

Manager Cohen refuses to estimate the ore reserves on account of the irregularity and extreme richness of the veins. He says, however: "The mine to date has produced roughly 5,800,000 oz., of which the Carson vein has produced in development below the 100-ft. level 800,000 oz. and the other veins a total of 500,000 oz., so that the stope above the 100-ft. level on the Carson vein has produced about 4,500,000 oz. There is still as much ore left at this level on the Carson vein alone as has been extracted and the whole stope between the 100- and 200-ft. levels is practically intact. Besides this, veins Nos. 2, 14, 17 and 24 have rich oreshoots blocked out, and some of the other veins will be good producers."

He recommends that stoping be done on veins Nos. 2, 14, 17 and 24, and the smaller veins be developed at the 100-ft. level; that the Carson and No. 17 veins be exploited to the 300-ft. level and that crosscuts be run the entire length of the property at 500-ft. intervals on the 200-ft. level.

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[1] *Bull.* 410 U. S. Geol. Surv., by A. G. Maddren.

The United States Mint in 1909

Coinage executed at the United States Mint for the year 1909 was:

Gold:	Pieces.	Value.
Twenty dollars...	2,988,707	$59,774,140.00
Ten dollars......	598,753	5,987,530.00
Five dollars......	4,382,098	21,910,490.00
Two-and-a-half...	441,899	1,104,747.50
Total gold.....	8,411,457	$88,776,907.50
Silver:		
Half dollars......	5,058,050	2,529,025.00
Quarters.........	16,442,650	4,110,662.50
Dimes...........	14,481,650	1,448,165.00
Total silver....	35,982,350	$8,087,852.50
Copper and Nickel:		
Five cents.......	11,590,526	579,526.30
One cent........	117,686,263	1,176,862.63
Total minor....	129,276,789	$1,756,388.93
Grand total....	173,670,596	$98,621,148.93

The mint also coined for the Philippines 7,578,000 pesos; 528,000 fifty-centavo pieces, or half pesos; 450,000 twenty-centavos; 312,190 ten-centavos; 1,737,612 one-centavo pieces; a total of 10,605,811 pieces, having a value of 7,980,596.02 pesos. In addition the Mint made 693,170 pesos for San Salvador.

Detailed County Surveys of West Virginia

The West Virginia Geological Survey has just issued a volume describing the minerals, soils, physical features, coal beds and oil and gas pools of Marshall, Wetzel and Tyler counties, together with topographic, geologic and soil maps of that entire area in a single sheet on a scale of one mile to the inch. The data and maps are in great detail. Bore-hole records and structure features are given, showing the oil and gas pools developed to the end of 1909 and the line of disappearance of the Pittsburg coal. The price, including the case of maps, is $2. Copies of the topographic and geologic maps mounted on muslin for office use may be had for $1.50 each or $2.50 for both, express prepaid, from the office of the survey at Morgantown.

Correction

In the JOURNAL of Jan. 8, page 112, in the table of ore reserves in Gold Coast and Ashanti mines, the tons should have been marked as short tons (2000 lb.) except in the case of the Ashanti goldfields. Note *b* refers to the Bibiani reserves and not to those of the Ashanti Goldfields. On page 115, Table VII, the footnote should read, "includes 1s. 3d. reserve gold declared."

Colorado Fuel and Iron Company

This company owns coal mines, iron mines, blast furnaces and steel works in Colorado; coal and iron mines in Wyoming and New Mexico. It is the largest iron producer west of the Mississippi. The report for the year ended June 30, 1909, shows that it has outstanding $34,235,500 common and $2,000,000 preferred stock; $20,834,000 bonded debt. The debt was increased by $889,000 during the year.

The production statement for the year is as follows, in short tons:

	Production.	Used by Co.	Sales.
Coal...............	4,094,352	1,798,004	2,296,047
Coke...............	645,545	477,912	167,633
Iron ore...........	580,784	580,784	....
Limestone	363,975	363,975	....
Iron and steel ...	1,682,794	1,340,756	359,793

As compared with 1907-8 there were decreases of 184,743 tons coal; 144,445 coke; 66,485 iron ore; 27,153 limestone; 394,437 tons iron and steel. The coal used last year in making coke was 1,125,165 tons, showing a consumption of 1.74 tons to the ton of coke. Stocks on hand decreased during the year. The iron statement does not separate pig iron and finished products; the pig iron made is largely used in the steel plant.

The income account for the year condensed is as follows:

	Earnings.	Expenses.	Net Earnings.
Iron department.	$12,058,229	$ 9,952,935	$2,105,294
Fuel department.	7,889,910	6,894,936	994.974
Denver retail.....	596,492	379,931	16,561
General expenses	....	215,818	....
Total	$20,344,631	$17,443,620	$2,901,011
Interest, etc. received..................			445,761
Total income..........................			$3,346,772
Interest, taxes, rentals, etc............			2,488,396
Surplus for the year			$ 858,376
Depreciation, etc..........................			$ 95,949
Debit balance from 1908..................			1,229,932
Total....................................			$1,325,881
Debit balance, July 1, 1909............			$ 467,505

The president's report says: "No important additions to the property were made during the year, but its physical condition was well maintained by liberal expenditures for repairs and renewals, which in accordance with past custom were charged against costs.

"The demand for the company's products is good. The rail capacity for the remainder of this fiscal year has been sold and orders for a substantial tonnage entered for delivery in the last half of 1910. Sales of the smaller products of steel keep pace with production and promise well for all of this year. Orders for coal are satisfactory, and only shortage of railroad equipment will prevent our sales this autumn and winter being fully up to the capacity of the mines."

First Modern Change House in the Birmingham District

SPECIAL CORRESPONDENCE

The recent erection of a modern change house by the Tennessee Coal, Iron and Railroad Company, to serve the slopes of the Muscoda division of its ore mines on Red mountain, Alabama, marks the first real effort of an operating company in the Birmingham district to look to this feature of its workmen's welfare. This may be accounted for by the fact that nearly all of the mines in this district are worked by contract labor and hence the companies do not feel responsible for the care of the laborers. The fallacy of this idea is, however, bound to become evident sooner or later.

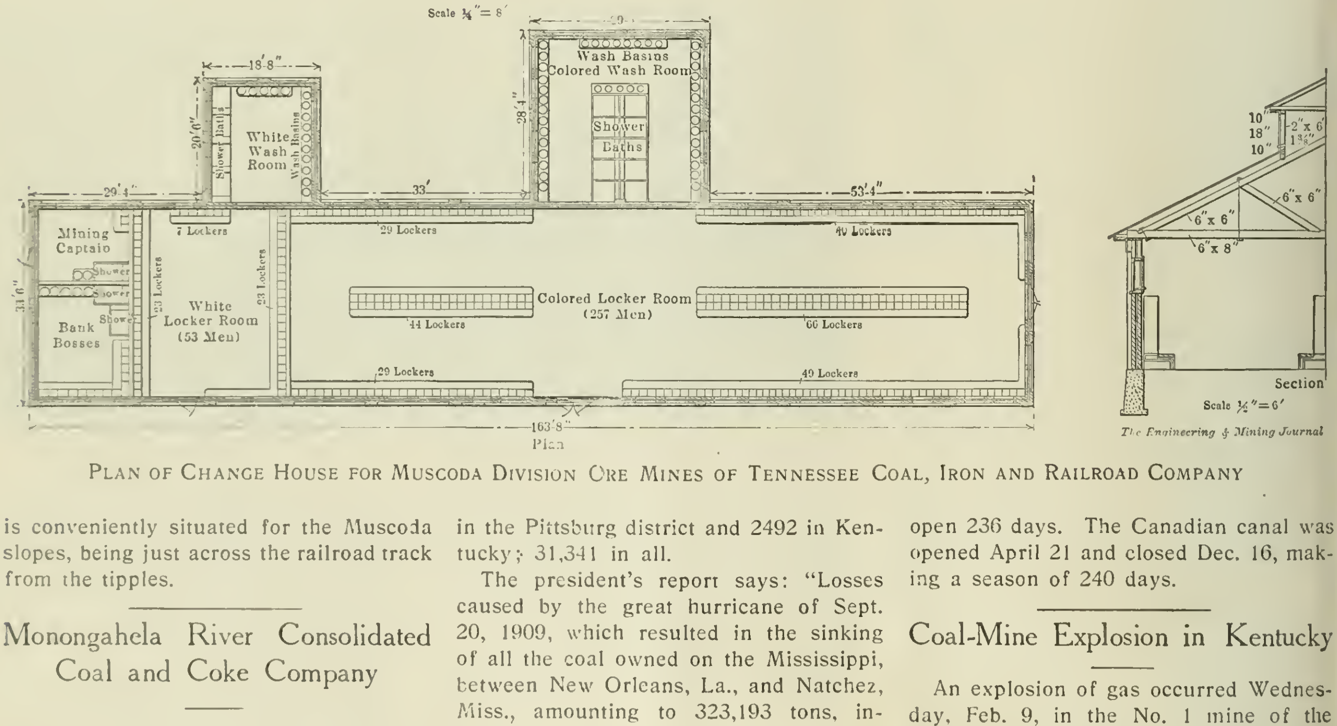
The Tennessee company has plans already drawn for the construction of four similar change houses, two for its Fossil division mines, and two for those of the Ishkooda division. This company also maintains a thoroughly up-to-date and well equipped hospital for the benefit of its employees. Previous to the erection of the Muscoda change house the nearest approach to anything of this kind was a wash house equipped with showers built for the use of convict laborers on the Pratt division coal mines.

MODERN CHANGE HOUSE ON RED MOUNTAIN, BIRMINGHAM DISTRICT, ALABAMA

ARRANGEMENT AND CONSTRUCTION

The Muscoda change house is built entirely of brick and with galvanized iron roof and concrete floors. It accommodates 319 men and has separate locker and wash rooms for white and colored men. Separate rooms are also provided for the mine captain and the bank bosses, as the sub-bosses are termed in this district. The mining captain's room is fitted up as an office and here such first-aid remedies and apparatus are kept as are deemed necessary. The company's hospital is situated only a few hundred yards from this point. The change house is equipped throughout with metal lockers, open so as to allow free air circulation. The building is steam heated and supplied with hot and cold water connections. It is roomy and plenty of space is allowed between the rows of lockers, so that there need be no uncomfortable crowding of the men.

The accompanying photograph and plan show clearly the arrangement and constructional details of the change house. It is conveniently situated for the Muscoda slopes, being just across the railroad track from the tipples.



The Engineering & Mining Journal

PLAN OF CHANGE HOUSE FOR MUSCODA DIVISION ORE MINES OF TENNESSEE COAL, IRON AND RAILROAD COMPANY

Monongahela River Consolidated Coal and Coke Company

The report of this company, the "river coal combine," covers the year ended Oct. 31, 1909. The balance sheet shows $10,000,000 preferred and $20,000,000 common stock; $7,923,000 bonds; $1,305,000 certificates of indebtedness; $242,000 car-trust notes; $165,818 land mortgages. There was a reduction during the year of $288,000 bonds, $135,000 certificates and $44,000 car-trust notes.

The coal mined during the year was: Pittsburg district, 5,947,826 tons; Kentucky, 84,566; total, 6,032,392 short tons, a decrease of 63,718 tons from the previous year. In addition, the Ohio Valley Coal and Mining Company, a subsidiary, mined 81,566 tons, a decrease of 26,068 tons. Coal sales for the year were 6,278,896 tons.

The income account for the year is given as follows:

Net earnings	$2,134,589
Maintenance and repairs, river craft	$405,548
Depreciation charged off	834,927
Interest on bonds, etc	560,858
Losses by storm	709,410
Total charges	$2,510,743
Deficit for the year	$376,155

If the special charge for losses by storm had been omitted, the year would have shown $333,255 surplus over charges.

The net earnings showed a decrease of $186,273, as compared with the previous year. The total surplus, after deducting the deficit for the year, was $1,600,852. The depreciation account was made up as follows: On river craft, $405,534; on mine equipment, $191,873; on coal acreage, $237,520. Only nine acres of coal land were bought during the year; 790 acres were mined out or sold. The total owned Oct. 31, 1909, was 28,849 acres in the Pittsburg district and 2492 in Kentucky; 31,341 in all.

The president's report says: "Losses caused by the great hurricane of Sept. 20, 1909, which resulted in the sinking of all the coal owned on the Mississippi, between New Orleans, La., and Natchez, Miss., amounting to 323,193 tons, including all the harbor equipment, such as pump boats, lines, chains, tugs, etc., aggregating $909,410. From this amount we have deducted for salvage $200,000, leaving a net loss from this item as shown by the statement of earnings of $709,410. This amount may be slightly reduced hereafter by increased recoveries of sunk coal.

"The effect of the general business depression of 1908 was manifest throughout 1909 and, coupled with a general overproduction of bituminous coal, caused severe competition and low prices. Conditions as to tonnage and prices are encouraging and should result in a marked improvement during the current year."

Sault Ste. Marie Canal Traffic

The report, just issued, gives the total freight passing through the Sault Ste. Marie canals during the season of navigation at 41,390,557 short tons in 1908, and 57,895,149 tons in 1909; an increase of 16,504,592 tons, or 39.8 per cent. The total in 1907 was 58,217,214 tons, or 322,065 more than last year. The total number of vessel passages in 1909 was 19,204, showing an average cargo of 3015 tons, against 2726 tons for 1908.

The mineral freight included in the totals was as follows, in short tons except salt, which is in barrels:

	1908.	1909.	Changes.
Coal	9,902,460	9,940,026	I. 37,566
Iron ore	24,650,340	40,014,978	I. 15,364,638
Pig and man. iron	289,308	522,281	I. 232,973
Copper	101,735	127,212	I. 25,477
Building stone	1,019	1,784	I. 765
Salt, bbl	547,223	651,091	I. 103,868

In 1909 iron ore was 69.1 and coal 17.2 per cent. of the total freight tonnage.

The United States canal was opened April 20 and closed Dec. 11, 1909, being open 236 days. The Canadian canal was opened April 21 and closed Dec. 16, making a season of 240 days.

Coal-Mine Explosion in Kentucky

An explosion of gas occurred Wednesday, Feb. 9, in the No. 1 mine of the Stearns Coal Company, at Stearns, Ky. As a result of this accident, six white miners were killed outright.

It is thought that the victims ran into a pocket of gas which ignited when it came into contact with their lamps. None of the other workers in the mine were harmed. The explosion occurred in one of the innermost recesses of the mine and expended its force upon the men in the immediate vicinity. The hoisting machinery was not damaged and no difficulty was experienced in recovering the bodies. Whether work will be resumed at once in the colliery will be determined after an examination by State Mine Inspector Norwood.

Tin Mining and Ore Dressing in South Africa—I

Three Classes of Bedded Deposits of Tin Ore in Swaziland; Sluicing Methods and Hand Jigging Employed; about $750,000 Thus Realized

BY E. M. WESTON*

Swaziland, which is at present adminstered by British officials under the diect control of the High Commissioner f South Africa, forms a portion of the astern border of the Transvaal, while etween it and the ocean lie the Poruguese possessions and the British porions of Tongaland. The hills and mounains of Swaziland form the buttresses of he great central plateau of South Africa, nown as the high veldt.

The largest portion of the country consists of the older granite of South Africa ntruding between patches of schists nd quartzites of Archean age. The rchean formation is generally divided nto two groups: the crystalline schists and the clastic rocks of the Barberton seies. The rocks of the Barberton series are auriferous, and gold mining is carried on in northern Swaziland at Korbes reef, Piggs peak and the Hora mines, while just outside Swaziland, to the north, lies the famous Sheba mine, which paid £750,000 in dividends.

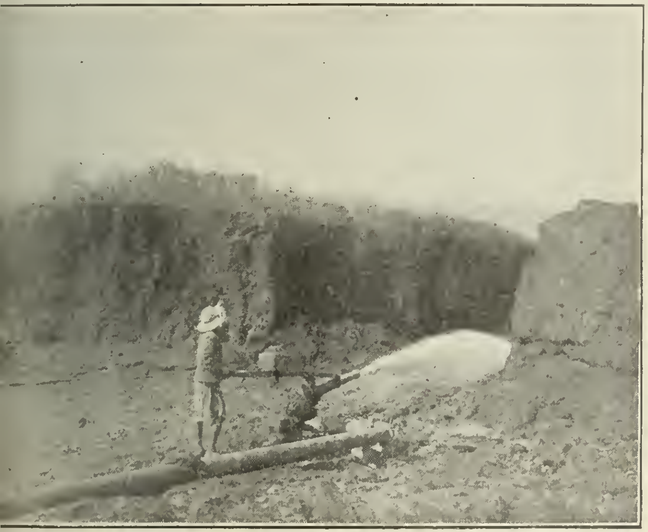


Fig. 1. Hydraulicking with 140-ft. Head

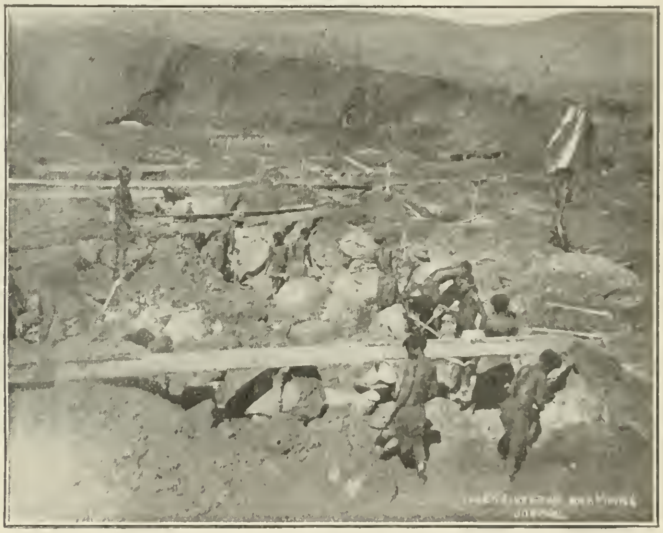


Fig. 2. Working Face of Wash

Geology of the Tinfields

The crystalline schists as developed near Embabaan, the center of the tinfields, consist of mica, talc and chlorite-schist, with amphibolite and quartzites. The older, a gray granite, in which the tin deposits occur, is seen intruding through the schist, and contact metamorphosis is in evidence. The granite is a gray microcline. The quartz crystals tend to show crystal faces of the first prism. Biotite and a little muscovite, feldspar of both varieties and sometimes a little colorless garnet, make up the bulk of the rock in the tin-bearing areas. The composition of the granite varies greatly. In places owing to the presence of hornblende and the preponderance of plagioclase, the rock approaches the composition of diorite, and in other areas mica is almost absent and the rock is primarily a binary granite.

Where the tin impregnations are most plentiful, the crystalline quartz of the matrix is in places almost absent, and the rock contains only mica and feldspar with fine cassiterite and ilmenite as accessory minerals. The coarse cassiterite occurs chiefly where the granite has assumed a gneissoid or a schistose structure and is traversed by veins of quartz-orthoclase pegmatite with a little mica and irregular veins and bunches of segregated quartz. Some of the richest deposits are connected with a blue quartz; others with a milk-white or even yellow variety.

These pegmatite veins are often only a few feet wide and occur in short lenticules; in other cases they form broad dike-like masses. The crystals of cassiterite occur sometimes in a rather rare form, giving single crystals a monoclinic, and twins an orthorhombic appearance. The bulk of the crystals are from ¼ to ½ in. in diameter, and pieces weighing from ¼ to ½ lb. are not uncommon. Near Forbes reef the tin ore occurs in scattered crystals in the schist in nuggets up to 8 lb. in weight and also in connection with gold. Specimens showing native gold on cassiterite have been obtained from this locality.

Ilmenite, mostly in fine grains, corundum, monazite, æschynite and euxenite in crystals as large as those of the tin ore are found in the drift and in the pegmatite veins with the cassiterite. Near the schists is a little fine gold. Large dikes of diabase traverse both granite and schists, and their outcrops can often be seen stretching for long distances on some of the more rounded granite hillsides. While portions of the granite are hard and resist erosion, forming bold escarpments and cliffs, the more feldspathic and micaceous portions have suffered decomposition owing to epigenic agencies, and are softened and kaolinized to a considerable depth. To these hard portions of the granite are also due some fine falls in the rivers. A feature of this decomposition is of considerable economic importance in cutting large water races. In Fig. 5 is shown a section of hillside. It is obvious that as long as the excavation for the water race does not go below the dotted outline shown, the race will hold water well. However, where deep cuttings are attempted, trouble with erosion and the percolation of water causing land slips is liable to occur unless the whole wet perimeter of the race is carefully protected by clay, faced if necessary with grass matting, sacks or iron sheets.

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*Mining engineer, 20 St. Mary's building, Johannesburg, South Africa.

THREE CLASSES OF DEPOSITS

There are two seasons: One wet season, lasting from about September or October to March or April; and the rest of the year (winter) almost without rain. The smaller streams are mostly of steep grade and carry heavy floods in summer, though almost dry in winter. Rainfall is about 50 in. per annum, but is variable. In the larger streams there is always a large supply of water.

The workable tin-ore deposits may be divided into three classes. The first class consists of decomposed bodies of pegmatite and granite, carrying tin ore worth from a few pence to five shillings per cubic yard. These deposits can be worked in places by sluicing or hydraulicking, but no deposits that will pay to mine and crush have so far been encountered, and there does not seem to be any probability of such discovery.

The second class of ores is the alluvial deposits formed *in situ* by the decomposition of the granite and pegmatite. The final decomposition product of the granite is a dark red, pulverulent soil, and on the steeper slopes this is constantly being washed down by rains. The heavier and coarser products of decomposition, including angular and semiangular fragments of segregated quartz veins together with the cassiterite and other minerals associated with them and disseminated through the granite, form a layer on the surface. The original tin content of the granite is thus concentrated in proportion to the extent of denudation. At the foot of the slopes sometimes two layers of gravel are formed, Fig. 6 being a section of the face shown in front of the hydraulic nozzle, Fig. 3. The upper layer of gravel has evidently been formed by a slipping down of the surface deposit on the steeper portion of the hill after the lower deposit had been formed *in situ*.

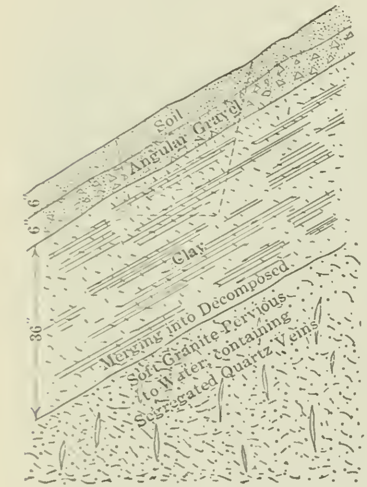


FIG. 5

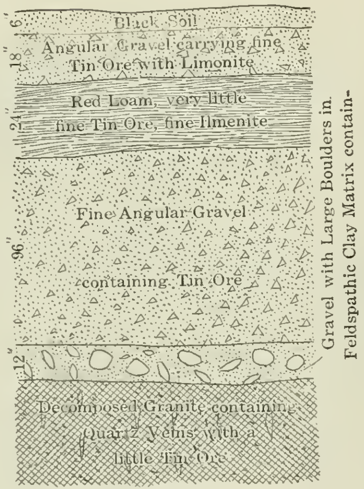

Black Soil
Angular Gravel carrying fine
Tin Ore with Limonite
Red Loam, very little
fine Tin Ore, fine Ilmenite
Fine Angular Gravel
containing Tin Ore
Gravel with Large Boulders in
Feldspathic Clay Matrix contain-
ing Coarse Tin Ore Crystals.
Decomposed Granite containing
Quartz Veins with a
little Tin Ore
6"
18"
24"
96"
12"

FIG. 6

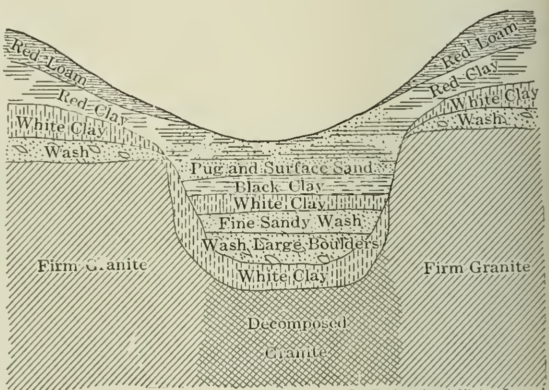


FIG. 7 *The Engineering & Mining Journal*

SECTIONS OF GRAVEL TIN DEPOSITS IN THE SWAZILAND FIELDS

Generally these deposits are shallow and are very irregular in value, those portions lying in the immediate vicinity of pegmatite veins being rich, while above or below the ground may be unprofitable. Grave errors in estimating these ores have been made by engineers unacquainted with the conditions and inexperienced in estimating such deposits. The alluvial deposits are also difficult to estimate correctly owing to the extreme irregularity of the deposition of tin ore.

Too large estimates may be made owing to the fact that where creeks have cut through tin-bearing granite the deposits may show up rich in coarse tin, which, owing to the size of the crystals, does not wash far, thus leaving neighboring portions much poorer. On the other hand, beds of compacted clay wash, made up largely of granite fragments and forming false bottoms, may be easily mistaken in many cases for the true bottom of decomposed granite and the gravel deposits underlying them missed. These true alluvial deposits form the third class.

DEPOSITS NOT EXTENSIVE

Owing to the general steepness of the country the alluvial washes do not extend very far from the banks of the various creeks, the largest flat being in the vicinity of Mbabane along the Mbabane river. These river deposits vary in character. Large boulders occur in the lower washes and beds of creeks, as shown in Figs. 2, 3 and 4. Sometimes the wash is free and sandy, but some of the richest wash is in connection with a white kaolin clay, sometimes darkened by vegetable remains. A typical section of a flat creek is shown in Fig. 7. In other places both wash and overburden are quite free from clay. In the washes numerous stone battle axes and arrow heads are met with, some being beautifully fashioned. Though they are not usually considered to be of great antiquity their position in the deposits can be accounted for only by assuming denudation that must have taken place during many thousand years.

Large deposits of wash filling old river channels and lake beds, or really large alluvial flats carrying regular amounts of tin ore such as are met with in Australia and the Malay states, have nowhere been encountered in Swaziland, and there appears to exist no ground suitable for bucket dredging. There are, however, some flats where water under natural pressure may not be available and which could be worked and elevated by centrifugal pump dredges as in Australia.

Prospecting is generally carried out by sinking small oval or round shafts, as the ground is seldom very deep and small unlined bores made by augurs give unreliable results owing to the coarseness and irregular deposition of the tin. Sounding rods can generally be forced down in the creek beds to determine the presence of wash.

GENERAL WORKING CONDITIONS

Labor is cheap and efficient. The native Swazi takes cheerfully to work in the open where he is not too far from his kraal, his wives and his native beer. Wages range from 5s. per month for small hoe boys to £1 to 35s. per month for laborers, averaging about 25s. per month with food costing 10 to 15s. additional. White overseers are paid from £15 to £25 per month and supervise from 30 to 60 natives.

The country is split up into mining and land concessions and the Swaziland Tin, Ltd., owns the bulk of the tin-bearing area. There are about 20 creeks known to carry payable tin ores.

The methods of working have until re-ntly been of the most primitive descrip- n, but in discussing them certain local nditions must be taken into considera- n. When labor is cheap the tendency to neglect the aid of mechanical ap- ratus as apparently cheap work can done. A good Swazi laborer at 1s. 6d. r day can excavate and shovel over cu.yd. of wash per day, and when over- rden is friable and there is a fair ream of water for ground sluicing he n remove over 10 cu.yd. of material, so at costs per cu.yd. appear small.

In some of the creeks water becomes arce in winter and the mines cannot be ached by water led from other sources. nce the creeks are subject to floods, per- anent lines of sluices cannot be laid in em nor can they be used as ground ices except in winter and deposits ened up by cutting out bars may be shed away. In many places the bottom which the wash rests is a sticky clay which it is impossible to ground-sluice ving to the tin ore sinking into the bot- m or being rolled up in balls of clay om pieces of bottom excavated with the ash.

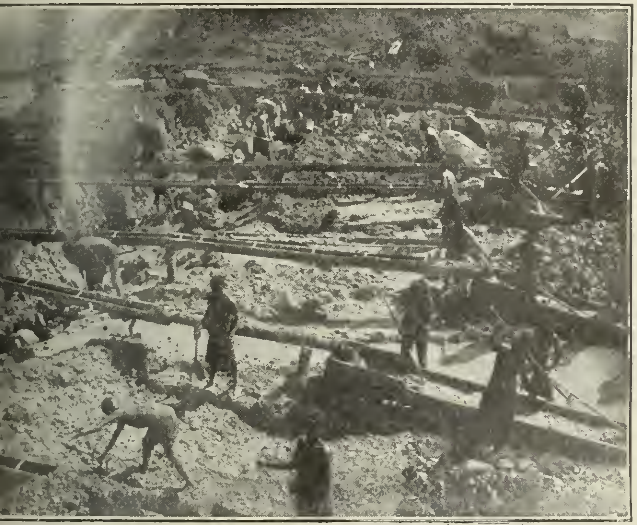


FIG. 3. SLUICING, SWAZILAND TINS, LTD.

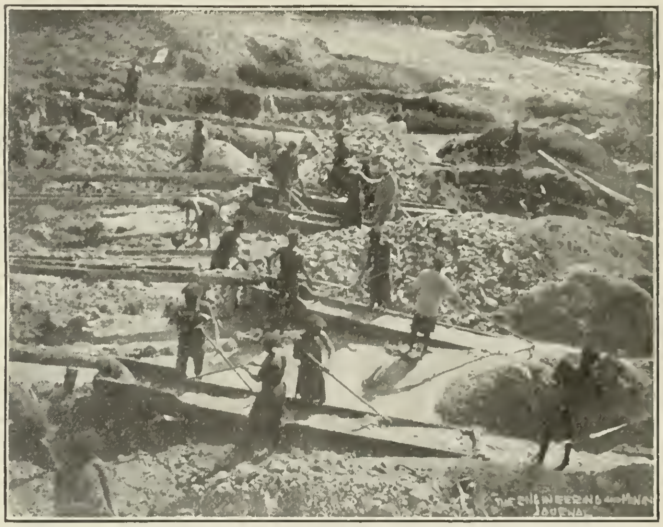


FIG. 4. METHOD OF STACKING TAILINGS

On the hillsides, and in other places, fficulties present themselves when deal- g with large volumes of water and tail- gs in ground sluices, as the rock is often composed to great depths and the ound sluices become *dongas* or ravines om which it is difficult to extract the ncentrates; all timber for sluices has to imported, making the initial expense long lines of fluming high.

Despite these circumstances rendering variation in the methods of work for y given deposit necessary, opportunities ist for the employment of several meth- ls to advantage. Ground-sluicing was known until recently and no attempt ade to deal with any large flow of ater and gravel. The method univers- ly employed was that shown in Figs. 1, and 4 and known as boxing.

When the deposits were first opened out a cumbersome plant consisting of trommels driven by water wheels was purchased and erected. This could not be moved about and the expense of carting wash to it and disposing of tailings made it a hopelessly impracticable method of dealing with the deposits and caused the failure of the original company holding the concession. This caused a reversion to simple methods.

PRODUCTION

The Swaziland tin fields have produced between 1600 and 1700 tons of tin ore, realizing from £150,000 to £160,000. Of this total, Swaziland Tins, Ltd., has produced 1520 tons of ore valued at £141,415. A creek known as Foys has produced over 300 tons. Working expenses have absorbed £90,840, leaving a profit of £50,575, or about £33 5s. 7d. per ton. Most of the easily obtained, richer washes have been heavily drawn upon, leaving, however, deep runs of rich ground and large bodies of lower grade deposits which will now be worked in a systematic manner.

(To be continued)

St. John Del Rey, Brazil

SPECIAL CORRESPONDENCE

During the six months, March to August, 1909, 91,500 long tons were crushed and bullion to the value of £197,495 was realized by the St. John del Rey Mining Company, operating in the state of Minas Geraes, Brazil. The ordinary ore, that is, excluding 1929 tons of low-grade ore, yielded 42s. 10d. per ton. The working costs were about 30s. per ton, including a charge of 1s. 3d. for development. London expenses and sundries accounted for another 2s. 6d. per ton. The net profit per ton was therefore about 10s. per ton. A portion of the profits is retained for capital expenditure; this half year, the amount set aside is £20,000, and altogether £200,000 have been put to capital account since 1901 out of the profits.

Developments on the Vianna lode of the Cuiabá mines have not opened any large quantity of payable mineral and further exploration is to be discontinued. At the Morro Velho mine, No. 19 winze has been sunk to horizon 16, and up to the end of October a level had been driven 260 ft. along the course of the lode in mineral that compares favorably in area and quality with the horizons above. The average width of the lode is approximately 12 ft. Shortness of water made it necessary to run the auxiliary steam engines at an increased expenditure for power.

After many trials, alterations and improvements, the electric steel furnace has been so perfected that both pig iron and steel of good quality have been produced direct from iron ore from the company's property. The directors hope that the governing authorities of the state of Minas Geraes will hold out every encouragement to induce ironmasters to give attention to the purity and high metallic value of the ironfields as well as to their enormous extent, and that they will also offer facilities and assistance to bring about the profitable working of the iron, which would add largely to the producing power and prosperity of the country. Although the electric smelting of iron ore has been successfully accomplished, it does not appear to have been so far a commercial success. The prosperity of the country as a producer of iron seems to depend on whether the ore can be exported to compete against Bilbao or Lapland.

Sand for first-class concrete should not contain more than 0.1 per cent. of organic matter.

Method of Splicing Wire and Other Ropes

The Long Splice Is as Easily Made as the Short Splice. Detailed Instructions for Making and Tapering Long, Short and Eye Splices

BY J. WATT

The short splice is, as a general thing, better known than the long splice, and I have often heard landsmen say, "I can make a short splice but not the long splice. It is so much more difficult." This is not true; the one is as easy as the other, and while they are probably equally strong there are many places where a short splice cannot, because of its larger diameter, be used; for instance, in a fall where the rope will just pass through the blocks.

THE FIRST STEPS

Unlay the rope ends as far as desired. The rope used for the halftone reproductions, Figs. 1 to 5, was common cotton clothes line about ⅜ in. diameter, and was unlaid for about 6 in., although it is not necessary for a short splice to unlay so far, as a splice is in length equal to nearly twice the length of the part unlaid. One part of the rope used for the cuts was dyed to make a contrast between the two pieces being spliced.

The two ropes are then in sailor language "married," as shown in Fig. 1. The two ends are brought together so that the ends of one rope lie between alternate strands of the other. If a short splice, as shown in Fig. 5, is to be made, a string can then be tied around the ropes at the point where they meet, so as to keep them in place.

THE BEGINNING OF A SHORT SPLICE

Take any one of the strands, for instance, the white one marked *A* in Fig. 1, lay it over the first black strand to the left marked *B* and under the second black one to the left, that is, the one just behind the white strand marked *C*. Then take the next white strand and pass it over the next black strand to its left. Repeat with the third white strand. Then turn to the black ends and repeat the same operations carrying the black and white ends along in the same way till the splice looks like Fig. 5.

If a very neat splice is not wanted the ends can be cut off at this point, but if a neat splice is wanted, take each strand end in turn and unlay half of it back to where it passes under the last part, cut one half of it off at this point but be careful to cut the half next to the rope, so that the half which remains will, when laid over and under once more cover the cut ends. Repeat this with all the ends splicing over and under either once or twice. Then cut the strands in half again and repeat as before. This will give a nicely tapered splice which is much more sightly than the one referred to before.

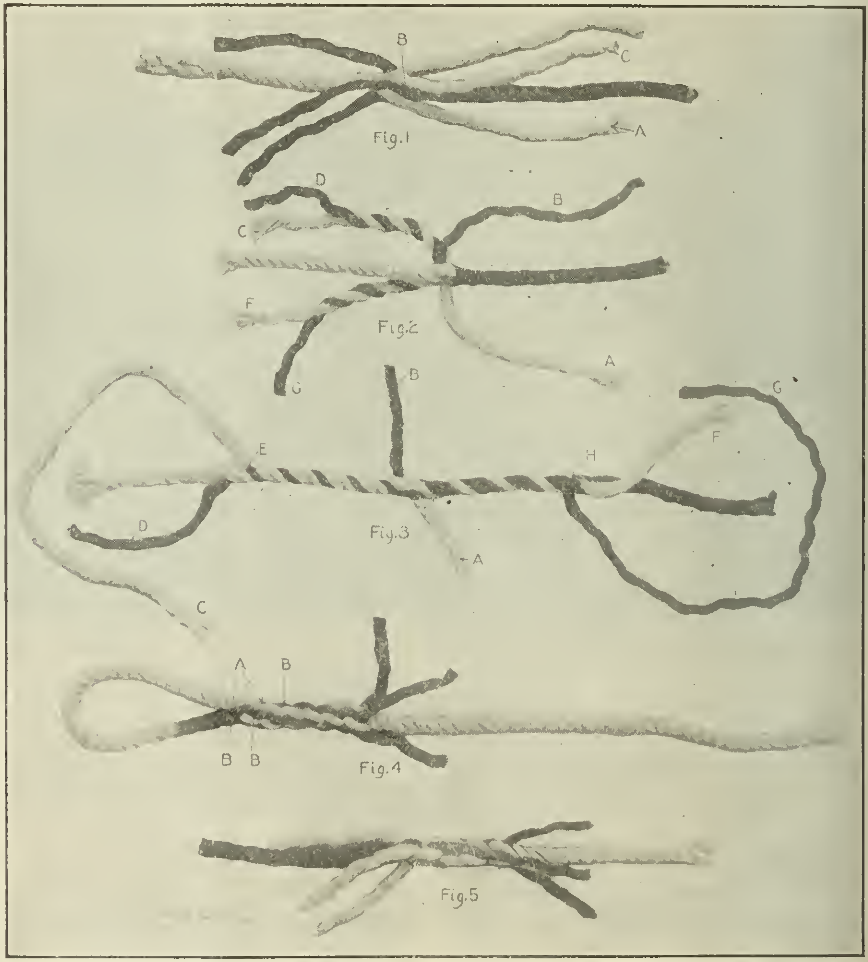
THE EYE SPLICE

The eye splice, shown in Fig. 4, is made in the same way. For clearness I dyed the end of the rope black. The ends are unlaid and the size of eye being decided upon the end is brought around and if desired can be tied in place with a piece of string. The three ends are one at a time brought under the three strands of the rope, each one under the strand which comes nearest to it. The run of the strands is shown in Fig. 4 at *A A*, *B B B*. They are then passed over a strand and under one just as described before. The ends can also be tapered off in the same way.

THE BEGINNING OF A LONG SPLICE

After the two ropes are "married," as in Fig. 1, they are, for a long splice, arranged as shown in Fig. 2. One pair, a black and a white, are tied in a simple overhand knot, as shown by *A* and *B*, Fig. 2. The other ends are twisted together, as shown, in pairs. This twisting is done to keep them in place, and while not necessary in this case (a light three-stranded rope), shows how to do it in the case of a heavy six-stranded wire rope which is shown later.

The next step is to untwist from each other one of the pairs, say for instance, *C* and *D*, Fig. 2. The white strand *C* is then unlaid from the white rope to the left and the black strand *D* is laid in its place. When this has been done far enough, say 6 in. in a small rope, an



SHORT, LONG AND EYE SPLICES IN COTTON ROPE

Note.—Reprint from *American Machinist*, D[illegible] 1909.

overhand knot is tied in the two at *E*, Fig. 3, just the same as was tied by *A* and *B* in Fig. 2 (shown in the center of Fig. 3).

Then the two strands *F* and *G* are untwisted and the black strand *G* is unlaid from the black rope at the right and its place is filled by the white strand *F* until at 6 inches from the center another overhand knot *H* is tied. We now have the splice in the condition shown in Fig. 3, and all that remains is to fasten the ends of the strands off. We proceed exactly in the same way as we did with the short splice over one and under one strand with both the black and white strands, tapering the ends for a neat job.

SPLICING AN EYE IN A WIRE ROPE

Wire rope has, as a rule, six or more strands and a core of tarred hemp in the center. The splicing of an eye in a six-trand wire rope is an entirely different peration from splicing one in a three- r four-strand hemp or cotton rope. The nd of each strand is prevented from unaying by binding it with a piece of wire r string. The length to be unlaid is hen determined and a piece of string or ire is tied around the rope at this point, s shown at *A* in Figs. 6 and 7. The trands are then unlaid to this point, the emp core cut out and a marline spike pointed piece of round steel) is passed hrough the center of the rope where the irst strand is to be put through. The arline spike is withdrawn and the first trand is passed through the center of the ope; thus there will be three strands on ach side of it. The second strand is then assed into the same hole, but it is rought through between the second and hird strands of the rope. The third trand is then passed under the first trand of the rope. The remaining strands re passed with the aid of the marline spike, each under a separate strand of the rope. In this way we have a strand coming out between each adjacent pair of strands of the rope.

In splicing an eye in a wire rope the procedure is now different from that used for hemp. Instead of passing the unlaid strands over one strand and under the next, the unlaid strand *B*, Fig. 7, is passed several times around the strand it is first passed under. In Fig. 7 the rope is opened out to show the run of *B*. The strands can be reduced in size (first removing the core) as the work goes on, so as to taper the splice. With wire splicing a good, heavy pair of pliers and a hammer and anvil or block of iron will be found useful to hammer the splice into shape. After being finished the eye splice can be covered with canvas (called parcelling) and wound, on top of this, with tarred marlin (called serving). These are, however, details which have nothing to do with the splicing itself.

MAKING A LONG SPLICE IN A WIRE ROPE

This is used for endless wire cables or joining wire ropes together. The individual strands on the ends of the wire rope which it is desired to make double, or the wire rope which is broken and is to be repaired, are secured by binding with wire or string as stated before.

The length of the splice is settled on. The rope shown in Figs. 6, 7 and 8 is ¼ in. in diameter, and 18 in. was unlaid from each end. One-half this length is marked off on each end of the wire rope to be made endless, or the parts to be joined.

Both parts are wrapped with wire or string at the marks and the strands are unlaid up to this binding. The hemp core is then cut off at this point. The two parts are brought together and "married." All the strands are "mated" and wound around each other, as shown in Fig. 2 at *C D* and *F* and *G*, except one pair. As wire is generally too stiff to make a snug overhand knot, we bring these together the best we can, dip the one under the other, as shown in Fig. 8, and in order to prevent the unlaid strands from coming loose, we tuck each one of them under the next strands *C* and *D*, as shown. Previous to tucking the strands *A* and *B* under *C* and *D* the strands ocmposing *A* and *B* can be carefully unlaid and the hemp cores cut out back where *C* and *D* are twisted around each other. After passing *A* under *C* and *B* under *D* the end *A* is passed over *H* and under the next two strands *I* and *J*. The same thing is done with *B*, passing it over *E* and under *F* and *G*. The finish in a wire-rope splice is over one and under two, over one and under two till finished. The wire can be tapered off as previously described. Practice is everything in the making of a neat splice in wire rope. Flexible wire ropes from ⅛ to ½ in. in diameter can be bought in any large city and are excellent to practise with.

The long splice, shown in Fig. 6, reaches from *D* to *C* and is 2 ft. 5 in. in length. The rope used is ¼ in. in diameter. The ends at *C*, Fig. 6, have been partly finished off, while those at *B E F G* are in the same condition, as shown in Fig. 8, at the center.

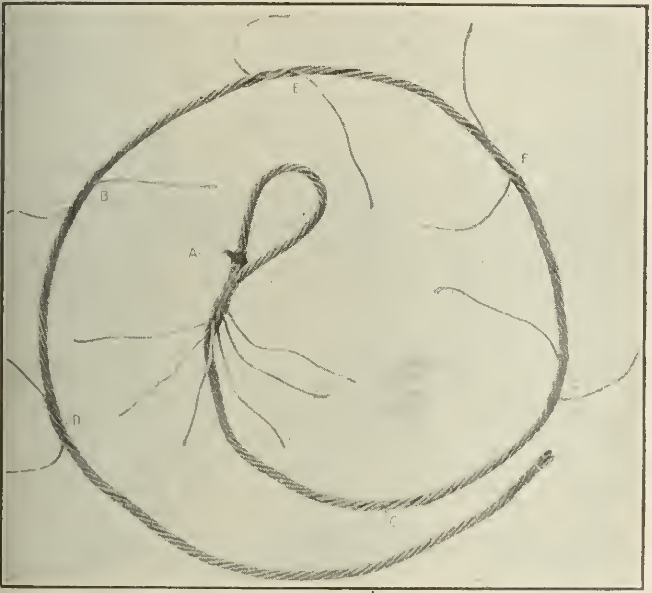
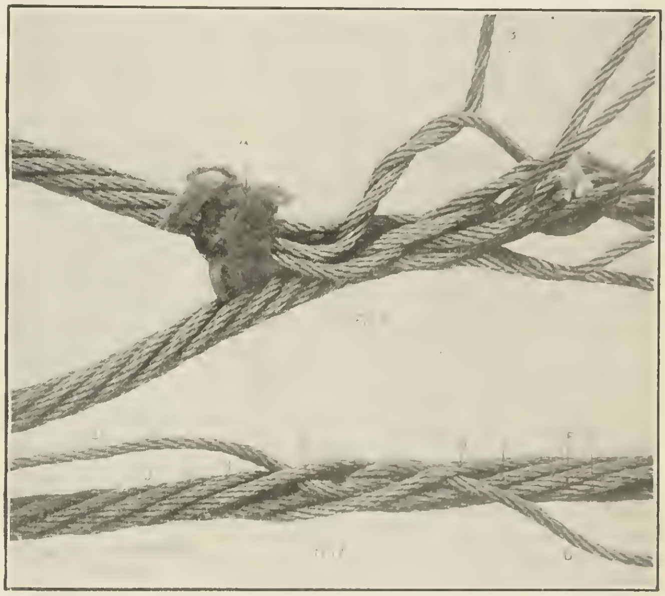


FIG. 6. AN EYE AND A LONG SPLICE IN A WIRE ROPE



DETAILS OF WIRE-ROPE SPLICING

The material carrying the highest percentage of cinnabar at the Nevada-Almaden mine, Humboldt county, Nevada, is found in the limestone, in connection with a soft dike which has intruded and considerably displaced the limestone. A large amount of placer gold was formerly taken from the gravels near this mercury deposit.

A Topical Digest of the Mexican Mining Law

Recently Enacted by the Mexican Congress, and Effective Jan. 1, 1910. Important Changes in the Penal Provisions to Protect Investors

STATUS OF ALIENS UNCHANGED

A topical digest of Mexico's new mining law is presented herewith. This law contains various innovations designed to facilitate the securing of titles and to promote mine operations generally, especially in regard to opposition and expropriation proceedings, easements, water rights, exploration permits, monuments, etc. Many points in the old law that were not clear have been elucidated in this new law.

The law went into effect Jan. 1, 1910. Owners of mining properties, titles to which were issued prior to June 4, 1892, and which have not been stamped as required by the law of said date, are allowed six months to comply with this requirement.

DEFINITIONS

Pertenencia—The unit of mine locations. It has a superficial area equal to one hectare, or 2.47 acres; it is 100 meters square and of unlimited depth.

Denouncement—A mine location which consists of one or less than one pertenencia, of two ore more contiguous pertenencias, or, under conditions hereinafter mentioned, of pertenencias that are not contiguous. A mining claim includes all ores to whatever depth within the vertical planes of its sidelines.

Demasia—A parcel of ground between other claims. It may consist of less or more than one pertenencia.

Expediente—The file of the papers pertaining to a single matter, as a denouncement, a suit, an administrative investigation, etc.

Testimonio—A certified copy of a public document, the original of which is written in the protocol or register of a notary.

Protocolization—The entering of an instrument on the protocol or register of a notary. When applied to foreign corporations it is equivalent to registration.

Fomento—The Department of Fomento, Colonization and Industry, which corresponds practically to the Department of Interior of the United States.

Mining Agent—A representative of Fomento appointed in a mining district to officiate in matters pertaining to mines.

MINE CONCESSIONS

All minerals, the composition of which , distinct from the country rock, whether occurring in veins or in deposits of whatever nature, are under government control and subject to denouncement. The following materials belong to the owner of the surface soil and their exploitation requires no special concessions: Combustible minerals and bituminous substances in whatever form and of whatever variety; surface salt deposits; surface and sub-surface water, subject to the provisions of this and the common law; building and other stone, as slate, porphyry, basalt, limestone, earth, clays, bog and stream iron and tin and ochers. The Department of Fomento is authorized to grant special concessions for the working of mineral deposits in the beds of rivers that are under Federal jurisdiction.

DENOUNCEMENTS

Only free ground is denounceable. Ground previously located, though title has not issued, is not free ground. Mineral lands that have been forfeited, whether subsequent to the issuance of title or during the process of titling, and lands that have been declared free by the Department of Fomento, are not subject to relocation until after notice of such forfeiture has been posted for 30 days on the bulletin of the respective agency. A person declared in default may not redenounce, during a period of one year, even in part, the lands forfeited because of such default.

Each denouncement shall consist of but one or less than one pertenencia, or of two or more contiguous pertenencias. This requirement of contiguity is dispensed with, if within the area inclosed by the new location there are other claims previously denounced or providing further that the new pertenencias, though not contiguous, are on the same lode or deposit and are within the jurisdiction of the same agency.

Denouncement applications shall be presented in duplicate by the party in interest, or by his attorney, to the mining agent of the district wherein the property is located. The application must express the name, age, occupation, nationality and domicile of the applicant; the principal minerals to be exploited; the number and description of the pertenencias (the number may be approximated if the boundaries are clearly defined in the application or if the new claim is entirely surrounded by other locations) and the names of the adjacent properties. A letter power is sufficient to accredit representation, but this must be ratified by the party in interest within 60 days after the denouncement.

Record of the application is made by the agent in a book especially kept for that purpose and notations are made as to the time of presentation, etc., on the original and duplicate, the latter being returned to the applicant. Within three days the agent, from whose decisions there is an appeal to the Department of Fomento, must formally accept or reject the denouncement. The priority of two or more denouncements filed at the same time for the same ground shall be determined by lot.

All matters pertaining to surveys, maps, publications, etc., shall conform to the requirements set forth in the reglamento to be issued by the Department of Fomento.

OPPOSITION PROCEEDINGS

Within a time to be prescribed in the reglamento, a protest may be filed against a new denouncement because of an invasion of claims that have been previously located, titled, or to which title has not lapsed. If no agreement is reached by the parties, they may choose between an administrative and a judicial settlement, either subjecting themselves to the decision of the Department of Fomento or instituting the corresponding legal action. If the former method is adopted the parties may not subsequently change, the title proceedings are continued without interruption and the question of invasion is decided in due course by the Department of Fomento, from whose decision there is no appeal. If recourse is had to the courts, such action may be discontinued at any time and an administrative adjustment resorted to. If the protest against the invasion is not filed within the time prescrbed by the *reglamento*, it may subsequently be presented, before the issuance of title, to the Department of Fomento and shall be admitted, providing the opposer can show justifiable cause for not having filed the same as provided in the *reglamento*. If the opposer is not present at the meeting called for an adjustment of differences, he shall be considered as having desisted from his opposition, unless he can show that the cause of such absence is not chargeable to him. Opposition for causes other than those enumerated herein shall be filed with the agent, but shall not interfere with the title proceedings. In due course the matter will be passed on by the Department of Fomento, from whose adverse decision, in this case, the opposer may appeal to the courts.

NOTE—Prepared by the Mexican Title Mortgage Company, Calle del Espiritu Santo No. 2, Mexico, D. F.

CLAIM REDUCTION AND RECTIFICATION

A reduction of the number of pertenencias contained in the denouncement may be secured by application to the agent within 40 days after the date of such denouncement. This does not imply an extension of time for the presentation of plans. After title has issued the claim may be reduced by filing an application to this effect, accompanied by the original title, and the presentation of new plans; a new title will be issued and the old one cancelled. To increase the number of pertenencias requires a new denouncement.

Rectification of a mining claim may be applied for by the owner of the same, by owners of adjacent properties, or by the Department of Fomento. In the last case parties in interest have recourse from the decision of the Department of Fomento. A new title is not issued if the rectification consists in the adjustment of the ground claimed, to the description as contained in the title and in the denouncement. If the description as set forth in the title does not correspond to that contained in the denouncement, or if, in addition to this defect, the ground as monumented does not correspond to either description, the issuance of a new title, with the prescribed formalities, is required.

MONUMENTS

If, on examination by the Department of Fomento, the title expediente is found in order, the applicant shall be notified to monument his claim within a specified period. When evidence is furnished that this requirement has been complied with, the title shall be issued. If the ground is not monumented as and when provided for, the applicant shall forfeit his rights under the denouncement. The same applies in case of a reduction, rectification or any other modification of the property. Present owners of mining claims that have not heretofore been properly monumented are allowed one year within which to comply in this respect with this law, subject to a fine for non-compliance of from 100 to 500 pesos and subject to a charge of a criminal nature if the compliance is deferred 30 days from the date of the imposition of the fine.

TITLES

Mine titles shall be issued, without prejudice to third parties, by the chief executive of the nation and signed by the Minister of Fomento, in favor of the denouncer, or his assignee, providing such assignment is evidenced by a public document. The Department of Fomento may refuse to issue a title, even though the *expediente* is in order, if the granting of the same is contrary to the public good. In this case the denouncer shall be reimbursed for his expenditures in connection with the denouncement, and if the ground is subsequently declared denounceable he shall have a prior right of denouncement for a period of 90 days. In order for the physical division of a mining claim to have legal effect, new titles shall be issued to the fractional parts, in place of the original title, which shall be cancelled. If proof is furnished that a mine title has been lost or destroyed, a duplicate title will be issued by the Department of Fomento, costs to be paid by the applicant. In case of fraud and within three years from the issuance of a title the Department of Fomento may institute proceedings to nullify a title fraudulently secured, or such proceedings may be instituted by a third party in interest.

MINE TAXES

Titles—At the time of denouncement the applicant shall deposit with the stamp office, as a title tax, an amount equal to 5 pesos per pertenencia, or fraction thereof, of the entire number applied for, and shall present to the agent with his application a certificate of such payment. If the number of pertenencias is only approximated, the deposit shall correspond to the approximation, the deficiency, after the exact area is determined, to be made up by the applicant or the excess to be returned by the Department of Fomento. If, for any reason, the title is not issued the entire deposit will be returned to the applicant, after deducting the agent's fees and the stamps to be placed on the expediente.

Annual Tax[1]—An annual Federal tax of 6 pesos per pertenencia, or fraction thereof, is imposed on all titled claims. This tax is paid in three equal instalments payable during the months of July, November and March of each year, or may be paid annually in advance. On application, taxes may be paid in Mexico City on mines located in any part of the Republic. If one claim contains more than 25 pertenencias, or if several contiguous claims owned by one person or company contain more than this number, taxes are collected on the first 25 pertenencias as hereinbefore explained and at the rate of 3 pesos per pertenencia on the excess. Any person may pay the taxes on a mining property, but in order to recover from the owner by legal process the amount so paid, the payer must show that he had a direct interest in preventing the forfeiture of the title. A claim arising from such payment constitutes a lien on the property in question and is preferred even before a mortgage of a prior date.

Tax on Output—Gold and silver ores shipped from the country shall pay, as a Federal tax, 3½ per cent. of their assay value. These ores when treated and refined in the country shall pay as a tax only 2½ per cent. of their values, with a reduction in favor of metallurgical companies, special in each case, if the metals are refined to 999 fine. A State or Federal tax, depending on the location of the property, may be levied on the output, but is not to exceed 1½ per cent. of its gross value. Each state usually fixes an annual amount, called an *iguala,* to be paid as tax by the mine owners operating therein, which amount is apportioned among themselves by a committee appointed for this purpose.

Tax on Improvements—The states may also levy a tax on reduction plants not to exceed 6 pesos per 1000 pesos of their valuation, but no other surface improvements are taxable by the state, neither the capital stock of mining companies.

MINING REGISTER

A special mining register shall be kept in municipalities wherein mining properties are located. In this register shall be entered all mine titles, public documents and administrative and judicial decisions affecting mining property, options on mines and court decisions affecting mine operations. A recorded contract of promise of sale shall serve as notice to third parties for a period not to exceed two years. If instruments concerning mining properties are entered of record within 30 days from the date of their execution, the recording shall have legal effect from the date of execution; if recorded after 30 days the recording shall date from the date of entry. The recording of a document executed in a foreign country shall date from the day on which the *testimonio* of the protocolization of such document is filed for recording. Titles and mining contracts recorded prior to Jan. 1, 1910, in accordance with the old law are not required to be re-recorded. All instruments drawn prior to the date that this law becomes effective and that have not been recorded, must be entered of record as herein provided and shall be legally effective in respect of third parties only from the date of such recording.

CAUSES OF FORFEITURE

1. Infraction of the law or *reglamento,* when such infraction is chargeable to the applicant.
2. Non-correction of irregularities in the title proceedings when required so to do by the Department of Fomento, even though such irregularities do not constitute an infraction of the law or *reglamento.*
3. Failure of the party in interest to be present at a second meeting called in accordance with legal requirements, after his failure to be present at a previous meeting called for the same purpose.
4. Failure to furnish within a specified time the stamps necessary to legalize the title proceedings.
5. Failure to pay fees of the mining agent as provided in the *reglamento.*
6. Failure to place monuments as required.

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[1] Laws of June 6, 1887, and March 25, 1905.

7. Default in the payment of mining taxes.

EXPLORATION PERMITS

Exclusive exploration privileges over an area having a radius of 500 meters may be secured by application to the respective agent. If the zone is on private property, permission shall be obtained from the owner thereof, or, in case of opposition, after due process permission will be given by the agent, if there is no legal cause for refusal. The exploration permit shall be for a period not to exceed 60 days, which time shall not be extended. Similar permits covering the same ground in part or as a whole shall not be granted during a period of six months subsequent to the termination of the next preceding permit. Exploration zones over an area wherein mine workings are located shall not be granted, even though such workings are abandoned; and the limits of such zones shall not be nearer than 200 meters from the sidelines of existing claims. During the life of the permit the grantee has the exclusive right of making denouncements within the zone.

WATER

The owner of a mining property is also owner of all the water contained therein or flowing therefrom, and may freely dispose of the same, together with all substances held in suspension or in solution, but he shall have no action for damages if such water is lost because of the unwatering of other properties. Should mine operations result in the drying up of springs, the owner of such springs may recover from the mine the water so lost, but without depriving the mine of the water necessary to its operations and without having any action for indemnity. The assignment or the forfeiture of the mine implies the assignment or forfeiture of all right to the water having its source therein.

Land owners have exclusive right to springs and lakes within their property, and also to streams rising therein, unless their rights are barred by limitation. A stream rising and ending within a state is under the jurisdiction of such state. Rivers forming the boundary between, or flowing across, two or more states, or any part thereof, are subject to the Federal Government.[2]

EASEMENTS

Tenements of all kinds are subject to easements in favor of mining properties for the building and use of wagon roads, railways, power transmission lines, pipe lines, canals, discharge ditches, drainage tunnels, ventilation connections and for other purposes necessary to the development and operation of mines. Mining properties are subject only to easements for ventilation and drainage. The ground to be used by the dominant owner is limited to a strip 10 meters wide. Servitudes imposed on landed property are governed by the provisions of the civil code of the Federal district.

Connections for the purpose of ventilation or drainage may be made with the workings of adjoining properties, and shafts may be sunk and tunnels run on ground, the surface and subsurface property rights of which are not vested in the mine owner, providing no injury result therefrom to the servient property; and underground workings, by whomever made, may be used for ventilation and drainage by mines having or executing subsurface connection therewith, if such usage does not interfere with the operations of the servient mine.

The owner of the servient property retains the right of inspection of all work done within his sidelines and may require that gates, as provided for in the reglamento, be placed at points of connection with his own workings. If pay ore is encountered in tunnels run through another's property the owner of the tunnel shall immediately advise the Department of Fomento and also the property owner, placing the ore extracted at the disposition of the latter. If ore is found in free ground, the owner of the tunnel shall not develop the orebody nor dispose of the said ores until a title to the same has been issued to him. For 30 days after the date of the discovery of ore he has a prior right of denouncement over an area 100 meters on each side from the center of the tunnel.

The right of establishing an easement of those hereinbefore mentioned may be evidenced either by the consent of the servient owner contained in a public document, by a decision of the Department of Fomento, or a decision of the courts. Should the servient owner not consent to the easement, the other party in interest may apply to the Department of Fomento, who, after the hearing of evidence, shall decide on the merits of the case, pursuant to the provisions of this law and of the civil code of the Federal district. Within 30 days either party may appeal from the decision of the Department of Fomento. If the department favors the granting of the easement and the servient owner appeals, it may authorize the execution of the work in question, requiring a bond from the dominant owner, pending the decision of the court. Agreements and decisions relative to easements shall be recorded in the district wherein the servient property is located.

EXPROPRIATION

The owner of mining property may expropriate such surface ground as is required for the operation of his mines and the treatment of his ores. If no agreement is reached with the owner of the surface for its occupation, on application the Department of Fomento, after hearing evidence in the case, shall decide on the area to be expropriated and the amount to be paid in consideration therefor. The mine owner may occupy the ground necessary to his purpose even before a decision is entered, by depositing an amount fixed by the Department of Fomento as indemnity. Either party may appeal from the Department of Fomento, providing the department is notified of any unconformity with its ruling, and if the appeal is filed with the Federal court within 30 days. When the necessary surface ground has been pronounced expropriated, the former owner thereof having no further recourse, the person in whose favor the expropriation is made may ask for and secure from the court a deed in his favor.

In the following cases possession may be recovered by the person dispossessed: (1) If the land has been condemned for a given operation, work on which is not begun within one year, or is discontinued for the same period, except in case of unavoidable interference; (2) if the ground is used as a whole or in part for a purpose different from that for which it was expropriated; and (3) if the mine in favor of which the expropriation is made is declared forfeited. Recovery in these cases shall not require the return of the consideration paid.

JURISDICTION

The Federal courts of the district wherein mining properties are located shall have jurisdiction in matters of opposition to denouncements, to titling, or to the rectification of claims; in the fixing of boundaries, nullification of titles, expropriations, easements and cases of criminal liability or negligence. The proceedings shall take the form of summary actions, as provided for in the Federal code of civil procedure, except that the period for filing evidence shall be extended to 40 days. In questions of opposition the denouncer, or applicant for rectification, shall be the plaintiff and his demand shall be filed within a term of 30 days; otherwise it shall be held that he has consented to the opposition. All legal questions that arise concerning mining companies or relative to contracts for the sale and working of mines and for the treatment of ores shall be subject to the jurisdiction of the common law courts and to the procedure set forth in the commercial code.

POLICE REGULATIONS

The Department of Fomento may order the inspection of plants or mine workings to determine if there is any invasion of adjoining properties or if the workings are endangering life or property, and may order the discontinuance of operations in case of such existing danger. In case of extreme urgency the governor of the state may also issue an order to this effect. This also applies to coal mining.

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[2] Law of [illegible] 1888.

PENAL PROVISIONS

This is one of the important features of the new mining law, whereby the public is safeguarded against collusive practices on the part of engineers appointed to survey and file maps of mine locations, of mining agents and of other parties in interest. Specified penalties are attached to the failure on the part of engineers to present their plans and reports within the time limit, for non-compliance with instructions received from the Department of Fomento and for any misrepresentations or other fraudulent acts. The same applies to mining agents for neglect, bad faith, or for the non-observance or infraction of the law or the reglamento in title proceedings or in other matters connected therewith. The unlawful appropriation of ores from outside the limits of one's own property, the theft of ores by employees or laborers and the destruction or moving of monuments or other boundary marks are punishable by fine or imprisonment, unless a plea of error is substantiated. A person who interferes with the surveying of properties is liable to the same punishment.

MISCELLANEOUS PROVISIONS

Dumps belong to the mine from which they were extracted. In case their origin is unknown, the matter shall be subject to the provisions of the common law. An appraisal made of property by incorporators of a mining company, and for which stock is to be issued, for all legal purposes shall be considered as final. "Lesion" cannot be pleaded as a cause for the rescission of a contract relative to mines; *i. e.*, the seller shall not ask for nullification on the grounds that the price paid did not represent more than one-third of the actual value of the property sold; nor shall the buyer make a similar demand alleging that the consideration was twice the true value of such property.

FOREIGNERS AND FOREIGN CORPORATIONS

Titles to mining properties situated within a zone of 80 km. wide along the international border shall not be issued, without express permission to this effect from the chief executive, to foreigners or to foreign corporations, even though the denouncement shall have been made jointly with Mexicans; neither shall foreigners or foreign corporations acquire, without special permission, direct property rights of whatever nature in mines within the said zone. All acquisitions contrary to this provision are void, and action to have them so declared may be instituted by an interested party or by the Department of Fomento. Should a foreigner by inheritance, devise, or judicial adjudication in payment of debt, acquire property in mines within the prohibited zone, he shall be allowed one year in which to dispose of the same, unless he obtain the necessary executive permission for its retention. Should a foreign corporation acquire property in this way, it shall necessarily dispose of such property within one year. Property held in contravention of this law shall be sold at public auction and the proceeds therefrom, after paying the costs, shall be given to the party in interest. This law does not prohibit foreigners and foreign corporations from holding stock in Mexican corporations that own mines within the 80-k.m. zone.

The Lena Goldfields, Limited

SPECIAL CORRESPONDENCE

The Lena Goldfields, Ltd., is the name of an English company formed in July, 1908, to buy up the shares of the Russian Lena Gold Mining Company which owns gold-bearing gravel deposits in eastern Siberia. The first report of the English company covering the period from the incorporation of the company to June 30, 1909, has been issued, together with a report by C. M. Rolker on the properties acquired in Siberia.

According to the directors' report the English company has already acquired 74 per cent. of the Russian company, called for short the Lenskoie company. The sum of £334.315 was raised by the issue of shares, out of which about £200,000 has been advanced to the Lenskoie company for working capital and for the purchase of a local railway. Operations at the mines are being carried on very profitably; the net profits for the year will be not less than 4,000,000 rubles (£423,000), out of which it is proposed to pay a preliminary dividend of 2,500,000 rubles (£264,000). Owing to the great distance of the mines from St. Petersburg, the headquarters of the Lenskoie or Russian company, the accounts are belated and although the results of the year, 1908-09, are known now approximately, the final figures will not be known for some time. The financial arrangements of the company are somewhat unusual and complicated.

The property consists of 58,072 acres on the Vitim river, a tributary of the Lena river, and is reached from Irkutsk, a town on the Siberian railway, after a journey of 249 miles by land and 890 miles by water. The gold is won mostly by drift mining from gold-bearing gravels of ancient river beds 100 ft. or less below the present surface of the ground. Many of the deposits are unexplored and consequently only a rough estimate can be made of the value of the whole property. The Lena company owns a stream length of 50 miles, and 6.58 miles of the best known group, Bodaibo, are estimated by Mr. Rolker to yield a working profit of £1,234,290; 9.37 miles along the Kulebrianik river are calculated to produce a gross return of 32,788 of wash gold per mile.

The gravel worked is exceptionally rich. The average gravel of the Bodaibo group worked during the first ten years (1896-1906) contained 8.93 dwt. per cu.yd., and for the twelve years 1896-1908, 9.37 dwt. During the last two years the average has been even higher, 10 and 10.5 dwt. per cu.yd. respectively.

Mr. Rolker does not anticipate that these high returns will continue up stream, the present yield being due to the close proximity of the junction of the upper Akanak tributary with the Bodaibo proper, but estimates the value of the virgin ground of this group at 8.7 dwt. per cu.yd. The working expenses during 1906 were 6.3 dwt. per cu.yd., or 23.6s. The government buys the gold at 3.76s. per pennyweight.

The total gold production from all properties under the Lena company's control up to October, 1908, is given at 5635 poods. In a table of Russian weights and measures attached to the report 1 pood is given as equal to 526.645 oz. Troy, 21,160 rubles. At average exchange 9.45 rubles equal £1, therefore the gold production has been £2,157,000.

Mr. Rolker has examined the Bodaibo deposits only, but A. D. Gassaway, of California, who has had experience in the frozen gravels of Alaska, has been engaged to report on the other portions of the company's property. Mr. Gassaway has recommended the use of steam points for thawing the frozen gravel of the Kulebrianik district and an order for this plant has been placed. At present the gravels are thawed by charcoal fires placed underground.

Operating Placer Claims Below Bedrock

In connection with the mining in Yukon Territory a point has arisen which is of some interest there and which may be of interest elsewhere. The distinction between the placer claims and quartz claims is understood there as in general, the placer properties having the right to operate only to bed rock. In this district it is possible for the dredges to lift several feet of the loose bed rock and claim that they have the right to do so, whereas the owner of the quartz claim in the property and under the quartz-claim right contends that all the material in place belongs to the quartz-vein location. The matter has been referred to the Gold Commissioner for adjustment.

St. Eugene Mine and Mill, East Kootenay, B. C.

Canada's Most Important Lead-Silver Mine; 400 to 600 Tons Milled Daily; The Zinc By-product Is Being Saved for Future Treatment

BY E. JACOBS

The early history of the St. Eugene mine, the largest lead-silver mine in Canada, is of especial interest in the East Kootenay district of British Columbia, in which the mine is situated. For many years a devoted Roman Catholic priest, Rev. Father Coccola, labored among the Indians of the Fort Steele and neighboring sections of the district, having his headquarters at the St. Eugene mission, near Fort Steele, long a flourishing town supported mainly by rich placer-gold mining camps.

Among the Indians connected with the mission was one who had the idea that the money requisite for the building of a new church for the mission could be obtained from "chicamon stone" if only he could find it in sufficient quantity. Eventually in his wanderings over mountains distant about 20 miles from the mission he discovered an outcrop of mineral, and thereafter he gave the reverend father no peace until his "chicamon stone" find had been located.

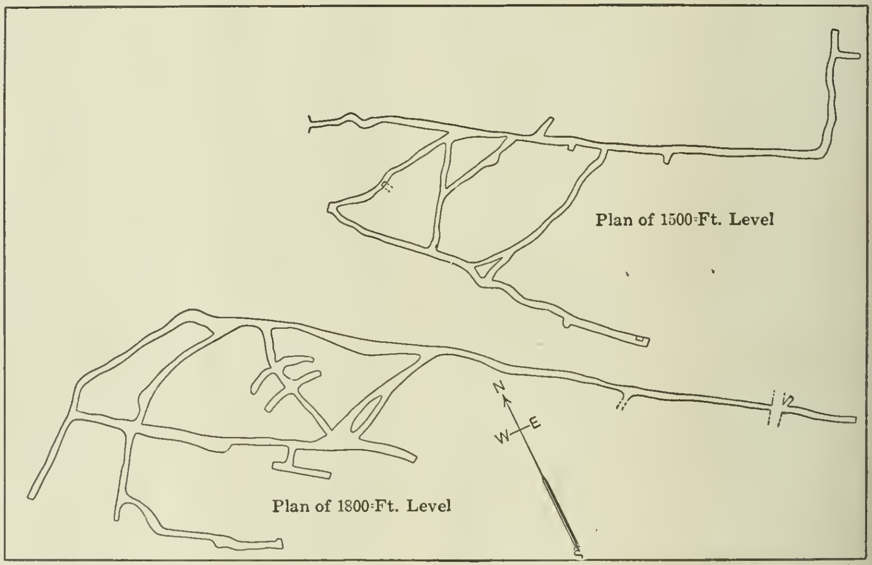
Location Due to an Indian

The location of the claims came about in this wise—James Cronin, a mining man of many years' practical experience in the United States and elsewhere, while traveling in the district, was hospitably entertained at the mission. Becoming interested in Father Coccola's story of the persistence of his Indian ward, Mr. Cronin agreed to go with the priest and the Indian to the scene of the latter's discovery. Thus it was that, on June 20, 1893, two mineral claims were located on a mountain rising 2000 ft. or more from the eastern shore of Moyie lake. One of these, located for himself by Mr. Cronin, was named the Peter after its Indian discoverer, and the other, Father Coccola's location, the St. Eugene after the mission it was intended should benefit from the discovery.

Later it was ascertained that the lode on which the St. Eugene location had been made dipped into the Peter, so an arrangement was agreed upon under which the two locators each held a half interest in the two claims. Sufficient assessment work was done in 1893 to meet the requirements of the Mineral Act for two years.

In 1895 the property was extensively prospected and a vein of lead-silver ore 8 to 10 ft. in width opened. This looked so promising that John A. Finch, of Spokane, Wash., purchased Father Coccola's interest for $12,000, which sum not only paid for a new and beautiful church at St. Eugene mission, but also provided the Indian Peter with a ranch for himself.

During the three following years Messrs. Cronin and Finch expended about $80,000 in developing the St. Eugene mine. In 1899 they sold a two-thirds interest to the Gooderham-Blackstock Syndicate, of Toronto, Ontario. The development and equipment of the mine were thereafter still more vigorously proceeded with and about $150,000 was spent in this work under the new auspices. Meanwhile the Moyie and Lake Shore groups of mineral claims, which lay between the St. Eugene and Moyie lake, were purchased and the St. Eugene Consolidated Mining Company was organized to acquire and operate the amalgamated properties.



Two Levels of the St. Eugene Mine—Argall, 1905

In 1905 the Canadian Consolidated Mines, Ltd., was incorporated, and it acquired the St. Eugene and other mines and the smelting works at Trail, B. C. The St. Eugene group then comprised 10 mineral claims and fractions, having a total area of 484 acres. Later the name of the company was changed to that of the Consolidated Mining and Smelting Company, of Canada Ltd., the present owner of the property. The St. Eugene group now comprises 23 adjoining mineral claims (including several fractional claims), having an aggregate area of about 1050 acres, all situated in close proximity to Moyie lake. Chief among these claims, in regard to development work done, are the St. Eugene, Moyie, Queen of the Hills and Lake Shore.

Occurrence of Ore

The outcrop on the St. Eugene claim is about 2000 ft. higher than the level of the lake. The ore occurs in a quartzite formation in which a sheared or fissured zone is mineralized by sulphides, chiefly galena. The orebodies are generally somewhat lenticular in shape, occurring very irregularly—so far as yet ascertained—and without characteristic indications of their presence. For instance, between two levels more than 100 ft. apart in which no ore had been encountered, an exceptionally important orebody, continuous for about 1000 ft. and ranging up to 60 ft. in width, was discovered in 1904. The existence of these conditions eventually led to the extensive use of the diamond drill in prospecting underground, with much advantage both in regard to expedition in finding new orebodies and lessened cost of development of the mine.

Philip Argall, of Denver, Colo., who had charge of the field work of the "Commission Appointed to Investigate the Zinc Resources of British Columbia," in his report to Walter Renton Ingalls, chief commissioner, gave the following geological notes of the ore deposits in the St. Eugene mine:

"There are two almost parallel veins, the main and the south vein, connected at irregular intervals by a series of interlacing fissures extending from the footwall of the south vein to the hanging-wall of the main vein. These cross-fissures form the principal ore deposits of the mine. * * * The main veins would average about 6 ft. in thickness; the pay ore about 5 ft. The cross-fissures, however, and the points of their junction with the main fissures are the depositories of great ore masses, reaching in some cases a thickness of 30 and, I believe, in one instance, 63 feet.

"The property was practically closed down at the time of my visit (Nov. 8, 1905), on account of fire having destroyed the shaft house, hoisting plant and mouth of the 1800-ft. level. I was able, however, to pay a hasty visit to part of the 1700- and 1800-ft. levels. My observation during this brief trip through the workings is to the effect that the main and the south veins occupy irregularly fissured and slightly crushed zones which have been impregnated with galena and a little blende occasionally associated with garnets, and in which there is little sign of faulting and not much slickenside, or gouge. The idea conveyed on examining the vein structure is that of an irregularly fissured and broken zone, the fractures in which have been filled principally with galena; toward the ends of the galena shoots blende predominates but where the galena is at its best there is but little blende.

Interlacing Veins Due to Shattering

"An interesting feature is the interlacing veins, the drifts on which are designated as avenues. This feature is shown on an accompanying plan. The first avenue on the 1800-ft. level appears to have been fairly productive, while the second avenue is perhaps best described as a bonanza deposit. In one stope between the 1700- and 1800-ft. levels on this cross-vein, I noticed 4 ft. of almost solid galena on the footwall and a 3-ft. seam on the hanging-wall of similar material, with streaks and veins of galena occupying the crushed zone of country rock between these ore seams, the whole of this cross-vein or avenue being at this place 25 ft. in width; a very remarkable showing.

"The country rock may be an altered slate, but it exhibits at this time no slaty structure. It is highly silicious, in places almost a quartzite. This rock cannot be said to be softened or altered in the vein. In places quartz occurs in the vein formation, more particularly where there is impoverishment. I could see but little quartz in the second-avenue stope previously noted. The northern vein is probably the main one and carries in places a little gouge on the footwall and irregular seams of vein quartz, but the rock fractures and vein structure suggested a shattering rather than a shearing or faulting movement indicative of deep fissuring.

"The longitudinal section on the veins shows that the stoping conforms fairly well to the contour of the hill, and that a line drawn parallel with the latter at a depth of 200 ft. would possibly include all the rich stopes in the veins. The ore deposit will thus appear to be somewhat superficial. No doubt, in places where the fissuring is more profound and the shattered zone large and well mineralized, pay ore will continue below the 200-ft. contour, and in other places where the fissuring is less intense it may not reach this depth.

"The country rock is thinly bedded, and the beds have a southerly dip of about 10 deg. Pyrites is common in the rock joints away from the vein and many of the bedding planes near the surface appear to have been water courses and are now partially filled with iron oxide."

It will be observed that Mr. Argall's notes relate to the mine as it was toward the end of 1905. Since then much development work has been done and more than half a million tons of ore extracted, while late reports are to the effect that large ore shoots have been found on levels opened since Mr. Argall's visit.

Mine Worked by Adits

Down to the 1800-ft. level, known as the 1800 tunnel, the mine has been opened by a series of adits driven into the mountain. Of these the 1300 and 1800, opened on the Lake Shore claim, have been driven on the main veins through the Moyie and Queen of the Hills claims into the St. Eugene the respective distances of 5200 and 4400 ft. Below the 1800 level, a 3-compartment shaft (each compartment, 3x5 ft. in the clear) has been sunk vertically to a depth of 800 ft., and from this five levels—the 1900, 2000, 2100, 2200 and 2400—have been opened. Between the 1800 and 1900 the distance is 125 ft, while the others are 150 ft. apart.

In the upper levels of the mine there are two main parallel veins, and in the lower, four or five. These are connected at oblique angles by the occurrences of ore, locally termed "avenues," of which 11 have so far been discovered, and they have been numbered 1 to 5, with intermediate numbers ¾, 1¼, 1½, 1¾, 2½ and 3½. To date, Nos. 2 and 4 have been the most important producers of ore. Without exception, these ore avenues terminate at the main parallel veins, outside the limits of which no important shoots of ore have yet been encountered. The strike of the main veins is north 35 deg. west, and that of the avenues, north 20 deg. east. The dip varies from 45 deg. to vertical.

Ore from the four higher levels is delivered to the concentrating mill by an aërial tramway, about a mile in length, while that from the other levels and shaft workings is conveyed over an electric tramway to the mill bunkers. The greater part of the output of ore is now hoisted from the shaft, the 2000 level being the most productive in the mine. Hoisting is done by a 300-h.p. hoist steam for which is supplied by three 100-h.p. return tubular boilers.

The main drifts are about 8x9 ft.; the progress made daily in drifting usually averages 7 ft. Piston drills—2½ and 3¼ in.—and numerous hammer drills are used. The general style of timbering is by square sets. The main haulage ways in the mine and on the surface are equipped for haulage by electric locomotives, of which there are three in use. From the mill to the portal of the 1800 level the distance is about 1800 ft., and the electric tramway runs into the mountain on this level half a mile. Main haulage ways and mine stations are lighted by electricity, and electric signals are used in the mine.

The Concentrating Mill

The St. Eugene concentrating mill is substantial in construction and its equipment is modern in character. It is situated near the lake and close to the Crow's Nest branch of the Canadian Pacific Railway Company, thus providing convenient and advantageous transportation facilities. The accompanying plan of the mill is numbered and lettered to show the flow of the ore in treatment.

The ore, conveyed from the mine by the aërial and electric tramways already mentioned, upon delivery at the mill is weighed and dumped into receiving bins, of which there are four—one each for coarse and fine ore from the lower levels and the other two provided with a grizzly for separation of the coarse and fine of the mixed ore from the upper levels. Automatic feeders discharge the fine ore on a belt which conveys it to a 30-mm. trommel. The fines from this trommel are taken by a conveying belt to an elevator leading to the concentrator storage bin. A 36-in. picking belt takes the oversize from the trommel, also the ore from the coarse-ore bins after the latter has passed through a 24x15-in. Farrell crusher.

On an average there are four men working at this belt, two picking out waste and two picking out the higher grade crude ore, more or fewer being employed as occasion requires. The discharge from this belt is into two 9x15-in. Blake crushers, and thence into a set of 12x36-in. rolls. The ore is then hoisted by a pair of automatic loading and dumping skips to the concentrator bin, the discharge from the skips first passing through a sampler which cuts out 1/20 of the entire feed. The portion thus cut out passes through another set of rolls, adjusted to ¼ in., and then through a Vezin automatic sampler, which takes out 1/20, the ore rejected being passed to the mill bin. This sampling gives a sample of 1¼ tons from the day's run of 500 tons of ore.

From the mill bin, which has a capacity of 475 tons, the ore is automatically fed to a 30-mm. trommel, oversize to rolls, undersize to an elevator discharging into a main trommel line, consisting of screens of 15, 25, 8, 12, 6 and 3 mm. respectively. The oversize of the 25-mm. screen goes to two 2-compartment bull jigs, 1*a* and 2*a;* that of the two 15-mm. screens to two 4-compartment jigs, 3*a* and 4*a*. The feed of jigs 1*a* and 2*a* is thus over 25 mm. and that of 3*a* and 4*a* is 25 to 15 mm. The middlings from 1*a*, 2*a*, 3*a* and 4*a* pass through a set of 24x30-in. rolls set up to about ¼ in., thence back to main elevator and trommel line.

The oversize of the 12-mm. trommel is fed to jigs Nos. 11 and 12, each 3 compartments; the oversize of the 8-mm. trommel to jig No. 1, 4 compartments; the oversize of the 6-mm. trommel to jig No. 2; the oversize of the 3-mm. trommel to jigs Nos. 9 and 10, 3 compartments. The undersize from the 3-mm. trommel goes to two classifiers, the hutches of which feed two 24-mesh Callow screens and the undersize feeds two 60-mesh Callow screens. Oversize of the 24-mesh Callow screens goes to jigs Nos. 3, 4 and 7; over- and undersize of 60-mesh Callow screens to tables Nos. 4 and 5 respectively.

FINE CONCENTRATION

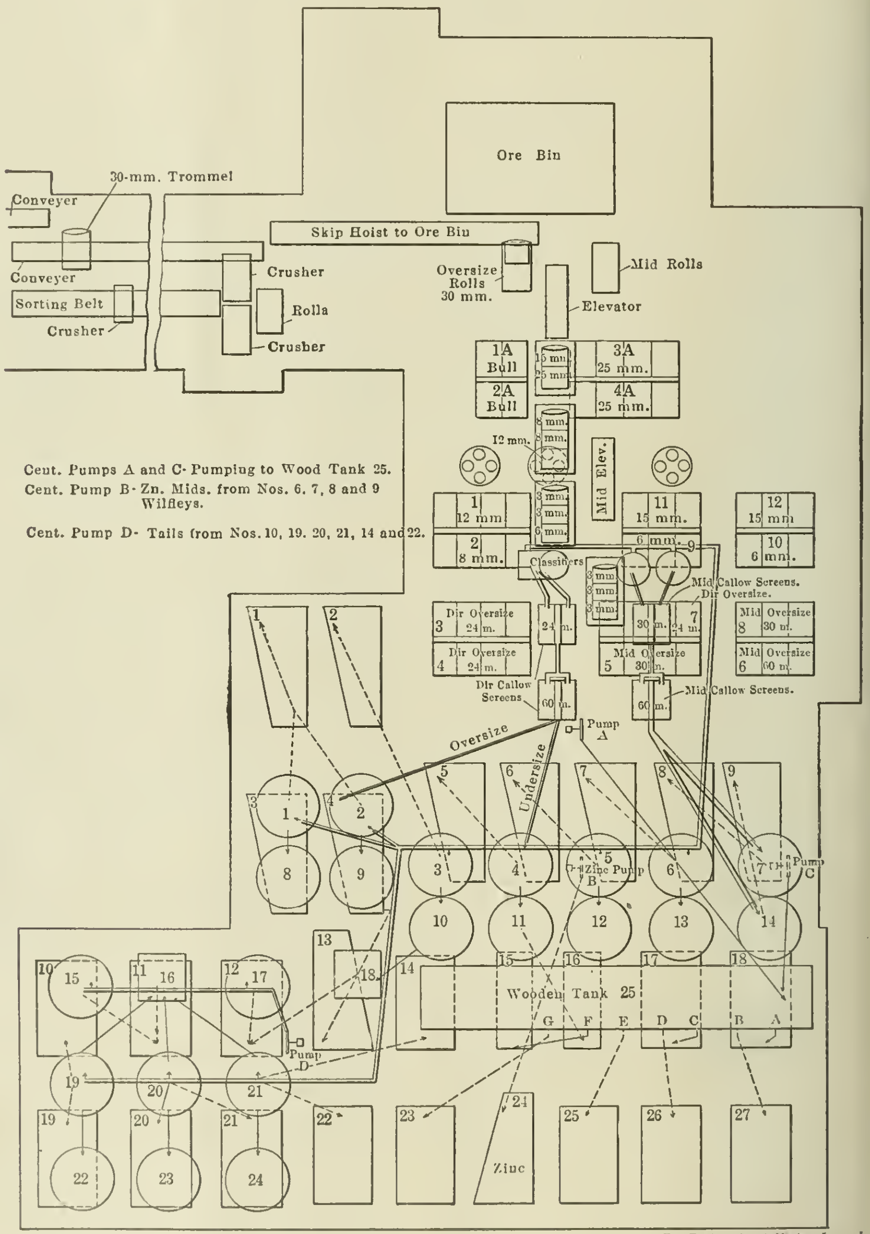
Table No. 4, which is fed with the oversize, makes 75 per cent. lead concentrates; the tailings and slime water go to table No. 13 for retreatment. Table No. 5 treats undersize which is fed from Callow tank No. 4. The concentrates from this table contain about 82 per cent. lead. All the slime water from this table goes to the concentrate bin, the original feed being about 50 per cent. lead. Callow tank No. 4 sloughs off into No. 11, which feeds vanner No. 16; the water sloughed off tank No. 11 goes to tail-race.

The middlings from all the jigs under 25 mm. go to three Huntington mills. These mills have from 16- to 30-mesh screens; the crushed product goes to the fine elevator, thence to 3-mm. trommel; oversize back to Huntingtons. Undersize goes to two small Callow tanks, hutches discharging to two 30-mesh Callow screens, undersize to 60-mesh Callow screens: the oversize from the 30-mesh Callow screens goes to jigs Nos. 5 and 8, over 60-mesh to jig No. 6; tailings of this jig back to Huntingtons and 3-mm. trommel line. Under 60-mesh goes to Callow tank No 7 which sloughs to No. 14. These tanks feed tables Nos. 8 and 9 or tank No 14 sometimes feeds No. 18 vanner.

Slime water from the main trommel line is carried in a launder to Callow tanks Nos. 6, 5, 3, 2. 1, 21, 20 and 19; at each of the above numbered Callow tanks there is a small 12x12-in. sump, outlet at the side. This is faced with a disk of ¼-in. plate, which has different sized holes and a blank space. The feed can be regulated or entirely shut off by the moving of the disk. Tanks Nos. 6, 5, 3, 2, 1, 21, 20 and 19 slough off into tanks Nos. 13, 12, 10, 9, 8, 24, 23 and 22. These in turn slough to the tail race. Tank No. 10 sloughs to wooden tank No. 18, and No. 18 to tail race. Tables Nos. 1, 2, 6 and 7 are fed from tanks Nos. 1, 2, 3, 5 and 6; vanners Nos. 15, 17 and 18 from tanks Nos. 10, 12 and 13: vanners Nos. 10, 19, 20, 21, 14 and 22 from tanks Nos. 21, 20, 19, 22, 23 and 24; vanners Nos. 16 and 12 from tanks Nos. 11, 12 and 18.

The slime water from the head end of the Wilfley tables on direct feed contains about 10 per cent. lead and is pumped by centrifugal pumps A and C to settling tank No. 25, which is 55x8x8 ft. V-shape. The overflow from this tank goes to tail race. This tank feeds vanners Nos. 23, 25, 26 and 27. The tailings from all vanners on direct feed are pumped by centrifugal pump D to tanks Nos. 17, 15 and 16. The overflow of these tanks goes into tail race. These tanks feed vanners Nos. 11 and 12.

The middlings from tables Nos. 6, 7, 8 and 9 carry about 18 per cent. zinc and 8 per cent. lead. These are pumped by pump B to table No. 24 and brought up to about 20 per cent. zinc and 4 per cent. lead. This product is stored for further treatment for its zinc content. The overflow from all the fine concentrate bins is carried to three settling tanks each 100 ft. long. There are in the mill 16 jigs, 11 Wilfley tables and 16 Frue vanners.



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SKETCH OF ST. EUGENE MILL SHOWING FLOW

WATER AND STEAM POWER USED

The St. Eugene ore is of a silicious nature and therefore is most suitable for concentration. The quantity of ore treated daily in the mill varies from 400 to 600 tons and the concentrates made average about 66 per cent. load.

The yearly and aggregate production of mine and mill, respectively, for five years are exhibited in the accompanying table.

ST. EUGENE PRODUCTION.

Year.	Shipped Crude, Tons.	Milled Tons.	Concentrates, Tons.
1904 (eight months)	708	60,658	15,051
1905 (10 months)..	1,126	129,582	28,235
1906..............	3,491	152,978	25,949
1907..............	401	133,988	22,667
1908..............	2,614	160,229	22,076

Water for milling purposes is pumped from Moyie lake by a centrifugal pump, 16-in. suction, 14-in. discharge and of 3000-gal. capacity. A 500-gal. Underwriter pump supplies water to a sufficient number of hydrants to afford protection against fire. Both water and steam power are available for the operation of the mill, while the latter is also used for mine power purposes. Water for power is obtained from four creeks, and flows through two flumes of nine and four miles length, affording heads of 475 and 600 ft., respectively. The mill crushers and jigs are driven by two Pelton wheels, 52 and 48 in., and the vanners and tables by a 36-in. Pelton.

The main steam plant consists of two Babcock & Wilcox water-tube boilers, each of about 250 h.p., and four horizontal return tubular boilers—three of 150 and one of 60 h.p. There are, as previously stated, also three 100-h.p. boilers at the Lake Shore shaft. Superheated steam is used throughout. When it is necessary to use steam, the mill machinery is driven by a 250-h.p. Corliss engine. A 250-h.p. compound condensing engine is being added. The generator for the electric tramways and the 3000-gal supply pump for the mill and other equipment will be driven by this engine.

Two air compressors supply air for the operation of 45 machine drills in the mine, and for other uses. One of these is a two-stage Rand, compound condensing engine with a capacity of 3000 cu.ft. of free air per min.; the other is a single-stage, compound condensing compressor having a capacity of 1600 cu.ft. of free air per min. Air is used at 105 lb. pressure. Air pipe lines to and in the mine total about 20 miles in length.

W. H. Aldridge, of Trail, is managing director of the Consolidated Mining and Smelting Company, of Canada, Ltd., controlling this group of mines; R. H. Stewart, of Rossland, is manager of the company's mines, and Selwyn G. Blaylock, of Moyie, is superintendent of the St. Eugene mine and mill.

Capillary Attraction in Diamond Drill Test Tubes

By J. E. Jopling*

The difficulty of keeping diamond-drill holes straight or determining their position when deflected has been a serious problem in explorations. J. Parke Channing, in an article entitled "Curvature of Diamond Drill Holes,"[1] shows the result obtained by testing a number of holes with the usual glass tubes containing diluted hydrofluoric acid. This is the method in general use.

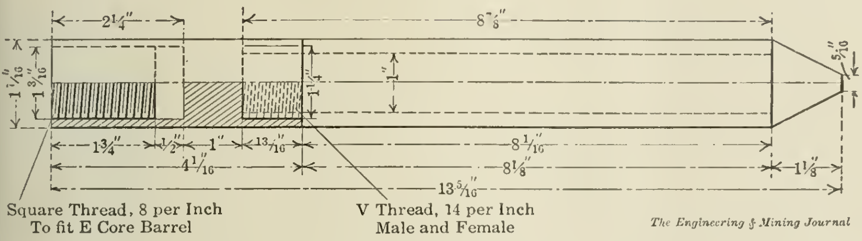

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FIG. 1. CLINOMETER USED AT END OF ROD

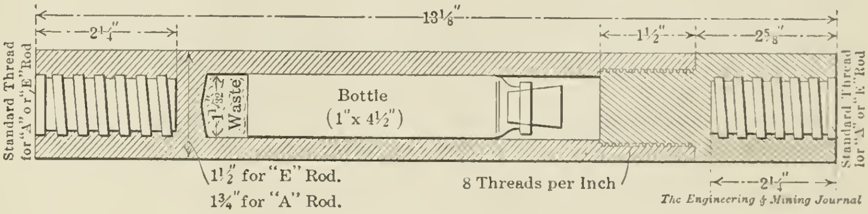

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FIG. 2. CLINOMETER USED BETWEEN SECTIONS OF ROD

In the case of inclined holes the angle etched on the tube approximately gives the dip where the test is made, and is close enough for holes, say, less than 100 ft. in length where the dip approaches the vertical or horizontal. The greatest error is at or about 45 deg. This error is caused by the capillary attraction of the liquid to the tube and varies with the size of the tube used. As the diameter of the tube depends necessarily on the size of the apparatus or clinometer containing it, which the drill hole will permit, it may be stated that the one in general use by the Cleveland Cliffs Iron Company is 1½ in. in diameter. This permits its use in holes bored by an "E" bit, making it generally useful and obviating the necessity of keeping clinometers of the various sizes on hand in the different exploring districts. While most of the deep drill holes are started with an "A" bit, this size is seldom continued for more than half the depth.

The design of the clinometer used by this company is shown in Fig. 1. The form shown with the point is used where the clinometer is placed at the end of the rods. In this design the clinometer is threaded for an "E" bit, and a coupling is used when it is to be used on an "A" bit. The second design, Fig. 2, which is shown with threads at either end, is like one in use by Longyear & Hodge, diamond-drill contractors, of Marquette. It is convenient in many cases where a number of tests have to be made at the same time. From a practical standpoint it is more desirable usually to make the tests as the holes progress. Most of the vertical holes drilled by this company are tested at least every 300 ft. The underground holes, which are usually horizontal, are tested at least every 100 ft. A frequent source of change in the direction of drill holes is where a reduction is made in the size of the holes from the "A" rods to the size of the "E" rods. This can usually be avoided by carefully drilling a short distance with an "E" bit and short section of rod attached to the "A" rods.

Figs. 3, 4 and 5 show the corrections for the errors due to capillarity for the apparatus in use by this company. Until a year ago, tubes having an internal diameter of 0.605 in. were used. It was found that the error at about 45 deg. was so great as to make their use undesirable. It will be noted, for instance, that where the line etched on the tube represents an angle of 45 deg. the actual inclination of the drill hole is only about 31 deg. This error is caused by the liquid adhering to the sides of the tube, forming a slightly upward curve on the upper side of the tube and a correspondingly slight downward curve on the under side of the tube, thereby giving an etching for the angle of inclination always greater than the true inclination of the drill hole. This error decreases in either direction from 45 deg.

The bottles with an internal diameter of 0.843 in. were then used and gave much more satisfactory results. For instance, when the angle read on the tube is 45 deg. the correction is 8 deg., so that the correct angle is 37 deg. A bottle having an external diameter of 1 in.

NOTE—Paper read at the Marquette Range meeting of the Lake Superior Mining Institute.

*Chief engineer, Cleveland Cliffs Iron Company, Ishpeming, Mich.

[1] *Trans.* Lake Superior Mining Institute, Vol. 2, 1894, p. 23.

(15/16 in. internal) is now being used and gives still more satisfactory results; the error has been reduced so that where the tube is etched showing an angle of 45 deg. the correction is 5 deg., making the true angle 40 degrees.

The tests from which the curves were plotted were made in the office, the tube being partly filled with liquid of the same strength as used in the clinometer. The tubes were set in a frame with a movable arm which could be inclined at different angles. The best proportion of the solution was found to be two parts of water and one part of hydrofluoric acid; this took one hour to make a perfect etching on the glass. After the line had been etched, the arm of the frame was moved until the line on the glass was horizontal and the difference in the angle read.

Later an instrument was adopted which was obtained through W. J. Mead, of the U. S. Geological Survey at Madison. This instrument has two adjustable circles. The tube or bottle is held in place by a spring and revolves on an outer circle which can be set at the angle to be tested. A string across the inner circle can later be set to coincide with the etching on the glass. It may be noted that this instrument is quite useful also in obtaining the dip of the stratification of diamond-drill cores. In case the strike of the formation with regard to the direction of the drill hole is known, the dip of the stratification can be obtained in inclined holes by setting the outer circle on the inclination of the hole and reading the dip of the formation by means of the inner circle.

A recent consular report states that the postmaster-general of Australia has made an investigation as to the source of copper wire used by his department. He found that the bulk came from the United Kingdom and America, and has advised a local copper company that in future preference will be given to wire made from Australian copper.

Is China Clay a Mineral?

Whether china clay is a mineral or not, under the Railway Clauses Consolidation Act of Great Britain, is a question that has been fought at great expense through three courts and has now been finally settled by the House of Lords. In all three courts judgment was given in favor of the contention that china clay is a mineral within the meaning of the act of Parliament. The railway company which had acquired land under which china clay was found to exist, sought to prevent the original owners from working the china clay on the plea that it was not included under the expression "mines of coal, ironstone, slate or other minerals," the rights to work which were reserved to the sellers of the ground. The case has been interesting to mining engineers from the discussion produced on the nature and occurrence of the substance in dispute. Some of the evidence in the lower court was referred to in the JOURNAL, Aug. 29, 1908.

Champion Reef Gold Mining Company of India

During the year ended Sept. 30, 1909, the profit earned by the Champion Reef Gold Mining Company of India, Ltd., operating in the Kolar goldfields, was £118,822, out of which dividends amounting to 6d. per share, or 20 per cent. on the nominal capital, were paid. The profit was less than that made during the previous year, but the rate of dividend has been maintained. There were 172,378 long tons crushed, and the cyanide works treated 253,325 tons of tailings.

From the mine ore a yield of 9 dwt. 3 grains fine gold per long ton was obtained by amalgamation. The average assay of the pulp leaving the stamp mill was 2 dwt. 21 grains, from which an extraction of about 70 per cent. was obtained in the cyanide works, giving a total extraction of 92½ per cent. It is hoped to improve on this extraction by finer grinding.

The figures shown in the report are somewhat confusing, and no statement of working costs per ton is given. In this respect the report is behind the times. In the profit and loss account the expenditure is classified departmentally and the costs per ton can be calculated fairly closely, but not absolutely correctly. A shareholder at the regular meeting called attention to this unbusinesslike method of reporting the working results, but the chairman's reply was to the effect that the management did not consider any change necessary. This disinclination to publish working costs in conformity with the best practice of mining companies of the world is regrettable, especially as it comes from one of the oldest and most respected of the mining houses in London, John Taylor & Sons.

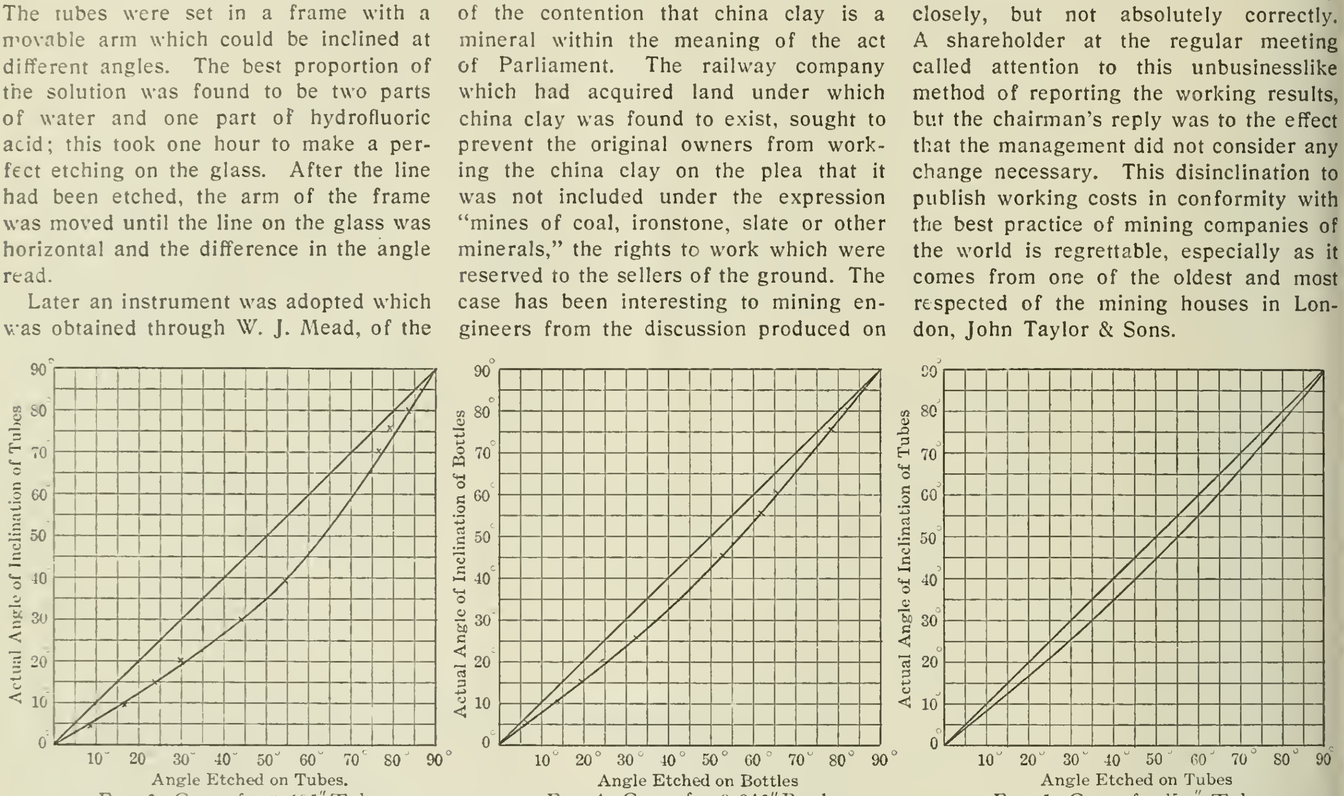

FIG. 3. Curve for 0.605" Tube. FIG. 4. Curve for 0.843" Bottle. FIG. 5. Curve for $^{15}/_{16}$" Tube.

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CORRECTION CURVES FOR ERROR DUE TO CAPILLARITY IN TESTING DIAMOND-DRILL HOLES

An examination of the costs which can be approximately calculated from the statement of revenue and expenditure, shows that Indian mining costs are high. The total costs on 172,378 tons milled, including the cyanide treatment of perhaps 75,000 tons of old tailings, amounted to 34.6s. ($8.30) per ton, of which 23.4s. ($5.62) was debited to mining and about 6s. to milling and cyaniding. Depreciation of plant is, however, not allowed for in this account. In round figures the working costs appear to average about 32s. ($7.68) per long ton or 28.5s. ($6.84) per short ton.

The directors of the company are liberal as regards the information they give about the mine and the work generally. In some respects, especially financial statements and tables of past results, they are in advance of many mining companies. Their technical statistics are, however, poorly presented and incomplete. Attention is called in the report to a decided improvement in the deeper workings. The ore reserves are given at 306,772 tons.

The Silver Market in 1909

Records of the silver movement in ondon, which still remains, as it has een for many years, the great silver arket of the world, have been kept for ver half a century by Pixley & Abell, of at city. Their annual circular contains uch interesting information about the ilver movement and prices. The year 909 was marked by generally low prices, nd moderate fluctuations. London handles early two-thirds of the silver production f the world, and the markets everywhere re ruled by its prices.

The following table shows the imports f silver into Great Britain; the exports f silver to the Far East—India, China, apan and the Straits; the highest and owest prices in London, in pence per terling ounce, for the past 10 years:

	Imports, Value.	Exports to the East, Value.	London Price. High.	London Price. Low.
900......	£13,322,300	£ 9,985,642	$30\frac{3}{16}$	27
901......	11,501,678	9,018,419	$29\frac{9}{16}$	$24\frac{15}{16}$
902......	9,764,296	7,565,305	$26\frac{1}{8}$	$21\frac{13}{16}$
903......	10,310,330	8,051,780	$28\frac{1}{2}$	$21\frac{11}{16}$
904......	11,687,339	10,038,319	$28\frac{9}{16}$	$24\frac{7}{16}$
905......	12,992,014	8,643,405	$30\frac{5}{16}$	$25\frac{7}{16}$
906......	17,288,063	15,565,304	$33\frac{1}{8}$	29
907......	15,983,892	12,752,230	$32\frac{7}{16}$	$24\frac{3}{16}$
908......	10,326,889	10,243,968	27	22
909......	11,814,889	8,936,715	$24\frac{7}{8}$	$23\frac{1}{16}$

The smallest exports to the East were n 1902; the largest in 1906. Those of 909 were less than those of six years ut of the ten given. Messrs. Pixley & Abell note the comparative steadiness of he market in 1909, the range between he highest and lowest price being 13/16d. only, against 5d. in 1908, and 3¼d. in 1907. The comment on the narket for the year says further that India and China have been the largest operators in the market, and most of the important movements were due to their acions.

Indian Operations

Shipments to India, though less than in 908, have continued on a large scale nd amount to about £6,750,000 while the tock held in Bombay is now £1,000,000 vith nearly £500,000 on the water, gainst a stock of £400,000 and £840,000 n transit at the end of 1908. With the xcellent crops of cotton and other proluce in India, it is anticipated that there vill be a large demand for silver for ewelry and hoarding during the comng year, though, judging from the increased shipments of gold to India during he last few months, it is probable that a greater proportion of gold than usual will absorb the savings of the people. The speculation to which reference was made ast year continued until recently, and at one time it was estimated that Indian speculators had sold short on this market o the extent of £2,000,000. During the last few months, however, this has been largely liquidated and the amount now open can be but trifling. This buying was probably the principal cause of the steadiness of the market during the later months of the year.

The Indian government has again made no purchase. Its total holdings of silver rupees, which at the beginning of the year stood at about 46 crores (£30,500,000), increased during the summer to 49 crores (£32,500,000), but during the last few months, owing to the demand for currency to move the heavy crops referred to above, these stocks have been reduced to 38¾ crores (£25,825,000) and it is probable further large reductions will be made during the early months of 1910. Whether these will be so large as to lead to fresh purchases of silver by the government remains to be seen.

Chinese Buying

China was a larger and more important buyer in 1909 than usual, though at times, when quotations have suited, she has sold freely. In addition to her operations on this market, she has also bought and sold largely in Bombay, while from San Francisco she has received upward of £1,500,000, against £1,100,000 in 1908. The low rates of exchange ruling in China have again adversely affected the import trade, while exports for the same reason have been stimulated. The country has been favored with excellent crops and the banks have been obliged to buy and import silver freely to pay for their exports. Large purchases of Manchurian beans, of which the crop this year is unusually large, have been made for Europe, and these have had to be paid for in silver. This is practically a new trade so far as Europe is concerned, Japan having previously been the principal buyer of these beans. In Shanghai the stock of sycee, which at the beginning of the year amounted to 19,000,000 taels, is now about 14,200,000 taels. Shipments of silver from London to China during 1909 amounted to nearly £2,000,000, against £821,000 in 1908, but these figures are not necessarily correct, for silver shipped to China from London is often diverted while in transit to India, while shipments to India are in the same way diverted to China.

Production

The production of the Cobalt district of Canada continues to show an increase. This year's output is estimated to amount to about 24,000,000 oz., against about 20,000,000 oz. in 1908. Though the development work at all the good mines shows satisfactory results, and there is a large amount of valuable ore in sight, sufficient for several years working, it is improbable that the output will be largely increased unless a substantial rise in the price of silver takes place. There are other districts, such as Gowganda, within 100 miles or so of Cobalt, where important discoveries of silver have been made, but sufficient development has not yet been done on these properties to show what amounts of silver may be expected from them in the future. The total Canadian production is estimated at 28,000,000 oz., against 22,000,000 oz. in 1908. This increase in the output of silver by Canada is probably offset to some extent by reduced production in the other countries, such as Mexico, where the effect of the recent low prices is felt more severely than in Canada, where the cost of production is remarkably low.

Coinage

Coinage by the London mint for home use has been on a small scale, but there have been purchases for colonial coinage, notably for the new silver currency of Australia. The well-appointed mint of the Canadian government in Ottawa, which was completed a little over a year ago, is now supplying Canadian requirements in this direction.

A few purchases have been made by the countries comprising the Latin Union, but purchases by the American, French and Mexican governments have been practically nothing. Rumania bought about £100,000 in May, while Brazil also took a moderate amount. Russia took over £1,000,000, of which a large part is probably intended for Manchuria, while to Germany about £1,500,000 was shipped for the increase of the silver currency referred to in the circular of 1908, though a portion may have found its way to Russia. It is also probable that Germany was largely interested in the important purchases made in December.

The Prospects

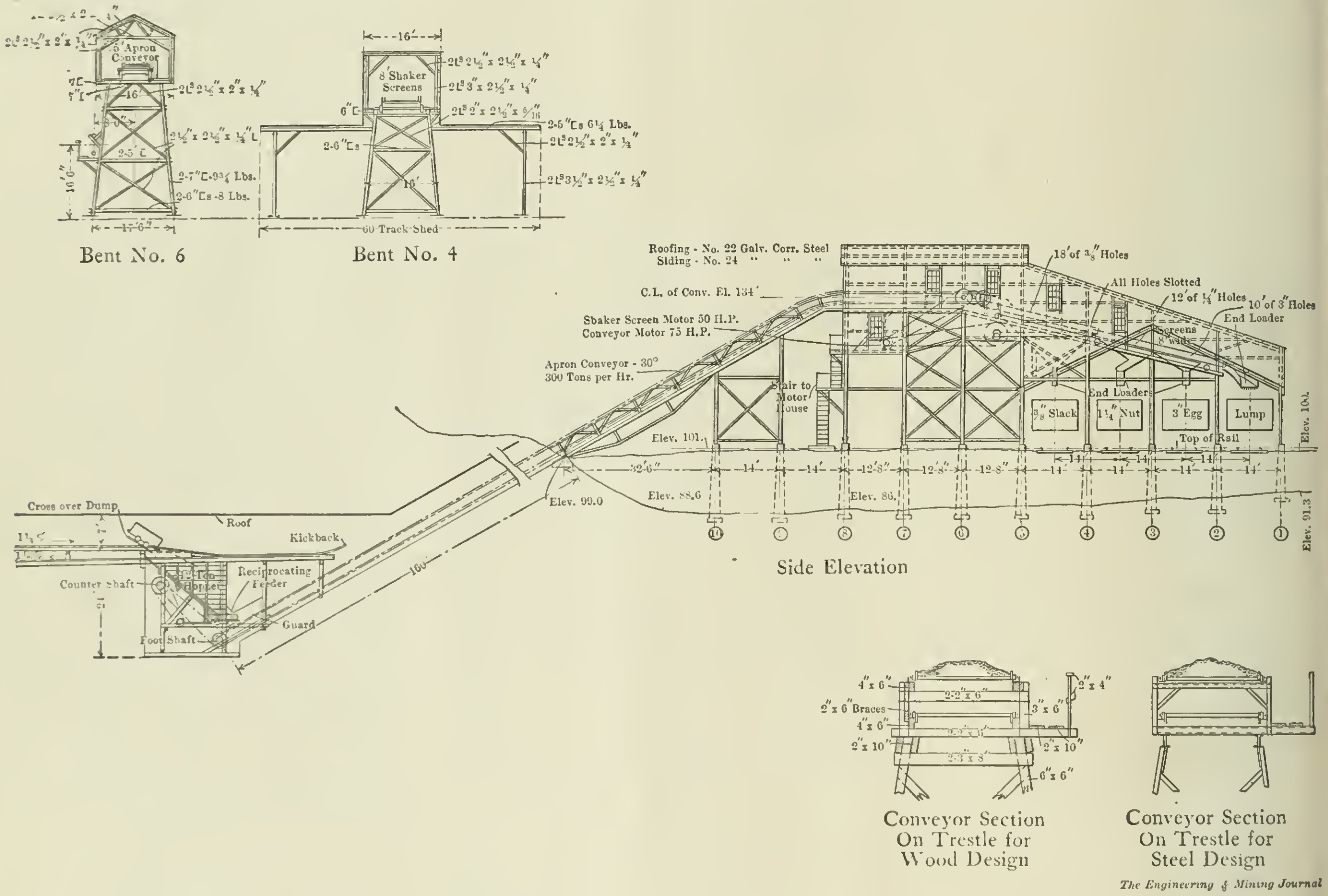
Though it is always difficult to forecast the future of the market with any degree of confidence, yet it seems probable that apart from any unforeseen factor that may arise, the average price for the coming year will be somewhat higher than that of 1909. The general improvement in trade, which is now becoming evident the world over, especially in India and China, where silver plays a most important part, and the tendency of several States to increase the amounts of silver subsidiary coinage in circulation, and so relieve the pressure on their gold reserves with profit to themselves, should lead to a good general demand for silver during the current year.

Outside Arrangements of Modern Coal Mine

A Discussion of All the Varying Conditions Which Govern the Production of Coal with Reference to the Design of a Mining Plant

BY WARREN R. ROBERTS*

The form, dimensions and other principal elements of a tipple, for instance, will depend on the mine being a drift, a slope or a shaft operation. The tipple and all of the tipple equipment will vary somewhat, depending on the size and dimensions of the pit car and the manner in which the cars are brought to the tipple. Likewise the power plant and the boiler plant should be designed for the kind and amount of power required underground as well as above ground. All of these varying conditions which govern the production of the coal must, therefore, be taken into account in designing a mining plant.



Bent No. 6

Bent No. 4

Side Elevation

Conveyor Section On Trestle for Wood Design

Conveyor Section On Trestle for Steel Design

The Engineering & Mining Journal

SECTIONAL VIEW OF STEEL TIPPLE FOR POCAHONTAS COAL COMPANY, POCAHONTAS, VIRGINIA

The market requirements must also be considered. Too often this essential element in the design of a mining plant is overlooked with the result that after the plant is built numerous and expensive changes and additions have to be made.

The nature or physical characteristics of the coal should also be carefully considered. The equipment which would be entirely suitable for one class of coal with a certain physical structure would be entirely unsuited to the handling and marketing in the best condition of some other grade of coal.

Having in mind all of the above mentioned conditions and requirements it will be seen that the mining plants for the different coal districts of the United States will vary so greatly that one cannot describe a mining plant which would be suitable for more than one district.

FIRST CONSIDERATIONS

The first and principal considerations in deciding on the type and character of a mining plant are as follows:

(1) Shall the construction be of wood or shall it be fireproof?

(2) Shall greater consideration be given to the first cost of the plant or to the cost of maintenance and operation, meaning, of course, is the amount to be paid for the plant absolutely limited, or can an amount be spent which would seem to be justified for this particular mine?

(3) A careful study of the underground conditions, and methods, by which the coal will be brought to the plant.

(4) Consideration of the character and quality of the coal to be handled.

(5) Consideration of the market requirements.

(6) Competitive conditions, that is, the character and extent of mining plants, producing coal with which the coal from this mine must come in direct competition.

Referring to this schedule, it will be necessary to make certain assumptions to discuss a typical plant, whereas, of course, in actual practice instead of making assumptions we would study the conditions. We will endeavor to make assumptions which would seem to be most in keeping with the conditions which would be met with in West Virginia.

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*President, Roberts & Schaefer Company, Chicago, Ill.

Class of Construction

It must be decided whether the plant will be built of wood construction or whether it should be fireproof. I will seect the latter as being more in keeping with the best modern practice and especially the tendency of the better class of plants in West Virginia.

The principal reason for building the plant of fireproof materials is to insure he continuous operation of the mine. That is, the primary consideration is not based on saving the operator against diect loss from the destruction of his plant by fire, but the indirect and much greater oss of having his mine shut down, probably at a season of the year when it would be most disastrous to him. Therefore, when an operator asks why he hould be at the expense of building a ireproof plant, instead of the much heaper one of wood, I give him this as he principal reason. There are, of ourse, other and important consideraions, but none nearly so important as his.

I have found from experience that it s possible to make the different units of a plant fireproof at the least cost, with he following construction:

The tipple will be of structural steel, overed sides and roof with corrugated teel. This leaves no combustible parts xcept the stair treads, walks, floor, winow frames and sash, etc., which constiutes practically fireproof construction.

The various buildings for the power plant, boiler plant, ventilating plant, hops, etc., should have concrete foundaions; either concrete or brick for walls nd the roofs of structural steel covered with 1-in. to 1½-in. boards, with a finished roof of slate, some good quality f prepared roofing, or otherwise, deending somewhat on the economy to be xercised in the construction.

First Cost vs. Cost of Operation

In deciding the question of first cost s. cost of operation, it is best to assume a cost for the plant which will allow a easonable expenditure for the sake of conomy in operation and maintenance, and also to insure a guarantee of coninuous operation. By the last expresson I mean the purchase of a superior grade of equipment which will as nearly as possible insure continuous operation.

In the design of the equipment hroughout the entire plant, operators hould direct their efforts toward the eplacing of labor, as far as possible, with machinery, thus securing a minimum cost of operation. Care, of course, must be exercised that this effort is not carried too far and thereby make an expenditure which is unjustified. A mining plant is operated necessarily under different conditions from a manufacturing or an industrial plant.

Those in authority should take into consideration the underground conditions, the method of bringing coal to the plant, etc.; for on these will depend, first, the type of tipple to be adopted, and, second, the character and extent of the power plant, boiler plant, etc.

I will assume that the coal is to be electrically mined, that it will be brought to the tipple by electric haulage and that the tipple will be built to suit these underground conditions. I will also design our power plant and boiler plant to meet the power requirement outlined above, together with the power requirement of the plant above ground.

Character of the Coal

We must consider the character of the coal of this particular mine, taking into careful consideration its physical characteristics, for the reason that on these characteristics will depend somewhat the extent of the first expenditure necessary to protect the coal from breakage. On the character of the coal will depend also many little details of the equipment, especially of the tipple equipment, such as the slope to be given the various screens and chutes. We should state in this connection that the coal from different mining districts behaves differently in being handled mechanically and a design suited to the coal of one district would give considerable trouble when applied to the coal in another field.

Description of a Typical Modern Plant

I will describe briefly a plant which we have under construction in the Pocahontas field. While this particular plant is over the line in old Virginia, yet it is in a field which extends up into West Virginia, and I have selected it because it is in so many respects typical of the best class of construction for a mining plant. In some respects it is special in arrangement, which I will point out as I proceed with the description.

The tipple is a four-track steel structure arranged for shaker screens and for a slope mine, but instead of the coal being brought to the tipple in the pit cars by one of the usual types of car haul, the pit cars are dumped into a hopper at a point within the mine and the coal is brought from this hopper to the tipple on a coal conveyer. This arrangement modifies somewhat the construction of the rear portion of the tipple from that required were the pit cars brought up into the tipple, and a cross-over dump or some other form of dump used.

In passing, I would like to describe briefly the method suggested above for bringing coal up to the tipple. It is a rather unusual arrangement, but has its special advantages, one of the principal of which is that the pit cars never have to leave the mine. They pass on one of the tracks in the mine entry over a rotary dump, by which the coal is deposited into the hopper from which it is fed regularly onto the conveyer and delivered onto the shaker screens in the tipple. A rotary dump is used instead of a cross-over dump or some other type of dump at the foot of this conveyer to avoid the use of a door on the cars, that is, to secure a solid box car; and also because it simplifies the arrangement of the tracks at the point of dumping in the mine.

Another advantage in this arrangement is that the coal is brought at a uniform rate from the hopper beneath the dump in the mine up to the tipple and onto the shaker screens and thereby a better grading of this coal is secured by the same set of shaker screens than would be secured if the coal were dumped onto the screens from pit cars in the usual manner.

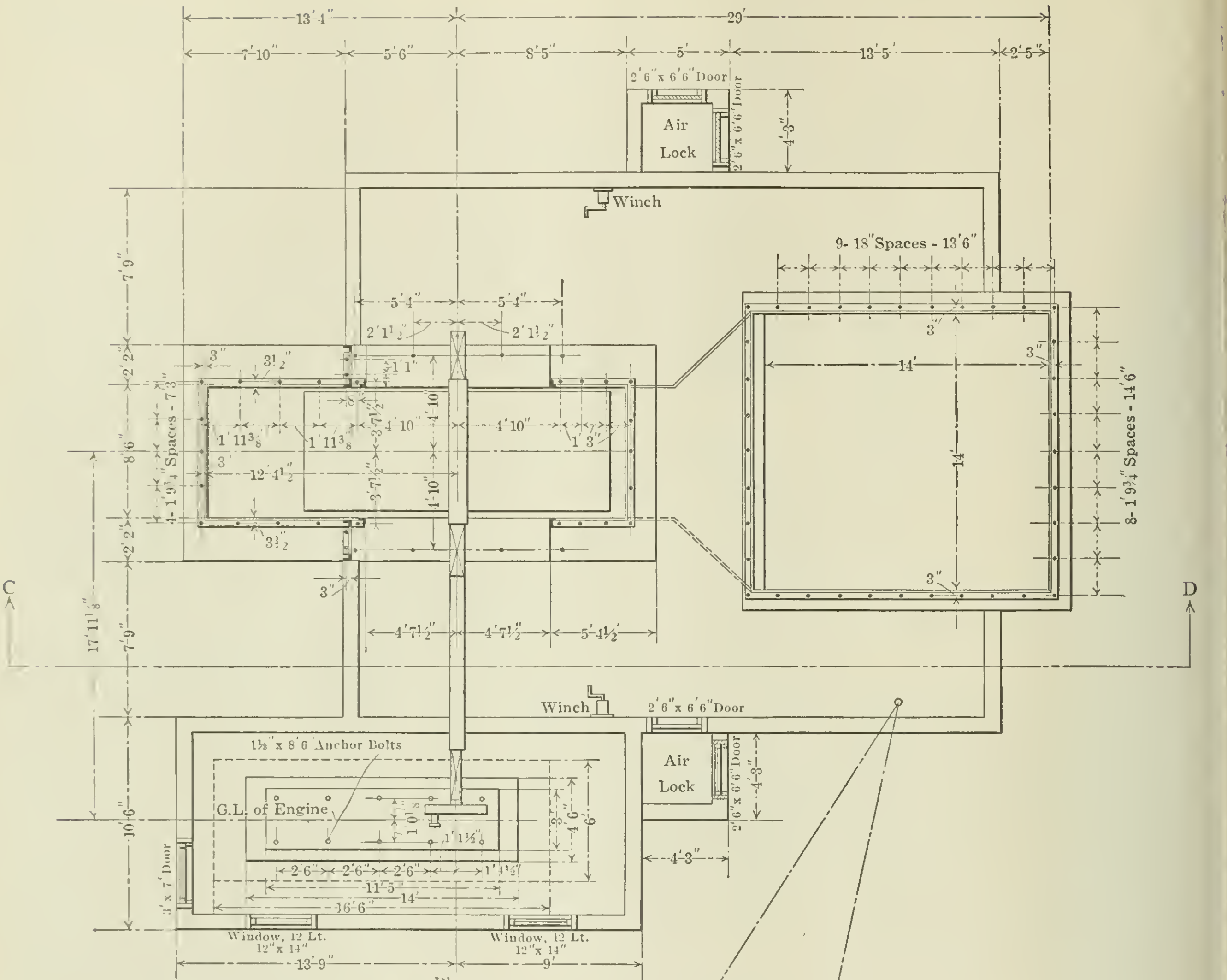
The screens for this tipple are 8 ft. wide and of the standard roller type, instead of hanging screens. The chutes beneath each set of screen surfaces are made into the form of a hopper from which the coal is loaded out by an end-loading chute. These chutes have two advantages: first, that the coal can be loaded into the cars with less breakage, and second, that the cars can be trimmed more uniformly and to full capacity with the least amount of labor. The chutes are also arranged to act as a door and shut off the flow of coal and thus avoid the usual delay while the railroad cars are being shifted beneath the tipple.

In the upper end of the shaker screens there is a door which when opened, enables those in charge to take out mine-run coal and load it into cars on the slack track, or into a local-trade bin placed alongside of the slack track. By this arrangement it is possible to make mine-run coal without the necessity of operating the shaker screens.

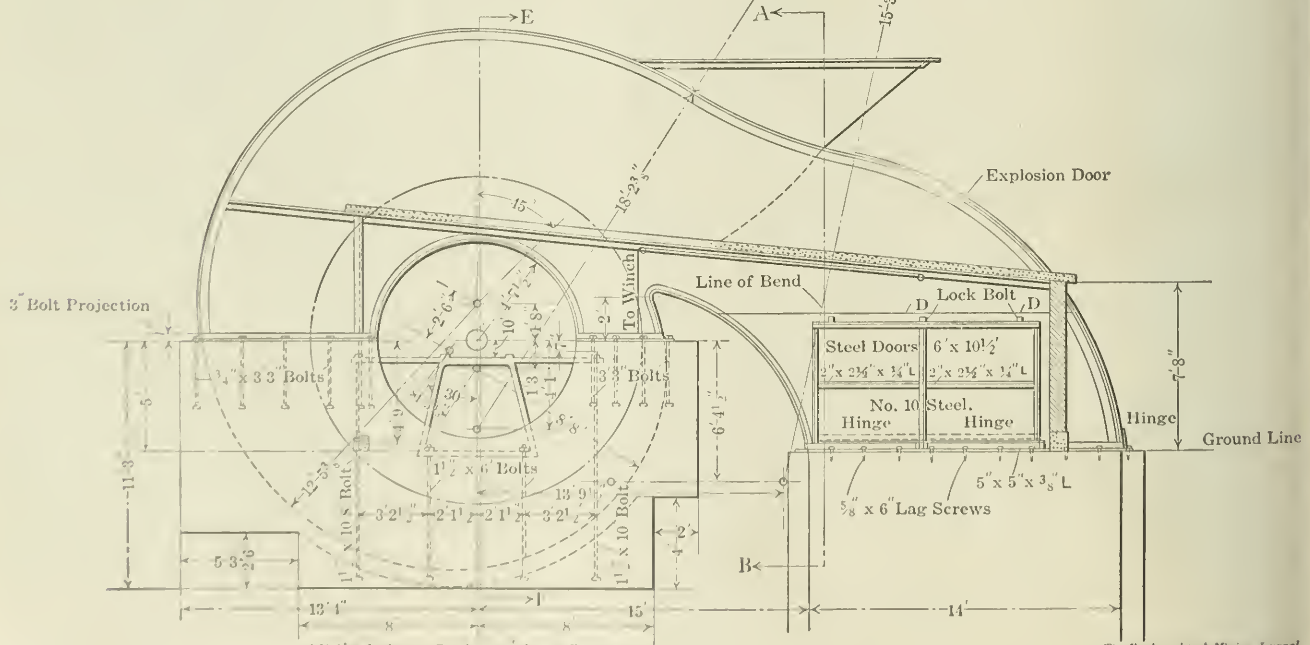
Arrangement is also made for the future installation of the necessary chutes for loading box cars on each of the four railroad tracks. These chutes were not installed but the hoppers beneath the screens are so arranged that they need not be reconstructed when these box-car chutes are installed. Provision is also made for the future installation of picking tables on each of the four tracks, if found necessary, without having to change any of the screens or chutes in the tipple.

Power Plant

The power and the boiler houses for this plant are in one continuous and uniform building, but are separated by a brick partition. The foundations for the



Plan.



All 1½" Bolts to Project 3" above Concrete.

Section C-D.

The Engineering & Mining Journal

PLAN AND SECTION OF HIGH-SPEED FAN FOR BIG VEIN, POCAHONTAS COAL COMPANY uilding and for all of the equipment, oth for the power house and the boiler ouse, are of concrete. The walls of he building are brick and the roof con- truction, trusses, purlins, etc., are en- irely of steel. The roofing was corru- ated galvanized steel. But I do not ecommend this kind of roof for a power r boiler house. I consider it better con- truction to put on a good quality of ressed and matched boards on which nay be laid either slate, composition oofing, or, if a permanent and fireproof onstruction is required, asbestos pro- ected metal or some equally good ma- rial.

Over the boiler-house portion of the uilding are placed star ventilators for iving the proper ventilation to the boiler oom. The building, of course, is also rovided with the necessary windows nd doors, and one large double door ading into both the power house and e boiler house for the installation of uture equipment or repairs.

The floors for both the power house and the boiler house are of concrete placed on the proper cinder or other suitable foundation.

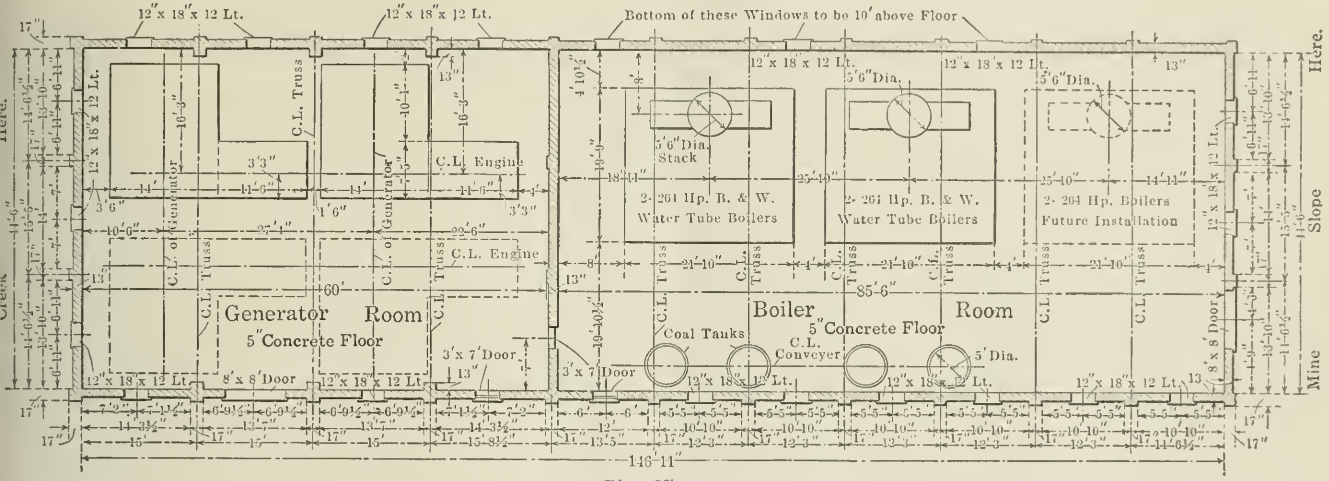
The equipment for the power house consists of two 250-kw. generators direct connected to high-speed engines with room for the installation of two additional units of the same size.

These generators furnish power for driving all of the equipment above ground and for the electrical cutting machines used in the mine. When the development at the mine will justify electric haulage and the use of a larger number of mining machines, the additional generators will be installed.

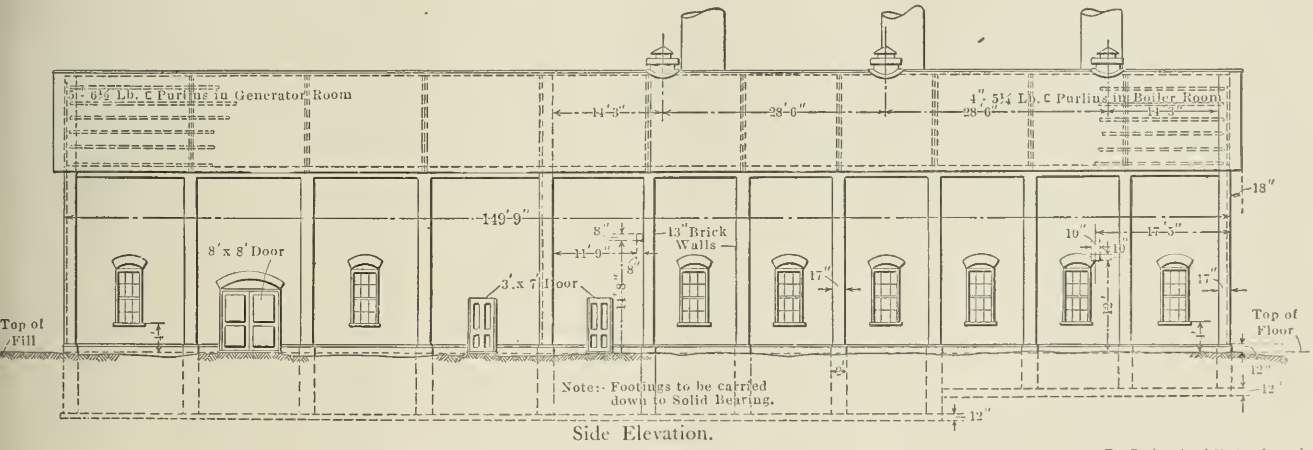
The equipment for the boiler plant consists of four 264-h.p. Babcock & Wilcox water-tube boilers set up in pairs. The boiler house is designed for one more battery of the same size boilers, giving a total of 1584 horsepower.

These boilers should be equipped with chain-grate stokers, which enable the use of the slack coal from the mine. This coal is brought directly from the chute beneath the shaker screens in the tipple by a boiler-house coal conveyer and deposited in the bins in front of the boilers. The coal should be fed from these bins automatically into the hoppers of the stokers. With such an arrangement the coal for feeding the boilers is handled entirely by machinery at a very considerable saving in labor.

A feed-water heater and purifier is provided of sufficient capacity for the six boilers described above. A pair of feed-water pumps is also provided, each of sufficient size to feed the entire battery of boilers. These pumps are cross connected so that either pump may be used whenever the other is shut down for repairs, thus avoiding any delay incident to the usual behavior of a feed-water pump.



Plan View.


5- 6½ Lb. ⊏ Purlins in Generator Room
4- 5¼ Lb. ⊏ Purlins in Boiler Room
14'-3"
28'-6"
149'-9"
8'x 8' Door
3'x 7' Door
13" Brick Walls
Top of Fill
Top of Floor
Note:- Footings to be carried down to Solid Bearing.
18"
17'-5"
12"

Side Elevation.
From R.R. Track Side

The Engineering & Mining Journal

PLAN AND ELEVATION OF POWER HOUSE FOR BIG VEIN, POCAHONTAS COAL COMPANY

MINE VENTILATING PLANT

For this mine the ventilating plant consists of a 13-ft. diameter by 6-ft. wide high-speed fan direct connected to a high-speed engine. This is a double-inlet, direct blowing, reversible fan; that is, under ordinary operation it is used as a blowing fan, but is provided with the usual reversing doors so that it may be very quickly changed to an exhaust fan.

The casing for the fan together with its connection with the air shaft is of steel as are also the reversing doors. The foundations for the entire equipment, also the floors and roofs, are of concrete. The walls for the engine house and for the side drifts are of brick. The entire construction is, therefore, permanent and fireproof.

I believe a fireproof construction for the shops of a mining plant is unnecessary, and unless it is desirable to have an absolutely fireproof and permanent plant throughout, I recommend a building of wood construction having the sides covered with sheet metal and the roof of a good composition material or slate.

The equipment which it is advisable to install in the shops of a mining plant will depend largely on whether the mine is isolated or whether it is near a town containing a good general machine shop and supply house. In the latter case, a less expensive installation for the shop can be provided.

BRIQUETTING PLANT

The time has arrived in the development of bituminous-coal mining in this country when it is becoming necessary to enlarge the markets for the smaller grades of coal. Our methods of mining produce such a large proportion of fine coal that operators find themselves constantly facing the difficulty of having a surplus of this grade of coal on their hands. If they were to run their mines at the capacity at which they could provide markets for the larger sizes of coal they would find themselves with a great amount of the small sizes on their hands. This is especially true where the smaller sizes of the coal cannot be consumed by coking, that is, for coals which will not coke or where coking has not been adopted.

The condition outlined above is not a temporary one, but has become entirely permanent and in all probability will grow rather than diminish. It is therefore essential for the best interests of the industry that processes should be developed or methods devised whereby these smaller grades of coal may be converted into a product for which there are markets, or for which markets may be provided. Such a process or method is found in the briquetting of the smaller grades of coal. While this process is still new and unfamiliar to most coal operators in this country, and while they think of it as something which they hope in time may become practical and feasible, yet they do not believe that the time has arrived when it is possible to briquet their finer grades of coal in a manner and at a price that is a commercial possibility.

I have made a very careful study of this phase of the bituminous-coal industry for several years and not long ago reached the conclusion that the time had arrived when the fine coal for certain localities at least could be profitably briquetted. We have fully demonstrated the possibility of briquetting Illinois slack and the slack from mines of western Arkansas, and from our experience gained on these propositions we believe that there are other localities where the fine coals may be profitably briquetted.

Briquetting, however, like washing coal, does not consist of a press with the necessary elevators, conveyers, etc., but it is a process of treating and compressing the coal which also needs the most careful study by someone who has had the experience which can be applied to an intelligent study of the problems involved. I fully believe that with the same intelligent experience applied to the briquetting of fine coal which has been applied to the successful washing of coal, that practical and highly beneficial results will be obtained.

The Utilization of Firedamp in Sarrebruck Coalfields

SPECIAL CORRESPONDENCE

An interesting case of utilizing firedamp occurs at the Frankenholtz mine in the Sarrebruck district of Germany. The coal seams in this property are separated in two portions by an important faulting inclined north and situated close to the southern boundary of the property. Owing to the difficulties of passing through this faulting, the seams were worked only at the north of it, down to a point where it was worth making researches to the south of the faulting, the tonnage left between same and the boundary being possibly important at this depth.

Horizontal drillings, 4 cm. in diameter were therefore made with a Sullivan drill. On entering carbonaceous sandstones, 60 m. beyond the faulting, the drill was suddenly thrown back by a violent rush of firedamp. A few days later, the flow of gas being still the same, and it being impossible to shut up the drill hole, gas pressure being as high as 200 lb. per sq.in., a 6-in. steel pipe was laid to carry the gas to the air-return shaft. One month later the gas pipe was lengthened to the surface and six months after its discovery gas was burnt under a boiler with burners of the Bunsen type.

Some time after that, the quantity of gas seemed to decrease, when a second hole was drilled some 10 m. from the former with practically the same results and same pressure of gas. A receiver was installed to regulate the gas.

The Relation of Foreign Labor to West Virginia's Coal Industry

In an address before the winter meeting of the West Virginia Coal Mining Institute, Neil Robinson, of Charleston, W. Va., disclosed some intersting facts. Mr. Robinson showed that 31.6 per cent. of the labor engaged in mining in West Virginia came from foreign countries. In answering the question, "Why do we employ so many foreigners?" he said that while the total population of West Virginia has increased 25.1 per cent. in nine years, the total number of miners employed has increased nearly 122 per cent. during the same period of time.

Mr. Robinson continued: "Within the last six months, many operators have scattered handbills, posted notices at tipples and advertised in local papers for more laborers, but these efforts only resulted in drawing men temporarily from neighboring mines and demoralized, without increasing the State's supply of labor. After careful observation I am inclined to believe that this action is causing a labor loss of 1500 men every day through the encouragement of roving and moving from mine to mine.

"If the aspirations of West Virginia to become the second coal-producing State in the Union are to be realized, she must secure at least 15,000 new mine employees within the next 12 months. This means the importation of three times that number to provide a margin for desertion, changes to other employment, and the discharge of those who are unable to adapt themselves to underground work.

"During the year 1908, the nonfatal accidents to foreigners constituted 39.7 per cent. of the total number. If the accidents had occurred in proportion to nationality, they would have amounted to 31.6 per cent.—a difference against the foreigners of 8.1 per cent. Taking into consideration the fact that the minimum of experience yields the maximum in accidents, it is remarkable that the untrained men from abroad compare so favorably with the Americans, but there is room for improvement.

"A foreman who will learn 200 or 300 words of the foreign language predominating at his mine, may by his ability to give intelligible directions prevent a large amount of suffering, in many instances, save valuable lives, and, incidentally, increase the quantity and quality of his production. Aside from the humanitarian services which may be rendered through knowledge of another language, a foreman will have a commercial increase in his earning power. Other things being equal, an operator will invariably give preference and frequently a larger salary to the man who can give orders without the help of an interpreter."

NEW PUBLICATIONS

Die Binaeren Metallegierungen, by Dr. K. Bornemann. 4 marks. Wilhelm Knapp.

L'Electricité dans les Mines, by E. J. Brunswick. 7 fr. 50 cen. Gauthier-Villars, Paris.

Twenty-seventh Annual Coal Report of the Illinois Bureau of Labor Statistics, 1908. David Ross, secretary.

The Granites of Vermont, by T. Nelson Dale. U. S. Geological Survey, Bulletin 404. Government Printing Office.

tructural Details or Elements of Design in Heavy Framing, by Henry S. Jacoby. $2.25. John Wiley & Sons.

The Flow of Water: A New Theory of the Motion of Water under Pressure and in Open Conduits and Its Practical Application, by Louis Schmeer. $3. D. Van Nostrand Company.

Handbook of British Guiana, 1909, Comprising General and Statistical Information concerning the Colony. Edited and compiled by George D. Bayley. 5s. The Argosy Company, Limited.

Thirtieth Annual Report of the Director of the United States Geological Survey to the Secretary of the Interior for the Fiscal Year Ended June 30, 1909. Government Printing Office.

Mineral Deposits of the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohave County, Arizona, by F. C. Schrader. U. S. Geological Survey, Bulletin 397, 1909. Government Printing Office.

nvestigations of Coal Fields in Indiana, North Dakota and Montana, by G. H. Ashley, C. D. Smith, R. W. Richards, L. J. Pepperberg and C. H. Wegemann. U. S. Geological Survey, Bulletin 381-A. Government Printing Office.

Geology and Water Resources of the Northern Portion of the Black Hills and Adjoining Regions in South Dakota and Wyoming, by N. H. Darton. U. S. Geological Survey, Professional Paper No. 65, 1909. Government Printing Office.

Recherches sur la Dessiccation du Vent Soufflé dans Les Hauts Fourneaux et sur l'Emploi Rationnel du Chlorure de Calcium, by F. Daubiné and E. Roy. Bulletin et Comptes Rendus Mensuels de la Société de l'Industrie Minérale, November-December, 1909. Published by the Society.

Hydraulic Tables and Diagrams for Practical Engineers. By Capt. A. ff. Garrett. Longmans, Green & Co.

Contains numerous tables 24 diagrams, etc., useful in hydraulic calculations. Diagrams are plotted logarithmically and are hence compact, at the same time giving more range than most diagrams heretofore published.

Elements of Mineralogy, Crystallography and Blowpipe Analysis from a Practical Standpoint, by Alfred J. Moses and Charles L. Parsons. Fourth Edition. $2.50. D. Van Nostrand Company.

A description of all common or useful minerals; the tests necessary for their identification; the recognition and measurement of their crystals, and a concise statement of their uses in the arts.

The Geology of Ore Deposits. By H. H. Thomas and D. A. MacAlister. Longmans, Green & Co.

Under the general editorship of J. E. Marr, a series of geological handbooks is being issued, of which "The Geology of Coal and Coal-Mining" by Walcot Gibson was the first and the present work is the second. The books are compact, of convenient size and neatly printed. The work before us is divided into nine parts or chapters as follows: Introduction, 21 pp.; Ores Due to the Differentiation of Igneous Magmas, 50 pp.; Pneumatolysis, 43 pp.; Hydatogenesis, 120 pp.; Metasomasis, 63 pp.; Bedded Ores Due to Precipitation, 29 pp.; Metamorphic Ore Deposits, 27 pp.; Secondary Changes in Ore Deposits Apart from Metamorphism, 16 pp.; Detrital and Alluvial Deposits, 33 pp. This blocking out of the subject will show that it is treated in a thoroughly modern manner and that the latest views are given due prominence.

In the introduction the authors review the general processes which give rise to ores. They assume a molten mass of rock and trace it through its several stages of crystallization on cooling and note the connection of each with possible orebodies. Thus while the mass is yet molten or when only the earliest metalliferous minerals have separated from it, there may arise a differentiation which will lead to the formation of orebodies. In the magma's later stages the emission of heated vapors and gases affords the pneumatolitic varieties of chapter 3. Still later in time or else at points remote from the heated rock in its early stages we have the work of waters, more or less heated, as described in chapter 4. If these magmatic waters or those of another type, give rise to ores by replacement, the examples result which are outlined in chapter 5, where the direct influence of igneous phenomena has been followed to the end. Surface reactions which give rise to bedded deposits occupy the field of view in chapter 6. They are followed by the types which are so much metamorphosed that their past careers are uncertain. Secondary enrichment and its related phenomena fill a chapter and detrital and alluvial concentrations close the work.

Under each chapter after a few paragraphs regarding the processes specially involved, the authors briefly describe the orebodies of the world belonging to the type under consideration. The authors have read widely and with care. They have overlooked little if anything of importance. Limitations of space have prevented the recording of citations so that a reader who has become interested in the brief summary of some particular district cannot go to first sources except through the medium of larger works. The treatment thus seems at times sketchy but despite this latter feature the authors have prepared a thoroughly modern and interesting work.

Modern Practice in Mining: Volume 2: The Sinking of Shafts. By R. A. S. Redmayne. $2.25. Longmans, Green & Company.

Coming from the pen of so distinguished an engineer as the chief inspector of mines in Great Britain, who has also held the chair of mining in the University of Birmingham, this book is a keen disappointment. The largest part of the text consists of material abstracted from the writings of others, and while it is, of course, eminently proper to credit the original source of such material, still one is entitled to expect a larger degree of originality in the presentation of the subject by an engineer of such wide experience. The book was prepared, naturally, for the use of British students, and it will doubtless be restricted to that field, for many of the colloquial technical terms are unintelligible elsewhere, as, for example, the sentences on page 44: "To allow of the lorries on which the banksmen stand passing over the pit top, four balks are often placed across the mouth carrying bridge rails on which the lorry and the bogie into which the kibble empties may be run. Thus a square framework is formed over the pit mouth, and the landing of the hoppit or kibble, is completely covered. The lorry is sometimes called the running bridge or 'giddy.'" The special methods for sinking shafts under difficult conditions are presented with so little detail that an engineer would still have to turn to the original articles, and the present work does not, thereby, fulfil the author's hope "that it may be used both as a textbook and work of reference." The chapters relating to the English methods of lining circular shafts with iron or with brick masonry are the most illuminating parts of the book, but are of little interest to American readers.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. H. Cahan, of Montreal, has gone to Mexico City on business.

Robert Hawxhurst, Jr., of London, has gone to Rumania on professional business.

Fritz Cirkel, of Montreal, has left for Denver, Colo., and San Francisco, Cal., on professional business.

Carl Scholz has been elected vice-president and general manager of the Consolidated Indiana Coal Company.

O. C. Gayley has been chosen vice-president of the Pressed Steel Car Company in place of J. W. Friend, deceased.

M. J. O'Brien, of Cobalt, Ont., has purchased four gold claims near the Bannerman group, Porcupine district, Ontario.

W. B. Thompson, president of El Rayo Mining and Development Company, is visiting the mines at Santa Barbara, Mexico.

Theodore J. Hoover has been appointed consulting engineer for the Minerals Separation, Ltd., 62 London Wall, London, England.

Charles N. Wilson, president of the Cobabi Mining Company, has removed his residence from Los Angeles, Cal., to Tucson, Arizona.

John S. Kennedy has been chosen president of the Sunnyside Coal Company, of Johnstown, Penn., in place of H. T. de France.

R. A. Conrads has resigned his position with the Esperanza Mining Company at El Oro, and is now at Ixtlan del Rio, Tepic, Mexico.

Jose L. Requena, director and ex-president of Dos Estrellas, has just returned to Mexico from a month's visit to Washington and New York.

B. N. Lehman has been chosen treasurer and general manager of the Black Bird Copper-Gold Mining Company, of Salt Lake City, Utah.

Alexander Glass has been elected president of the Whitaker-Glessner Iron Company, of Wheeling, W. Va., in place of N. E. Whitaker, deceased.

Jorge Hohagan has resigned his position as director of the Bolivian Mint, and will practise as a mining engineer, with headquarters at La Paz, Bolivia.

Arthur R. Campbell has been appointed assistant superintendent of the United States Smelting Company's lead smeltery at Bingham Junction, Utah.

L. P. Mathewson, general manager of the International Smelting and Refining Company, has returned to Anaconda, Mont., after a visit to plants of the company.

Lee Denis, of Quebec, has been appointed electrical engineer of the Commission for the Conservation of National Resources to report on the value of water powers throughout Canada.

W. D. L. Hardie has resigned his position as superintendent of the Galt mines, Alberta, to accept the general managership of the Diamond Coal Company, Diamond City, Alberta, Canada.

Carl E. Maeder, superintendent of the Duquesne rolling mills of the Carnegie Steel Company, has retired to become general manager of the Western Steel Corporation, at Irondale, Washington.

Samuel W. Cohen, general manager of the Crown Reserve Mining Company, Ltd., of Cobalt, Ont., has returned to the mine from a business trip of two weeks to Montreal, New York and Pittsburg.

Robert Kann, consulting chemist to the Raritan Copper Works, Perth Amboy, N. J., has opened at 24 Cliff Street, New York, a commercial laboratory making a specialty of metallurgical analysis and research.

James S. Higgins, of Butte, Mont., recently appointed general manager of the Twin Buttes Copper Company, Tucson, Arizona, arrived at the mine Jan. 27, but was called back to Butte Feb. 2, on personal business.

Clement K. Quinn, formerly mining engineer for the Inter-State Iron Company, has been appointed chief engineer for the mines operated by the Jones & Laughlin Steel Company, in Minnesota. The group includes 11 mines on the Mesabi range.

G. A. McDonald has resigned his position as manager of the Great Falls Iron Works at Great Falls, Mont. He is succeeded as manager by A. C. Green, recently with the United States Smelting, Refining and Mining Company at Salt Lake City, Utah.

We have received many inquiries from the friends of W. H. Freeland of Ducktown, Tenn., with respect to the sad accident that occurred last week at Kelvin, Ariz., in which one of his name was killed. This was not W. H. Freeland, of Ducktown, who was at his home.

Holland E. Benedict, formerly assistant superintendent at the United States Smelting Company plant, Bingham Junction, Utah, has gone to Needles, Cal., as superintendent of the Needles Mining and Smelting Company, one of the subsidiary companies of the United States Smelting, Refining and Mining Company.

D. L. H. Forbes, who has just completed his engagement with the Esperanza Mining Company, El Oro, Mexico, where he has been in charge of the design and construction of the new 700-ton mill, has accepted a position as metallurgical engineer for the Lucky Tiger-Combination Gold Mining Company, at Yzabal, Sonora.

OBITUARY

Charles W. Owston died suddenly at East Orange, N. J., Feb. 14, aged 76 years. He was born in Pittsburg and was an active oil operator in the Pennsylvania oil region for a number of years. For nearly 40 years past he was connected with the Standard Oil Company, and had been for some time manager of its fuel-oil department.

R. Prewitt Coleman, of Salt Lake City, Utah, was killed in the accident near Kelvin, Arizona, Feb. 5, mentioned in the JOURNAL last week. He was 30 years old, and was one of the most capable and trustworthy of the younger mining engineers; in his death the profession has lost one of its most promising members. He spent his youth in Colorado and was graduated from the Colorado School of Mines. Being reared in a mining region and the son of a mining engineer of distinction and wide experience, Robert J. Coleman, he had exceptional opportunities for preparation for his chosen profession. After completing his studies he spent some time assisting his father in mining examinations in this country and Mexico. Four or five years ago he accepted the position of assistant to Henry Krumb, mining engineer of Salt Lake City, Utah, which position he continued to fill until his untimely death. His work included participation in a number of the more important examinations of recent years and took him to many mining districts of this country and Mexico. He was thus brought into contact with a number of prominent men in the mining world and was rapidly building up an enviable reputation as an able, observant and conscientious engineer, who was blessed with the power of independent thinking. His absolute honesty with himself and others and his independence of judgment assured a rapidly increasing number of clients and friends. His cheerful face, his consideration for others and his modest manner made him many friends.

SOCIETIES *and* TECHNICAL SCHOOLS

University of Kansas—Notice is given that the new engineering buildings at Lawrence, Kan., will be formally dedicated Feb. 25. They include the general engineering, the geology and mining buildings and the mechanical laboratory and power plant. The exercises will include addresses by Frank O. Marvin, dean School of Engineering; Richard C. Maclaurin, president Massachusetts Institute of Technology; and Ernest R. Buckley, president American Mining Congress.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Feb. 11—In his analysis of the sources f the gold produced in California in 908, Charles G. Yale of the U. S. Geoogical Survey gives some interesting data. The Mother Lode counties of Eldorado and Mariposa produced but ittle gold from the Mother Lode proper during that year; but the output of Amador, Calaveras and Tuolumne came chiefly from mines on the lode. From hese counties 1,112,415 tons of ore were milled, producing $3,730.145, or $3.36 per ton. Of this amount $2,438,983 was recovered by amalgamation and $1,291,162 from the concentrates. The total value of the silver recovered was only $26,415 or only 2.4c. per ton of ore. The average value of the concentrates per ton was $49.76, and per ton of ore $1.16. Total mining costs on the Mother Lode usually approximate $2 to $3 per ton of ore.

The total value of the silver produced in the State was about $769,000 of which approximately $630,000 came from ore smelted, chiefly copper ore. Of the total gold production of $18,760,000, about $9,300,000 came from milling ores; $6,150,000 from dredging, $880,000 from ores smelted and the balance from hydraulic, drift and other kinds of placers.

A. C. Eisen, president of the Mayflower Bullfrog Consolidated Company in Nevada, filed suit Jan. 6 against the company for the recovery of $50,000 alleged to have been advanced to the corporation. Eisen is one of the largest stockholders and his plan for reorganization on a leasing basis has been fought by the minority.

A copper smeltery is planned near Keddie station on the Western Pacific railroad, Plumas county, Cal., to treat ores from the Ingalls group of copper claims and from other sources, east of Indian Valley. These mines or prospects have been known for 30 years and considerable work done.

A decision of the Supreme Court of California on underground waters is of general interest. The Santa Clara valley is drained by Coyote creek, which flows into the bay of San Francisco. Much of the water of this creek sinks and saturates underlying gravel beds, forming an underground reservoir which supplies wells of many of the landowners of the valley. A former decision held that one landowner could not pump water from this underground supply to the detriment of another landowner. The decree just handed down, holds that the owner of land overlying a body of underground water which is fed largely by the seepage from a stream, can enjoin an appropriator of the waters of the stream from diverting any of the water if the effect would be to lessen the amount of percolating water beneath his land. In the winter season the flood waters of Coyote creek in part sink and in part overflow into the bay, and the Bay Cities Water Company claimed that it was entitled to take such of the flood waters as did not sink but were lost in the bay.

The National Gold Dredging Company is declared by the State mineralogist to be fraudulent. W. R. Rice, of Long Beach, Cal., had sold stock to the value of about $60,000 to many people, mostly women, in southern California on representation of soon paying dividends. It was claimed that the company had title to 11 miles of the bed of the American river, which is stated not to be the fact. However, operations were conducted on the gravels of this river for six months and only one-half ounce of gold produced.

The Mt. Hamilton Land and Oil Company and the Esperanza Land and Oil Company own considerable land in the oil districts and should own much more, according to their claims. The former president, John F. Krause, has been convicted by a jury in the Federal court of using the mails to defraud. Krause sold a lot of stock held in trust by him for the companies, and used the proceeds to buy land in his own name. On the sentencing of Krause on Feb. 14, legal steps will be taken by the companies to recover the lands purchased by Krause with funds belonging to the companies.

The T. A. P. Oil Company has been incorporated with a capitalization of $1,500,000 to prospect 10,000 acres of land in the southwestern part of Santa Clara valley. This is practically a new field, although seven years ago a well was bored near the Los Gatos-San Jose road, which produced 300 bbl. per day.

Butte

Feb. 10—The Iron Mountain Tunnel Company has filed amended articles of incorporation with the Secretary of State. The number of shares has been reduced from 1,600,000 to 200,000 and their par value increased from $1 to $10. The total capital is thus increased from $1,600,000 to $2,000,000.

As a forerunner of the proposed copper merger the notice of a special meeting of stockholders of the Anaconda Copper Mining Company is being published in a Butte newspaper. The notice states that the meeting will be held March 23 at Anaconda, Mont. The purposes of the meeting are specified as being: (1) The increase of the company's capital stock from 1,200,000 shares of the par value of $25 each, to 6,000,000 shares of the same par value; and (2) the amendment of the articles of incorporation so that the company may "purchase, or otherwise acquire, own, hold, mortgage, pledge, sell, assign, transfer, or otherwise dispose of, shares of the capital stock of, or any bonds, securities, or other evidences of indebtedness, created by any other corporation or corporations, wherever formed or organized, and to exercise all the rights, powers and privileges of ownership, including the right to vote upon such stock." The law which allows a domestic corporation to hold and vote the stock of other companies was passed by the Montana legislature in 1909 after considerable opposition. The bill, however, contained a provision that nothing contained therein should be construed as abrogating the anti-trust laws of the State, and was thus finally passed.

Denver

Feb. 11—The annual meeting of the stockholders of the Portland Gold Mining Company was held in Cheyenne, Wyo., on Feb. 7, resulting in the reëlection, by a majority of four to one, of the present board of directors. The usual opposition by James F. Burns, the former president of the company, was manifested both by his resolution condemning the present management on various points and by the casting of his vote of 454,500 shares against the reëlection of the old board. This vote, by the way, represented but 4500 shares more than Burns' personal holdings. A total of 2,384,390 shares of the capitalization of 3,000,000 were represented at the meeting. The president of the company, Frank G. Peck, reported a gross production for the fiscal year of 83,908 tons, of a gross value of $1,438,650, net earnings $425,444, of which $330,000 was disbursed in dividends to the stockholders.

The Southern Pacific Company has filed articles of consolidation of six

Southern Pacific subsidiary companies, organized to build 1900 miles of new railroad. The new company, which is to be capitalized at $40,000,000, will be known as the Arizona & Colorado. It will build from the main line of the Southern Pacific & Arizona, through Arizona and western New Mexico, to Durango, Colo., where the company has large coal deposits. Other lines are to reach the principal cities of Arizona and compete with the Phelps-Dodge lines in that section.

The annual stockholders' meeting of The Isabella Mines Company, held at Cheyenne, Wyo., on Feb. 7 and 8 was a rather stormy one, James F. Burns, formerly president of the Portland, charging his opponents for control of the handling of the ore with attempted stuffing of the ballot box. It is reported that the Burns faction was the victor. The report for the year showed gross receipts of $187,542 from ore sales, with a mining, milling and transportation expense of $204,516, making a net loss on mining alone of over $16,000, which was increased to $19,865 by other miscellaneous expenses. The cash balance on hand Dec. 31, 1909, was given as $81,434.

Salt Lake City

Feb. 9—A weather bureau has been installed at the Tooele plant of the International Smelting and Refining Company, and is now in operation. Some experimenting with the apparatus is still being carried on. Self-recording instruments for measuring the precipitation, direction and velocity of the wind, also barometers, etc., of the same type as used by the U. S. weather bureau have been adopted. The records, especially regarding the direction of the wind and the time and amount of precipitation, will be of value to the company in the event of certain kinds of damage suits being brought against it, i.e., when damage to crops or stock from smeltery fumes is alleged. Progress on the construction work has been somewhat delayed by the severe winter weather and late arrival of material. Between 375 and 400 men are employed. In regard to reports that have been circulated that the company would not be ready to receive ores until next autumn, Mr. Mathewson has stated that the plant will be ready to receive ore on April 1, according to contract.

The aërial tramway connecting the Utah Consolidated mine at Bingham with the International Smelting and Refining Company's new plant near Tooele is rapidly approaching completion. Both cables have been laid on the Tooele side up to the top of the divide, which is about a mile and a quarter from the terminal at the mine. This terminal is at the mouth of No. 7 tunnel, and has ore bins of 1500 tons capacity. Additional ore bins are situated near this point in the mine. The terminal at the smeltery is expected to be completed in about three weeks. Receiving ore bins at this end will have a capacity of 500 tons.

The tram is of the Bleichert type, made in this country by the Trenton Iron Company. All the towers have been erected, and are of wood with concrete foundations. Laying of the cable has been started on the Tooele slope. The cable for the load is 1½ in. in diameter, and 1¼ in. for the empty buckets on the return side. The traction cable is 1 in. in diameter. The length of the tramway is 21,050 ft. Altogether there are 80 towers, 6-tension stations, two control stations and one rail station. There is a drop of 2000 ft. in 4000 on the Pine Cañon side, with another rise and gentle slope before reaching the smeltery. The greatest span is 1040 ft. on the Bingham side near the summit. A 100-h.p. induction motor is placed at each of the control stations. These will be used in starting the line to haul the buckets to the top of the divide; after that no power will be necessary. When the tramway is loaded and in operation the motor at No. 2 control will act as a generator, No. 1 being cut out, and will develop 100 h.p. which will be used at the mine. The capacity of the tram is 100 tons per hour. The line is designed for a speed of 600 ft. per min., and the capacity of each bucket is 1500 lb. of ore. At the present time the Utah Consolidated is mining 800 tons of ore per day, and is shipping to the American Smelting and Refining Company at Garfield.

Circulars are being sent by the State board of equalization to mining companies of the State, calling attention to the necessity of reporting to the board the returns of all mine improvements, machinery and net proceeds for the year ended Jan. 1, 1910, for assessment purposes, in accordance with the State law to that effect. These returns must be sent in so they will be received on or before the second Monday in February, and the board requests that improvements, buildings and machinery be fully enumerated and separately mentioned. It is stated that up to the present time only one-third of the companies owning property in the State have responded.

Scranton, Penn

Feb. 12—The Conyngham breaker at Wilkes-Barre has suspended operations. The breaker will be torn down and all the coal from the Conyngham that will be mined in the future will be taken from the Baltimore No. 5. About 600 persons employed in the mine will be thrown out, but in the course of time all these will be employed at other mines of the company. The company has taken out of the mine all the available coal that can be profitably handled through the Conyngham, and any coal that may be produced hereafter will be carried out through the Baltimore breaker.

The carelessness with which miners handle explosives was exemplified in an accident that happened in the Excelsior mine at Shamokin on Feb. 4. While taking a charge of powder from a keg, a spark from the lamp that a miner, Langdon, was wearing in his cap ignited the powder in the keg from which they were extracting the charge, and this in turn set fire to other kegs. The explosion set fire to the men's clothing, but did not injure them seriously.

Morgantown, W. Va.

Feb. 11—The Kittanning vein of coal was recently drilled in Monongahela county and was found to be 7 ft. thick and 730 ft. lower than the Pittsburg seam. As the latter outcrops in this locality, the Kittanning vein is thus less than 800 ft. from the surface and is a valuable future reserve of fuel. Only 26.2 per cent. of the applicants, or 242 candidates, were certificated at the annual coal-mining examinations by the State board. Of the successful men, 19 were fire-bosses, 11 were second-grade foremen and the balance were first-grade foremen.

Cobalt

Feb. 11—A short time age E. T. Corkill, inspector of mines for Ontario, had a conference with the Cobalt Mine Manager's Association, and as a result it has been decided to petition the Dominion government to order an inspection of all dynamite, fuse and caps used in the Province. This action was determined by the large number of fatal accidents that have occurred from premature explosions and other similar causes. The matter will be taken up with the Dominion rather than the Provincial government, on account of its being in a far better position to make tests.

An order-in-council has been promulgated to the effect that all lands under Night Hawk and Frederickhouse lakes, and all the lakes adjoining the townships of Whitney, Tisdale and Mountjoy in the Porcupine district should be withdrawn. Precautions have also been taken to insure a right of way for the Temiskaming & Northern Ontario railway in case the district should prove of sufficient importance to warrant a line being built, and by an order-in-council, surface rights for a 99-ft. right of way have been reserved.

J. S. Bradley, who headed the fight against the present control of the Cobalt Central at the last annual meeting, and Judge Mayer claim that they have secured 2,500,000 shares of stock in that company. As a consequence they have served a demand on Thomas Nevins, president of the company, to call a special meeting of the shareholders. Bradley has been fighting for some time to oust Nevins & Sons from the management, but so far his efforts have been unavailing. The Buffalo shareholders of the Temiskaming are also organizing and sending out letters to the other shareholders asking them to send delegates to the annual meeting to be held in Toronto shortly. The object is to gain information regarding the operations of the company and to protect the interests of the shareholders.

The revival of interest in the Gowganda and Elk Lake districts is evidenced by the fact that three new plants have lately been sent in to the Devlin, Welch and Transcontinental companies. The Bartlett is to resume operations shortly under new management and the old shareholders are to be taken care of. Shipments still continue to come out and the Blackburn has shipped another car of high-grade ore.

One of the most important deals yet made in the Porcupine district was consummated on Feb. 10 when the Timmins' took up their option on the Hollinger-McMahon properties. It is said that the first payment of $15,000 on the purchase price of $300,000 has been made. A shaft has been sunk 40 ft. on the McMahon property and it is understood that there is free gold in the bottom. This shaft was sunk off the main vein, but a 4-ft. lead was encountered a few feet down. Sinking will be continued to a depth of 100 ft. and then crosscuts will be run. A plant has been ordered and work will be prosecuted vigorously. The fact of this option being taken up will have a beneficial effect on the new camp which has been coming in for a good deal of unfavorable criticism lately.

Toronto

Feb. 11—Prosecutions are being instituted by the provincial government against company promoters who violate the Companies Act by advertising stock without giving information concerning the status of the companies as required by law. Henshaw Maddock, promoter of the California-Alberta Oil Company, was fined $200, and A. J. Davis, representing the Chicago Alberta Oil Company, $100 for this offense.

The government of Newfoundland has imposed a royalty of 7½c. per ton on the gross output of the hematite-ore mines on Bell island, the production of which averages about 1,000,000 tons annually. These deposits are operated by the Dominion Iron and Steel Company and the Nova Scotia Steel and Coal Company.

Hon. W. S. Fielding, finance minister, has proposed an amendment to the currency act to enable the coining of Canadian $10 gold pieces, each of a weight of 516 grains, consisting of 9/10 gold and 1/10 alloy; also providing that the standard of silver coins shall be 0.925 fine silver and 0.075 alloy, and that the weight of a 50c. piece shall be 180 grains.

The Ontario government has decided to lay out a town site at the northeast end of Porcupine lake. It has been surveyed into town lots which will shortly be offered for sale. A new mining division has been created with Arthur E. B. Bruce, late of Haileybury, as mining recorder, and the record office is under construction. Hundreds of prospectors continue to arrive, the total number of people now in the district being estimated at about 4000. The extent of the gold area is widening with new discoveries. Free gold was recently found by John Callahan, 3½ miles east of Night Hawk lake, the vein being reported to be 8 ft. wide with a fair showing of gold. This is the first find east of Night Hawk lake.

Mexico

Feb. 6—Mexico affords an excellent field for exploration and exploitation companies. There are vast areas in this country which were only superficially explored by the Spanish miners looking for bonanza ore. Undoubtedly they overlooked deposits such as are today being utilized in the United States.

The Mexican field is practically virgin, as far as investigation by competent mining geologists is concerned, except as to a few of the older and more important camps. There are vast areas in the country in which no scientific or specially trained man has been, places that are entirely abandoned at the present time, owing to lack of large capital and to difficult transportation conditions. Undoubtedly there are important copper deposits in the Sierra Madre region extending from Sonora south to the Isthmus of Tehuantepec, which will at no distant day be recognized and utilized. There are, too, deposits in connection with the abandoned mines which will be discovered through intelligent and efficient explorations along modern scientific lines.

The recent revival of the zinc-mining industry in Mexico is much in point in connection with this discussion of the possibilities latent in the Mexican field. In connection with the extensive mining operations of northern Mexico, important zinc orebodies were disclosed and developed. They were absolutely unrecognized, and it was only in the last four or five years that these old mines have been revived and taken over by men who found it profitable to take out the zinc ores on a royalty or other basis, and incidentally in extracting the zinc ores new zinc bodies have been developed, as well as new bodies of the lead-silver ores.

An instance in this connection may be cited relating to the Boquillas mine in northern Coahuila on the Rio Grande. More than 20 years ago, these mines produced extensively lead-silver ore which was mined for the Kansas City smelteries and transmitted overland at great expense. The mines were abandoned until about two years ago when it was found that the zinc values were important and they probably will now yield more than the total yield of silver-lead in early days.

The search for gold properties, too, in Mexico has been largely haphazard. There is reason to believe that in Mexico will yet be found deposits of ore similar to those at Cripple Creek and Goldfield in origin, and perhaps in commercial importance, but so far practically no ores of this character have been commercially exploited, and few of the operators in the field would recognize ores of the Cripple Creek character if they discovered them.

There are, too, great possibilities in exploiting the irregular but important and wonderfully rich limestone deposits of the northern Central Plateau region. Many of these mines have been discovered and developed in recent times and there is abundant reason to expect that others also will be discovered. There are many places in the Central Plateau country, which geologically duplicate the conditions which are found at the important lead-silver deposits in that region, but they have been entirely unexplored as far as underground work is concerned, and there is an opportunity for a legitimate expenditure of a moderate amount of money on deposit of this character with the expectation of disclosing bodies of lead-silver-iron carbonate ores similar to those already known.

Little "dead" work has been done in any of the great mines of Mexico and the opportunity to explore in the region of known important ore deposits has been largely overlooked. The results which have been obtained at Pachuca and Santa Eulalia, at El Oro and at Guanajuato, where such explorations have been carried on to a more or less limited extent, have been so favorable that the prospect of results from similar explorations under similar conditions is indeed alluring.

Following the construction of the Harriman road on the west coast many American prospectors have gone into that region and they have gone over some districts after the fashion of the prospecting in the Western States of America. The result has been the discovery of a number of deposits, which ultimately will be successfully developed. These prospectors have a practical knowledge of conditions in the districts in the United States and they are persistent and pertinacious in their search for new orebodies. There is no question but what important results will follow from the prospecting which is now going on in the western states of Mexico by the typical American prospectors.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY·
INSTALLATIONS·DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

The smeltery at Benson is about to start operations, and the small mines in the Benson district are preparing to resume work.

Copper Queen—The new drift on the 400 level of the Holbrook shaft has opened a body of rich chalcopyrite and bornite. As yet nothing definite can be said in regard to the geological occurrence of this ore except that a short distance before the ore was encountered, the drift passed through easily recognizable limestone; then about 15 ft. of massive pyrite which gave way to chalcopyrite and, later on, bornite. Further developments are necessary to show the extent of the ore and the part that the porphyry plays in its formation. At the Uncle Sam, the raise from the N level has encountered some good oxide ore. This raise is coming up under an extensive cave on the level above, in which was some good oxide ore. As soon as the winze in Lowell territory has reached the 1600-ft. level, drifting to the Sacramento shaft will be commenced. The drift from the Sacramento has been running for several weeks and is well under way toward the winze. A tunnel has been started in Sacramento hill, the big porphyry outcrop in the center of the camp. General indications point to the fact that development is too low and the tunnel has been started with a view to exploring ground where enrichment may have taken place.

Calumet & Arizona—There is no truth in the rumor that the working force or the output has been decreased. The 450 level has been started at the Irish Mag shaft. A drift is to be started on this level to prospect the ore found in the cave on the 550 level.

Shattuck-Arizona—The terminal of the Shattuck tram has been repaired and shipments at the rate of 100 tons per day are being made to the Douglas smeltery.

Wolverine-Arizona—The mine is opening up new ore and is now shipping about 150 tons weekly to Douglas.

Courtland—It is rumored that the larger companies will abandon this camp on account of no ore being discovered on the lower levels. The one hope of the district is considered by the majority of the people to rest in the gold discoveries about a mile and a half from the present townsite of Courtland. The principal property of that zone is the Gold Queen. The shaft has been sunk to a depth of more than 200 ft. upon a surface ledge which is said to be richer as depth is reached.

GILA COUNTY

Old Dominion—The west drift on the 16th level has apparently opened the same large sulphide lode as was profitably worked on the 10th level.

Arizona Commercial—The January output was a little over 400,000 lb. of fine copper. The flow of water has decreased to 500,000 gal. per day.

Miami—The foundation for the concentrator is being enlarged by the addition of two units to make the daily capacity 3000 instead of 2000 tons per day.

Arizona-Michigan—A payment of 10 per cent. of the purchase price, amounting to about $15,000, has been made by the new purchasers. The balance is to be paid in two instalments, the last one, Feb. 1, 1912.

Live Oak—This mine is installing a 10-drill compressor. The suit over the ownership of the Copper King claim was decided in favor of the company in the district court, but the case will be appealed by the plaintiffs.

PINAL COUNTY

Ray Central—J. Parke Channing reports there were 7,500,000 tons of 2 per cent. copper ore blocked out on this property, Jan. 1, 1910

YAVAPAI COUNTY

Square Deal—The control of this property on Cherry creek, formerly known as the Golden Era, is reported sold to Chicago people. The mill will be enlarged and active work started.

California

AMADOR COUNTY

Argonaut—The vein on the 3100 level of this Jackson mine, is 16 ft. wide. A new level is being opened at 3300 feet.

BUTTE COUNTY

McMillan—In this mine at Hurleton, ore of unusually high grade has been uncovered.

CALAVERAS COUNTY

Ingomar—This property near Campo Seco, worked for many years for gold, is now being developed as a copper mine. A new 500-ft. shaft is being sunk on a wide vein of copper ore.

Dolling—At this mine, Angels, Geo. Stickle superintendent, a new three-compartment shaft is being sunk, a heavier hoist will be installed and a mill built.

NEVADA COUNTY

Champion—Tributers have again commenced work in these Nevada City mines.

Ben Franklin—This mine at Grass Valley, under bond to Benjamin Franklin of Goldfield, Nev., is just installing a new electric hoist and compressed-air pumps.

Charronat—This mine near Nevada City, under bond to D. M. Stevenson and B. Barnes of Pittsburg, is about to resume work after a long idleness.

PLACER COUNTY

Red Sea—Operations have been resumed on this mine near Yankee Jim's, under superintendence of Thomas Browne, and an upraise is being made to tap the channel.

Gold Blossom—An option has been given on this mine at Ophir to Eastern men, and it is probable that operations will soon be resumed.

Hobson Claims—These claims at Iowa Hill, owned by John B. Hobson of Caribou, B. C., are to be leased for drift mining. They were at one time extensive hydraulic mines.

Bear River—The Grass Valley men interested in this property have decided to reopen the tunnel, which is now in 500 feet.

SIERRA COUNTY

Rainbow—P. Woodbury, general manager of this mine at Alleghany, has made the second payment of $25,000 on the property, and the 10-stamp mill has been started up.

Young America and Corotoman—Captain Morrell is rehabilitating these drift mines.

Morning Glory—A rich shoot of ore has been found in a raise on the second level of this mine at Alleghany. The mine is one of the oldest at Alleghany and is owned by Rohrig Brothers.

TRINITY COUNTY

Knob—This mine on Eastman Gulch, near Deadwood, under bond to T. M. Lane and Ernest Blank, has been worked by leasers, but the new owners are buying out the leases.

Colorado

LAKE COUNTY—LEADVILLE

Louisville—It is reported that Hanifen and Reynolds have taken a lease on this old-time producer, situated on Carbonate hill, and will carry on their operations through the Yak tunnel. The Louisville shaft is sunk a distance of about 350 ft. below the tunnel level, but the work of the lessees will be at the higher level named, or about 700 ft. below the surface.

Garbutt—Development work on this property, under lease to John Cortellini and others, is progressing steadily and rapidly, and the output since last fall is reported as averaging 100 tons per month.

Yak Tunnel—The smeltery at El Paso, Texas, has recently entered the market for Leadville zinc-bearing ores, this property, however, being the only one so far to make shipments to that point. From 25 to 30 tons per day are said to be going out.

Big Four—Lessees who have been so successful in their operations in the St. Louis tunnel have taken a two years' lease on the adjoining Big Four property, into which it is believed the ore streak extends. They expect to reach this deposit through the Big Four shaft, which, by the conditions of the lease, they are required to sink an additional 250 ft. before the end of 1911.

La Plata—This Rock Hill property is now being actively worked under lease by Berg and associates, and a regular output of ore carrying an average of 45 per cent. lead is being maintained.

International—The new mill of the Wilson Mining Company, now owning the International mine at Robinson, is rapidly nearing completion. Its capacity is 150 tons per day.

LAS ANIMAS COUNTY

An explosion in one of the Colorado Fuel and Iron Company's coal mines at Primero Jan. 31, killed several and imprisoned more than 150 men.

TELLER COUNTY—CRIPPLE CREEK

Old Gold—Announcement is made of the settlement of the long continued litigation with the El Paso company, involving about one-tenth acre of the Lonaconing claim. Under the terms of this settlement the territory in dispute is equally divided between the two companies, and the Old Gold company makes a small cash payment to the El Paso company. The Old Gold property is under lease to Joseph Brentlinger and associates, who are making shipments of ore of good grade. Upon completion of the drainage tunnel, the operation of the property on company account will be considered.

Modoc—A shipment of two cars of screenings has been made during the past week from this property, the ore being mined from an 8-ft. vein recently encountered east of the shaft on the 900-ft. level. The estimated value of the screenings is from $70 to $80 per ton.

Indiana

CLAY COUNTY

The last ton of coal has been removed from No. 1 Brazil Block mine in the corporate limits of Brazil. This marks the passing of one of the best mines in the block coalfield. The mine is completely worked out and the pumps and fans will be kept running only long enough to remove the equipment and track. The mine was the first to substitute electricity for mule power on the long hauls and to install other modern equipment.

Plans are being made to develop a new block coalfield near Howesville. The United States Steel Corporation at Gary is negotiating for some of this land and will sink shafts to supply some of its coal. The new field is near the Monon railroad. Considerable interest is manifested over the prospects of early development of this field. W. K. Dean, of Howesville, is one of the principal owners.

GIBSON COUNTY

In the Oakland City oilfield, test wells are being put down all over the district. Good producing wells have been brought in at a depth of 1200 to 1800 ft. The initial wells, drilled eight years ago, are flowing as steadily now as at first and this fact has attracted many oil men. Indiana produced 1,965,923 bbl. of oil last year.

GREENE COUNTY

The Oakhill Coal Mining Company has opened two new mines in the Clinton field. The mines are equipped with modern machinery and appliances.

The Miami Coal Company and the Clinton Coal Company have each begun breaking away coal in new mines and the Jackson Hill Coal Mining Company expects to open a new mine soon.

VIGO COUNTY

Operators and railroads are getting ready for a big output from this time until April. The railroads already are beginning to haul additional cars of coal daily for storage purposes.

Idaho

COEUR D'ALENE DISTRICT

Alameda—The discovery of shipping ore is reported from this mine. The company will be reorganized with a capital of $1,500,000.

Black Horse—It is reported that the ore recently encountered at this mine now fills the face of the drift and is of good milling grade.

Bunker Hill & Sullivan—A decision has recently been rendered in the Federal court in favor of the company in its suit against the January company. This decision is supposed to be to the effect that the January and the Federal Mining and Smelting Company are one and the same concern and if that be the case all litigation between the Bunker Hill and the January companies must hereafter be tried in the Federal court.

Kansas

The Kansas district has added the following mills during the last year: Nymo, McCullagh, Clermont, Ebenita, Wilcot, Ihlseng, Black Hills and Cassco. Some of these are not yet in operation but soon will be. Two new tailing mills are being built to handle the immense tailing piles of the S. H. & S. and Peacock mines at Peacock. The production for January was 3,635,170 lb. of zinc ore and 329,640 lb. of lead ore, with a total value of $94,005.

Maryland

Maryland Coal Company—At the annual meeting Feb. 1 there was a general change, six of the old directors being dropped. The new board is composed of W. H. VanKleeck, C. L. F. Robinson, H. B. Nedham, John T. Mason, Thomas A. Knickerbacker, William H. Ziegler, Henry C. Rogers, Samuel S. Slater, Howard H. Shields and Mathew Rath. The board elected Henry B. Nedham president; W. H. Ziegler, vice-president; W. H. VanKleeck, secretary and treasurer. Mr. Nedham has been for a number of years secretary and treasurer; the other officers are new.

Minnesota

IRON—MESABI RANGE

Gilbert—Stripping and other preliminary work is about finished, and the mine is in condition to be a large shipper this year. It is a Steel Corporation mine, in the Sparta district.

Susquehanna—At this mine, at Hibbing, work has been started on the stripping, which is one of the biggest jobs yet undertaken on the Mesabi. The overburden is in some places 150 ft. deep. This stripping will come close to the town of Hibbing, and will make necessary the removal of several railroad tracks.

Union—Contracts have been let for the removal of the overburden at this mine, near Virginia. About 1,000,000 cu.yd. of material are to be removed. The mine is owned by the Republic Iron and Steel Company.

IRON—VERMILLION RANGE

Shagawa—A spur line two miles long is to be built from the Duluth & Iron Range road to this mine—the old Section 30—near Ely. George A. St. Clair, who is operating the mine, expects to ship

100,000 tons this year. He is making extensive explorations also on a tract east of the mine.

Missouri

Joplin District

The month of January showed a steady decline in the prices of zinc ores and caused many of the low-grade sheet-ground mines to shut down, and others to run on short time. A surplus of 11,000 tons of ore remains unsold in the bins. Two large sales of fees occurred during the month. The 80-acre fee of James Luke at Porto Rico was sold to the Pike Land Company for $70,000. This tract includes the greatest sheet-ground mine of the district, the Nowata. The other sale was the Cameron mine and 53-acre fee in South Joplin to Noble, Barnett & Pyle for $45,000.

The weather conditions were an improvement over December, but were yet quite severe, and many of the smaller mines have not resumed. The production for the month was 31,425,460 lb. of blende, 2,846,375 lb. of calamine and 6,228,645 lb. of lead ore, with a total value of $958,056.

Madison County

Madison Lead and Land Company—This property, which has been in the hands of a receiver, has been transferred to the Phœnix.

Montana

Butte District

Butte Coalition—The enlargement of the Rarus air shaft to four compartments throughout is now completed. The air shaft is down 1500 ft. The Rarus mine has not as yet resumed operations.

Amalgamated—The new electric pump on the 1800-ft. level of the Pennslyvania mine is now in operation and is pumping all the water of the mine up to the 1200-ft. level, whence it is taken to the Leonard mine and then pumped to the surface. The air shaft is now down 1400-ft. and is two-compartment. Preparations are being made to raise under the air shaft from the 1600-to the 1400-ft. level and to make it three-compartment throughout. One cage is already in operation in the air shaft but when the shaft is enlarged two cages will be used and a larger hoist installed. These cages will be used principally to lower timbers and men but some ore may be hoisted with them. The Pennsylvania is now hoisting about 1300 tons daily. At the Mountain View mine the air shaft is down 1000 ft. and is two-compartment. Sinking the air shaft from the 1000-to the 1200-ft. level has been commenced, and the shaft will be enlarged to three compartments throughout. Two cages will be put in the shaft when enlarged. On the 1400-ft. level, connections have been made with the same level of the Pennsylvania, thus improving ventilation. The Mountain View is hoisting about 1500 tons daily. At the Badger State the shaft is down over 1500 ft. and sinking continues. Crosscuts are being run south on the 1300-ft. level and north on the 200-ft. level. The shaft is one of the best in camp, being practically without water and in very hard rock. At the West Colusa the retimbering of the shaft has recently been completed. The shaft originally consisted of two compartments, each 9x4½ ft., and a third or pump compartment, 4x4½ ft. In retimbering, false sets were used in the two larger compartments and their size reduced to 4x4½, thus making all three compartments of equal size. Considerable difficulty had been experienced by the shaft squeezing together, and now by means of these false sets the timbers may be eased off as the occasion requires.

Raven—The shaft is now down 1500 ft. on the incline. The crosscut on the 1300-ft. level is in 163 ft. and should reach the vein with another 80 ft. A crosscut will be started on the 1500-ft. level.

Ida-Montana—A special meeting of stockholders has been held at which it was decided to transfer all property to a new corporation to be organized with a capitalization of $3,000,000. The company owns the Ida and A. B. quartz claims, located about two miles east of Butte. A three-compartment shaft is down 480 ft. The property has a modern surface plant, including a hoist good for 1500 ft. and a 20-drill air compressor.

Butte & Superior—Two hundred tons of ore are being treated daily at the Basin concentrator and about 50 tons of concentrates are being shipped daily from the concentrator to Bartlesville, Oklahoma.

Butte & Balaklava—The shaft has been retimbered from the surface to the 1300-ft. level and the remaining 100 ft. down to the 1400-ft. level is being retimbered with all possible speed.

Nevada

Elko County

The new mining district of Jarbidge lies about 56 miles north of Deeth, or about 8 miles south of the Idaho-Nevada State line. There is a good route to the camp from Elko at the present time. The population is now about 300 and a rush is expected when the snow melts.

Esmeralda County

Sandstorm-Kendall Consolidated—The Sandstorm and Kendall mines will be worked under a consolidation, the new company being capitalized at $1,500,000. Assessments will be levied to provide working funds.

Black Butte—A 10-ton shipment from the Campbell lease returned $68 per ton.

Esmeralda County—Blair

Pittsburg Silver Peak—Twenty stamps are being added to the mill and by the end of the month 120 stamps will be dropping. The mine is working two shifts, and is producing about 450 tons per day. The steam-shovel level above the Drinkwater is being opened up and ore produced here and from the glory holes. The south drift on the Wassau level has picked up the orebody and raising for a stope begun. About 100 men are employed on the surface and underground at the Silver Peak mine; practically no work is being done at the Mohawk and Valkalda workings. Edmund Juissen is general manager.

Esmeralda County—Rawhide

Rawhide Queen—The Grutt lease has struck rich ore on the 350-ft. level. The vein is about 3 ft. wide.

Coalition—The Mint lease is now down 550 ft. and has encountered milling on the 400- and 500-ft. levels.

Rawhide Phoenix Mining and Leasing Company—This company, operating the Old Original Rawhide or Kerns No. 1 lease, recently shipped 200 tons of ore to the local mills.

Lincoln County

Goldflint-Keystone—These properties, at Sylvanite in the Yahk district, have recently been sold for $75,000 and work will be begun shortly under the management of H. I. Reynolds. The properties have been idle a number of years owing to a disagreement between the owners.

Victor-Empire—A 5-ft. Pelton water wheel and a Blaisdell compressor have arrived and are being installed.

Nye County—Tonopah

Belmont—A picking plant has been installed and 100 tons per day is being shipped to the smeltery at Kennett, Cal.: the Belmont mill, at Millers, is not operating. The Belmont shaft, 1900 ft. northeast of the present working shaft, has reached a depth of 925 ft., and raising from the 1055-ft. point has advanced 55 ft. When completed this will assist materially in ventilating the lower workings and afford an easy outlet for the ore now being mined below the 1000 level. The new strike on the Mizpah fault has been developed for 190 ft., and in places shows a stoping width of 14 ft. of shipping ore. Frederick Bradshaw has been appointed superintendent. About 100 men are employed on two shifts.

Montana—About 140 tons are being milled per 24 hours. B. A. Bosqui is mill superintendent, having succeeded G. H. Rotherham, who has gone to South Africa with F. L. Bosqui. The greater portion of the mine output is coming from the orebodies recently opened up to the south of the shaft.

STOREY COUNTY

Monte Cristo—This old mine in Six Mile cañon has been purchased by the Butters company and rehabilitation is being pushed. A hoist and compressor will be installed and pumping begun.

WHITE PINE COUNTY

Nevada Consolidated—Output is again n the basis of 6000 tons per day from he steam-shovel pit, the severe weather eing past. It is expected to increase the aily tonnage to 7500 or 8000 tons in he spring.

Boston Ely—This mine has suspended ork in the drift from the 1125-ft. level ending the arrival of a drifting mahine.

Ohio

Sterling Coal Company, Ltd.—This ompany is in course of organization at oronto, Can., by a number of Canadian apitalists for the purpose of acquiring nd operating bituminous coal mines in hio and West Virginia for the supply of he Canadian trade. The properties inlude the Hileman group, with four perating mines on the Pittsburg & ake Erie railroad about 70 miles outheast from Cleveland; the Beckwith roup in the northern part of West Virinia; and the Acadia property in Athens nd Washington counties, Ohio. The diectorate includes President W. F. Tye, ate chief engineer of the Canadian Paific; N. Curry, Rodolphe Forget and J. V. McConnell, of Montreal; A. E. Ames nd F. H. Deacon, Toronto; H. D. Hilean, general manager, and Andrew quire, Cleveland, Ohio.

Oregon

Arkansas—This mine, Mormon Basin, 0 miles southeast of Baker City, the roperty of the Idaho-Oregon Investment ompany, under the management of F. . Smith, is working 30 men. It has everal miles of work planned, and a ile completed.

Uncle Dan—This mine, under the mangement of G. S. Blackman, is working 0 men, doing development and taking t shipping ore.

Highland—This gold mine, in the Elkorn district, under the management of obert McCaughey, is employing 35 men, d taking out rich ore.

Virtue—This mine, which first made aker county famous for its production gold, now under lease to J. K. Romig, Baker City, is doing development and eparing full operation next season.

Rainbow—The mine, Mormon Basin, ear the Arkansas, has produced very h gold ore. A few days ago a second oot of ore was encountered on level o. 2.

Cougar—The mine in the Granite district, near the Red Boy mine, is working 20 men and shipping.

E. & E.—The mine, Bourne district, eight miles south of Sumpter, is under the management of the Ladd estate in Portland, and will start in the spring with a large force.

Indiana—This copper mine, 20 miles east of Baker City, is sinking, under the management of J. W. Messner, of Baker City, also the manager of the Camp Carson silver-lead mine, 26 miles west of Baker City, which is expected to start soon.

Union Companion—The mine, under the management of Robert Betts, is employing 70 men, and has begun the shipment of concentrates. It is in the Cornucopia district, 60 miles east of Baker City.

Mountain Lion—Electrical amalgamating apparatus is being installed in the 5-stamp mill on this property, near Murphy. T. J. Brinkerhoff is superintendent.

Big Four—This mine, formerly the Judson placer mine, on Pickett creek, has been sold to I. J. Merrill, of Portland.

Pennsylvania

ANTHRACITE COAL

Penn Forest Coal Company—This company is at work on a tract of 600 acres between Weatherly and Beaver Meadow, which is leased from the Penrose estate. It is composed of Wilkes-Barre and Scranton stockholders: Robert J. Oliver, of Avoca, is superintendent. A prospecting shaft is said to have struck the Wharton vein at a depth of 40 ft., and the company has ordered additional machinery.

Utah

BEAVER COUNTY

Majestic Mines—A carload of ore which netted over $1000, was on the market Feb. 14th, from this company's Harrington Hickory mine. Control assays showed 32.3 oz. silver, 23.6 per cent. lead, 1.6 copper and a small amount of gold. Another car is on the road. Two feet of lead-silver ore is reported on the 160-ft. level of the company's Hoosier group.

Beaver Carbonate—The new orebody in the east drift of the 700-ft. level has been opened 60 ft. in length during the last month. The face is in ore of shipping grade. A raise of 20 ft. is still in ore, but no crosscutting has been done. This ore is the third chute opened by the east drift, the others being of milling grade.

JUAB COUNTY

Ore shipments from the Tintic district in carload lots for the week ended Feb. 4, were as follows: Gold Chain-Ajax, 1; Victoria, 3; Grand Central, 7; Victor Consolidated, 1; Centennial Eureka, 40; Chief Consolidated, 1; Eureka Hill, 2; Gemini, 2; Ridge & Valley, 2; Beck Tunnel, 1; Dragon Iron, 22; Sioux Consolidated, 19; Iron Blossom, 20; Colorado, 20; Eagle and Blue Bell, 4; Uncle Sam, 2; May Day, 2; Bullion Beck, 1; Scranton, 6; Total 156.

Fourteen onyx claims are said to have been located in North Tintic. The claims are about seven miles west of Utah lake.

Centennial Eureka—Connections will be made by the United States Company inside of four weeks between the 500 level of the Centennial Eureka shaft and the Bullion Beck railroad tracks. The new tunnel will reduce the cost of ore extraction and pumping.

Victor Consolidated—This company is reported to be mining copper ore from the 700 level. It is expected to resume shipments soon.

Tintic Standard—Eighteen inches of honeycombed quartz have been cut by the west drift on the 700-ft. level. This is reported to have widened to 5 or 6 ft., and to carry silver with some gold.

SALT LAKE COUNTY

Columbus Consolidated—A total of 50 cars of ore are reported to have been shipped by this company during January. News of a new strike came from the mine Feb. 7, but no detailed information was given.

Cardiff—According to reports, a strike was made of 15 in. of sulphide ore carrying copper and silver. This ore was cut in a tunnel about 325 ft. vertically below the surface.

SUMMIT COUNTY

Daly-Judge—An electrically driven Nordberg compressor of 6000 cu.ft. per min. capacity is being installed at the shaft. Less than 200 men are employed in the mine and mill. Zinc middlings are being sent to the Grasselli dry mill in Park City. The report for 1909 shows that during the year, 47,800 tons of milling ore and 3400 tons of first-class were mined, the greater portion of the latter during the last two months.

Virginia

A bill has been introduced in the house to impose a tax of $1 on each $100 of value of minerals extracted from the mines of the State.

West Virginia

Four States Coal Company—This company has filed articles of incorporation, with $5,000,000 capital, the office to be at Fairmont, W. Va. The company proposes to operate coal mines in West Virginia; also in Pennsylvania, Ohio and Kentucky. The incorporators are John H. Jones, David G. Jones, Thomas P. Jones, E. F. Miller, Stephen Stone, Pittsburg. Most of them are connected with the Pittsburg-Buffalo Coal Company.

Canada

Ontario

Doctor Reddick—The shareholders of this Larder Lake company authorized the directors to sell 100,000 shares of preferred stock at 10c. per share, to raise $10,000 to be expended in further development and starting the stamp mill.

Canada Cement Company—A large order for cement amounting, it is understood, to several hundred thousand barrels, has been placed with this company by the Quebec Bridge Construction Company, the first to be delivered being 100,000 bbl. The price has not been made public.

Bruce Copper Mines—This property is being operated by the Bruce Mines, Ltd. About 40 men are steadily engaged in development work, the ore extracted being stored until there is sufficient on hand to begin concentration.

Otisse—At a recent meeting of this company, Frank E. Loring presented a report showing the aggregate of work done as follows: Shafts, 236 ft.; crosscuts, 405 ft.; drifts 754 ft. While the veins upon which rich surface showings were found had not shown the same quantity of rich ore underground, the veins were strong and there was encouragement to proceed with deeper development.

Ontario-Cobalt

The shipments from Cobalt for the week ended Feb. 4 were as follows: Nipissing 300,300 lb.; La Rose, 195,248; Buffalo, 61,250; O'Brien, 69,050; Peterson Lake, 49,600; Coniagas, 61,200; City of Cobalt, 65,970; Temiskaming, 60,000; Crown Reserve, 61,444; total 924,062 pounds.

Coniagas—Another new vein known as No. 12 has been found on the 150-ft. level. The third level of the mine is now being opened up.

Century—A vein carrying some silver has been picked up by the diamond drill from the 200-ft. level.

Little Nipissing—Engineer M. B. R. Gordon reports that the vein being drifted on at the 100-ft. level is becoming stronger and richer. A winze on this vein is down 22 ft. and a raise of 14 ft. has also been made. There are 36 ft. in depth by 65 ft. in length blocked out, with a width of 14 in. The ore averages 4000 oz. per ton.

Quebec

Eastern Townships Asbestos Syndicate—This organization has been formed to acquire and operate 720 acres of asbestos-bearing land, one mile from St. Cyr. The property has previously been worked and shows the same formation as characterizes productive asbestos mines in this neighborhood.

Mexico

Baja California

Boleo—Production for January was 1200 metric tons of copper from ore having an average content of 3.588 per cent.

Chihuahua

Cinco de Mayo—A Colorado Springs, Colo., company is developing this lead property in the Escondido mountains near Villa Ahumada.

Veta Colorado—The affairs of the Veta Colorado Mining and Smelting Company at Parral have been adjusted so as to permit of the early completion of the 500-ton milling plant and the resumption of mining operations.

Guanajuato

Guanajuato Reduction and Mines Company—In December this American concern earned $10,000 above all expenses and bond interest. The mill is running exclusively on dump ore, principally from the Rayas property. An electric line is in operation between the mill and the Rayas dumps.

Cubo—This company is arranging to deliver 200 tons daily for treatment in the 600-ton plant of the Peregrina Mining and Milling Company.

Jalisco

Bramador Mines—The work of reopening the principal old producers of the Bramador district, under option to Paul de Vilaine for the sum of 125,000 pesos, has been commenced. J. C. Platt, of New York is interested with Mr. de Vilaine.

Oaxaca

St. Louis, Mo., interests have taken up an extensive iron tract, south of the city of Oaxaca, on the Rio Verde. The property is in the vicinity of Santiago Minas, and has been under investigation for some time. A company known as the St. Louis-Oaxaca Iron and Steel Company has been formed and is planning to develop the properties and take over the Divina Providencia foundry and a large timber tract. The iron deposit is said to be large and of good grade. Its exploitation will mean the extension or the building of a railroad through to the Pacific coast, and it is understood that the company is prepared to build its own line if it cannot negotiate with outside capital to do it. The line will probably connect with the railroad systems already astablished at Oaxaca. The deal has been carried through by A. K. Stewart.

Sonora

Greene-Cananea—A minimum average of 70 tons of copper in 24 hours was maintained during the closing week of January. Six furnaces are operating.

Fortuna—This concern, with properties situated in El Tigre section, has 65 men on the pay roll and is making shipments of first-grade ores.

Moctezuma-Arizpe—At the last annual meeting in Bisbee this corporation's capitalization was raised from $3,000,000 to $6,000,000. Exploration work will soon be resumed.

San Felipe—A new hoisting plant has been installed, with a gasolene engine as the motive power. Forty men are working.

Las Chispas—Five additional units of 1250 lb. each are being added to the 10-stamp mill, which is running steadily. The company employs 350 men.

Babacanora—Plans for the erection of a small cyanide plant have been drawn and considerable development work is being carried on.

Tepic

The extension of the Southern Pacific railroad, building south, has reached the Santiago river, 1004 km. from Guaymas. The city of Tepic, 96 km. south of the river, will be reached in the coming autumn. A total of 271 km. (168 miles) is necessary to connect with the Southern Pacific link in operation in Jalisco.

Africa

Transvaal

Gold production of the Transvaal in the month of January is reported by cable at 601,368 oz., or $12,430,277; a decrease of 13,745 oz., or $284,109, as compared with January, 1909. December and January both showed decreases from the previous year; the first losses in Transvaal production since the Boer war.

Asia

Korea

Oriental Consolidated—The mail advices of the results for December are as follows: Gross receipts, $117,636; operating costs, $69,808; improvements and development, $4498; net profit, $43,330.

Australia

Western Australia.

Gold production in January is reported as follows: Exported, 24,206 oz.; delivered to mint, 103,145 oz.; total, 127,351 oz., or $2,632,345. This is a decrease of 4936 oz., or $102,027, as compared with January of last year.

New Zealand

Gold production of the Dominion of New Zealand in January is reported at 35,965 oz., bullion in 1909, and 40,679 oz. in 1910; an increase of 4714 oz. The bullion reported this year was equal to $788,050, or 38,125 oz. fine gold. Silver production for the month was 44,420 oz. in 1909, and 157,332 oz. in 1910; an increase of 112,912 oz. this year.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Feb. 16—In the East the bi- minous-coal trade presents no new fea- re. Business is fairly good, but ir- gular car supply and bad weather have terfered with the trade to a large extent. he anthracite trade is quiet and steady.

In the West the possibility of trouble April has developed a disposition on e part of the railroads and other large nsumers to store coal for emergencies. his is keeping the mines busy, and will obably continue to do so for the next onth. No steps have been taken yet reopen the conference on the wage ale. The Illinois operators seem firm their refusal to take part in any con- rence, or in any joint agreement.

British Columbia Coal—Recent des- tches report that the Dunsmuir in- rests, comprising nearly all the large ines on Vancouver island and in the ast district, have been sold to the ackenzie-Mann combination, which con- ols the Canadian Northern railway. is transfer will give the railway con- ol of a coal supply for its British lumbia extension, besides a certain ount of traffic to the towns and in- stries which may grow up along its e. The Dunsmuir mines have been ge shippers of coal and coke to San ancisco, and are the most important ctor in the coal trade of that city.

COAL TRAFFIC NOTES

Coal receipts at Boston in January e reported by the Chamber of Com- erce as follows:

	1909.	1910.	Changes.
thracite	99,855	136,978	I. 37,123
uminous	226,444	269,401	I. 42,957
otal domestic	326,299	406,379	I. 80,080
reign	28,200	24,839	D. 3,361
otal	354,499	431,218	I. 76,719

The foreign coal reported is chiefly om Nova Scotia.

Coal and coke tonnage Chesapeake & io Railway, six months July 1—Dec. , short tons:

	Coal.	Coke.	Total.
w River	3,958,862	178,470	4,137,332
nawha	3,101,697	24,795	3,126,492
ntucky	227,593	228	227,821
nnecting lines	46,263	24,134	70,397
otal	7,334,415	227,627	7,562,042
otal, 1908	6,236,403	159,389	6,395,792

Total increase, 1,166,250 tons, or 18.2 r cent. Deliveries to points west of nes, 3,833,801 tons coal and 104,292 ke; points east, 933,864 tons coal and 123,355 coke; tidewater, 2,563,087 tons coal; anthracite to line points, 2573 tons.

The total anthracite shipments for two years past were divided by districts or regions, as follows, in long tons:

	1908.		1909.	
	Tons.	Per Ct.	Tons.	Per Ct.
Schuylkill	18,006,464	27.8	16,864,147	27.2
Lehigh	7,786,255	12.1	7,532,271	12.2
Wyoming	38,872,295	60.1	37,573,467	60.6
Total	64,665,014	100.0	61,969,885	100.0

The decrease from the Schuylkill region was 1,142,317 tons; from the Lehigh, 253,984; from the Wyoming, 1,298,828; total, 2,695,129 tons.

Corrected statement of coal tonnage originating on Southern Railway Company's lines, 11 months ended Nov. 30: Tennessee district, 1,153.912; Alabama district, 2,241,148; total, 3,395,060 short tons, an increase of 727,485 tons over the previous year.

New York

ANTHRACITE

Feb. 16—The anthracite trade has been favored by more cold weather, and business is good.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.85@2; barley, $1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Trade continues about the same as last week, with a fair demand which runs to the lower priced coals. New York harbor and the Sound are about even. Prices are unchanged, though some dealers look for an advance. Fair grades of steam coal, which are most in demand, bring about $2.60, f.o.b. New York harbor points, with better grades running up to $3. Gas coal is coming in a little more freely.

Car supply is a little better, though still irregular, and the working of mines depends largely on what cars they can get. Transportation has been disturbed by another snowstorm, and is irregular.

The coastwise vessel market has also been disturbed by stormy weather, and the tendency is to ask higher prices for charters. From New York to points around the Cape 90c. is asked, with $1 for some ports.

Birmingham

Feb. 14—Coal operations in Alabama are very active and the production is at a high mark. The railroads are falling a little behind and there is complaint as to the car situation, while locomotive power is short also. There is a scarcity of labor at many of the mines.

The mine inspector's latest corrected figures for Alabama in 1909 are 13,896,637 tons coal and 2,827,028 tons coke.

Chicago

Feb. 15—The coal market has become flabby under continued mild weather and better transportation conditions, all coals being in good supply now and prices being nearly down to their normal state. There is still a premium on Illinois screenings, which bring $1.60@1.85. Western coals have made up their deficiency of a few weeks ago and are pouring shipments into the market, with a depressing effect on prices. The average retailer seems to have come to the conclusion that there is to be no more very cold weather of more than a day or two's duration, and is buying lightly in consequence. A similar feeling appears to govern consumers' purchases. Meanwhile the steam trade is heavy and is bound to continue so.

Lump from Illinois and Indiana mines continues to bring $2@3; run-of-mine sells for $1.75@2. Hocking continues to have a steady sale, under a beneficial regulation of shipments that prevents track surplus, at $3.15. Smokeless is in large supply again, and lump brings $3.65 @3.75, with run-of-mine at $3.30@3.55. Youghiogheny is quiet but selling well at $3.15 for steam and $3.30 for gas. Anthracite has a scattering trade of small orders widely distributed.

Cleveland

Feb. 14—Local trade continues good. Some dealers and manufacturers are stocking up in anticipation of trouble in April. There have been fair shipments of lump for loading in Lake boats; one result has been a surplus of slack, which has been offered at 10 or 15c. below quoted prices.

Quotations are, f.o.b. Cleveland: Middle district, $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine, $1.50@1.60 for slack; No. 8 district, $2.25 for 1¼-in., $2 for ¾-in., $1.90 for run-of-mine, $1.60@1.80 for slack; Pocahontas, $3.20 for lump, $2.45 for run-of-mine; Massillon domestic, $2.95 for lump.

Indianapolis

Feb. 15—Notwithstanding the preparation being made by railroad companies and larger consumers to store immense quantities of coal during March, it is the opinion of well informed and disinterested persons that in the end the miners will get an advance and there will be no suspension. A few operators, however, are inclined to the belief that the country is on the eve of a great strike. The Indiana mines are now working almost full time and next month promises to break the record for production in this State.

Pittsburg

Feb. 15—Another attempt at conference between operators and miners will be made at Toledo two weeks hence. In the past week inquiries have gone out from a number of large consumers to nonunion districts, looking to the purchase of reserve supplies of coal against a possible suspension, and some important tonnages are being figured upon. The coal market in the regular channels is firm with prices unchanged at $1.15 for mine-run and nut, $1.25 for ¾-in., $1.40 for domestic 1¼-in. and 85@90c. for slack.

Connellsville Coke—The coke market has been stagnant since prices went to pieces. There does not seem to be any demand. Shipments are well maintained, as consumption is unaltered. Nothing but purely nominal prices can be quoted, in the absence of any important sales, as follows: Furnace coke, prompt or contract, $2.25; 72-hour foundry, $2.75@$2.90. There is no doubt that these prices could be shaded on some grades.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Feb. 5, at 474,203 tons; shipments at 4966 cars to Pittsburg, 8951 cars to points west of Pittsburg and 964 cars to points east of Connellsville, a total of 14,881 cars.

St. Louis

Feb. 14—Coal is much firmer this week and prices are considerably better. Three causes are responsible for this improvement: First, the car shortage seems to be getting worse almost daily. All roads are short of cars; even those known for exceptionally good service have only had about a 75 per cent. supply. Such roads, however, as the Illinois Central have been practically bare of cars; the car supply on that line has only been 20 per cent. On the other hand the Iron Mountain, which has been extremely short the whole year, seems to have had plenty of cars for the last two weeks. Taking the car situation as a whole it is very grave and there is no improvement in sight. Second, the weather has been much colder, which has caused a much better demand from dealers all over the country. Third and probably greatest cause is that the storage movement has begun. The Rock Island, Burlington, Missouri Pacific and other roads have been buying storage coal freely. Several orders have been placed this week amounting to 1500 or 2000 cars apiece. This business has been proportioned out to nearly all the operators in this district who are running railroad coal.

Prices are as follows, the first figure in every case being at mine, the second f.o.b. St. Louis: Standard 6-in., $1.75 and $2.27; mine-run, $1.20 and $1.72; 5-in., $1.20 and $1.72; 3-in., $1.20 and $1.72; nut and pea, $1 and $1.52; 2-in. screenings, 70c. and $1.22; slack, 50c. and $1.02; coal that will move out of town, 20c. premium.

Staunton, Mt. Olive and Springfield, 6-in., $2 and $2.52; 2-in., $1.60 and $2.12; mine-run, $1.50 and $2.02; screenings, $1 and $1.52 per ton.

Carterville, 6-in., $1.80 and $2.47; 3-in., $1.60 and $2.27; mine-run, $1.30 and $1.97; 1½-in. screenings, $1 and $1.67 per ton.

Franklin county, 6-in., $2.25 and $2.92; 3-in., $1.75 and $2.42; 1½-in. screenings, $1.10 and $1.77 per ton.

Anthracite coal is in exceptionally strong demand for this time of the year. The situation, however, is a little easier and coal seems to be coming forward more freely. Circular of $6.95 per ton for chestnut, stove or egg and $6.70 for grate is being held firmly.

Scranton, Penn.

If the bituminous miners of the Middle District obtain the agreement which they are seeking for a term of two years, the contracts between the bituminous and anthracite miners and operators would expire simultaneously. What the outcome of such a situation would be is looked upon with some apprehension by anthracite operators. However, the contingency is so remote that most operators think it not worth discussing just now.

FOREIGN·COAL·TRADE

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for the use of steamships in foreign trade, year ended Dec. 31, long tons:

	1908.	1909.	Changes.	
Coal	62,547,175	63,076,799	I.	529,624
Coke	1,193,036	1,161,626	D.	31,410
Briquets	1,440,438	1,455,842	I.	15,404
Total exports	65,180,649	65,694,267	I.	513,618
Steamer coal	19,474,174	19,719,507	I.	245,333
Total	81,654,823	85,413,774	I.	758,951

This shows an increase in 1909 of 0.9 per cent. in fuel sold for consumption outside of the United Kingdom. The average valuation of the exports in 1909 was $2.71 per ton.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Feb. 5: Best Welsh steam, $4.08; seconds, $3.96; thirds, $3.90; dry coals, $3.96; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $2.16; seconds, $1.92. The market is easier. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Feb. 16—The iron and steel trades are still in a waiting mood. Buyers seem to be discouraged by the slowness of the revival of business since Jan. 1, and are doubtful about committing themselves too far ahead—at least until stocks are worked off. On the other hand, sellers are reluctant to shade present prices for the sake of getting business.

In the Central West, the most interesting item is the purchase of some large lots of bessemer pig by the Steel Corporation. Nobody believes the iron was needed, and the purchase was evidently made to steady the market and establish a level for bessemer pig, which has been top heavy for a month or more. In the East there has been some buying of foundry, but the market is not yet clear of speculative iron from Southern furnaces.

In finished material there is no special movement. Some small orders for structural steel are coming in, making a fair total. Some orders for rails for electric lines are also noted. Jobbers are pretty heavily loaded with nails, bars and other small building material. The demand for these, which has been very good, is temporarily blocked by the severe winter which has put a stop to outdoor work for the time being.

Pig Iron Production—The reports of the blast furnaces on Feb. 1, as collected by the *Iron Age*, show 313 coke and anthracite furnaces in blast, having a total weekly capacity of 586,500 tons; a decrease of 8700 tons, as compared with Jan. 1, and of 11,700 tons from Dec. 1. Making allowance for the charcoal furnaces, the estimated make of pig iron in the United States in January was 2,644,000 tons; of which 1,773,000 tons were made by steel-company furnaces.

Baltimore

Feb. 14—Imports for the week included 1236 tons ferromanganese from Liverpool; 700 tons manganese ore from Rotterdam; 28,830 tons iron ore from Cuba. Exports included 990 tons steel rails and 123 tons rail fastenings to Costa Rica; 4738 tons steel rails and 239 tons fish plates to Western Australia.

Birmingham

Feb. 14—With the iron market lagging a little, Southern manufacturers are still confident. A small amount of iron is gong to the yards but not enough to disurb conditions. There is quite a quanity of iron sold for delivery in the secnd and third quarters of the year. Some ew sales are still being made in this secon and inquiries are coming in. The vaiting game is being played. Quotaons are not as firm as they might be ut half the reports out are not to be erified. The makers are quoting $14.50 er ton, No. 2 foundry, but there is some ale at $14. Under that price is only ossip. Local consumers are busy.

Chicago

Feb. 15—Quiet conditions continue in ie iron market, no decided change havig occurred from last week's record of mall sales widely distributed, of foundry ig iron. Buying of malleable iron has ontinued on a lessened scale. There re reports of Southern No. 2 foundry on having sold at less than $14 Biringham ($18.35 Chicago) but most of ie sales, if not all, are made at this gure. Northern No. 2 remains at $19 19.50, with a quiet but firm market. lost buyers of foundry iron are figuring n very small lots, with a feeling of unertainty about the general course of usiness. A waiting mood evidently has iken possession of the melters, which iay mean close buying for several weeks. rom a carload to 500 tons represents ie average contract now being made; ven inquiries for larger amounts have ecome scarce.

Iron and steel products show a firm one. Sales of railroad materials and of ructural shapes have been good in the ist week; other products show fair to ght sales. Coke is somewhat soft, at 5.50, the supply being large and the deiand not increasing.

Cleveland

Feb. 14—Ore buying is over for the resent. It is expected, however, that iere will be some eastern furnaces in ie market before long.

Pig Iron—Sales have been light and ie market is dull. For Cleveland deivery No. 2 foundry is still quoted at 17.50@17.75; gray forge, $17@17.25; ake Superior charcoal, $19.50. Besseer is nominal at $19, Valley furnace, r $19.90, Cleveland.

Finished Material—Several structural ontracts have been let for local buildigs and bridge work. The only other ctivity has been in bars, especially in on bars, which have sold at 1.60@1.65c. leveland.

Philadelphia

Feb. 15—The severe weather of the ast few weeks serves to explain the g-iron market and the indifferent deand that has prevailed. Deliveries have een interrupted to a considerable extent. Within the past week or 10 days a great deal of iron has been loaded and shipped. Most mills have iron still due them. A few orders will be placed probably next week as contracts expire the last of the month. Most mills have contracts or understandings which will keep them out of the market well into March, probably to April 1. The mills, as a rule, are well protected by contracts running variously from 30 to 60 days longer. The entire business is in a halting position, awaiting further developments one way or the other.

Plates—Some orders have reached this territory from New England sources, most of them for immediate delivery. Shipyard work is becoming quite an important feature.

Scrap—The scrap market is duller than ever. The mills are short of scrap, but are piecing out with very little buying. Most scrap is held at top prices and dealers are scouring around after supplies to fill inquiries received.

Pittsburg

Feb. 15—The general tone of the market continues to be one of discouragement, but here and there are slight signs of a better feeling. Specifications on old contracts for finished steel products are good, while new business is light.

Plates, shapes, sheets, tinplates and merchant-steel bars were well sold up, and mills entered the new year with the bulk of their first-class output sold. These lines continue in good shape, despite the lightness of new business. Wire and pipe were not sold far ahead, and there have been signs of distress in these lines. The pipe mills are largely adding to stocks, new business being light. In wire products there has been considerable shading, amounting to $2@3 per ton in some cases. Sales of plain wire have been made at 1.50c., against the regular price of 1.65c. Nails have been offered, by some mills and by some jobbers, at 10 to 15c. below the regular market of $1.85 per keg.

Pig Iron—The United States Steel Corporation has bought 40,000 tons of standard bessemer pig iron, for March, April and May delivery, at $18, Valley, or $18.90, Pittsburg, half the tonnage coming from W. P. Snyder & Co., and the other half from the furnaces represented by J. G. Butler, Jr., of Youngstown. It is regarded as possible that the corporation may buy some more iron at the same price. This is the first bessemer-iron purchase the corporation has made for a long time. While in a sense the corporation needs the iron, it seems clear that the chief object in making the purchase was to relieve a very awkward situation, for bessemer iron had gotten up to $19, Valley, other grades not following it to the proper relative levels, while these other grades had declined slightly, leaving bessemer in such position, with no demand, that if the $19 price once broke there might be a runaway decline. The Steel Corporation purchase is expected to avoid this and establish the market. Basic iron continues very quiet. It can be bought at $16.50, Valley, as formerly, and there is a possibility this price can be shaded. A western Pennsylvania furnace having approximately the same rate to Pittsburg as the Valley has been selling No. 2 foundry at $16.50, furnace, or $17.40, Pittsburg, this being quotable as the minimum of the market. Valley furnaces so far as known have not gone below $16.75 at furnace, equal to $17.65, Pittsburg. The Standard Sanitary Manufacturing Company picked up 2500 tons of Southern iron at an inside price yesterday, paying $13, Birmingham, for No. 2 and No. 2 soft, $12.50 for No. 3 and $12 for forge. The iron was sold by middle interests, for March and April delivery to Louisville. This was 25@50c. below the recognized market on prompt iron, while for extended delivery the market is in the hands of furnaces which quote $14, Birmingham. The Jones & Laughlin Steel Company yesterday blew in its No. 2 furnace at Aliquippa, the second of the three new furnaces at the new plant.

Steel—The market continues quiet, with prices nominally unchanged at $27@27.50 for bessemer, $27.50@28 for open-hearth billets, 4x4, $30 and upward for small billets and forging billets, and $28.50@29 for sheet-bars, all f.o.b. mill Pittsburg or Youngstown.

Ferromanganese—The market has been a trifle softer the past week on prompt material, $43.50, Baltimore, being possible on prompt, with $44@44.50 quoted on extended delivery, freight to Pittsburg being $2.30. An inquiry is out for 2000 tons for second-half delivery to a steel interest just west of Pittsburg.

Sheets—The market is firm but not active. We quote black sheets, 28 gage, at 2.40c., and galvanized at 3.50c.; blue annealed, 10 gage, 1.75@1.90c., depending on delivery, and corrugated roofing at $1.70 per square for painted and $3 for galvanized.

St. Louis

Feb. 14—There has been little change in the pig iron market during the past week; while a little more activity is shown than in January yet the trade as a whole is backward and below par. Some business has been closed and a number of inquiries received for deliveries in the second half. Prices remain $15 per ton Birmingham or $18.75 St. Louis for No. 2 foundry.

Iron Ore—The market for Missouri iron ore remains good at $3.75 per ton St. Louis for 50 per cent. ore.

METAL·MARKETS

New York, Feb. 16—The metal markets remain rather uninteresting, and there have been no important changes.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1909..	$10,579,304	$ 2,083,772	Exp. $ 8,495,532
" 1908..	7,357,707	5,152,732	" 2,204,975
Year 1909..	132,880,821	44,086,956	" 88,793,855
" 1908..	81,215,456	50,276,293	" 30,939,163
Silver:			
Dec. 1909..	5,297,965	4,167,276	Exp. 1,130,689
" 1908..	4,726,289	4,409,454	" 316,835
Year 1909..	57,592,309	46,151,282	" 11,441,027
" 1908..	51,837,671	42,224,130	" 9,613,541

Exports from the port of New York, week ended Feb. 12: Gold, $69,453; silver, $526,344, chiefly to London. Imports: Gold, $48,213; silver, $61,219, both from Mexico, Central America and the West Indies.

Gold—Quotations on the open market in London remain at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. There was no special demand.

Platinum—Business is reported steady and prices are unchanged, dealers asking $28.50@29 per oz. for refined platinum, and $34.50 for hard metal.

Silver—The price advanced sharply this week to 24d. on buying by Chinese banks. Since the Chinese New Year on Feb. 10, there has been evidence of renewed activity. Market closes strong in London.

SILVER AND STERLING EXCHANGE

Feb.	10	11	12	14	15	16
New York....	51¼	51¼	....	51½	52	51⅞
London	23 11/16	23 11/16	23 13/16	23 13/16	24	23 15/16
Sterling Ex..	4.8610	4.8610	.....	4.8610	4.8610	4.8610

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Feb. 3, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£ 467,500	£609,400	I. £ 141,900
China	80,000	202,000	I. 122,000
Straits......	61,000	....	D. 61,000
Total......	£ 608,500	£811,400	I. £ 202,900

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Feb.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
10	[illegible] @13⅞	13¼ @13½	59[illegible]	32¾	4.60 @4.65	4.45 @4.50	5.40 @5.45
11	[illegible] @13⅞	13¼ @13½	59 7/16	32¾	4.60 @4.65	4.42½ @4.47½	5.35 @5.40
12	.....	.....	.....	.....	......	......	.....
14	[illegible] @[illegible]	13¼ @13½	59 1/16	33	4.55 @4.65	4.40 @4.45	5.30 @5.35
15	[illegible] @[illegible]	13¼ @[illegible]	59[illegible]	33⅛	4.55 @4.65	4.37 @4.40	5.27½ @5.32½
16	[illegible] @[illegible]	13¼ @[illegible]	59 1/16	33¼	4.50 @4.60	4.35 @4.40	5.25 @5.30

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has been quiet and dull. The January statistics were better than had been expected and clearly show that the fundamental position of copper is improving. Reports from consumers both here and abroad indicate that consumption is increasing and the prospects for the metal are therefore better. Consumers abroad are not well supplied and had it not been that the London standard market was depressed by realizations on the part of tired speculators, a considerable demand would have resulted, but under the circumstances buyers held aloof. In this country, too, business was of small volume, owing mainly to the unsettled state of the stock market. Some fair-sized sales of Lake were made, some special brands fetching as high as 13⅞c. Electrolytic was freely offered at 13½c., delivered, 30 days. The market closes quiet at 13⅝@13¾c. for Lake copper, and 13¼@13⅜c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13⅛@13¼c. as the average for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill.

The London standard market moved within narrow limits, and closes somewhat lower at £59 1s. 3d. for spot and £59 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough £63; best selected £63@£63 10s.; strong sheets £73@£74 per ton.

Copper Producer's Association—The report for the month of January gives the following figures, in pounds of fine copper; comparison being made with the figures for January of last year:

	1908.	1909.
Stocks, Jan. 1.........	122,357,266	141,766,111
Refined in U. S...... .	112,135,200	116,547,287
Total supply........	234,492,466	258,313,398
Deliveries, domestic....	51,862,624	78,158,387
Deliveries for export ...	38,199,797	81,691,672
Total deliveries......	90,362,421	159,850,059
Stocks, Feb. 1	144,130,045	98,463,339

Production includes all copper refined and put in marketable form in the United States, both from domestic and foreign material.

Tin—Up to the end of last week the London market remained stationary. With Monday of this week, transactions increased and the market advanced vigorously. There was no reason given for this advance, which brought prices up to £151 12s. 6d. for spot and £153 5s. for three months. If it was the object of the London operators to scare American interests into buying, they did not succeed. American consumers remained as reticent as they have been heretofore, buying their immediate wants only. The London market closes weak at £150 17s. 6d. for spot and £152 10s. for three months, while spot tin in this market can be bought at about 33¼ cents.

Lead—Consumption of this metal is also proceeding at a very good rate. The market, however, has been somewhat weaker, owing to lower offers of Missouri lead, and close at 4.35@4.40c. St. Louis and 4.50@4.60c. New York.

The London market for Spanish lead is unchanged at £13 7s. 6d. while English lead is quoted at £13 10s. per ton.

Spelter—The market is very dull. There is little demand, and as stocks of the metal and also of the ore are accumulating, there has been some pressure to sell, so that the market is demoralized. It closes weak at 5.25@5.30c. St. Louis, and 5.40@5.45c. New York.

New York quotations for spelter Feb. 10 were 5.55@5.60c.; Feb. 11, 5.50@5.55c.; Feb. 14, 5.45@5.50c.; Feb. 15, 5.42½@5.47½c.; Feb. 16, 5.40@5.45 cents.

The London market is unchanged, the close being cabled at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc is $7.50 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—The market is unsettled, owing to the advance in Europe, which has materially raised the price at which foreign metal can be delivered here. It is also disturbed by the existence of some stocks in second hands, from which offers are made as low as 21c. for ingots. Importers are quoting 22¾@23c., New York delivery, duty paid. American aluminum is sold to meet these prices. Ingots may be quoted at 21@23c. Abroad, prices are still advancing, and the large sellers are reluctant to quote for future deliveries.

Antimony—The market continues dull but steady, and prices on the small business transacted are unchanged. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7⅝@7⅞c. named for outside brands.

Quicksilver—The market here remains steady and prices unchanged. New York quotations are $50 per flask of 75 lb. for large lots. Jobbers ask 70c. per lb. for small quantities. San Francisco, $49@50 for domestic and $2 less for export orders. The London price is £9 10s., with jobbers selling at £9 7s. 6d. per flask.

Nickel—Large lots, contract business,)@45c. per lb. Retail spot, from 50c. r 500-lb. lots, up to 55c. for 200-lb. ts. The price for electrolytic is 5c. gher.

Magnesium—The price of pure metal $1.50 per lb. for 100-lb. lots f.o.b. ew York.

Cadmium—Current quotations are 65 70c. per lb. in 100-lb. lots at Cleveland, hio. In Germany 450@475 marks per)0 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from ain, 11 months ended Nov. 30; re- rted by *Revista Minera,* in metric tons:

Metals.	1908.	1909.	Changes.	
g and manuf. iron	33,083	51,895	I.	18,812
pper	13,409	15,794	I.	2,385
pper precipitate	18,620	15,888	D.	2,732
ad	171,840	168,183	D.	3,657
ıc	1,886	1,584	D.	302
icksilver	1,805	1,500	D.	305
Minerals.				
n ore	6,780,388	7,341,173	I.	560,785
.nganese ore	20,957	14,133	D.	6,824
pper ore	1,097,858	1,004,402	D.	93,456
ıd ore	2,926	3,390	I.	464
ıc ore	117,036	117,765	I.	729
rites, iron	1,299,312	1,242,974	D.	56,338
t	518,101	510,144	D.	7,957

Imports of phosphates, 147,521 tons 1908, and 163,473 in 1909.

Zinc and Lead Ore Markets

Platteville, Wis., Feb. 12—The base ce of 60 per cent. zinc ore opened at 3 per ton, dropped to $40 at midweek; week end there was practically no base ce and very few sales. The base price 80 per cent. lead ore was $54@55 r ton.

SHIPMENTS, WEEK ENDED FEB. 12.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
ıeral Point	472,200	....	....
voy	369,000	....	....
tteville	336,800	....	385,130
ıton	327,400	....	....
hland	179,100	....	....
ıa City	88,260	....	....
ker	85,580	....	....
ıncil Hill	80,000	....	....
ıllsburg	75,000	60,500	....
ingston	......	75,000	....
otal	2,013,340	135,500	385,130
r to Feb. 12	9,748,120	837,729	1,942,050

In addition to the above there was pped to the separating plants, 3,311,-) lb. zinc concentrates during the week.

Joplin, Mo., Feb. 12—The zinc sulphide market opened the week with base erings of $42 per ton of 60 per cent. c, declining to $36. The week-end rket stiffened from the low point and erings were made for ore at $38@40 se. Zinc silicate ore sold at $20@26 ton of 40 per cent. zinc. The aver- price, all grades, was $39.99 per ton. lead market was generally $55, with ew bins selling at $56. The average ce, all grades, was $54.80 per ton.

Fifteen mills in the Webb City part of district and several in Joplin were sed down tonight for an indefinite pe- d. An additional number will be closed at the end of another week, unless the market strengthens. The output was reduced this week and will be still further lowered next week, but the smelters are still buying less than the production and the reserve stock is increasing.

SHIPMENTS, WEEK ENDED FEB. 12.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,223,800	967,430	$113,192
Joplin	1,349,140	224,050	34,496
Galena	1,111,450	122,980	26,165
Dnenwog	491,270	127,030	13,065
Badger	542,010	2,620	11,723
Alba-Neck	500,350	3,520	10,602
Carthage	403,550	......	8,474
Oronogo	393,400	......	8,372
Spurgeon	383,970	74,490	8,099
Quapaw	346,380	14,720	7,324
Miami	341,060	66,500	5,546
Granby	301,100	11,250	5,075
Saginaw	181,750	25,890	3,860
Jackson	179,260	......	3,674
Anrora	165,760	......	3.397
Sarcoxie	161,020	......	3,300
Carl Junction	84,800	......	1,822
Stott City	51,140	......	1,047
Wentworth	44,630	......	803
Totals	11,254,840	1,640,480	$270,036
7 weeks	70,960,680	12,714,920	$1,918,240

Zinc value, the week, $225,078; 7 weeks, $1,558,394
Lead value, the week, 44,958; 7 weeks, 359,846

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	......	34.37	......	50.50	......
March	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, Feb. 16—The general market is steady, with some tendency to improvement, but with no special activity.

Copper Sulphate—The market is firm and there is no deviation from recent prices, which are $4.10 per 100 lb. for carload lots, and $4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—Quotations are steady at 2.10c. per lb. for spot and 2.07½c. for futures. Supplies are too large to warrant any expectation of higher prices.

Arsenic—The market is easier and there is a slight weakening in quotations, which are $2.50@2.75 for 100 lb. for white arsenic.

Petroleum

Petroleum production and deliveries in January, reported by *Oil Investors' Journal* in barrels of 42 gal. each:

	Production.	Deliveries.
Oklahoma	3,757,075	3,927,962
Southeast Texas	671,052	978,553
Louisiana	257,046	230,744

Oklahoma stocks on Feb. 1 were 56,510,973 bbl. New wells completed in January were : Oklahoma, 181 oil and 8 gas; Southeast Texas, 41 oil; Louisiana, 7 oil and 6 gas wells.

MINING·STOCKS

New York, Feb. 16—The general stock market has rallied a little from its extreme depression, and the active liquidation reported last week is about over. The market is chiefly a professional one, and has been supported, probably, by those who believed the drop was going too far. At the close it is not as weak as it was, but is dull, and not inclined to advance.

On the Curb prices followed very much the course of the Exchange. Copper stocks recovered a little from the extreme low points reached but have not been active at the small advances made. Other stocks were generally weak.

Boston, Feb. 15—Copper shares have been irregular in their price course the past week, yet Lake Copper, North Lake and Franklin attract attention. Utah Consolidated has been the weak feature the past day or two, breaking $6.75 to $31.25. This is due to reports that the 50c. quarterly dividend will be omitted at the March period. Lake Copper stock rose $12.25 during the week's time.

North Lake made a record price at $20.75. Franklin rose $3.25 to $21.75, with some setback. This company has purchased 640 acres of land lying directly north from the St. Mary's Mineral Land Company, giving 33,333 shares of its treasury stock in payment or approximately $660,000 in value.

U. S. Coal and Oil stock has benefitted to the extent of $6.50 during the week, the price touching $40.75 on reports of a soft-coal merger.

Amalgamated recorded a $6.50 advance to $76.75 during the week with the final

Assessments

Company.	Delinq.	Sale.	Amt
Arcadian Copper, Mich	....	Mar. 1	$0.50
Bader, Cal	Feb. 24	Mar. 14	0.10
Belcher, Nev	Mar. 9	Mar. 29	0.10
Bullion, Nev	Jan. 11	Mar. 1	0.05
Caledonia, Nev	Feb. 16	Mar. 9	0.10
Challenge Con., Nev	Feb. 17	Mar. 10	0.10
Chollar, Nev	Mar. 8	Mar. 28	0.10
Crown Point, Nev	Mar. 8	Mar. 28	0.10
Hale & Norcross, Nev	Mar. 9	Mar. 31	0.10
Julia Con., Nev	Feb. 17	Mar. 10	0 03
King Philip Copper, Mich	Mar. 10	....	1.00
Mexican, Nev	Feb. 21	Mar. 17	0.15
New Arcadian, Mich	Mar. 10	....	1 00
Ojibway, Mich	Mr.Oct.	....	2.00
Oneco, Mich	Feb. 15	....	1.00
Rexall S. & C., Utah	Feb. 13	Mar. 15	0.01
Savage, Nev	Feb. 10	Mar. 8	0.10
Seg. Belcher, Nev	Mar. 8	Mar. 28	0.10
Wabash, Utah	Feb. 21	Mar. 15	0.05
Western Monitor, Utah	Feb. 1	Mar. 1	0.00½
Winona, Mich	Mar. 10	... .	1.00
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

tonight about $1.50 below the high. U. S. Smelting stock put $3 on to its price, losing $1 of it, and closed at $44.75. Other standard stocks show material advances.

Prices on the Curb have shown a general hardening tendency.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II, 1909	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672

VISIBLE STOCKS.

	United States.	Europe.	Total.
II, 1909	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1909.	New York. 1910.	London. 1909.	London. 1910.
January	51.750	52.375	23.843	24.154
February	51.472	......	23.706	......
March	50.468	......	23.227	......
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1909.	NEW YORK. Electrolytic 1910.	NEW YORK. Lake. 1909.	NEW YORK. Lake. 1910.	London. 1909.	London. 1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	......	13.295	......	57.688	......
March	12.387	......	12.826	......	56.231	......
April	12.56	......	12.93	......	57.363	......
May	12.893	......	13.238	......	59.338	......
June	13.214	......	13.518	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.298	......	13.647	......	59.966	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	......	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York. 1909.	New York. 1910.	St. Louis. 1909.	St. Louis. 1910.	London. 1909.	London. 1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	......	3.868	......	13.313	......
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1909.	New York. 1910.	St. Louis. 1909.	St. Louis. 1910.	London. 1909.	London. 1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	......	4.739	......	21.563	......
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer. 1909.	Bessemer. 1910.	Basic. 1909.	Basic. 1910.	No. 2 Foundry. 1909.	No. 2 Foundry. 1910.
January	$17.18	$19.96	$16.40	$17.98	$16.26	$17.94
February	16.73	......	16.09	......	15.90	......
March	16.40	......	15.84	......	15.62	......
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Feb. 15

Name of Comp.	Bid.
Listed:	
Acacia	.05¾
Cripple Cr'k Con.	.02⅞
C. K. & N.	.10
Doctor Jack Pot.	.07
Elkton Con.	.68
El Paso	.66⅞
Fannie Rawlins.	.06½
Findlay	.10¾
Gold Dollar	.10
Gold Sovereign	.03¾
Isabella	.20
Mary McKinney.	.46
Pharmacist.	.03
Portland	1.03½
Vindicator	.81
Work	.06½
Unlisted:	
Golden Cycle	1.40
United Gold Mines	.08½

S. LAKE CITY Feb. 15

Name of Comp.	Clg.
Carisa	.50
Colorado Mining.	.79
Columbus Con.	.90
Daly Judge	4.75
Grand Central	1.80
Iron Blossom	.84
Little Bell	1.90
Little Chief	.45
Lower Mammoth.	.50
Mason Valley	1.92½
Maj. Mines	2.32½
May Day	.19½
Nevada Hills	.58
New York	.13
Prince Con	.78
Red Warrior	6.00
Silver King Coal'n	3.25
Sioux Con	.33
Uncle Sam	.38
Victoria	1.50

SAN FRANCISCO. Feb. 15.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.18	Belmont	1.70
Belcher	1.35	Jim Butler	.11
Best & Belcher	‡.75	MacNamara	.28
Caledonia	.51	Midway	.25
Challenge Con.	.31	North Star	.02
Chollar	.26	West End Con.	.24
Confidence	1.50	Atlanta	.18
Con. Cal. & Va.	1.70	Booth	‡.10
Crown Point	1.35	C.O.D. Con.	‡.05
Exchequer	.27	Columbia Mt.	‡.03
Gould & Curry	.34	Comb. Frac.	.33
Hale & Norcross.	.56	Goldfield Belmont	‡.90
Mexican	1.72	Goldfield Daisy.	.98
Ophir	2.00	Jumbo Extension	.31
Overman	.75	Oro	‡.03
Potosi	.70	Red Hill	.05
Savage	.55	Sandstorm	.04
Sierra Nevada	.74	Silver Pick	.11
Union	.83	St. Ives	.15
Yellow Jacket	1.35		

N. Y. EXCH. Feb. 15

Name of Comp.	Clg.
Amalgamated	75⅛
Am. Agri. Chem.	‡40½
Am.Sm.&Ref.,com	82½
Am. Sm. & Ref., pf.	107
Anaconda	49½
Bethlehem Steel.	‡28
Col. & Hock. C. & I.	18
Colo. Fuel & Iron.	37¼
Du Pont P'd'r, pf.	86½
Federal M. & S.	80
Great Nor., ore ctf.	70
Nat'nal Lead, com.	80½
National Lead, pf.	‡108
Pittsburg Coal	20½
Republic I&S, com.	39
Republic I & S, pf.	101⅛
Sloss Sheffi'd, com.	77½
Sloss Sheffield, pf.	118
Tennessee Copper	33
Utah Copper	50⅛
U. S. Steel, com.	79¼
U. S. Steel, pf.	119½
Va. Car. Chem.	53

N. Y. CURB Feb. 15

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19¼
Braden Copper	4⅝
B. C. Copper	7
Buffalo Mines	3½
Butte Coalition	24½
Chino Copper	12⅝
Cobalt Central	.21½
Combination Fra.	.32
Con. Ariz. Sm.	2⅞
Cumberland Ely.	9
Davis-Daly	3 11/16
Dominion Cop.	7
Ely Con	.85
El Rayo	2½
Florence	2⅝
Gila Copper	8¼
Giroux	9⅞
Gold Hill	1¾
Goldfield Con.	7½
Greene Cananea.	9½
Guanajuato	1¾
Guggen. Exp.	225
Kerr Lake	.09⅛
La Rose	4⅜
McKinley-Dar-Sa.	.85
Miami Copper	24
Mines Co. of Am.	45
Montezu. of C. R.	3
Mont. Shoshone.	1
Mont.-Tonopah	.70
Nev. Utah M. & S.	1 3/16
Newhouse M. & S.	3½
Nipissing Mines.	10
Ohio Copper	4⅛
Pacific Sm. & M.	1⅛
Silver Queen	.21
Standard Oil	631
Stewart	9/16
Tonopah	6⅝
Tonopah Ex.	.73
Tri-Bullion	15/16
Utah Apex	6⅛
W. Va. Wyo. Cop.	2 3/16
Yukon Gold	4⅞

LONDON Feb. 16

Name of Com.	Clg.
Dolores.	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 9 3
Esperanza	2 19 0
Tomboy	0 17 6
El Oro	1 8 3
Oroville	0 8 6

BOSTON EXCH. Feb. 15

Name of Comp.	Clg.
Adventure	8½
Allouez	53
Am. Zinc	‡30½
Arcadian	7½
Arizona Com	39½
Atlantic	9
Boston Con.	19
Calumet & Ariz.	70
Calumet & Hecla.	630
Centennial	24½
Con. Mercur	.10
Copper Range	77
Daly-West	8
East Butte	10¾
Franklin	19
Greene—Can.	9½
Hancock	25
Isle Royal	22
Keweenaw	4½
La Salle	16
Mass	7
Michigan	5¾
Mohawk	66
Nevada	23⅛
North Butte	34
Ojibway	9½
Old Dominion	43½
Osceola	151
Parrot	20¾
Quincy	83
Shannon	15
Superior	57
Superior & Bost.	14
Superior & Pitts.	14
Tamarack	75
Trinity	8½
U. S. Smg. & Ref.	45
U.S.Sm. & Re., pd.	50
Utah Con	31½
Victoria	4½
Winona	9¾
Wolverine	141
Wyandotte	2¾

BOSTON CURB Feb. 15

Name of Comp.	Clg.
Ahmeek	200
Bingham Mines.	3¾
Boston Ely	4¼
Calaveras	5⅛
Champion	.06
Chemung	12
Chief Cons	2⅜
Chino	12½
Corbin	.09½
Cactus	4⅞
Crown Reserve	3⅝
First Nat. Cop.	4⅞
Gila Copper	7¾
Indiana	34½
Inspiration	8 5/16
Majestic	.89
Ray Central	3¼
Ray Con	21⅝
Rawhide Coal	.16
Rhode Island Coal	9¼
San Antonio	7¾
South Lake	12¾
Trethewey	1¾
Vulture	9⅛
Yuma	1 7/16

ST. LOUIS Feb. 12

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie.	.07	.06
Center Cr'k	1.75	1.50
Cent.C.&C.	85.00	84.00
C.C. & C. pf.	84.00	83.00
Cent. Oil	105.00	100.00
Con. Coal	20.00	18.00
Doe Run	105.00	100.00
Gra. Bimet.	.30	.25
St. Joe	12.50	12.00

‡Last quotation.

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**Illustrated.*

The Western Coal-mining Scale

The Western coal-mining wage scale, the yearly settlement of which is productive of so much unrest and disturbance in the coal trade, applies to the mines of what are known as the Central Competitive districts. These include the Pittsburg district in western Pennsylvania and the States of Ohio, Indiana and Illinois; that is, the region from which the main supply of the Central West and the Northwest is drawn. Closely allied to this, but having their own separate agreements, are the Clearfield and other districts in central Pennsylvania, which ship to the seaboard and to western New York and Canada; and the Southwestern district, including Missouri, Kansas, Arkansas and Oklahoma, the coal from which goes chiefly into local consumption. These two regions are unionized, and their agreements are closely allied to the general one, but are separately made. Outside of the Central Competitive district are the non-unionized States of West Virginia and Kentucky, the competition of which for trade is an exceedingly important factor in the situation.

The usual course of procedure is that the United Mine Workers in convention agree upon their demands for the coming year; the operators, on their side, agree as nearly as they can upon what they will concede. There is usuallly a wide divergence between the two at the outset. Delegations from both sides meet and after long discussion come to a compromise which can be accepted. It is usual for both sides to make larger demands than they expect to secure, and the preliminary scales are rather in the nature of bluffs, from which concessions can be made. Thus the mine workers this year demand an advance of 10 per cent., while the operators claim that the rates must be reduced if they are to hold their own against the West Virginia and Kentucky competition. It should be noted that each State has its own agreement, but all are based on the same general lines, with differences to meet local conditions.

This year the situation has been complicated by the action of the Illinois operators, who voted not to enter the general conference, though willing to meet their own miners in separate conference. The reason for this is found in several points which, it is claimed, need a separate settlement; chief among these being payment on the screened coal instead of the run-of-mine basis, and the less important but vexing questions of shot-firers and checking of mine cars. Anticipating such action, the mine workers in their convention voted that no district should sign its agreement until all had settled; and appointed a delegation from Illinois to the general conference. This resulted in a deadlock at the first meeting of the conference, the operators refusing to admit the Illinois miners unless the operators were also present, while the miners insisted on their presence in conference. Until this difference is arranged it is doubtful whether a new conference will meet, and whether the scales can be settled. The alternative is a strike or a stoppage of operations on April 1, when the present scales will end. Neither party really wants to see such a stoppage, however, and some compromise may be reached. Such a result is to be hoped for, since a general strike would mean not only trouble in the coal-mining industry, but also a general disturbance of business which would be especially undesirable under present conditions.

The difficult point in the whole situation is the active competition of West Virginia coal; to which may be added the growing production and importance of the Kentucky mines. The excellent quality of these coals and the low non-union mining rates have enabled them to secure a large business which formerly went to other States, the operators in which are compelled to cut their prices to the lowest possible points to hold their own. Existing mines can easily furnish a quantity of coal considerably in excess of the present demand, so that there is no prospect of a decrease in competition. The situation of the Ohio operators is especially unfortunate. Almost alone of all the States Ohio showed no increase in its production last year, and its place in the Lake and northwestern trade was largely taken by West Virginia.

The Price of Metal Manufactures

The daily fluctuations in the prices of the metals are of intense interest to the producers and manufacturers, but are of less direct concern to the ultimate consumers, who buy chiefly in the form of wire, sheets and other manufactured forms, whereof the prices are not subject to daily fluctuations and in many cases are established by agreement among the manufacturers. These prices are, however, determined by the prices for ingots, bars, etc., and upon the basis of the monthly averages the fluctuations are in some cases substantially parallel; in other cases, not so; but in nearly all cases a close parallel would doubtless appear upon comparison of the annual averages. The reasons for this difference in behavior will develop upon a careful study of the respective industries.

The diagrams and tables that were published in the Journal of Jan. 8, 1910, show many interesting things. In 1908 the difference between the average yearly prices of copper wire and wire bars was 1.95c. per lb.; in 1909 it was 1.87c. The curves plotted from the monthly averages were approximately parallel during the two years. The difference between the prices for copper in cakes and the rolled sheets was much less uniform, either by months or by years. Comparison of the annual averages shows a margin of 5.63c. in 1908 and 4.74c. in 1909. It is noteworthy that in the cases of both wire and sheets the margin was smaller in 1909 than in 1908. This may have been the result of the comparatively small fluctuations in the price for bar copper (undoubtedly due to the improved knowledge as to statistical position arising from the producers' association), but it would be unsafe to draw such a conclusion from the experience of only two years.

In sheet zinc the market in 1908 and 1909 was quite different. There are but two important producers of this manufacture and competition between them is not keen. In 1908 they maintained the price at 6.44c. throughout the year, the margin between prices of sheet at works and spelter at New York being 1.71c. per lb. In 1909 it was 1.15c. In 1908 the price for spelter did not fluctuate greatly, but in 1909 the reverse was the case, the price going up sharply in the second half, while that for sheet zinc did not go up so rapidly. The largest part of the production of spelter is used for the manufacture of brass and the galvanizing of iron and steel. The manufacture of the former, which also absorbs a large part of the production of copper, is chiefly in the hands of a few large companies, which adjust the price just as in the case of sheet and wire; while the cost of the spelter used by the galvanizers figures in the price of their products which fluctuate but not so frequently as the price for the crude metal. Similarly as to tinplate, which accounts for the largest part of the consumption of tin.

The largest single use for pig lead is in making white lead. The price for that commodity is changed, nominally at least, only at long intervals. Taking the quotational margin as the difference between the price for white lead and 80 per cent. of the price for pig lead, it was 2.16c. per lb. in 1908 and 2.08c. in 1909. However, the nominal price for white lead is commonly shaded by the corroders, among whom active competition exists, when it is necessary to secure business and the actual margin is less than the quotational. To some extent the same thing is true of copper sheet and wire. Probably a larger proportion of lead goes to the ultimate consumer as pig than in the case of any other metal. The uses of lead are more diverse than of copper, spelter or tin, and a great deal of it is consumed in unmanufactured form, such as for pipe joints and alloys (which many consumers prepare in their own shops). The rolling of sheet lead is not a difficult matter. Some consumers roll their own sheets, while others buy pig lead and have it rolled on contract, a toll of 0.5c. per lb. for rolling being sometimes negotiated.

A Question of Ethics

In another column we publish a communication from C. S. Herzig, who replies to a previous communication from H. C. Wilmot. The spirit of fairness demands that both sides be heard. However, we are bound to say that Mr. Herzig does not squarely meet the issue raised by Mr. Wilmot.

An engineer owes a duty to the stockholders of a company that employs him, besides to his immediate superiors. He owes, moreover, a duty to his profession, and he must as a mere matter of self-preservation safeguard his own reputation.

Mr. Wilmot became convinced that things for which he could not stand were expected of him, that he was becoming involved in questionable practices, that his own agreement was being violated. He said this in his letter to the Journal.

Being of this conviction he was correct in resigning and immediately leaving the property. This and his public statement were necessary for the preservation of his own reputation. His courage in speaking out commands the respect and approval of the profession, and the honor that is due to a man who lives up to his convictions.

The present advocacy of a bureau of mines is based on the claim that it is needed to reduce the loss of life and limb in mining. No other function for this bureau has been suggested by its partisans, and they are bound to admit that the subject is one especially pertaining to the police power of the States and that a Federal bureau can act only in an advisory capacity. Insofar as that field of usefulness is concerned it would appear to be comprised within the scope of a bureau of health, for which a movement is also on foot.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS AND THE EXPERIENCES OF READERS

Export Duty on Canadian Nickel

At the request of our Mr. Clark, who as left for London, England, we send erewith copy of a letter which we have written to the chairman of the Committee n Mines, Ottawa, Ontario:

"We are instructed on behalf of our lients, the Mond Nickel Company, to rotest most emphatically against the tatement that the International Nickel Company of New York controls all the upplies of Canadian nickel.

"The Mond Nickel Company owns its wn mines in Canada and does there most of the work required in producing nickel. The purchase money went into the pockets of Canadians and the Canadian public has benefitted. . . . Our clients have expended large sums in exploration or further orebodies, but in addition to hose which they acquired some time ago hey have not been able to find new orebodies which can be worked in competiion with the rich nickel deposits of New Caledonia. At present our clients are producing nickel from their mines in Canada and are supplying the British government and the Indian government with nickel mined, smelted, bessemerized and refined within the jurisdiction of His Majesty. About 90 per cent. of the entire wages are expended in this country. The completion of the refining is done in Great Britain, the nickel produced there from Canadian ore being completely manufacured within the British Empire.

"All well informed persons know that he Sudbury district has no monopoly so far as the supply of nickel is concerned. Moreover, the use of nickel is limited. Large amounts have been spent by nickel refiners in the effort to increase the use of nickel and to educate manufacturers as to the advantages of nickel steel, and notwithstanding these efforts it seems impossible to enlarge the scope of the industry.

"A large proportion of the nickel used at present comes from New Caledonia and within the last few years new works have been started in Europe for refining New Caledonian ores. Besides these Norway has also commenced to produce nickel again, and deposits of rich nickel ores have been discovered recently in Russia and other parts of the world.

"Under these circumstances to impose an export duty on nickel ore or matte would be to strike a severe blow against Canadian and British industry and to favor the products of convict labor in the penal colony of New Caledonia."

Clark, McPherson, Campbell & Jarvis,
Solicitors for the
Mond Nickel Company, Ltd.
Toronto, Canada, Feb. 8, 1910.

Loss of Dust from Roasting Furnaces

At a recent meeting of the local branch of the Australasian Institute of Mining Engineers, a paper on "Roasting Practice" was read by F. Brinsden, and during the subsequent discussion a question was asked relative to the percentage of dust lost from the stack. Several local metallurgists have made experiments with a view to determining this loss, but all agreed that it was a difficult problem to solve. I write you, noting the great number of roasting plants and smelteries in America, to see whether there is any good and fairly cheap method of finding out this loss.

Of course, the amount of dust carried over into the flues is known, as these are regularly cleaned out. About 81,000 tons of ore and concentrate are roasted here monthly; each group of furnaces has a large flue; stacks average 100x6 ft., and the average draft is ½ in. Take as an example: Six furnaces roasting 20 tons of ore each daily, that has been crushed through 25 mesh, are connected with a flue 100x7x7 ft., and a stack 100x6 ft., with ½-in. draft. Twenty tons of flue dust are collected monthly. Have you any data on these lines, and does the loss by dusting from the stacks from any American plant average 1 per cent. or over? M. W. von Bernewitz.

Kalgoorlie, W. A., Jan. 8, 1910.

Reckless Mining Investments

I wonder if the time will ever come when our British cousins, before subscribing the capital asked for the purchase and development of one of our Western mines, will insist on the report of an absolutely disinterested and well accredited mining engineer. It certainly has not come yet, for there are at least three mines whose subscribed capital reaches well into a million dollars each now being floated in London, not one of which can show a report such as I have described, but which are being swallowed whole on the strength of representations made by men interested in the promotion.

One is the making of a good mine, but under doubtful management as to technical knowledge, ability and economy; another, a good property, but in the hands of crooked manipulators; the third, an absolutely worthless property, sold on its early record of rich oxidized ores, with large bodies of sulphide ores left in the deeper workings of such low grade that they cannot possibly be produced and marketed at a profit at this time.

It is doubtful if any of the shareholders in these three will ever see the color of his money again. Then what happens? The country or State is blamed instead of the foolish people.

Any ordinarily sensible man who may be buying a horse, and is not a skilled judge of horseflesh, will call in a veterinary to look the animal over, the sum involved in the purchase being say $200, and the veterinary's fee say 5 per cent. of that amount. But in the purchase of a mine at a million dollars, which to do properly requires more science, experience, judgment and honesty than any other purchase on earth, it is not thought necessary to pay one-quarter of one per cent. of that amount in order to secure the services and report of a man who possesses those attributes.

In the first-class journals are published the cards of men of high reputation, who have spent many years of work and large sums of money to qualify themselves as doctors to find out the diseased spots in mine promotions; and if those who invest in mines or the shares of mining companies will not avail themselves of the services of these men, they have no one to blame but themselves when they find they have lost their money.

There are many things the public does not know: It does not stop to think that a good mine under worthless management will not pay; that a worthless mine under good management will not pay; that a good mine in the hands of crooked manipulators will not pay the shareholders; and that a rich mine in the hands of unscrupulous men is a most dangerous weapon for financial evil, as they can "whip-saw" the stock *ad libitum* for their own benefit and to the loss of the stockholders.

The science of mining engineering comprises a knowledge of geology, surveying, metallurgy, mineralogy, applied mechanics, the manual and methods of underground work and surface plant, etc., and yet we see accepted as evidence of value of a property reports of men who until lately were dry-goods salesmen, druggists, plumbers, doctors, Pullman conductors, *et hoc genus omne.* Verily, it is disgusting to the man who has spent a lifetime in the earnest study of his profession as a mining engineer, and it may be truly said in this line of business above all others, that "fools rush in where angels fear to tread."

J. W. Williams.

Denver, Colo., Feb. 15, 1910.

Ely Central Copper Company

In the Journal of Feb. 12 was published a communication signed H. C. Wilmot in which that individual commits a most pronounced breach of professional etiquette, at the same time making a statement which impugns my good faith and is extremely mendacious. In view of the fact that Mr. Wilmot has seen fit to rush into print with this unwarranted attack, it may be of interest to you to learn the exact facts of Mr. Wilmot's connection with Ely Central Copper Company.

I appointed Mr. Wilmot manager of the Ely Central Copper Company on the recommendation of Dr. Walter Harvey Weed who was in Ely at the time. I had no personal knowledge of Mr. Wilmot's previous experience or professional ability, but as I was informed that he had been general manager of the properties of the General Development Company at Butte, I assumed that he was competent to fulfil the duties of the position and that he was a man of integrity. Before appointing Mr. Wilmot as manager, at my request he visited me at Ely and in the presence of Dr. Weed was distinctly informed that he was not expected to contribute to the columns of "dope sheets," but that all the information he was called upon to furnish was that usually given by managers to the consulting engineers or other officials of the company for their information and that of the stockholders. There was absolutely no room for any misunderstanding on this point.

One of Mr. Wilmot's first acts upon assuming the management of Ely Central Copper Company was to request me to purchase for him 1000 shares of stock of the Ely Central Copper Company. The market price was then about $2 per share.

After Mr. Wilmot came to Ely to assume management of the property, I remained with him three days of the four days which he spent in Ely. I left Ely on a Monday morning and Mr. Wilmot left on the following morning ostensibly to purchase supplies for the mine, but in direct disobedience of my orders to him to remain on the ground.

I have been informed that simultaneously with Mr. Wilmot's departure the shaft was allowed to fill with water. The damage which was subsequently repaired was due to Mr. Wilmot's negligence or worse.

Mr. Wilmot's telegram regarding the character of the material encountered in the bottom of the drill hole was signed jointly by him and myself, but the information was supplied by him as I was not at the mine on that day. Mr. Wilmot was fully aware that the jointly signed telegram would be published in the market literature of B. H. Scheftels & Co., for the benefit of their clientele and Ely Central stockholders.

C. S. Herzig.

New York, Feb. 14, 1910.

Longwall Mining in Illinois

Referring to the article on the longwall mines of Illinois, in the Journal of Feb. 12, page 330, I observe that Mr. Peltier states that coal washing in this field is not carried on extensively; will say that the statement was formerly true, but that 90 per cent. of the fine coal produced in the field is now washed.

According to the illustration in the article, showing a section through the coal face, it would appear that mining is in the bottom of the coal and not in the fireclay under the coal. In this connection, will say that practically all of the mining is in the fireclay below the seam and the face is also snubbed off to some extent. Occasionally, in spots of limited area where the bottom is hard, all of the undercut is made in the coal. This practice, however, is so limited that it is practically correct to say that mining is confined to the clay. It is for this reason that it is necessary to wash the fine coal. Of the fine material hoisted, approximately one-third is fireclay, which is removed in the washing process. In an unwashed condition, the fine coal is of very little value, but washing produces a high-grade fuel.

A. Bement.

Chicago, Ill., Feb. 19, 1910.

Technical Books

I want to add a robust approval to some recent remarks in one of the contemporaries of the Journal anent the unnecessary weight of technical books. When asked why these lighter editions are not gotten out, a prominent publisher informs me that the sale would not justify the expense—that the editions of technical books are relatively small at best and that most of the editions are for book shelves and not for travel. He explained that the zinc etchings necessary for reducing such a book as McNeill's code to a size with leaves with a net printed area of 3x5½ in. would cost $600 to which would have to be added the cost of paper, printing and binding, and finally that an edition larger than 1000 would hardly be warranted. Would not a postal card vote of the members of the American Institute of Mining Engineers be a good method of enlightening the publisher?

The publisher should be forcibly criticized for inserting pages of advertising in the backs of his books. These serve no useful purpose and are no less than imposition. The Western Union code is issued in a small, light size as well as in the larger and heavier. It would be interesting to know the number of each size which has been sold.

The allied problem of carrying a typewriter was solved very satisfactorily a number of years ago and constant improvement has developed a sturdy little machine which in its leather case occupies a space 5x8x8 in. and weighs only six pounds. I have carried one for years and even on horseback in the mountains, room can easily be found for it in the blanket roll or in a corner of the saddle bags.

Mark R. Lamb.

Milwaukee, Wis., Feb. 9, 1910.

The Peterson Lake Silver Cobalt Mining Company

I notice on page 340 of the Journal dated Feb. 5, an item referring to the Peterson Lake action against J. A. Jacobs, D. M. Steindler and Edward Steindler. For the purpose of giving you the correct information I inclose a copy of the minutes of judgment. I have no further comment to make relative to the proposition other than as referred to by the inclosed, as the company's management is not desirous of pressing for publicity, except to have correct statements given to the shareholders and the public.

R. F. Segsworthy,
Secretary-Treasurer.

Toronto, Ont., Feb. 7, 1010.

[The abstract of judgment is too long to be given in full. It provides for the payment by the defendants of $50,000, with $3000 costs; for their surrender of 160,000 shares of plaintiff's stock; for the delivery by plaintiff to defendants of two notes for $14,145.55 each, due in one and two years, respectively, with interest; defendants to discontinue action for the recovery of the sum covered by such notes. Other litigation with regard to the transfer of certain stock held by the defendants is to be dismissed; also a pending action for an accounting. The judgment, in short, is to be a full settlement of all litigation between the parties. The main features of the judgment are substantially the same as those noted by our correspondent.—Editor.]

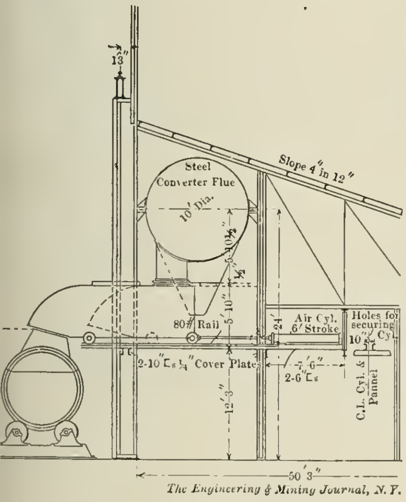
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to ontribute to this department. Articles hould be brief, thoroughly practical, and referably illustrated by drawings or etches. Our draftsmen will prepare roperly any kind of a pencil sketch that intelligible. Something that is an old ory in one district may be quite un-iown in another. Articles accepted and iblished are suitably paid for.

Movable Converter Hood

At the Butte Reduction Works the con-rter gases are carried off through a ovable converter hood, designed by imes Doull, and shown in the accom-inying sketch. The hood is mounted on ieels and is operated by an air cylinder ving a 6-ft. stroke. When in blowing sition, the hood is well over the mouth the converter, forming an efficient out- for the gases and reducing the escape the converter fumes to a minimum. e gases pass into the converter flue om the top of the hood, near the back d, where the connection is so close that th ordinary suction in the flue no gas n escape. Nevertheless there is no in-rference with the horizontal movement the hood when it is desired to change converter shell. With the converter od under easy control of the operator, stringent converter gases are kept out the building and not only is the com-t of the converter men augmented, but en furnaces are in the same building re efficient work in furnace tending can be counted upon by reason of this elimination of the converter gases. In many of the older plants where stationary or unwieldy hoods are employed it is frequently impossible for men to remain at their stations when unfavorable winds carry the escaping converter gases through the building, rendering crane service nearly impossible and causing many workmen to seek places of comparative immunity outside the line of travel of the converter gases.

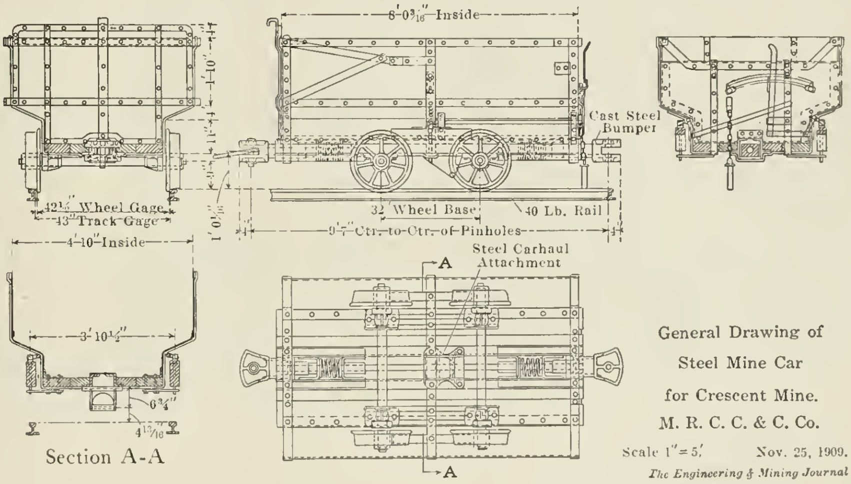


The Engineering & Mining Journal, N. Y.

MOVABLE CONVERTER HOOD

Steel Car for Coal Mines

There are a great number of designs for steel coal-mine cars. Many companies have found it advisable to build their own cars after designs prepared to meet local conditions. The accompanying drawing shows the details of a mine car used in the 6-ft. Pittsburg seam. The car is built for large capacity and long haul; the distance from the mine to the tipple being more than a mile. The cars are also hoisted up a slope by dogs on a chain-haul, so that a steel car-haul attachment is supplied on each car.



The Engineering & Mining Journal

STEEL CAR USED AT CRESCENT MINE, PITTSBURG DISTRICT

The use of dredges in the platinum placers of the Ural district is developing with satisfactory results. In 1909 there were four dredges at work, and the total quantity of metal recovered by them was about 50 poods, or one-seventh of the whole production.

A New Jig Grate

A new jig grate is being experimented with in the J. L. Sullivan and Little Princess mills at Oronogo, Joplin district, Mo. The grate is made of cast iron and it differs from the regular cast-iron grate in the shape of the bars. As shown in the accompanying illustration, the bars are ½ in. wide, 1⅛ in. deep and spaced about ⅛ of an inch apart. The object in making the bars with a bevel or slope on one side is to give a backward, as well as upward motion to the water, as shown at *c*, Fig. 1. In doing this, it retards the progress of the heavy mineral on the screen. By retaining the material on the bed a little longer, less of the middlings pass from one compartment to the next. The backward current of the water, as shown by the arrowmark *c*, also reduces the friction at the lower end of the screen so that the mineral has less tendency to work over the bridge. In using this grate about 3 in. of ore is kept on the screen. Of this 2 in. are concentrates and middlings which form the bed. The chats occupy about 1 in. above this, while there are 2 or 3 in. of water. The feed and water used are practically the same as with the regular grate. The new grate does not increase the capacity of the jig but it is claimed to give a cleaner extraction of the ore. One analysis of the tailings showed that they contained only 0.34 per cent. zinc. This is much cleaner than the average extraction in the Joplin district.

Another feature that is being worked in

connection with this grate is a gate or bypass whereby a portion of the heavy material from one compartment passes to the bed of the one following without going over the bridges. This is accomplished by means of a gate occupying about 3 in. at one end of the bridge. Along one side of the jig cell is a ¼-in. steel plate *c*, Fig. 2, about 10 in. wide. The steel plate is adjustable and can be placed at any depth in the bed, usually 1½ to 2 in. from the grate. This allows the mineral particles to pass under the gate and separate them from the chats. A portion of the middlings are drawn from the cell by the usual side gate *d*. The main advantage that seems to arise from this bypass is that middlings and concentrates may pass from one cell to the next without passing over the bridge. In other words, it maintains the concentrates and middlings at a lower level and holds this portion on the grate longer and at the same time allows the chats to pass off in the usual way. In this particular case the concentrates are not drawn off until at the last cell. There should be an arrangement to take at least a portion out at an earlier stage. There is a more or less abrasive effect on the ore and this will result in the loss of mineral.

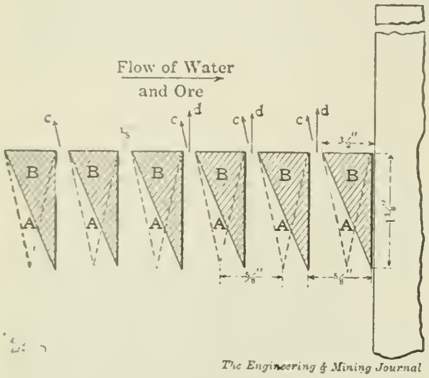


FIG. 1. RICHARDSON JIG GRATE

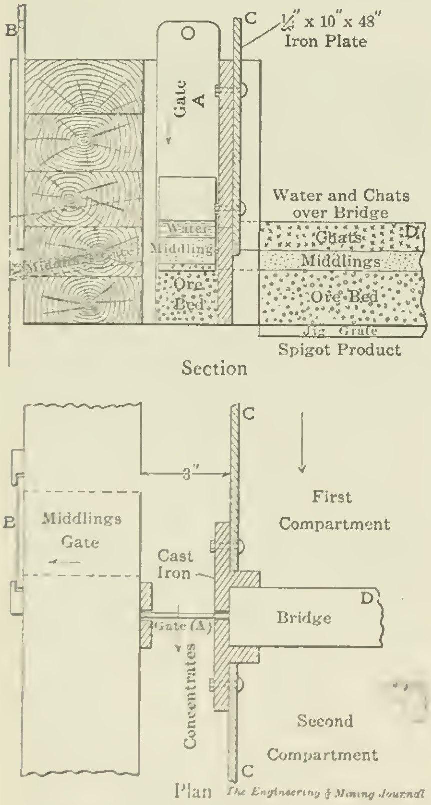
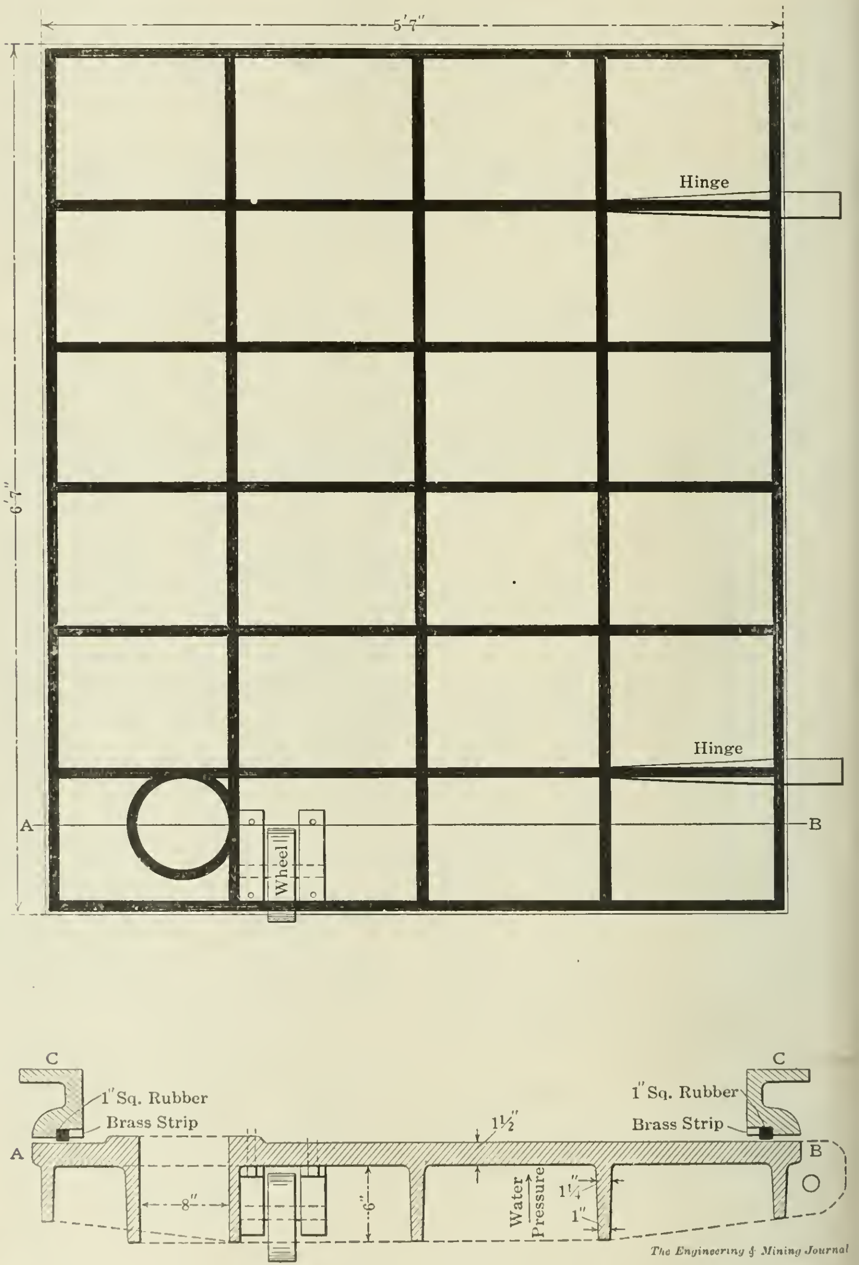


FIG. 2. RICHARDSON JIG GATE

The accompanying drawings show the method of the construction of the grate which is 36x48 in. Fred Richardson, of Oronogo, Mo., is the inventor and patentee of both the grate and gate.

Gate for Controlling Mine Water

A gate used for controlling water flow in mines is shown in the accompanying illustration. This particular gate was used at Flat River, Mo., to protect pumps and mine workings from sudden flows of water. The gate is of cast iron, 1½ in. thick, with longitudinal and cross ribs 6 in. high and 1¼ in. thick. The door is 5 ft. 7 in. wide, and 6 ft. 7 in. high. The door has an 8-in. opening in the lower left-hand corner to which a pipe and valve may be attached. Near this opening is a small wheel to support a portion of the weight of the door, and thus relieve the hinges of such a large burden.



CAST-IRON GATE FOR MINE DRIFTS

The door closes against a cast-iron

frame *C* which is securely cemented into the wall of the drift. A groove is cast in one side of the frame, and a piece of 1-in. square rubber packing is inserted and held in place by a small brass strip. The door closes against the rubber packing, and is so hung that the pressure of the water from within will hold it shut. In order to open the gate it is necessary to open the valve and allow the water to flow out, thus relieving the pressure.

Automatic Zinc Dust Feeder

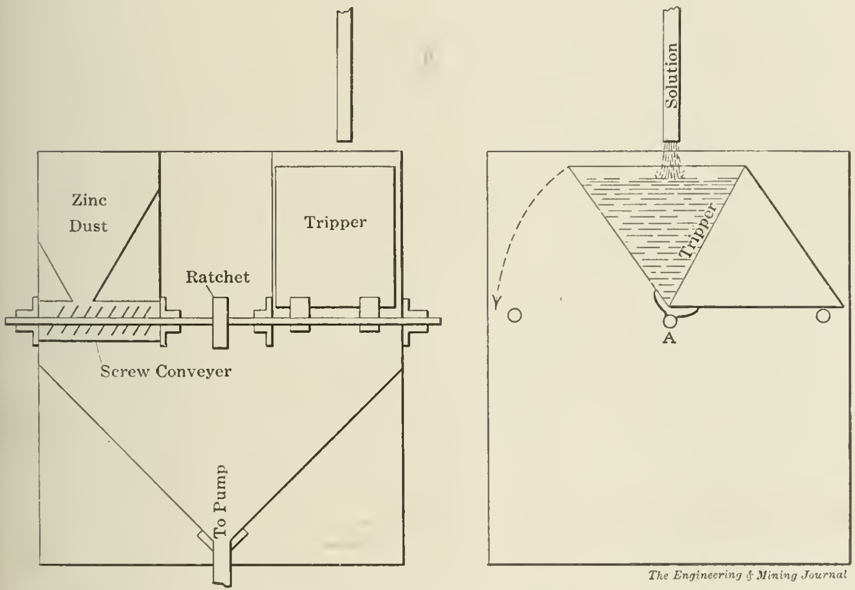
By James S. Colbath *

The accompanying sketch shows an automatic zinc-dust feeder which has been used with entire satisfaction at the El Rayo mill in Mexico. This device lowered the zinc consumption materially over the old method of feeding by hand into a cone agitated by compressed air. I do not, however, make any claim of excellence in this respect over any other device that will give a continuous and uniform feed. For simplicity, positive action and uniformity, it cannot be excelled.

The apparatus consists essentially of a receiver having diamond-shaped cross-section with a central partition. The hopper is mounted on a shaft *A*, and the whole caused to oscillate by flow of solution. The shaft is connected with a screw conveyer by a ratchet causing the screw to revolve only in a positive direction. The zinc drawn from a hopper by the screw mingles with solution discharged from tripper and flows to precipitating pump. The feed is controlled within the limit of capacity by the flow of solution.

The sketch, I believe, will be clear to anyone. I would caution those attempting to construct a feeder of this kind, not to have the opening over the screw too constricted, as there is a tendency for the zinc to arch. Also, the tripper must be accurately constructed and the bumpers so placed that the center of gravity when full of solution will be on the same side of a vertical plane through the shaft as the direction in which it should rotate.

The operating arrangement of this machine, with the addition of a spoon, is familiar to most millmen as an excellent pulp sampler. I am unable to give credit to the inventor. A lime feeder on the same principle, but differing materially in construction, is credited[1] to P. S. Taverns.



Automatic Zinc-dust Feeder

Graphic Indication of Drilling

Engineers engaged in prospecting and developing by drilling find it convenient to indicate graphically the results of drilling by using a series of wooden pins inserted on a board on which is represented a horizontal projection of the ground under exploitation. The pins extend to a relative hight corresponding to the contour of the ground and the progress of the drill is represented on them by suitable colors and the ore differentiated with another color. This simple device is useful in demonstrating and in explaining the extent and relation of the orebodies and is almost a necessity in order to have in mind clearly the interpretation of the various drill holes. In one engineering office the surface ground is represented on a relief map on the same scale as the drill-hole board with the contours differentiated by means of cardboard cut out to conform to the contour lines and accurately representing the surface topography of the claims. The drill holes are located on this contour map by means of dots and these, together with the other device, clearly indicate the extent, character and significance of exploration underway.

Preservation of Mine Timbers

By Chas. A. Chase*

The subject of the preservation of mine timbers for the mines at Telluride, Colo., has not been gone into thoroughly. The Tomboy and Liberty Bell mines joined in the expense of an investigation. While the report of this investigation has not yet been completed, it has become evident from the work done that it is impossible that the treatment of the mine timber would be an economical success for these mines.

From my own knowledge based on the history of the Liberty Bell mine, the largest user of timber in the district, I have to say that the idea of a timber-preserving plant is not at all attractive. In the first place the mine is wet, which gives timber a better chance; secondly, it is all ventilated, which has provided ample protection in the past.

I have struggled for years to get the Liberty Bell mine in such condition that we could go to the extreme end of the property with the development and then mine from that end inward, or perhaps better, back toward the main outlet, leaving an abandoned section of the mine behind us. We have practically reached a point where this scheme will be in effect for the future. Under such conditions it is obvious that most any kind of timber will last for this short period.

Of course, it may suggest itself that timber might be used a second time. I have given some attention to this, but have never been able as yet to experiment extensively on this line. As far as I have seen, the project of reclaiming timber from old open stopes is fraught with danger and the timbers are liable to be shot so full of rock as to be unfit for working the second time. Under these conditions the only demand for treated timber would be in the main gangways which have to be kept open for years. My experience, so far, has demonstrated that the draft and moisture are sufficient to preserve timbers in these passages.

As far as the Tomboy mine is concerned, the item of timber is not large. Of conditions at the Smuggler Union mine, I am not fully informed, but I am quite confident that with good methods the demand on the timber would not exceed its reasonable life.

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*Manager, El Rayo Mining and Developing Company, S. A., Santa Barbara, Chih., Mex.

[1] "Cyaniding Gold and Silver Ores," Julian and Smart.

*Mining engineer, Denver, Colo.

Improvements at the Needles Smeltery

The United States Smelting, Refining and Mining Company has recently acquired the smeltery at Needles, Cal., formerly controlled by the New Mexico and California Mining and Smelting Company; also the lead and zinc mines, near Chloride, Ariz., which were owned by this company. A number of changes and improvements are now being made. The old Needles smeltery is being remodeled to increase the capacity from 150 to 300 tons daily. A concentrating mill and zinc separator will also be erected. An experimental plant has been built to determine the best process of milling, and experiments are now being carried on. The concentrator is to have a capacity of 150 tons per day. Regarding the zinc plant, it has not yet been determined whether a dry or wet process will be used, but Huff machines will be installed in either case. The smeltery is a custom plant with lead and copper furnaces and is now in the market for the purchase of gold, silver, lead and copper ores. The company's lead and zinc mines at Chloride are starting development work. As soon as the necessary supplies of ores are obtained smelting will be resumed. Dr. L. D. Godshall, one of the owners of the old plant, is general manager.

South African Diamonds

At the annual meeting of De Beers Consolidated Mines Company, held at Kimberley, the directors' report showed an improved position of the company, as compared with its prospects of a year ago. In 1907 the dividends and bonuses paid to the holders of deferred shares amounted to £1,750,000, while for the two years ended June 30, 1908 and 1909, nothing whatever has been paid. The preference dividend of £800,000 per annum, payable half-yearly, has always been forthcoming, but last year the company had to raise funds on its securities in order to meet its obligations. By September, 1909, the position had so far improved that the directors felt justified in declaring an ordinary dividend in that month in anticipation of the one which otherwise would have been declared in December, and the chairman expressed the hope that another ordinary dividend would be declared next June.

The recovery in the value of diamonds is credited to the policy of restricted output which was adopted by De Beers and to the support given by the company and by the diamond syndicate to the market when the crisis was severe.

The De Beers and Kimberley mines washed 1,402,891 loads, yielding 0.42 carat per load, in the year ended June 30, 1909, as against 1,130,673 loads in the previous year; the Wesselton mine washed 1,798,160 loads, yielding 0.34 carat per load; and the Bultfontein mine 1,573,118 loads yielding 0.38 carat per load. This makes a total of 4,774,172 loads washed during the year as against 4,965,323 loads for the previous year.

It is estimated that more than 65,000,000 loads of blue ground are in sight at the properties of the company, itemized as follows: De Beers, 2,777,000 loads above 2040-ft. level; Kimberley, 1,400,000 loads above 2960-ft. level; Wesselton, 23,500,000 loads above 980-ft. level; Bultfontein, 18,000,000 loads above 1000-ft. level; Dutoitspan, 28,576,000 loads above 750-ft. level. There is a total of 9,526,531 loads of ground on the floors.

The balance sheet shows a total profit of £852,550, compared with £908,649 for the preceding year. The stock of diamonds at cost is taken at £937,430, which represents about 1,000,000 carats. Owing to the depression in the diamond market the prices realized showed a serious decline. Kimberley and De Beers stones brought an average of 46s. 7.8d. as compared with 58s. 1d. the year before; Wesselton, 32s. 2d. as against 38s. 11d; and Bultfontein, 33s. 5.4d. as against 41s. 5d. Since June, prices have improved.

THE PLACER DIAMOND FIELDS

The placer-diamond industry in German Southwest Africa continues to go ahead. The diamonds so far discovered are small compared with the mine stones, but their abundance and the ease with which they are recovered, render the industry highly profitable. The diamond deposits are said to extend over a stretch of territory 250 kilometers in length, and up to the present only a small portion of the fields have been worked.

The total yield of the mines amounted in the last quarter of 1908 to 23,852 carats, and in the first six months of 1909 to 200,227 carats, a total of 224,079 carats. The stones obtained by prospecting operations are not included in these figures. They total 33,709 carats, of which 24,553 carats were found in the Pomona district. The yield still shows a steady upward movement.

German Foreign Iron Trade

The foreign trade of the German Empire in iron and steel, including machinery, and in iron ores, for the full year 1909 is reported as below, in metric tons:

	Exports.	Imports.	Excess.
Pig and scrap...	645,333	318,959	Exp. 326.374
Other iron & steel	3,399,058	139,582	Exp. 3,259,476
Total..........	4,044,391	458,541	Exp. 3,585,850
Machinery	331,194	68,410	Exp. 262.784
Iron ore..... ...	2,825,007	8,366,599	Imp. 5,541,592
Manganese ore	4,487	384,453	Imp. 379,966

The important imports of iron ore were 2,880,390 tons from Sweden; 2,460,688 from Spain; 1,368,610 from France; 552,133 from Russia. The larger exports were 1,905,067 tons to Belgium and 868,121 to France.

Morgan-Guggenheim Syndicate in Alaska

The Morgan-Guggenheim syndicate, through legal representatives, John N. Steele, general counsel for the syndicate, and Stephen Birch, the managing director, appeared before the Senate Committee on Territories, Feb. 18, to justify its operations in the development of industries in Alaska.

Mr. Birch testified that all the money spent in the enormous development of Alaskan resources had been furnished by the syndicate itself; that the Morgan-Guggenheim syndicate had not issued to the public a single bond or a share of stock.

The syndicate owns one railroad and one copper mine in Alaska and has no interest in any other. It owns no coal lands. Testifying concerning the Guggenheim-Morgan option on the Cunningham coal mines, Mr. Birch said that it covered only a half interest, the Cunningham people retaining the remainder. The syndicate had agreed, he said, to pay $250,000 and to furnish transportation. The company was to be capitalized for $5,000,000. He estimated that it would cost $1.75 per ton to mine the coal and that it could be marketed at a profit of 50c. a ton. He estimates that this group contains 50,000,000 tons of coal, which is one-tenth of the estimated supply of the Bering River district. No mineral lands of any description have been acquired in Alaska by this syndicate or any other corporation or individual under the present administration.

The syndicate was formed in 1906 by the purchase of 46 per cent. of the stock of the Northwestern Commercial Company, which owned the Northwestern Steamship Company and the Northwestern Fisheries Company. The latter company packs 300,000 cases of salmon annually, as compared with a pack of 2,000,000 cases by other interests. Last year the Alaska Steamship Company was formed by reorganizing the companies in which the syndicate had bought large interests, and it now operates 11 steamers. A long list of steamship companies in which the Alaskan syndicate has no interest was given in support of its claim that it was not a monopoly.

Both Messrs. Steele and Birch insisted that there was no truth in reports that the syndicate had or was seeking a monopoly of railroads, steamship lines, fisheries, copper mines and coal lands in Alaska. Mr. Birch denied that ex-Governor Hoggatt, Major Richardson or Delegate Wickersham ever had been authorized to act as lobbyists for the syndicate.

The Uses and Abuses of Small Smelting Plants

Require as Careful Handling as Large Smelteries; Many Fail from Avoidable Causes; Arrangement and Equipment Demand Attention

BY HERBERT LANG[*]

For some years the pages of technical ublications have teemed with descripons and illustrations of those immense etallurgical installations which are a aracteristic of this era, and which have een made practicable and profitable rough the recent improvements in ore duction and in related arts. We seem ow to be in the midst of what may be rmed the building epoch—an epoch aracterized by aggregations of mining terests originating huge metallurgical nstructions.

It would be rash to imply that the cul-ination of the epoch has been reached, nearly reached, although the ingenuity many trained minds has long been ntered upon the problem of the cheap d expeditious reduction of metallic ores. esults have been attained so stupendous at the general public, and perhaps the ining profession also, has seemed to se sight of the fact that the principles d practice so successfully applied in e large way are equally applicable in any cases to smaller undertakings, and at many of the methods which have so panded the industry and given rise to eat works in central localities, favor ually perhaps the construction of aller establishments at the mines.

Some have gone so far as to assert that e day of the small smelting plant has ssed never, presumably, to return; but is is an exaggerated view, the result, doubt, of immature consideration. hile we can hardly expect that another a will speedily dawn in which there all be a division of mining interests d a more moderate scale of operations, d when the smelting arts will be car-ed on in installations of more modest ope, yet there is ample warrant for be-ving that works of comparatively small pacity will continue to flourish and their mber continue to be increased.

There are certain cogent reasons for so inking, the chief of which, perhaps, is e attitude of the public on the fume estion, wherein the agricultural inter-ts are allied against the metallurgical, ving rise to difficulties from which no tcome can be discerned save the re-ement of the smelting industry to re-ons where sulphur smoke can do no mage, and perhaps to the immediate cinity of the mines that gave it birth. owever this may be, there are several portant considerations relating to the matter which may be discussed with advantage at least to those who may contemplate the construction or operation of new works.

Causes of Failure

Such considerations lead inevitably to the wide and ever-present question, why are smelting works and metallurgical establishments generally prone to sink into idleness and abandonment after a period of activity more or less prolonged? This is a matter which presents little difficulty to the experienced operator familiar with the casualties of such pursuits; but to the uninformed observer it is a perpetual enigma.

I have prepared a list of 51 retired smelting plants of various sizes and capacities, of whose plans and history I have personal knowledge, and have set down the causes that in my opinion led to their disuse. In some of these the causes were notorious and there could be no mistake as to why the works were closed; but in others there might be much divergence of opinion. In more than one case several contributory causes were manifest and it is difficult or impossible to attach the proper relative weight to each. So far as I can judge of the situations the account stands thus:

Eleven of the 51 plants failed from defective design or construction.

The lack of ore to smelt killed six.

The unsuitability of the ores prevented the success of two.

Five became outgrown and superannuated and were then dismantled.

Diminished prices of metals retired seven.

Prohibitory freight rates blasted the hopes of three.

Three more were driven out of business by objections to their fumes.

Personal reasons, such as the lack of experience, internal wrangling or individual idiosyncrasy, were responsible for the death of four.

The remaining 10 died from a combination of causes which I cannot properly segregate. Among these the lack of capital and adverse competition figured largely. The term bad management is frequently given as the determining cause in certain of these cases, but this phrase appears too indefinite and remote for use in this connection. Bad management may have placed the six plants where there was not enough ore; but it is more instructive to give the purely material reason for their failure.

In locating new works, one of the chief considerations is that of transport, without which no works of more than local importance can exist. Every smeltery, it is generally held, must have a railroad, and every big one must have two or three. The earnest desire of railway managers that their freight cars shall receive a new load at the very spot where they have dumped the old one, compels in a measure the erection of smelting works at terminal stations where freight abounds, rather than at intermediate points devoid not only of return freight, but also of facilities for loading and unloading. It is not so much a matter of the long haul, about which we hear so much, as it is of getting a return load without the necessity of sending empty cars to distant points.

Railroads Not Always a Blessing

Keeping this in mind we are able to understand in some measure the frequently inexplicable behavior of railway magnates who apparently without remorse trample the life out of one smelting concern while building up another, seemingly no better entitled to exist. Favoritism doubtless enters into the scheme of things sometimes, but as a general thing the attitude of railways may be understood and even prognosticated. We must recognize that the extension of railways into remote mining regions, while being a potent factor in the creation of great central reduction plants and favoring the small local plant in several respects, offers in general a doubtful benefit to the latter. The same agency which might enable both to flourish may ruin the small enterprise and drive it out of existence by reducing freight rates on ore to a point which enables the large central plant to compete successfully with the local concern in the latter's own sphere.

It may consequently happen that the introduction of a new railway into a district formerly served by a small but active smeltery may prove more of a detriment than a help to the latter. A number of such establishments have been thus thrown out of business through the extension of railways to their vicinity, enabling the ore producers to send their product to a distance for reduction under circumstances that overpowered the local plant; and although I cannot point to as many instances of this kind as are generally imagined to exist, I believe it will usually be safer to build the small plant in a locality which cannot be invaded by new—or at least by hostile—lines of rails, and to trust to the humbler facilities offered by the mule team or other minor agencies of transport.

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[*] Metallurgical engineer, 489 Twenty-ninth reet, Oakland, Cal.

Some Avoidable Causes.

My list shows that 19 out of 51 plants failed from avoidable causes; that is, causes which might have been foreseen by any capable and experienced smelter. This number, constituting nearly 37 per cent. of the whole, is truly a large proportion but not greater, perhaps, than that of the banks and grocery stores that suspend from equally avoidable causes. I would make the distinction that the idleness of the remaining 32 plants is due to causes to which in the main could not have been foreseen, and it would be doing an injustice in many cases to refer to them as failures in the usual sense. Indeed, a fair examination of the conditions under which these went out of business would disprove the popular fallacy that the idleness of a metallurgical plant bespeaks its construction as having been a blunder and due to incompetency or worse.

Many small plants have undoubtedly met failure because of faulty design and construction. In an era when the smallest details and refinements of other processes have received the most anxious care and thought, the builders of smelting works have often been content to follow the beaten track and to erect their works in a traditionary style quite out of keeping with the spirit of modern progress. Travelers in the West are familiar with the appearance of such structures, which have an unmistakable family resemblance. Built in a style of simple ugliness, and as if convenience were not a thing to be much concerned about, the country smeltery, clinging to its barren hillside, is indeed a forlorn object.

In point of design the small local smeltery remains in the state in which it was twenty years and more ago; the result, as we must believe, of the loss of interest in this class of works. For some years the construction of local plants has almost entirely ceased, our designers, busy in other lines, having neglected them in favor of the large and imposing metallurgical concerns of the day. But the essential difference between small and great smelting works is the difference in degree and not in kind, and we ought to expect the constructional and metallurgical problems to be worked out in the one as well as in the other—but they never are.

Large Plants Have Better Management but Poorer Workmen.

As a rule we find the smaller concerns inferior in methods and practice as well as in design and construction—the result of a sort of deteriorating tendency whose effects may be noted all through. As compared with the better examples of large plants, the small concerns are in general poorly built and still more poorly run. So true is this that most people have acquired the fixed belief that a small plant must necessarily mean a cheap plant, and that being so it should be conducted on a cheap scale, with inferior management and subordinates. But cheap plant, cheap management and cheap labor, mean poor work, short campaigns, much money spent in abortive attempts and little or no profit. These things are inconsistent with the true function of the small plant, which is to serve economically the needs of limited mining areas where proper facilities do not otherwise exist—a condition prevailing in many new and isolated camps in an early stage of development and where the ores are of a complex nature, unsuited to less potent processes.

Large plants, as a matter of course, have better transport facilities and cheaper freight rates, which is their *raison d'etre.* By paying better salaries to their chief personages they secure better management, which manifests itself especially in a more systematic and effective organization; but as a rule they have worse operatives, the effect of paying lower wages. The isolated plant pays less to the management and more to the workman, and it is extremely important to such concerns to understand and appreciate the wage-saving virtues of machinery, by which to offset the exorbitant demands of their men.

With improved apparatus the local works is able to make use of the vigor and natural ability of that active class of men who flock to new mining localities, and who, when properly trained, cannot be surpassed as furnace operators. It cannot be denied that the workmen whom we find in small plants are far better qualified to handle machinery, especially of the more complicated kind, than are the "Greeks" of the larger plants; and this fact should be an incentive to the use of better and more comprehensive apparatus than we usually find around small works.

Too Little Attention to Details.

Restricting our observations to smelting plants, it is invariably noticeable that the chief weakness of the smaller ones consists mainly in the lack of economical methods by which to bring the smelting materials to and remove the smelted products from the furnace, the actual apparatus of smelting not usually being at fault. There are projectors of such works who mistakenly fancy that the furnace, with its immediate accessories of blower, etc., constitutes the only part of the works which is worthy of attention. Such minds need to graduate from the shovel-and-wheelbarrow school. The same applies to those who reproduce in trade circulars and the like the worn-out cuts of supposedly typical works, devoid, very likely, of dust chambers and other essentials, built with wooden roof and floor, with the engine and blowers in one and the same room with the furnace, and showing bins from which the ore is taken to the furnace in barrows filled by hand, to be dumped on the floor and shoveled thence into the furnace—a series of operations most wasteful in human labor. I need hardly observe that the equally wasteful and laborious act of removing the slag from the furnace in hand pots is also shown.

Notwithstanding these drawbacks the uninitiated reader receives from such sources the impression that the processes and apparatus advocated are superior to those employed generally throughout the mining regions, and that the latter are too slow and troublesome for his use. The beginner, whatever be his aptness and skill in business matters, is prone to think that a royal road to fortune is open to him. The idle plants that we see upon the hillsides were, many of them, born of such efforts to cut across lots.

To the present world such past efforts mean nothing unless they perchance stand for an accession to the sum of human knowledge; but it is through fiascos of this sort that we begin to realize the cost of a thorough schooling in metallurgical matters—a cost that would stagger the reader if he were to compute it—the cost of painful experiment, resulting in failure or in half successes, the fruit of which generally goes to someone else.

Costs Increase as Capacity Diminishes

The capacity of a plant will have much to do with its success, and I trace the failure of several to the disproportion of their size to the work they had to do. It is supposed by many persons, even those of much experience, that smelting furnaces of a capacity as small, for example, as 10 tons daily, cannot be successfully run; but this is error. Up to within comparatively recent years the whole of the lead and copper (and I may add iron) smelting of the world was done on as minute a scale, and the ruins of the furnaces in which the work was carried on may still be seen in many countries. Not only this, but furnaces of even smaller capacity are now running as in Mexico and other Spanish-American countries, the home of the primitive adobe stack.

It is true that such small affairs are difficult to run requiring, if anything, more technical skill and certainly more attention than larger furnaces, and they obviously cost more per ton of ore smelted. Under conditions as they exist in this country, such plants would be useless unless the object were to acquire experience that would serve in handling larger plants or if it were desired to asccertain the peculiarities of behavior of some particular ore. I can think of a number of instances where the building of such a small plant would be justified, but in no case would it be so unless the best technical skill were at command for running it. An educational campaign on this scale might be highly useful, but properly to interpret its results would be beyond the power of the ordinary smelting "doctor."

It sometimes happens that the builder may erect a small works at first, making it the nucleus of a later and larger plant. If such a coursé be foreseen, it is policy to erect the first increment in a more substantial manner than usual, after the preparation of the plan of the complete establishment. Such a course usually meets the view of boards of directors as well as of experienced engineers, and frequently leads to a distinct increase in economy.

Mechanical Features for the Small Plant.

The especial weakness of small smelting establishments, as before remarked, lies in their lack of proper arrangements for feeding the stock into the furnace and for withdrawing the melted products, and not in any inefficiency caused by either the size of the construction of the furnace itself. The simple act of feeding a furnace, aside from the occasional need of spreading the stock at the throat, is easily performed and may be made automatic or nearly so. All operators know the virtues of the several apparatus in common use on furnaces for this purpose, and the adoption of the most suitable is an ordinary exercise of judgment.

Getting the stock from the yard to the furnace, however, is a matter requiring much skilful planning and sometimes considerable preliminary expense. It is here and in the appliances for handling the melted slag and other products, that the skill of the designer best shows. In laying out a new plant he can make use of devices which, however simple, need not fall short of the best practice in larger and more pretentious establishments. In most cases a simple, revolving power crane, commanding the feed floor, suffices perfectly for raising the stock from the lower level of the receiving yard and dumping it directly into the furnace, should the latter be a small round one; or it may drop the stock into whatever charging apparatus may be chosen, the furnace being a rectangular one. In this way we may avoid the use of inclined rails or planes and also of bins or other incommodious storage arrangements on the feed-floor level, which usually involve excavation, grading and retaining walls and heavier and more expensive construction generally.

The value of a revolving crane lies in its ability not only to hoist its loads vertically, but to transfer them horizontally. Its hook, swinging in a circle, is able to pick up a load from any spot within a considerable area, elevate it to the required hight and then swing it over the desired spot, which would usually be the top of the furnace. If small or medium quantities are to be handled the crane answers the purpose most perfectly; but if the quantities be great, such as iron furnaces demand, the inclined skip railway is always preferred. The elevator, whose usefulness is confined to simply hoisting the stock, is not equal to either crane or skipway.

If the crane is by far the most adaptable machine for bringing the charges to and introducing them into the furnace, the railway is none the less so for removing the receptacles for hot slag and other products of the fusion. At this day few designers could be found to sanction the return to the old-fashioned hand pots once considered so indispensable about all small and many large works.

The use of the railway and large pots, however, demands some modification of the layout of the works, especially about the furnace, which must be placed higher than was formerly customary; but this involves little additional expense, while largely increasing the economy in operation. In order to reach a step farther toward perfection, the use of ball or roller bearings on the slag pots, and of well laid out tracks are necessary.

The adoption of these comprehensive means for performing the requisite operations reduces the number of operations and the number of the essential appliances. Thus, the considerable array of small slag pots gives way to two or three vessels of larger size; the multiplicity of barrows, hand cars, or "whatnot," is substituted by a bucket or two; and the complexity of the ordinary layout yields to the simplicity of the plant reposing wholly upon a single level.

The Evil of Crowding

The final improvement in this, as in other arts, consists in substituting the simple for the complex, the great for the petty. It is an axiom of prime import that plenty of room should be taken. For, as I have elsewhere said, the compactness that is so commendable in other connections is not a virtue but a vice in smelting-works construction. It is a singular, a remarkable, phenomenon requiring psychological explanation, that people will cramp themselves for room in a region where they might freely take in all outdoors: nor is this stranger than the devotion that some men evince to methods sanctified by habit and tradition. In metallurgy we are familiar with those devotees of the hill-side plan of building, who would haul ore 10 miles to get a chance to drop it 10 feet.

From all this we must discover what is not generally recognized, that the planning, construction (and I may add, conduct) of a small smelting works demands as much skill and knowledge as does a large one. The completed plant will not have as many parts, but these must be as nicely adapted to the ends sought; the construction must be as exact, and the plant should be run as well. The small plant is in effect a miniature of the larger—a fact that infers the provision of equally effective if not equally capacious apparatus.

The Smelting Mixture

If one visits a locality to examine minutely into the causes of a works' idleness, he is apt to find, among other shortcomings, an apparent unfitness of the ore for smelting process—a condition often characterized by the declaration that the ore was not, in ordinary language, "a smelting proposition." This phrase means merely that the ore was too acid or too basic and needed to be mixed with the appropriate fluxes before being introduced into the furnace. At the same time an inspection of the immediate neighborhood may show an abundance of such fluxing ores, which the smeltery people have neglected to use. Nothing is more common than this condition, which in its relation to the idleness of plants is referred to as the unsuitability of the ores.

In my practice I have invariably found it quite difficult, and, in the time given, impossible in most cases to impress upon investors the imperative necessity of procuring outside ores of a kind that will flux the principal supply without making use of barren material for that purpose It is even difficult to convince beginners in the art of smelting that such material as iron pyrites, calc spar, or indeed any pure or nearly pure mineral alone which sometimes composes so great a part of the output of a mine, will not smelt by itself, but must be mixed with something to offset it. This point at last being made clear against the pupil's inner conviction that the smelting expert ought to know how to get along without anything at all, the next thing is to convince him of the propriety of adding fluxing ores instead of barren stuff, like iron ore and limestone.

One would suppose that the fact would be self-evident, but it is not so and it almost always requires a demonstration of its truth on a large and expensive scale It scarcely ever happens that the matter of fluxing material is thoroughly attended to before beginning smelting, even by the largest and richest companies; and I may say never by small ones. The latter usually build their plants for the service of a single mine, and there are commonly reasons enough why it is not desired to go into widely extended operations; but the fact always remains that an ample supply of fluxing ores is essential to smelting when it is the aim to make all the profit the case will permit.

It follows from this that the works should be built, not for the service of one mine, but for a group, the product of which, when united, will form a smelting mixture. The discovery of ore supplies of this description is the business of the projectors or the engineers of the new scheme, and should be attended to before building begins.

If it were desirable or necessary to cite instances to prove or illustrate the proneness that new companies have to neglect this matter and to venture upon smelting while still unprovided with fluxing material, a great number could be given. In one recent case it was proposed to flux a low-grade cupriferous pyrrhotite with barren quartz, in lieu of buying or mining gold-bearing quartz. In another, a small plant was run for a time on a mixture of metal-bearing quartz, fluxed with limestone which cost delivered no less than $7 per ton, although unworked deposits of silver-bearing barite and calcite lay within short hauling distance. But it is useless to multiply instances of this kind.

With the foregoing observations in mind, and remembering the perfect adaptability of the smelting process to a mixture, no matter how complex, of ores of either of the precious metals together with either copper or lead, the conditions of success may be better understood. They imply a good but not necessarily extensive or costly plant, in which design cuts the principal figure; they imply good management and good workmen; they imply a preliminary thorough search of the locality for suitable ores, and the existence of valid contracts for the delivery of these ores to the works; they imply the needs for experience in handling the business end of the enterprise not inferior to that utilized in the business, let us say, of banking, manufacturing or any other pursuit; and finally they imply the necessity of fair and stable prices for the smelted products.

Correction

In the review of Montana operations, on page 94, of the JOURNAL, Jan. 8, 1910, beginning with the second line in the second column, the account of the work at the Rarus shaft should have read: "and the air shaft was enlarged from three to four compartments, giving increased ventilation. The North Butte company operated a group of claims through the Speculator shaft." The omission of a line made it appear that the Rarus air shaft and the Speculator shaft were connected

Mount Morgan, Queensland

Special Correspondence

Few mining companies have a record that can compare with that of the Mount Morgan at Rockhampton, Queensland, whose report for the half-year ended Nov. 30, 1909, has just been issued. Since the formation of the company in 1886 up to the end of May of last year, the value of the gold produced exceeded £13,000,000, and of copper not far short of £2,000,000, out of the proceeds of which dividends exceeding £7,000,000 have been paid to the fortunate shareholders. As is well known, the principal mineral won now is not gold but copper, although gold continues to be produced in large quantities.

The revenue from the mine is now derived from three main sources, auriferous copper ore, sulphide gold ore and oxidized gold ore, of which the first is the most important. During the last half-year 121,339 tons of auriferous copper ore were smelted, yielding 3513 tons of copper and 55,474 oz. of gold. Of the sulphide ore, 65,746 tons were treated, yielding 28,614 oz. of gold and 175 tons of copper in precipitate, while 38,847 tons of oxidized gold ore yielded 8938 oz. of gold.

An important change is shortly to be made in the reduction works, arrangements having been practically completed for substituting the basic ore of the Many Peaks mine belonging to the company, for the barren ironstone flux now being used. This change is expected to give a considerable increase in the yield of blister copper besides effecting a large saving in the cost of treatment.

The railway connection with the Many Peaks mine was expected to be finished at the end of last year, but, owing to a strike and other causes, it is not now expected to be completed before the end of March.

As regards the mine, where two serious accidents due to subsidence took place in 1908, it is reported that the sectional system of mining, recently adopted, has proved safe and as economical as the old method. The new system has been extended upward until the amount of roof to be supported by timbering has been reduced to what is regarded as satisfactory. The close filling of depleted stopes has been completed except in a few places of no immediate importance.

In July, 1909, a fire broke out in the mine, but fortunately in a position where it could be conveniently walled off. Strong brick dams were erected in the underground passages and the stope was flooded. The heat and steam coming off caused a creep which extended to the open cut, but it did not cause any more than temporary interruptions in one part of the workings.

The ore reserves blocked out during the half-year amount to 453,385 tons of ore containing 3½ per cent. copper and 8 dwt. gold, and 261,829 tons containing 3 per cent. copper and 2½ dwt. gold, and the total ore reserves on Nov. 30 stood at 1,737,200 tons of 3½ per cent. copper and 8 dwt. gold, and 2,035,400 tons of 3 per cent. copper and 2½ dwt. gold, these figures showing a considerable increase in the reserves as compared with the position on May 31.

The profits of the half-year have enabled the directors to declare two dividends of one shilling each per share, aggregating £100,000. Special precautions have been taken to avoid the shutting down of the mine and reduction works on account of labor troubles, which so frequently hamper Australian industry. Large reserves of coke, coal, timber, fluxes and stores have been accumulated so that operations may proceed as usual in spite of labor difficulties in other districts from which the company has been accustomed to draw supplies.

The Cost of Living

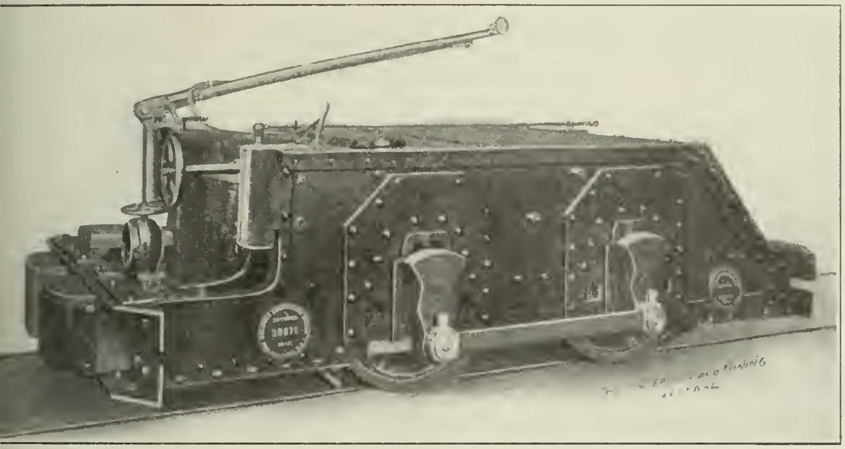
The text of the Payne resolution for an investigation of the cost of living by the committee of ways and means is all that could be desired, says the *Evening Post,* and in this opinion we concur. The following is from the *Post*: It directs the committee to make "a thorough and complete investigation" both of the facts and of the causes; it mentions "any laws of the United States" only secondarily as possible factors in the case; it authorizes the committee to investigate the facts as to prices, and the cause of advancing prices, in foreign countries; and it empowers the committee to employ experts and other assistants, as well as to send for persons and papers. What the committee will accomplish, assuming that the resolution will be passed, will depend almost entirely on the use it will make of its power to employ experts. Mere "hearings" will yield no result of real value, though they may furnish important light on various phases of the subject. The task that the committee will be called upon to undertake is one of simply stupendous difficulty; to attain results that are at once significant and trustworthy will require extensive and protracted research by the most competent specialists that can be secured. The investigation will be expensive, on whatever plan it is conducted; but the expenditure will be sterile if there is not put in, above all, a generous expenditure for brains. A few first-rate men, well paid, at the head of the whole investigation, will add but a small percentage to its cost, and may easily make the value of the result a hundredfold what it would otherwise be.

Electric Locomotive for Mining Work

The Baldwin Locomotive Works re- ntly supplied the Pittsburg Terminal ailroad and Coal Company with an elec- ic locomotive of the mining type, as iown in the accompanying illustration. he electrical equipment for this engine as furnished by the Westinghouse Com- any.

The design embodies various features ' interest. The frame is of plate steel, id placed outside the wheels. The nec- ssary stiffness is provided by riveting igles to the plates. The end bumpers e also composed of angles. In this ay maximum strength is secured with inimum weight, and heavier motor uipment can be provided without ex- eding the allowable maximum weight ' the locomotive.

This locomotive is propelled by one o. 115 motor, wound for 220 volts. The otor drives the rear axle through single duction gearing, and the front axle is iven by side rods. As the frame is aced outside the wheels, it is necessary use driving-axle cranks. These are of eel, cast in one piece with balance eights and keyed to the ends of the des. The wheels are steel-tired, with ist-iron centers.



Electric Locomotive Used by the Pittsburg Terminal Railroad and Coal Company

A traction reel of the Roan type is aced on the rear of the locomotive. The el is mounted in a horizontal position id carries 350 ft. of flexible steel cable. is driven directly from the propelling otor, and may be thrown into opera- on by a suitable clutch. This type of uipment dispenses with an auxiliary el motor.

The locomotive is equipped with an ficient hand brake, four sand boxes, ie gong and two electric headlights. wo trolley-pole sockets are placed right id left near the front of the frame. heet-iron covers are placed outside the anks and side rods, to protect the mov- g parts against possible damage.

Locomotives of this type have fully demonstrated their value in mining operations. They are simple in construction, flexible, and a large proportion of the weight is spring-supported. The principal dimensions of the engine are as follows: Gage, 3 ft. 8 in.; wheel-base, 3 ft. 4 in.; diameter of drivers, 30 in.; journals, 3¾x4 in.; width, 6 ft. 2 in.; hight, 3 ft. 4½ in.; length, 10 ft. 4 in.; weight, 11,500 pounds.

Cyaniding at the Ashanti Goldfields

In the latest report of the Ashanti Goldfields Corporation, West Africa, that for the financial year ended June 30, 1909, some interesting information is given by the company's consulting engineer, W. R. Feldtmann, on the processes employed for extracting the gold from the different classes of ores that are met with on the property. The ores are won from two main sources: one being the ordinary gold-bearing quartz from the fissure lodes, and the other from a wide deposit, known as Justices' Find, which is at present quarried, about the nature and origin of which there is considerable uncertainty.

In former days the process employed for treatment of the ore coming from the mines was ordinary wet stamp-milling followed by cyaniding. The ore, which carries graphitic material and small quantities of various sulphides, yielded a poor recovery—only about 60 per cent—by that process and it was therefore decided to adopt another process, namely, dry crushing followed by roasting and cyaniding, which has resulted in the extraction being raised to 90 per cent. and over. The cost of treatment by the new process is considerably more than by the old, about 6s. per long ton, but the increased extraction more than compensates for the increased cost, the net saving amounting to 12s. 6d. on 15-dwt. ore. The ore after being broken in a rock breaker is dried in a rotary cylinder and then fed into Krupp ball mills, the largest pieces of ore being not greater than 2½-in. cubes. The product from the ball mills, which is fine enough to pass through a 30-mesh screen, is then roasted in Edwards' furnaces which discharge to cooling floors, preparatory to transporting the ore to the cyanide vats.

On leaving the furnaces the ore has lost 12 to 15 per cent. of its original weight, having been deprived of its graphitic constituent and of most of the sulphur and arsenic contained. The ore is treated with cyanide solution for 10 days, dissolving 90 per cent. of the gold, which is precipitated on zinc shavings. The residues average only 1 dwt. from ore carrying about 17 dwt. per long ton. The cost of treating 33,003 tons during the year was: Dry crushing and roasting, 9s. 7d. ($2.33) per ton; cyaniding roasted ore, 5s. 2d. ($1.25); total, 14s. 9d. ($3.58) per ton.

Non-roasting Process

The ore from Justice's mine or quarry receives a different treatment. This ore, instead of consisting mainly of quartz, is of a soft clayey nature and in it practically none of the gold is amenable to amalgamation. It is no doubt due to the refractory nature of the ore that its value escaped the notice of the natives. On crushing wet, the ore makes considerably more slime than sand. The gold is fairly easily, although not completely, soluble in cyanide solution.

The treatment decided on was crushing wet with cyanide solution in a stamp battery, separation of the sands, which are leached, and agitating and filter-pressing the slimes. The first instalment of the plant, which started work in February, 1909, consisted, in addition to the stamps, of hydraulic classifiers for separating sand, three Brown agitators for agitating the slime pulp, the necessary treatment vats for the sand, and three filter presses with necessary filling and washing pumps and clarifying presses. This plant was duplicated in June, 1909, and is now dealing with over 4000 tons per month, and extracting 13.5 dwt. from 15.5-dwt. ore, or 87 per cent., at a cost of about 10s. per ton. On 10,663 tons treated in this way last year the costs were about 13s. per ton.

Justice's ore in depth becomes a sulphide ore and will probably require a different treatment. Roasting and filter-pressing are proposed or a combination of the two processes previously described. The ore requires a longer roast than the quarztose mine ore and does not give a good, leachable product for sand treatment. Hence filter-pressing is proposed. Before deciding on the treatment experiments in concentrating the ore are to be carried out, as perhaps this may prove the most economical method.

Horwood Process for Separating Zinc Sulphides

Blende Separated from Other Minerals by a Combination of Partial Roasting and Oil Flotation; Successful Separation of Intimate Mixtures

BY DONALD CLARK*

A process for the separation and recovery of zinc sulphide from intermixed sulphides has been patented by E. J. Horwood, of Broken Hill, N. S. W. The principle of the process is that when a mixture of iron, copper, lead and zinc sulphides is roasted, the surfaces of the particles of the two former sulphides are changed to oxide and sulphate at a comparatively low temperature, whereas the zinc sulphide is practically unaltered. The partly roasted material is then subjected to a heated-acid oil-flotation process, such as is used by the Minerals Separation Company at Broken Hill, when the zinc sulphide will float away and the deadened compounds of iron and lead will sink with the gangue.

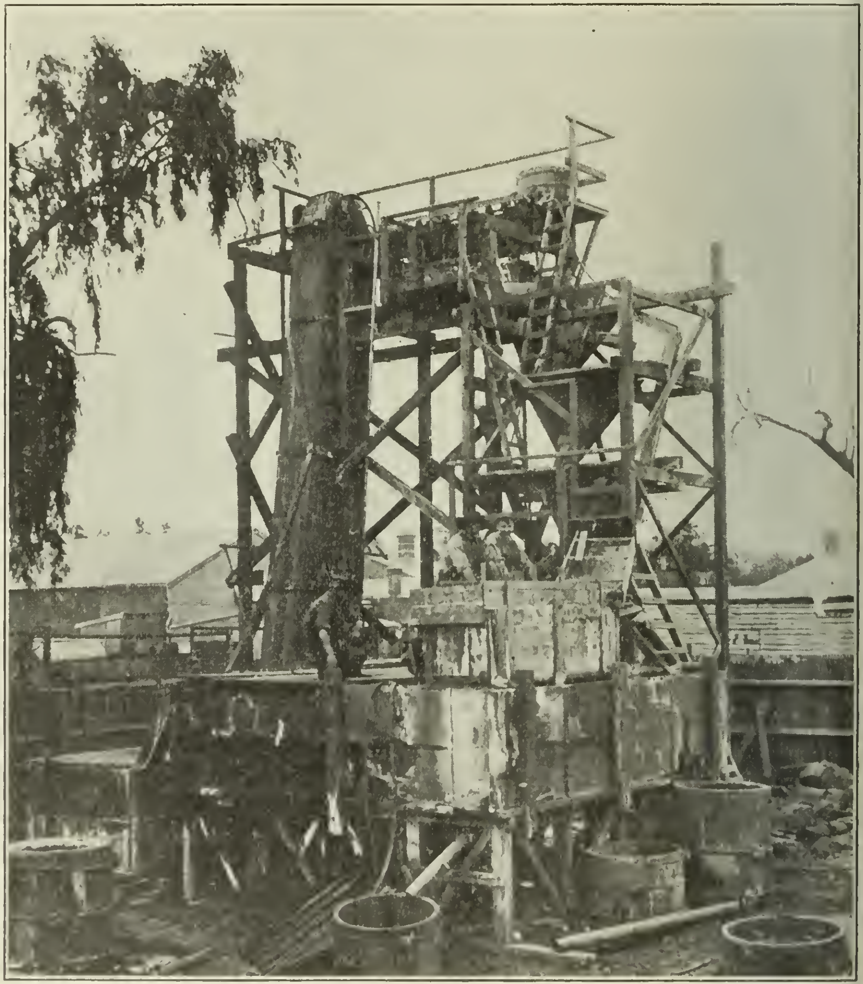
Preliminary tests must be made on ores which are to be treated by this process in order to ascertain in just what combination the metals really exist. While the ores at Broken Hill are somewhat granular, the grains of galena and blende being to a great extent separable by comparatively coarse crushing, there are many steely grained admixtures of blende, galena and pyrite which have to be reduced to a slime before the individual grains are separated. Attempts to concentrate this finely divided material have ended in failures. Such ores exist in large quantities on the west coast of Tasmania.

In addition to these ores, the slime products from the Broken Hill mills contain an intimate mixture of blende, galena and gangue. The mixed sulphides from these slimes are in some instances recovered at the mines by flotation. A hot dilute sulphuric-acid solution with a small amount of oil is agitated with the ore, and the mixture sent through a series of spitzkasten; the admixed sulphides float and the gangue is drawn away from the bottom of each box. The product obtained usually runs about 30 per cent. zinc, 25 to 30 per cent. lead and 30 oz. silver per ton.

ROASTING THE ORE

Many of the Tasmanian ores contain as high a percentage of zinc as the Broken Hill slime concentrates, but there is practically no demand for such a low-grade zinc product. Mr. Horwood's process promises to deal with such ores, and an experimental plant having a capacity of one ton per hour is now at work at the Bendigo School of Mines.

The ore must be so pulverized as to separate the ingredients; in some cases 80 mesh will suffice, but most ores require 100- to 150-mesh crushing to liberate the mineral. Preliminary laboratory tests must be made on ores to be treated by this method to determine the percentage of flotation obtainable, the amount of lead required to be converted to sulphate, acid consumption, crushing, etc.



HORWOOD EXPERIMENTAL PLANT

The ore is roasted in an Edwards furnace, the temperature being kept below the ignition point of zinc sulphide; usually the temperature of the heated gases passing over the ore as tested by a pyrometer varies between 300 and 400 deg. C. The end point of roasting is determined by prior laboratory experiment, and varies with the composition and fineness of the ore. Tests are made from time to time on the furnace product to find the amount of lead present as sulphate, and as soon as the predetermined amount is reached, the ore is discharged from the furnace.

In the first test the ore was roasted in charges until sufficiently sulphated, but latterly, and with more satisfactory results, a continuous feed and discharge and a slow rabble motion was used. The first to oxidize is the pyrite and next the galena, the zinc sulphide being almost unaffected. The time required for Broken Hill slime concentrates, when roasted in charges, was about three hours.

FLOTATION

The partly roasted ore is fed into the boot of a bucket elevator with about five times the weight of a dilute solution of sulphuric acid, heated to near the boiling point. The amount of acid required is determined by laboratory experiment, nd varies with the ore. The mixture of re and acid then passes through the agiator box, about 7x1x2 ft. deep. This agitator box is divided into six compartments by transverse vertical partitions having 2-in. holes near the bottom. In ach compartment is a cross-shaped agiator with arms about 2 in. deep, ½ in. wide and 4 in. long, springing from a entral boss. Each agitator is keyed to a central vertical spindle, and by means f bevel gearing each alternate agitator evolves in a different direction. A speed f about 600 r.p.m. is maintained.

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*Director, School of Mines and Industries, Bendigo, N. S. W.

Sometimes the acid is added in the first ompartment by allowing chamber acid to rip in continuously. Oleic acid is allowed to drip into the second compartment at such a rate as to supply a few from two to three) pounds per ton of naterial treated, the best amount being etermined by laboratory experiment. If oo much oil is used, it prevents flotation y causing an agglomeration of zinc-sulphide particles, which then sink with the gangue.

The violent churning caused by the agitators causes bubbles of air and an mulsion of the ore and solution. The particles of sulphide remaining will not e wetted by the liquid, and, further, the bubbles of air and gases evolved from he ore become attached to these sulphide particles; thus the agitators prepare the re for flotation.

The pulp leaves the agitator through a losed launder and impinges against the bottom of a small box about 6 in. deep attached to the end of one of the spitzkasten and having its surface a little below the level of the liquid in the latter. The spitzkasten are 3x2x3 ft. deep. The nds and one side slope, but the other ide is vertical and the discharge opening is near the bottom of this side. The discharge may be regulated by a gate valve or sluicing plug. The sulphides rise o the surface in the spitzkasten and the gangue and deadened lead and iron compounds sink to the bottom, the rise of the sulphides being hastened by the gas bubbles.

The sulphide product of the spitzkasten, zinc sulphide, flows over the top and nto a covered launder which leads to an open box about 6 ft. long, 2 ft. wide and 2 ft. 6 in. deep, divided into four compartments by top and bottom baffle boards. In this box the blende becomes granulated due to the cooling action in he open launder. The granules of blende then rapidly sink and may be tapped off from time to time. The liquids carrying some lead sulphate and fine gangue in suspension escape into a storage vat in which the lead residues from he final overflow of the spitzkasten are also settled.

The iron and lead sink to the bottom of the spitzkasten and form an underflow product. The underflow product is retreated in each of the different spitzkasten shown in the accompanying illustration, while the zinc product each time flows direct to the launder. After the minerals are separated out, the solutions, still warm, are pumped to a storage vat where they are reheated by the introduction of steam and used again.

On one lot of Broken Hill slime concentrates, the laboratory test showed the concentrate to contain 32.4 per cent. zinc and 22.3 per cent. lead. This was roasted and treated in the testing laboratory and two products were made: No. 1, a zinc concentrate, contained 50.8 per cent. zinc and 6.3 per cent. lead; the lead residue contained 2.6 per cent. zinc and 49 per cent. lead. About 53½ per cent. of the original concentrate was recovered as a zinc concentrate and about 38 per cent. reported as a lead residue. About 85 per cent. of the total zinc and 85 per cent. of the total lead were recovered in this test.

In actual operation there were obtained from this ore a zinc concentrate containing 50.4 per cent. zinc and 7.3 per cent. lead, and a lead residue containing 12 per cent. zinc and 41 per cent. lead. The lead residues may be improved by further agitation, raising the content of the lead and reducing that of the zinc.

A complex sulphide from Tasmania, containing an intimate mixture of blende, galena and pyrite, was also tested. This ore had to be crushed dry to a slime product to insure separation of blende and galena. The ore assayed 30.9 per cent. zinc and 9.9 per cent. lead and yielded in actual operation in the experimental plant a zinc concentrate containing 57 per cent. zinc and 5 per cent. lead and a lead residue containing 5.8 per cent. zinc and 20 per cent. lead. These Tasmanian ores were so intermixed that some mineralogists considered the zinc-lead sulphide to be an isomorphous compound.

Copper Leaching in the Ural Mountains

The leaching plant recently completed to treat the old dumps from the Gumeshevsky copper mine, owned by the Sissert estate, was fully described by A. L. Simon in *Bull.* No. 65 of the Institution of Mining and Metallurgy. The Sissert property is one of the largest concessions in the Urals and was originally obtained for working iron-ore deposits. As early as 1727 two important copper deposits were discovered on the property. These were worked intermittently for more than 100 years.

The Gumeshevsky mine was shut down in 1871. From old data available it appears that the mine is a contact deposit between limestone and diorite. Oxidized copper ore occurs in a clay formation along the contact where there are old workings extending about two miles in length and possibly 1000 ft. wide. The mine was worked for the oxidized ore only. The deepest shaft is 500 ft. The material raised from the shaft was evidently hand picked and only the large lumps of oxidized ore saved.

The dump consists of the clay material with the fine ore that escaped hand picking. It covers an area of about 20 acres, with an average depth of 17 ft. This was thoroughly sampled and is estimated to contain 680,000 cu.yd. carrying 23 lb. of copper per yard. Extensive laboratory tests indicated that about 56 per cent. of the copper could be recovered by leaching with sulphuric acid and precipitating with iron. Accordingly a plant was built for treating 420 yd. per day.

Leaching Plant

Since a portion of the ore is coarse (1- to 2-in.), it was necessary to build a crushing plant which has its complement of conveyers, Blake crushers, ball and chilean mills to reduce the material to a pulp, the consistency of which is two parts water to one one part of dirt. Screen tests show that 49.2 per cent. passes through a 136-mesh screen and only 9.4 per cent. is retained on a 38-mesh. Each leaching tank is charged with 200 tons of tailings (dry weight, and 13.2 tons of sulphuric acid of 53 deg. B. The pulp is agitated nine hours, after which the first decantation takes place. Water is again added and the mixture agitated four hours, when it is decanted a second time. By the time the third and fourth decantations take place, 50 per cent. of the copper is leached out. The copper solutions are conducted to 20 precipitating tanks made of concrete and covered with asphaltum. The copper is precipitated with iron, 400 tons of plate and 200 tons of granulated iron being used. About 95 per cent. of the copper in the solution is thus precipitated. The accompanying table shows the actual consumption of acid as compared with laboratory tests.

CONSUMPTION OF ACID.

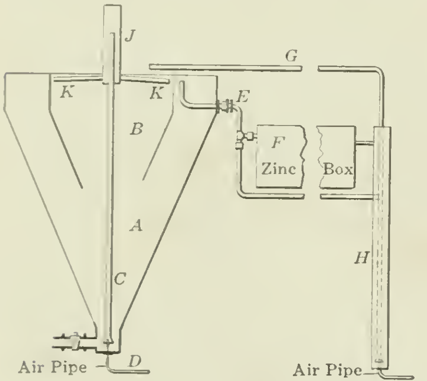
Acid Consumed by	Laboratory Tests. Per Cent.	Actual Practice. Per Cent.
Copper	22.5	25.0
Alumina	49.9	50.0
Iron oxides	12.4	15.0
Lime	4.2	10.0
Unaccounted	11.0	

In 1908 the plant was at work for two months only, August and September, because some of the leaching tanks were not completed until the end of July. During that time 38,000 cu.yd. of material were treated. The total amount of precipitated copper obtained was 175 tons at a total expense of £7075. In 1909 the plant realized better results and copper was produced at £39 per ton as against £50 the previous year.

Treatment of Ore Slime

In order to do away with filter-pressing or decantation methods of slime treatment, A. F. Crosse, at the November meeting of the Chemical, Metallurgical and Mining Society of South Africa, described a process of his own that has been operated successfully for 14 months by the Crown Mines, Ltd., in the Transvaal. Mr. Crosse said in part:

"In my process the slime, having been collected in a suitable manner, is washed with a weak cyanide solution into a conical treatment vat. This vat is provided with an interior conical baffle, open at the bottom and reaching about half way down the treatment vat. Inside the vat is a pipe extending from nearly the bottom of the cone, to a foot or two above the surface of the pulp. This pipe has a small pipe introduced at the lower end, through which air is forced; this causes a current of concentrated or thickened pulp to be forced up the tube. At the same time the clear liquid, in the outer portion of the conical vat, is overflowing into the zinc box where the gold and silver are deposited, and then this clear solution, deprived of its gold and silver, is pumped by a small pump, which can be regulated as to speed, back into the top of the inside cone where it mixes with the underflow brought up by the air-lift pump. By this means the whole mass is kept in continuous circulation under the most advantageous condition for the solution of the gold or silver; as the air circulates and aërates the pulp, the gold and silver are being continually extracted from the solution. The same solution acts as a wash, practically all the gold and silver having been extracted and deposited in the zinc box.



CROSSE'S APPARATUS FOR CYANIDING SLIME

"The method of operating the plant is as follows: The slime, having been collected by any suitable method and the excess of water decanted off, is washed by means of a weak cyanide solution into the treatment vat *A* (in the accompanying illustration) through the baffle *B*. Further weak cyanide solution is then added and air turned on through the pipe *D*. This forces up through the pipe *C* into the receiver *J* a mixture of slime, dilute cyanide and air, to a point a foot or two above the level of the liquor in the vat *A* to which it returns through the pipes *K*, which are so arranged as to give their discharge a circular motion within the baffle cone *B*. The slime then settles down continuously, reaching the bottom of the cone in the form of a thickened pulp, and is again lifted through the pipe *C*. The pulp occupying the space between the baffle cone and the wall of the cone *A* is in a state of comparative quiescence, the only movement being a gentle upward flow of the enriched solution to the pipe *E*, on its way to the zinc box. The conical shape of the vat *A* reduces the rate of upward flow and insures that the top few inches of liquor are clear and free from slime, and thus are in a fit state for precipitation. The solution deposits its gold content in the zinc box and is then returned by the pump *H* to the inside of the baffle where it continues its work, and the sequence above described is allowed to proceed until a large proportion of the gold has been precipitated."

Le Roi Mining Company

The report of the Le Roi Mining Company, Rossland, B. C., for the year ended Sept. 30, 1909, states that for want of ore active operations were suspended last March, but that an extensive scheme of exploration and development had been decided upon. This work provides for thorough prospecting of the upper levels of the mine and undeveloped portions of the property, and particularly for a large amount of diamond drilling in the lower levels by means of which it is proposed to explore the vein for 1000 ft. below the 1650-ft. level in the hope of locating the downward continuation of the valuable oreshoots encountered in the levels above. This program was drawn up by W. A. Carlyle, professor of metallurgy at the Royal School of Mines, London, and consulting engineer to the company. The future development will be governed by the results obtained.

During the year under review 26,935 tons of ore of an average value of $15.48 were mined, of which 26,534 tons were shipped. The total costs, which were swollen abnormally this year on account of the large amount spent on development work, amounted to $15.23 per ton as against $11.71 in 1908 (15 months). At the Northport smelting works 38,958 tons were smelted, producing matte and clean-up material to the value of $678,575, or $578 per ton.

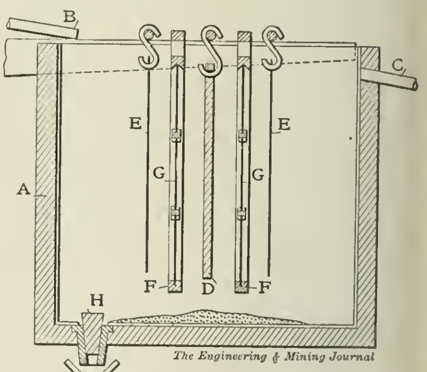
In December, 1909, advices were received from the mine that the diamond drill had located 2 ft. of ore at the 600-ft. level worth over $85 per ton, and 3 ft. of ore on the 1200-ft. level worth $14 per ton. Crosscuts are being driven to ascertain the extent and value of these discoveries.

The surplus of assets over liabilities amounts to £30,000, the greater part of which is in the form of ore and matte. The financial position of the company appears, therefore, precarious. The balance sheet is disfigured with a large sum (£79,331) to the credit of profit and loss account, which has no equivalent cash or liquid asset on the other side of the balance sheet.

Apparatus for Refining Copper

Frank L. Antisell of New York, in United States Pat. No. 13,020 reissued Sept. 14, 1909, describes an apparatus for the electrolytic refining of copper. The important features are: The saving of the silver (which has heretofore been carried by mechanical action to the cathode); prevention of the anode and cathode from short circuiting; and placing them close together, thus reducing the electromotive force required and enabling more anodes and cathodes to be used.

In the accompanying illustration *B* is the inlet pipe supplying the electrolyte, and *C* the overflow from the lead-lined refining tank *A*. Suspended in the electrolyte by hooks from cross rods is the impure anode *D*, connected to the positive pole of the electric circuit, and the cathodes *E*, of practically pure copper, to the negative pole. *F F* are removable porous diaphragms. *H* is a plug for draining off the slimes that collect in the bottom of the tank.



APPARATUS FOR ELECTROLYTIC REFINING OF COPPER

The diaphragms have wooden frames with cross arms. In the openings formed, are inserted panels *G*, preferably of white wood about 1/28 of an inch thick with the grain running vertically. The diaphragms will allow the electric current to be transmitted through the electrolyte, but will not allow the fine particles of silver to be carried to the cathode by the circulating electrolyte.

Stoping Methods in Mines of Ducktown Basin

Underhand Stoping Generally Used; Shrinkage System Being Tried; Orebodies Large; Little Timber Used; Small Pillars of Ore Left for Support

BY JOHN TYSSOWSKI

The visitor to the mines at Ducktown, Tenn., is impressed by the cavernous open stopes left in the worked out areas. In many places the acetylene mine lamp is useless to show any more than the ground in front of one's feet and the ordinary miner's lamp, burning "sunshine," seems only to intensify the surrounding blackness. There are many stopes with widths ranging up to 150 ft. and open vertically for 75 ft., and in the Mary mine of the Ducktown Sulphur, Copper and Iron Company one old stope s open for three 100-ft. levels and for probably half as great a width. To iluminate these workings when showing visitors through the mines oil-soaked waste is lighted and thrown to several places in the stope. At one point in the Mary a level is carried through an open stope on a bridge supported from one wall. This gives a secure passage and was much cheaper to build than it would have been to run a drift through the country rock.

The ore in the Ducktown mines is a pyrrhotite varying somewhat in character, but generally hard and tough and tending to break in large pieces. The orebodies are usually wide, over 30 ft., of considerable length and dip steeply. The copper content of the ore is uniformly low, generally below 2½ per cent. The country rock is a granitic schist which holds well.

Underhand-stope Practice

Underhand stoping has been generally practised in the Ducktown mines and proved satisfactory from the crucial viewpoint of cost. The underhand-stope methods are well illustrated by a general description of the scheme employed at the Tennessee Copper Company's Burra Burra mine. This orebody is mined through an inclined foot-wall shaft from evels at 100-ft. intervals. Crosscuts are run to the ore which is then drifted on in either direction. At 50-ft. centers or more often if necessary, raises are put up to within 20 or 30 ft. of the evel above, thus allowing for a pillar to hold the level above and support the hanging wall. From the top of the raises cuts are opened across the ore and advanced along the orebody with a face carried the full width of the ore. From this opening the ore is then milled or benched down to the haulage level beow, benches varying from 6 to 10 ft. n hight, according to the nature of the ore. Joint planes, or at least planes of weakness, occur in the ore and determine the point at which it will break and economy is obtained by drilling to these planes. If they are not taken account of short holes require excessive charging and holes put in beyond the planes are liable to bootleg; those drilled the proper length break the ore satisfactorily and economically. In benching out the ore, only down-holes are drilled. This is one of the chief advantages of the underhand stope. In milling the ore down in benches especial care is constantly exercised to keep the toe of the stope cleaned up well to the base of the slope. For benching out ore in stopes the large piston drills (3B Rand or similar types) are generally used, but the Tennessee company is now experimenting with Murphy sinkers for this purpose; so far they appear to be giving satisfaction. The results of this experiment will be extremely interesting. Small plugger drills are used to block ore which breaks in too large pieces to be conveniently handled. As the ore is mined out for the entire width and hight of the stope and no roof is left to protect the haulage way, ore chutes cannot be used with the underhand stopes and all the ore is shoveled from the floor of the stope into cars.

Pillars and legs of ore, other than those left to hold the levels, are occasionally left. All of these are to be recovered later by caving. None of the mines in the basin have, however, reached this stage in their development, but plans are being made in several for the accomplishment of this feat. In the lower levels now being opened up in the Burra Burra, in preparation for later caving, haulage ways paralleling the orebody are being driven in the footwall.

An Unusual Stope Problem

At the London mine of the Tennessee Copper Company quite a difficult piece of stoping is now being carried on to remove ore left in the bottom of the open cut, the base of which has been undermined, leaving a pillar of 20 or 30 ft. or ore above a stope open for 140 ft. This ore is of a character desirable at the smeltery, so steps are being made to recover it. The ore pillar is from 30 to 80 ft. wide and will be dropped down to the 150-ft. south level below. There is an opening from the surface into the open stope below. Various plans were suggested for removing this ore, among them working from below on ladders as in trimming "balk" ground. Finally it was decided to cut out a bench to the north of the opening to connect with an old drift or gopher hole on the west of the orebody. From this, long uppers will be put in to pull the ore above, and the ore to the south will then be underhanded and dropped into the hole. This is mentioned merely to show the difficulty of mining above the open stopes. Fig. 1, accompanying, is a reproduction of a photograph taken looking south in the London open cut and shows the connection to the old stope below. It was

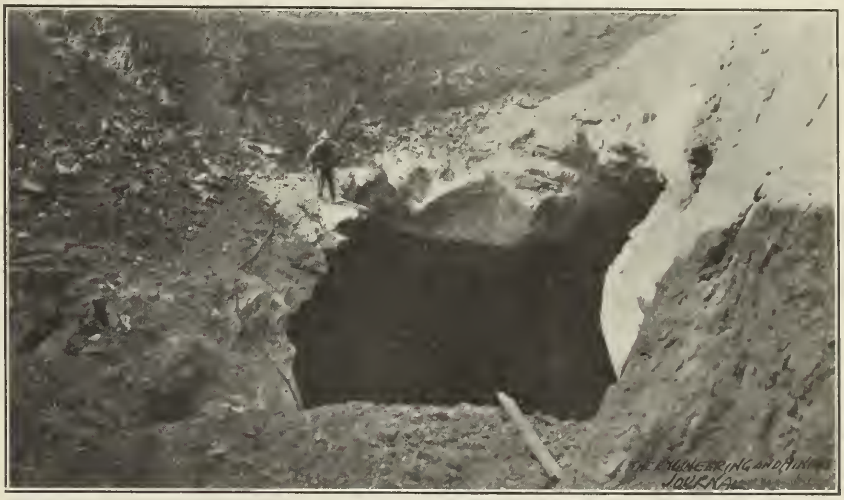
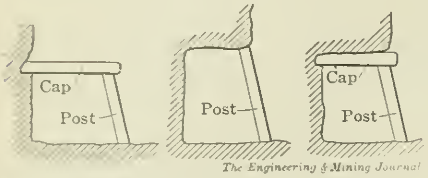


FIG. 1. OPEN CUT AT LONDON MINE SHOWING OPENING TO STOPE BELOW. THIS ORE IS TO BE RECOVERED

through this opening that the imprisoned miners were rescued at the time of the recent mine fire at the London mine.

SHRINKAGE STOPES

Lately a number of shrinkage or back stopes have been opened up in the Burra and these are being tested out in regard to cost against the underhand stopes. The result of these tests will, in all probability, determine the future stope methods to be adopted in the Tennessee companys mines, where under shrinkage stoping is possible. The necessary conditions for the successful working of filled stopes are: A fairly large orebody of uniform content so that all the ore may be mined; a steep dip; and firm walls, uniform enough so that the ore will run readily as drawing progresses. A filled stope is, in reality, an underground ore bin and owing to the amount of capital it represents is not adaptable in many mines, but where large storage is desirable, is excellent. If a mine has ore-filled stopes to fall back upon, any unusual demand for ore can be met. Then, too, the stopes being held open, the ore can readily be drawn into cars without any shoveling. The upper stopes may be drawn first and then allowed to cave above.



The Engineering & Mining Journal

FIG. 2. TIMBERING OF END CROSSCUTS FOR FILLED STOPES

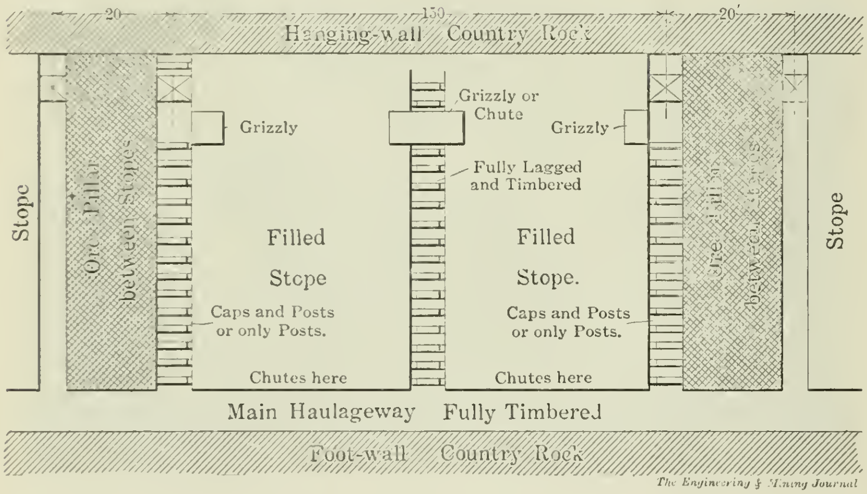

20
150
20'
Hanging-wall Country Rock
Stope
Ore Pillar between Stopes
Grizzly
Grizzly or Chute
Grizzly
Fully Lagged and Timbered
Filled Stope
Filled Stope.
Caps and Posts or only Posts.
Caps and Posts or only Posts.
Chutes here
Chutes here
Ore Pillar between Stopes
Stope
Main Haulageway Fully Timbered
Foot-wall Country Rock
The Engineering & Mining Journal

FIG. 3. SILL PLAN OF FILLED STOPES

The development of the shrinkage-stope method in the basin is still necessarily in the transitional stage, but the accompanying sketch, Fig. 3, shows in plan the general idea of the back stope as practised in the Burra Burra. Stopes are blocked out 150 ft. in length with 20-ft. pillars left between stopes. A drift is run on the footwall and timbered and maintained as the haulage way. At either end of the portion of the lode to be stoped out crosscuts are run to or close enough to the hanging-wall so that vertical raises from their ends will strike the hanging-wall at the level above. These crosscuts may be cut into the pillar and held open with posts or posts and caps as shown in Fig. 2, or run in the stope and timbered with caps and posts. The sill is then cut out from foot to hanging for the entire length of the stope and a crosscut run from the haulage drift at the centre of the stope into the broken ore to the middle of the orebody, and timbered and lagged. Ore chutes and grizzlies are then put in where necessary in the crosscuts at the end and middle of the stope and in the drift. The stope is then opened, the men working always on broken ore; just enough ore is drawn to maintain a proper level so that machines can be rigged to drill the roof.

UNDERGROUND GRIZZLIES

After a shrinkage stope is once opened all holes are uppers and stope drills are universally used. The raises at the end of the crosscuts at either end of the stope are cribbed up as the stope advances and maintained as pipe and manways. Owing to the fact that the ore tends to break in large pieces such as would block up the ordinary type of chute underground, grizzlies such as described on page 1279 of the JOURNAL, Dec. 25, 1909, are used on the hanging-wall side where the large ore tends to run. Ordinary chutes serve satisfactorily for delivering the smaller material which follows the footwall. The number of chutes and grizzlies used in any stope depends on the size of the stope, haulage facilities, etc. After the stopes are drawn the pillars will be caved. In many places if the system prove a success, stopes open for two or three levels may be used and possibly in such places the haulage ways will be maintained in the footwall instead of in the ore. The general idea of opening the stopes will, however, be about as here described.

Nitrates from the Atmosphere

The present method of carrying out the Birkeland-Eyde process for the utilization of atmospheric nitrogen at Notodden, Norway, is described by S. Eyde in *Journ.* Soc. Arts, 1909, Vol. 57. There are 36 furnaces, the current for which is transmitted by means of 18 copper wires of 12-mm. diameter. These wires pass to oil-cooled current transformers in the furnace house, each of which is furnished with an induction coil in order to regulate the supply of power to the furnaces. The furnaces are constructed of cast steel and iron, lined with firebrick so as to form a circular reaction chamber, into which the water-cooled electrodes of thick copper tubing project radially. The electrodes need renewal every third or fourth week, and the furnace lining every fourth or sixth month. The temperature of the arc flame is about 3500 deg. C. The reaction products leave the furnace at a temperature of 800 to 1000 deg C. and are led through two large pipes, 2 m. in diameter, to four boilers where their heat is utilized in generating steam, which is used among other purposes for evaporating the liquors obtained subsequently.

The gases then pass through a large number of aluminum tubes, cooled by flowing water, into iron cylinders, lined with acid-proof stone, where the oxidation of the nitric oxide is completed; and then pass to absorption towers, packed with quartz. The first set of towers is constructed of granite and fed with water, and the final tower or towers are built of wood and fed with a solution of soda. The passage of the gases from the furnaces through the towers is effected by means of aluminum centrifugal fans. In the granite towers the absorbing liquid is circulated until it contains 35 per cent. of nitric acid by volume, when it is run into granite cisterns, and thence into granite vats containing limestone. The resulting calcium nitrate solution is evaporated in a vacuum apparatus and then put either into thin iron drums or shallow iron pans. The sodium nitrate solution from the wooden towers is concentrated and allowed to crystallize.

Trials of the calcium nitrate as a fertilizer have been made, and it is stated that for a given quantity of nitrogen it is quite equal to sodium nitrate, and indeed superior on soils deficient in lime.

A recent consular report states that a 30-foot seam of iron ore has been found near Halifax, Nova Scotia. The tunnel leading to this seam is 1½ miles long under the sea.

Geology of Southeast Missouri Lead District

Review of Dr. E. R. Buckley's Report on this District. Lead Deposits in Bonne Terre Limestone. Possibility of Ore in Underlying Sandstone

BY H. A. WHEELER*

This contribution on the geology of the most important lead-producing camp in the United States is the latest and by far the most thorough work that has been done in this old mining center. Numerous fragmentary articles have appeared since Schoolcraft's descriptions in 1819, especially in recent years, and it was described in the earlier reports of the Missouri Geological Survey, by Litton in 1855, by Gage in 1873 and by Winslow in 1894. The two former wrote when the district was mainly in the "gopher-hole" stage of development, and while their elementary descriptions are nteresting, they have little of geologic value. The Winslow report was an ambitious effort in two volumes (Nos. 6 and 7), called "Lead and Zinc," to describe not only the deposits of Missouri, but also of the United States and Europe, besides giving the metallurgy of both metals. It gave a complete description of the district, and added greatly to our geological knowledge, but a more valuble though concise study of its geology was contributed by Winslow in 1896, n *Bull.* No. 132 of the U. S. Geological Survey.

Doctor Buckley's work is based on much more extensive developments than revious writers enjoyed, as the output as quadrupled since 1896. Every facility nd the fullest information were genrously offered by the operators in the istrict, while the U. S. Geological Surey coöperated in making special toporaphic maps. That full advantage was aken of these opportunities during the ve years that Doctor Buckley more or ess completely devoted to a study of he district while serving as director of he Missouri Geological Survey, the reort fully demonstrates. It is a most raiseworthy exhibit of detail, of painsaking care and of thorough field work, resented clearly and elaborately in two olumes of fine book work that are alled Parts I and II of Vol. IX. Part I as 259 pages, illustrated by nine geoogic sections and 40 photographic reprouctions of field subjects. Part II conains 81 plates of geologic and toporaphic maps, geological sections, mine aps and sketches of ore occurrences.

The report is a detailed study of the ocal geology and a description of the mines. It is quite exceptional in the strictness with which it adheres to its title and the limits of the area under consideration. Even the adjoining Madison county basin of disseminated ore is practically ignored, which is unfortunate when the genesis of the ore deposits is considered.

GEOLOGY OF THE DISTRICT

The orebodies in this district occur in what was formerly known as the Third Magnesian limestone, which consists of a series of predominant limestones and subordinate shales about 1000 ft. thick that rest on the Third (or La Motte) sandstone and were regarded as Lower Silurian in age. Beneath the sandstone occur Archean granites and porphyries that outcrop as knolls and ridges in the southwestern portion of this area. Doctor Buckley calls the pohphyry rhyolite, and places the sediments in the Middle Cambrian. Winslow in 1894 divided the limestone into two members, calling the lower half, with its lower and upper shale beds, the St. Joseph (or Bonne Terre) limestone and the upper half the Potosi limestone, which latter is devoid of shales and is rich in cherty layers and quartz concretions. The lower half contains the disseminated deposits and the upper half the small but often rich pipe and gash veins, containing some zinc and much barite.

Doctor Buckley further differentiates it by placing the shaly beds at the top of the Bonne Terre into what he terms the "Davis" formation. His work shows that this is eminently desirable, as, while it mainly consists of thin alternating limestones and shales that aggregate 150 to 190 ft. in thickness, he described 15 more or less persistent conglomerates that give it marked individuality. He further differentiates the base of the Potosi into the "Derby," 40 ft. thick, and the "Doe Run," 50 ft. thick, dolomites that are free from the cherts and quartz that characterize the remainder of the Potosi.

Doctor Buckley attaches great importance to the shaly Davis formation, beyond the fact that at or near its outcropping base occur the old surface diggings and most of the disseminated mines. He regards it as the vital determining factor in the formation of disseminated orebodies. For, unless these upper shales have been eroded to enable descending solutions to pentrate into the underlying Bonne Terre limestone, he thinks it hopeless to expect to find orebodies. On this basis, he sweepingly condemns the adjoining Washington county, where the Davis shales have been eroded from but a small area, and the Potosi formation covers most of the county. To indorse this prediction, he cites that the diamond drill has not thus far found disseminated ore in that county, except at Irondale, but he fails to state that the number of holes that have been drilled to the base of the Bonne Terre or disseminated ore horizon is comparatively insignificant—so trifling as to have little or no value—especially when it is remembered that 90 per cent., if not 98 per cent., of the prospect drilling in the heart of St. Francois county has been a failure.

LEAD DEPOSITS IN THE BONNE TERRE LIMESTONE

That the occurrence of the shallow lead ore in the Bonne Terre formation is largely influenced by the outcropping edge of the Davis shales there is little doubt, but this ore is totally different from the deep, disseminated lead ore. It has evidently been formed slowly from very weak solutions, whereas the disseminated lead shows rapid precipitation from complex solutions. The surface lead usually occurs in large, primary crystals; it contains less silver; is very pure; retains its brilliancy in the air indefinitely, and is seldom associated with other sulphides. The shallow lead deposits are usually richest at cap rock and rapidly diminish in value with a moderate increase in depth. The disseminated lead is never crystallized (except as secondary deposits); it contains more silver; it is less pure—having enough iron to soon tarnish on exposure to the air, and is associated with the sulphides of iron, zinc, copper, nickel and cobalt. While the accompanying sulphides are often too slight to be noticed by the miner, the metallurgist is always aware of their presence.

The disseminated deposits are always richest at or near the basal sandstone and decrease in richness and size to a marked extent as the distance above the sandstone increases, with a single exception. The one instance, out of 42 orebodies where the upper and lower workings were both rich and strong, is also unique in so many other respects as to be *sui generis*. The much greater richness of the deposits at or near the base of the Bonne Terre limestone, the com-

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NOTE—"Geology of the Disseminated Lead eposits of St. Francois and Washington ounties," by E. R. Buckley, Ph.D., Vol. IX, issouri Bureau of Geology and Mines, Rolla, o., 1909; 6½x10 in., cloth. Part I, text, 59 pp., illustrated; Part II, 81 plates and aps.

*Mining engineer, St. Louis, Mo.

plexity of the sulphides (although the lead usually predominates) and the generous occurrence of chlorite (a product of chemical metamorphism) at or near the sandstone and usually associated with the lead, all indicate that the ore-bearing solutions came from the porous, underlying sandstone. Doctor Buckley gives analyses of the waters rising from the sandstone at eight of the mines, and they all carry lead. If the sandstone has been the main conveyer of the ore-bearing solutions, then Washington county should be at least as prolific at St. Francois county in disseminated orebodies, as it is much richer in the shallow deposits and all the other conditions are favorable. That more or less of the lead may have been derived by ascending solutions from the sandstone Doctor Buckley freely admits and lays great stress, in practically accepting after much elaboration the lateral secretion theory in its broadest sense, that the ore-bearing solutions may have been downward, upward and lateral—concurrently, alternating or individually—but the descending currents he thinks were the more important.

It is to be regretted that Doctor Buckley did not give more attention to the Irondale mine, which is the only body of disseminated ore that has thus far been operated in Washington county. While it was only worked about a year, its importance is due to the fact that it is situated beyond the recognized disseminated belt and in a county about which there is so much skepticism. The drilling of considerable territory about this mine showed an extensive dissemination of lead but a lack of concentration into paying bodies, so that much larger, richer orebodies may be expected when conditions for concentration are favorable.

Possible Ore Deposits in Underlying Sandstone.

That the underlying sandstone will be found to carry workable deposits of lead Doctor Buckley regards as probable, and the great sandstone deposits at Mechernich, Germany, render this more than tenable. He gives no hint that zinc may be the main constituent of the sandstone ores, which to me seems probable. For lead and zinc are usually twin brothers, and I can recall few large deposits of lead that did not, in depth, "turn into zinc," to use the miner's expression. The granites and porphyries which he accredits as being the primal source of the lead, contain as much or more zinc than lead. In the innumerable transmigrations that have occurred since they were dissolved out of the Archean rocks, the much more soluble zinc has probably escaped more readily into the oceans than the lead. Still quite a little zinc occurs in the Potosi formation and in some of the deeper disseminated mines considerable zinc has made its appearance. As the lead occurs in paying quantities in the sandstone at several places, it is not unlikely that large bodies of zinc ore may occur at greater depth.

Doctor Buckley has traced and mapped quite a number of heavy faults that run through the district, which have not been observed by previous writers. While no direct connection with the orebodies was noticed, they are highly interesting and suggest that further work is desirable to trace out their influence on the minor disturbances that are noticeable in all the orebodies. That this area was once covered by the coal measures, and that they furnished some of the lead, Doctor Buckley regards as probable, although erosion has completely removed all vestige of any formation younger than the Silurian.

Lead Output of the District.

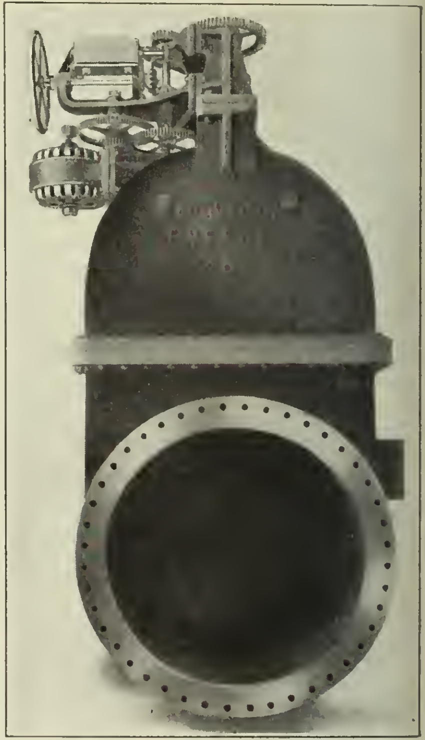
Doctor Buckley gives the output of lead concentrates from this district from 1869 to 1906 at 1,202,607 tons, valued at $59,869,354. Adding the output given by Winslow prior to 1869 as 59,526 tons, valued at $1,984,900, and the Journal's figures for the last three years, or 470,000 tons concentrates at $23,500,000, we have the estimated total output of this district to Jan. 1, 1910, of 1,732,133 tons of lead concentrates, approximately valued at $85,354,254.

A feature of the Missouri geological reports that is to be regretted is a duplication of the volume numbers by starting a second series. Winslow started a serial numbering of the reports that was continued by two of his successors, Keyes and Gallaher. While tacking on the words "Series 2" unsatisfactorily distinguishes the Buckley-Buehler reports from the Winslow-Keyes-Gallaher series, it is liable to cause confusion and error. When the "Series 2" is omitted, which is the case in this valuable report of Doctor Buckley's, it renders the numbering system not only useless but highly misleading. The above report of Doctor Buckley is labeled Vol. IX, while there is a prior report published in 1896 by the Missouri Geological Survey as Vol. IX with the title of "Aërial Geology."

A Motor-operated Gate Valve

The large gate valve shown in the accompanying illustration is installed at the plant of the Pressed Steel Car Company, McKees Rocks, Penn., where it is inserted in the exhaust line from a 1000-kw. Westinghouse generator. The valve closes upon a clear opening 48 in. in diameter, and is operated by a 3-horsepower, three-phase, 60-cycle, 550-volt Westinghouse type "CCL" induction motor. The motor speed of 1120 r.p.m. is reduced through suitable gearing to the speed of the main operating thread, proper for closing the valve safely and quickly. A hand wheel for hand closing is also provided. A worm gear on one of the intermediate shafts operates a limit-switch mechanism, which automatically controls the movement of the gate by stopping the motor at a certain point in the gate travel either way.

To open or close the valve, it is only necessary to throw the operating switch into the corresponding position, starting the motor which continues to run until it is automatically cut off when the end of the valve travel is reached. The valve is thus operated with the absolute minimum of effort or trouble. The limit switch which accomplishes this automatic control is inclosed in the box shown at the right of the valve gear. The operator's switch, by which the valve is opened or closed, may be placed in any convenient position about the building or plant.



Electrically Operated Gate Valve

The assembly of the motor and gearing in the instance shown was a special construction made necessary in clearing neighboring pipes and walls. The 48-in. gate valve illustrated was designed and built by the Pittsburg Valve Foundry and Construction Company, Pittsburg, Penn., and the motor and limit-switch device were furnished by the Westinghouse Electric and Manufacturing Company.

The New Zealand Government spends a large part of its revenue from rents of mining claims in building roads and constructing dams and water races in the goldfields.

Rapid Determination of Lead in Chilled Blast-furnace Slags

By Francis S. Schimerka[*]

Some time ago I received orders from he superintendent to report the lead contents of the blast-furnace slags, hitherto determined by fire assay, as obained by analysis in the wet way.

The customary method for volumetric determination of lead in chilled blast-furnace slags is to dissolve between 2 and 5 grams of the slag in aqua regia, dehydrate the silica by evaporation to dryness, ake up in dilute hydrochloric acid, filter, cautiously almost neutralize the filtrate and pass sulphureted hydrogen into it to precipitate the lead as sulphide; treat this after filtration with nitric and sulphuric acids, filter off the sulphate of lead and determine it in a solution of ammonium acetate, acidified with acetic acid, by itration with a graduated solution of ammonium molybdate, using tannic acid for an outside indicator.

It was obvious that the method in this form could not be used when at least 15 slag samples had to be tested daily for lead, the larger number of which had to be run as soon as taken. The operations, especially the dehydration of the silica, careful neutralization and passing of sulphureted hydrogen into a solution surcharged with ferric iron, take far more time than can be alloted in a smeltery to a lead assay for slags. To meet the demands I modified the usual method in a way to eliminate the time-consuming operations, without changing its principle or impairing its accuracy.

The rapid execution of the determination makes the use of a filtering pump imperative; the two filtrations in the course of the analysis can then be made over asbestos fiber, placed on a platinum filter cone. By this means it is possible to keep down the volume of the nitric acid solution of the lead sulphide, because the latter need not be rinsed off a filter paper by water or dilute nitric acid. As only precipitates are used in the analysis, the suction can be applied equally well to tubulated bell jars or the old-fashioned filtering flasks.

Details of Method

Weigh 2 grams of the slag into an 8-oz. flask, add 15 cc. of water, heat to boiling and add 5 cc. of concentrated hydrochloric acid while agitating the flask. Almost immediately pour about 140 cc. of cold water into it, and then 50 cc. of saturated sulphureted hydrogen water; stopper the flask with rubber and shake vigorously for 15 sec. The lead and copper, in a solution containing all the iron in the ferrous condition, will fall out instantly as sulphides and collect in flakes. The occasional precipitation of zinc is of no consequence. If small particles of the slag remain still undissolved, they will be attacked by the treatment to follow. The addition of water to the hydrochloric acid solution of the slag has to be made quickly, otherwise gelatinous silica will fall out, making filtration impossible. The above proportions of acid and water have to be observed, or the lead will not come down in the too acid liquor.

Pour the solution, containing the sulphides, on an asbestos filter, filtering with the aid of suction. Wash twice with water, put the cone with asbestos and the mixed sulphides of lead and copper into a small porcelain casserole and cover with 10 cc. of a mixture containing 8 cc. of concentrated sulphuric acid and 2 cc. of strong nitric acid; boil until red fumes disappear. Cool by placing the casserole in cold water; add about 40 cc. of water to contents of casserole; heat to ebullition (or iron salts from the slag particles which had not been attacked by the first treatment might remain undissolved) and filter over paper (preferably again over asbestos); wash with water. The lead sulphate is on the filter, and the copper in the filtrate where it can be determined.

Place the filter paper or asbestos, containing the lead sulphate, in a 150-cc. beaker in which a mixture of 5 cc. saturated ammonium acetate solution and 3 cc. of acetic acid, diluted with about 50 cc. of water, has been kept boiling; stir a few seconds and titrate in the small bulk. The ammonium molybdate solution ought to equal 0.01 gram of lead per 1 cc., and for rapid work it is advisable to keep on hand a solution of lead acetate of the same strength. The titration can then be made quite easily, working the solution back and forth until the desired end point is obtained.

Single Assays in Nine Minutes

Single assays of slags have thus been run in the short time of nine minutes and with a battery of three suction filters nine determinations are made in 1¾ hours, all operations being performed by a boy. The method has been in use eight months and the results leave nothing to be desired, as can be seen from the accompanying table, to which I add the fire assay for comparison.

COMPARISONS OF METHODS.

Sample	1 Pb, %	2 Pb, %	3 Pb, %	4 Pb, %	5 Pb, %	6 Pb, %	7 Pb, %
Assay with dehydration of the silica....	0.51	1.10	1.36	2.93	3.05	5.04	5.22
Assay by rapid method.....	0.11	1.09	1.38	2.90	3.02	5.15	5.15
Fire assay....	0.25	0.68	1.00	2.48	2.43	4.53	4.48

It is erroneous to think the lead in blast-furnace slags can be determined with accuracy by wet methods in the way it is customary to proceed with ores, i.e., dissolve in aqua regia and hydrate the silica with sulphuric acid, separating at the same time the lead as sulphate. The large amount of acid-soluble silica makes it prohibitive to use more than 0.5 gram. Moreover, the silica, dehydrated by sulphuric acid instead of by evaporation to dryness, is slimy and collects in lumps which tenaciously hold lead, iron and lime included; the end point of the titration is never well defined, appearing often on adding the first drops of ammonium molybdate solution and exact results cannot be obtained.

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[*] Chemist, Mazapil Copper Company, Ltd., Saltillo, Mexico.

Lake Iron Ore and Iron Prices

The accompanying table, taken from a larger one compiled by the Cleveland *Iron Trade Review*, shows the selling prices of merchant ore from the Lake Superior region, delivered at Lake Erie ports, and the selling prices of bessemer and No. 2 foundry pig iron at furnaces in the Mahoning and Shenango valleys. The figures extend over a period of 20 years, and make possible some interesting comparisons. The extreme range for bessemer pig during the 20 years was $15.80; for Old Range bessemer ores $2.90 per ton. The lowest prices recorded were $8.35 for bessemer pig and $2.60 for bessemer ore in 1897; the highest were $24.15 for pig and $5.50 for ore in 1900. In four years out of the 20 No. 2 foundry sold higher than bessemer pig; in five years the prices of the two grades were equal. When Mesabi ore was first put on the market, Mesabi bessemers sold at 85c. below Old Range ores, but the difference gradually receded to 25c. per ton, at which it now stands. In three seasons Old Range bessemer sold at $5 or over; in four it sold below $3 per ton; but since 1898 it has been $3 or over.

LAKE IRON ORE AND PIG IRON PRICES.

	Bessemer.		Non-Bessemer.		Pig Iron.	
	Old Range.	Mesabi.	Old Range.	Mesabi.	Bessemer.	No. 2 Foundry.
1891....	$4.50	.....	$4.25	.....	$15.15	$15.00
1892....	4.50	.....	3.65	.....	15.00	13.65
1893....	3.85	$3.00	3.20	.....	12.65	12.15
1894....	2.75	2.35	2.50	.....	9.65	9.65
1895....	2.90	2.15	2.25	$1.90	9.40	9.40
1896....	4.00	3.50	2.70	2.25	12.40	11.15
1897....	2.60	2.25	2.15	1.90	8.35	8.40
1898....	2.75	2.25	1.85	1.75	9.55	9.80
1899....	3.00	2.40	2.15	2.00	10.30	9.75
1900....	5.50	4.50	4.25	4.00	24.15	22.15
1901....	4.25	3.25	3.00	2.75	16.15	14.40
1902....	4.25	3.25	3.25	2.75	15.90	15.90
1903....	4.50	4.00	3.60	3.20	21.50	21.65
1904....	3.25	3.00	2.75	2.50	13.35	13.15
1905....	3.75	3.50	3.20	3.00	15.50	16.00
1906....	4.25	4.00	3.70	3.50	17.25	17.25
1907....	5.00	4.75	4.20	4.00	21.50	21.50
1908....	4.50	4.25	3.70	3.50	16.00	15.00
1909....	4.50	4.25	3.70	3.50	11.75	14.25
1910....	5.00	4.75	4.20	4.00	.....	.....

The prices of pig iron at the opening of 1910 are $19 for bessemer and $17.25 for No. 2 foundry.

Inland Water Transportation in England

BY JAMES DOUGLAS *

As bearing on the resuscitation of inland water transportation in this country the following extracts from a paper by T. B. Grierson, member of the Institute of Civil Engineers, on an old English water-way, may convey some warnings and information. The canal which he describes is the old Kennet & Avon canal, connecting Bristol with London through Reading. Portions of it were constructed, probably after the first Act of Parliament, authorizing the opening of Kennet river for traffic, in 1714, but it was not completed for through traffic until well on in the nineteenth century. Some of the engineering difficulties overcome were regarded as perfect feats of skill, especially the 29 locks between Lower Fox Hangers bridge and Devizes Town lock, by which within the short distance of 2¼ miles boats were raised or lowered a vertical hight of 235 ft. Large pumping engines were needed to supply the waste of water on such a system of locks as well as catch-basins. It is indicative of the conservatism and reverence for old plants in England that there is still at work an engine originally erected just 100 years ago. Mr. Grierson says:

"Engine No. 1 is a single, condensing, Cornish, beam engine, with 42-inch cylinder, 7 ft. 9 in. stroke, working with a steam pressure of 16 lb. This engine was supplied and started to work in March, 1810, and has therefore been in use over 99 years, and is practically the same in every respect as when it was first erected. On a recent inspection, the original cylinder was found to be in splendid order, and was much admired by all concerned, especially by the contractors, William Rollinson & Sons, of Nottingham, who have just completed their contract for overhauling and general repairs of this engine and all the machinery and pumps worked by it. The contract includes the boring out of the great pump barrel, 2 ft. 6 in. diameter by 7 ft. 9 in. stroke; supplying and fixing a new gun-metal water-packed bucket for it; and new feed-water supply pipes and valves for the boilers. The old timber beams upon which the machinery formerly rested, being rotten, have been removed and replaced by new steel girders.

"The equilibrium valves, and cataract motion, and numerous other parts having been thoroughly repaired, the old engine and pumps may now be said to have obtained a new lease of life, and are working as well as ever.

"It is not certain who was the maker of this engine; there can be no doubt, however, that it is precisely the same type of engine as that made by James Watt as an improvement on the atmospheric engine which he was called upon to repair. The improvement consists in the piston being made to work in a closed cylinder and steam taking the place of atmospheric air in pressing down the piston, and thus raising the pump bucket at the other end of the engine beam. That the workmanship and materials were of a high order is proved by their lasting practically a century, and at the end of that time the main portions being as good as ever; it certainly shows the conscientious work done in those days. Inquiries among the canal staff lead to the supposition that engine No. 1 and pumps were supplied and erected by Nicklow Harvey, of Hale, Cornwall, in March, 1810; but this also is not certain, as there is no name or date on any of the machinery or any record of the fact."

The Fate of the Canal

The fate of the canal is described by Mr. Grierson as follows:

"The directors of the canal company and others evidently thought that with the opening of the Kennet & Avon canal, and with the mail coaches traveling at the rate of 12 to 15 miles per hour, a maximum of facilities for the rapid, safe, and comfortable conveyance of passengers had been reached as between London and Bristol!

"Alas, for human foresight! Barely a generation had passed when the first portion of the Great Western railway between Reading and Bath was opened for traffic (1840-41), from which time the canal receipts steadily diminished, until at last, in 1852, the railway company, at the request of the canal company, took over the canal under the Act of Parliament of that year, in consideration of an annual payment to the canal company of £7373; the railway company undertaking to keep the canal open for traffic and maintain it in good working order, which undertaking has been honorably carried out ever since.

"It is a singular fact that the Kennet & Avon Canal Company appears to have relied upon passenger traffic for their revenue, as it was not until the year 1848 that they began to carry goods traffic, under powers conferred on all canal companies to carry goods as well as passengers, as common carriers."

Decline of Canal Traffic

The decline of the traffic on the canal is thus described:

"It is frequently deplored that there is at present no great traffic on the canal, particularly on the reach between Wooton river and Devizes, a stretch, without a lock, of 15 miles; also on the reach of nine miles between Bradford-on-Avon and Bath; the railway company is charged with the sinister design of strangling the traffic.

"It should, however, in fairness to the railway company, be remembered that the general public is almost wholly to blame for this; the passenger naturally declines to lose his time by traveling at so slow a rate by canal as would be possible under the best conditions as compared with traveling on the railway. The trader also finds that he can more economically buy small quantities of goods at frequent intervals, than as heretofore large quantities at long intervals, since he can now order what he requires by telegraph and telephone and obtain them at once by train.

"It must not, however, be supposed that there is no traffic on the canal; on the contrary, although the traffic does not even pay the cost of maintenance, there are along the canal flour mills, saw mills and paper mills, some even utilizing the canal water-power; as well as flour, grain, coal, timber, manure, lime and other traffic.

"And notwithstanding that Parliament compelled the railway companies to reduce the rates by one-half for several kinds of goods carried by them over their canals, the expected large increase in tonnage of traffic carried has not taken place, as the trader prefers the quicker railway facillties. The reduction of canal rates, instead of benefiting the traders, only further increased the loss of the canal owners by diminishing their gross receipts, while the cost of haulage by canal remained the same, viz., about six times the cost of hauling goods by railway!"

Railroads to Purchase Canals

The practice in England seems to be to recoup the defunct canal companies by compelling the railroads to purchase their useless plants. Mr. Grierson comments upon the injustice of the condition that the railroads "in many cases only obtained Parliamentary powers to construct their lines on condition that they purchased the canals with which they were about to compete! But for injustice to

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*President, Phelps, Dodge & Co., Inc., New York.

railway companies this cannot be compared to local authorities being now allowed to construct electric tramways alongside of railways out of the rates; and the railway companies, usually the largest rate payers in the district, are actually compelled to pay special rates to support and continue the very opposition which is competing with them, thus taking away their passenger traffic, traffic of a kind which pays best because it loads and unloads itself."

The Future of Canals

With regard to the future of canals in general the author says: "What the future of canals in general, or the Kennet & Avon canal in particular, may be, it is difficult to say; . . . . . The wonderful success of the motor bicycle and the motor car has done much to injure railway passenger traffic. . . . Probably the most serious danger which railway companies may be called upon to face in the near future would be the construction of main roads for fast motor passenger and goods traffic, which, if supported by local and central authorities out of public rates or taxes, would soon very seriously reduce the value of railway securities. . . . .

"It is frequently stated by the 'man in the street' that with our uptodate knowledge of steam, electric traction, and other means of dealing with traffic, this canal should be utilized for slow goods traffic. Against this, is the fact that one of our best managed canals, only a short time ago, tried experiments with a steam tug, towing several barges at once, and found, under the most favorable conditions, the cost per ton per mile of haulage by canal to be 0.15d. against 0.05d. per ton per mile by railway goods trains; thus showing the canal haulage, even in this case, to cost three times more than haulage by railway. It should also be remembered that many goods wagons from which the average cost was taken did not carry a full load, but the barges in the experiment were fully loaded, which would increase the cost of the comparison as against the canal and in favor of the railway; so that the canal haulage, under the most favorable conditions, may be safely assumed to be from four to six times more costly than haulage by goods trains.

"There is, therefore, no possibility of the Kennett & Avon canal ever being able to pay a dividend on the capital outlay which would be necessary to enable it to deal with the goods traffic of the present day. It may also be stated that a careful inspection of the canal by walking over its entire length, shows that an enormous additional capital outlay would be required to protect its clay banks against the waves which would be caused by motor or steam tugs when towing barges on the canal under the assumed new traffic working. Again, the terminal charges on any canal must always be greater than those on railways, as goods or minerals cannot be unloaded out of boats or barges into carts as easily as out of goods wagons without much extra labor—another serious and expensive consideration."

Annual Statement of Mining Companies of Silver Bow County, Montana

The laws of Montana require that every pecuniary corporation shall, on or before Jan. 20, of each year, file in the office of the county clerk of the county in which its principal place of business is situated, a statement showing the condition of the corporation. The penalty for failure to do so is to make the directors of the delinquent corporation personally liable for all the debts of the corporation then existing or which may thereafter be contracted until the statement shall have been filed. A summary of the statements of mining companies recently filed with the county clerk in Butte, Silver Bow County, is given herewith.

STATEMENTS OF MINING COMPANIES FILED IN SILVER BOW COUNTY, SHOWING AMOUNT OF CAPITAL PAID IN AND INDEBTEDNESS.

Name of Company.	Capital Paid In.	Indebtedness.	President.
Alliance Copper Company	$400,000	$21,050	Donald Campbell
Bald Butte Gold Mining and Milling Company	250,000	434	William Dyer
Baltimore Copper Mining Company	1,000,000	8,000	D. J. Charles
Bayonne Gold Mines, Ltd	450,000	21,000	T. F. Hickey
Benton Mining and Milling Company	100,000	500	H. A. Gallwey
Blue Vein Copper Mining Company	1,000,000	1,365	F. L. Melcher
Brooklyn Bridge Milling and Mining Company	500,000	4,673	....
British Butte Mining Company	5,000,000	221,580	N. L. Jenks
Broadway Gold Mining Company	5	none	F. R. Merk
Brooklyn Mining Company	500,000	none	....
Butte-Ballaklava Copper Company	450,000	none	D. H. Steele
Butte-Curtis & Majors Copper Mining Company	100,000	20,000	Jas. Doull
Butte & Red Eagle Copper Company	5,000,000	none	Fayette Harrington
Centennial-Toledo Mining Company	100,000	652	B. F. Smith
Clara Mining and Smelting Company	749,997	725	T. A. Grigg
Columbia Butte Mining and Milling Company	100,000	3,300	W. K. Malcolm
Copper Eagle Mining and Smelting Company	250,000	8,920	A. W. Burnett
Copper Mountain Mining Company	1,000,000	1,250	I. N. Symons
Corbin Consolidated Mining Company	500,000	5,450	G. T. Cousins
Corbin-Montana Copper Company	1,000,000	3,000	J. H. Foy
Corbin-Wickes Copper Mining Company	25,000	1,000	I. N. Symons
Corbin Mining Company	500,000	none	B. Jarvey
Delta Mining Company	300	none	H. O. Edmonds
Eureka Gold and Silver Mining Company	1,750,000	30,000	J. P. Reins
Farrell Copper Company	1,000,000	21	W. C. Lewis
Free Gold Mining and Milling Company	....	8,361	F. Boucher
Georgia-Montana Gold Mining Company	27,193	10,000	G. H. Casey
Glory Mining Company	50,000	10,000	J. B. Leggatt
Gold Circle Mining Company	5,000	16,241	C. B. Moase
Golden West Mining and Milling Company	3,500	420	G. Hodel
Hudson Mining Company	150,000	none	M. S. Largey
Iron Rod Mining Company	150,000	14,871	M. S. Largey
Keating Gold Mining Company	1,874,995	64,968	J. B. Roote
King Realty and Mining Company	200,000	3,000	Henry King
Libby Placer Mining Company	60,000	31,609	....
Mayflower Mining Company	100,000	none	W. A. Clark
New Departure Mining Company	none	13,302	O. M. Best
North Butte Summitt Copper Company	1,000,000	220	G. W. Mickel
North Pacific Placer Mining Company	1,000,000	none	G. Pascoe
Ohio Keating Mining Company	500,000	46	R. M. Calkins
Park Copper Mining Company	10,000	10,000	R. M. Cobban
Pittsburg-New York Copper Mining Company	1,500,000	6,424	Jerry Mullen
Pittsmont Copper Company	6,000,000	....	J. H. Reed
Pittsburg & Montana Copper Company	30,000,000	....	J. H. Reed
Python Gold Mining Company	40,000	2,400	R. E. Davis
Pyrenees Gold and Silver Mining Company	100,000	3,934	C. H. Moore
Raven Mining Company	1,000,000	65,000	E. C. Frisbee
Reins Copper Company	5,000,000	307,446	J. M. Guffey
Ramshorn Placer Company	200,000	1,500	C. R. Leonard
Star Silver and Lead Mining Company	1,000,000	1,744	C. F. Booth
Summitt Gold and Silver Mining Company	136	....	J. Turner
Volunteer Mining Company	400,000	....	....

Mining Districts of North Central Nevada

A reconnaissance[1] of some mining camps in Elko, Lander and Eureka counties, in north-central Nevada, has been made by W. H. Emmons for the U. S. Geological Survey. The region covered, comprising 7000 sq.m., has produced silver and gold worth about $50,000,000. Mr. Emmons sketches the geology of the region and describes the ore deposits. The development at the numerous mines, the minerals of the veins worked, and the character and mode of occurrence of the ores are noted in detail.

Mining in this part of Nevada reached its greatest activity in the 70's and 80's and declined rapidly in the 90's. In 1906 and 1907 new discoveries of gold ores gave fresh zest to prospecting. Nearly every one of the old camps was overhauled, the mines and dumps were sampled, and in some of them new orebodies were discovered. In consequence of the business depression of 1907 prospecting ceased and many of the mines were closed. Prospecting has been taken up again and interest in this region has been revived. The report includes one geologic and four topographic maps.

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[1] *Bull.* 408, U. S. Geol. Surv.

Tin Mining and Ore Dressing in South Africa—II

Swazi Labor Is Cheap and Efficient; Primitive Mining Methods Necessitated by Circumstances; the Use of Undercurrents Is Recommended

BY E. M. WESTON*

In working the tin ores of Swaziland, boxes of pine, constructed of 1½-in. boards, 16 ft. long and about 18 in. wide, are employed. They are first brought right up to the face to be worked and set up on tailings to give a slope varying with the amount of water available; but anything like a large volume of water is avoided.

Where water is scarce, they are given a high slope and worked with a minimum of water supplied as in Fig. 4. A trench is then excavated to bottom about 12 ft. from the boxes and worked forward 12 or 13 ft., the gravel being picked out from the larger boulders and stones and shoveled back over the unwashed ground in two or three stages to the native who feeds the sluice box with a shovel. The face is afterward worked back to the boxes, the boxes being moved forward for every 20 or 25 ft. of face worked.

Where the bottom is below water level water percolates into the excavation during the night and partially fills it. This water must be bailed out in the morning before work can be carried on in the deeper wash. About 15 cu.yd. is the maximum that can be put through one box per day. Simple hydraulic ejectors would be useful to drain these workings and could be easily made of a few feet of piping, nozzle and some rubber hose. Many of the lower-lying washes could be cheaply worked by portable hydraulic elevators, as no wash over 1 in. in diameter need be sent to the boxes.

At the head of each box a native works a fork, continually loosening the wash. The teeth of the fork are about ¾ in. apart, and all rocks over that size are lifted out and piled on one side as shown in the photograph. Below the fork boy a native, usually a boy, works a hoe against the current and another native stacks any tailings that the small stream of water cannot carry away. The labor involved in this method is, of course, very great, and, owing to the short length of box and any inattention of the native fork boy in allowing the wash to pack, tin-ore losses are liable to be large: clayey or puggy wash is not in contact with the water long enough to disintegrate properly, and much tin ore is forked out of the box in lumps. With all these disadvantages the method is a convenient one and the only possible one in many instances.

Recent Working More Systematic

The tin-bearing creeks were first let out to tributers who worked the richest patches with no method and often shoveled overburden on workable ground; no effort was made to work the creeks by cutting tail races, blasting bars, or carrying out any systematic work. It was not until the present manager of the Swaziland Tins, Ltd., took charge that schemes for systematic work were laid out and monitors used for removing overburden. The first large water race was constructed by the McCreedy Tins and is 10 miles in length, passing over difficult country. This company is making the first attempt to use hydraulic elevators and to deal with large volumes of water and gravel in large sluice boxes.

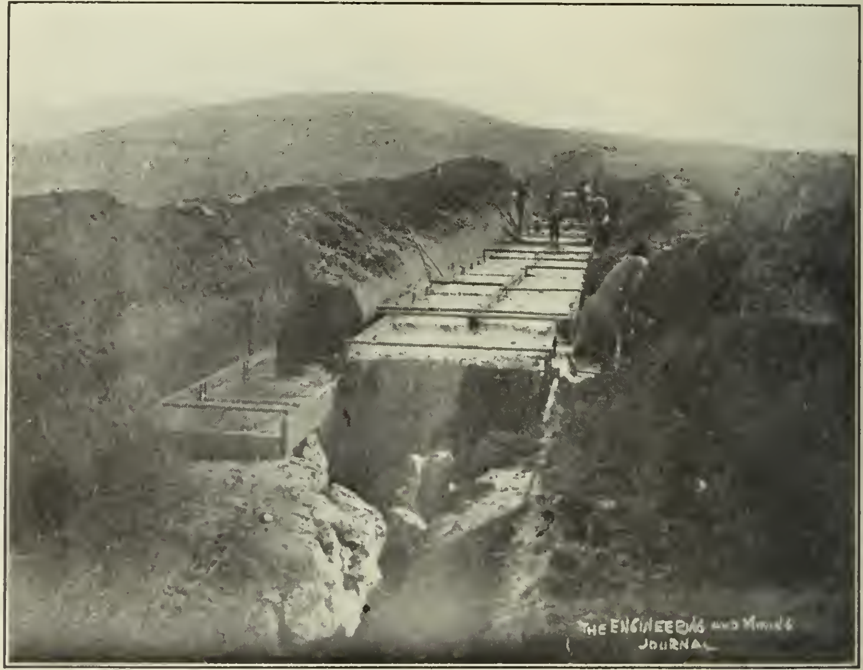

Fig. 1. Grizzly and Undercurrent

Another large water race is now being constructed by the Swaziland Tins, Ltd., and in a short time monitors will be largely employed to work the poorer portions of the wash in several creeks. So far monitors have been used for removing overburden and for washing the deposits down into the beds of streams where the lighter material is washed away, thus leaving tin ore enriching the gravel which is then worked over by boxes in the usual way. Hydraulicking tin ore is a very different matter from that of dealing with gold, the specific gravity of cassiterite being about 7 against about 19 of gold, and a review of the methods of recovery used in other parts of the world is of interest in this connection.

In all parts of Australia ground sluicing is adopted for working shallow deposits wherever possible, and great trouble taken to lead up tail races into the wash for this purpose. The good old Roman practice of booming is also employed to move tailing where the getaway is not steep. It has long been realized that the best way to save tin ore is to have as great a length of gravel bed as possible for the tin to sink into; if the race can be broken up so as to contain a few falls, results are better. Generally the labor of only one or two men can be afforded to fork or hoe in the race, as labor is dear. If the tin ore is very fine a box is put in at the end of the ground sluice and a man kept working there; when the gravel in the race is charged with tin ore everything is cleaned down into this box or washed out of crevices in a dish.

Tasmanian System

When centrifugal pumping sluice plants were first started the problem of saving the tin ore in the large rush of water from the pumps became an acute one, as the dredges did not carry

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*Mining engineer, 20 St. Mary's building, Johannesburg, South Africa.

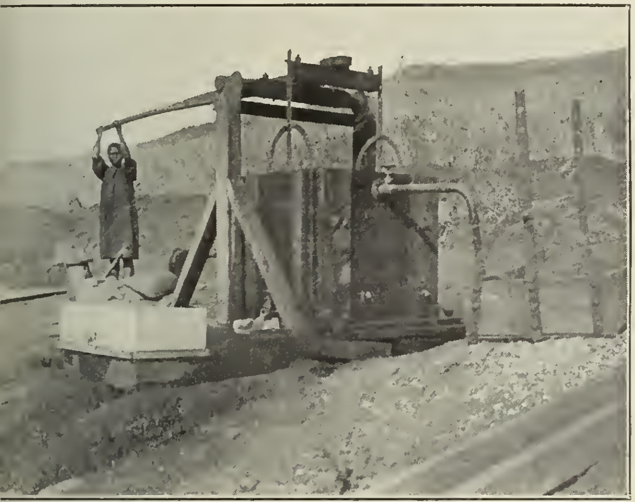


Fig. 2. Hand Jig, McCreedy Tins, Ltd.

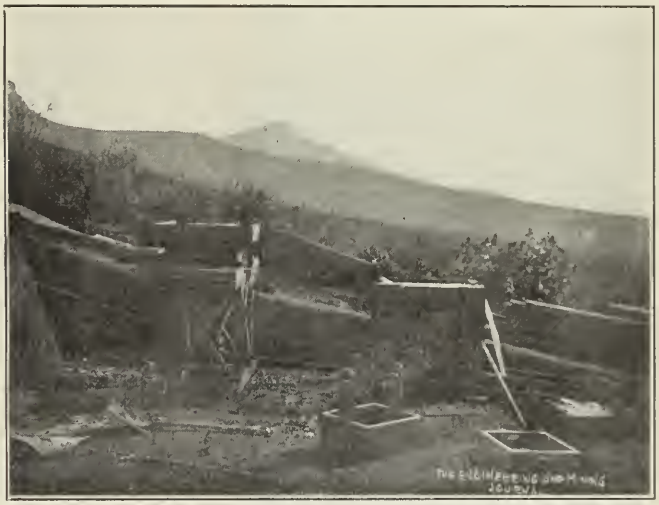


Fig. 3. Spitzutten for Fine Tin Ore

y trommels or sieves to size the mate-al. Sometimes a grizzly is placed at e head of the sluice, but generally rger stones are removed by a fork. At st 3-in. riffles as in gold sluices were ied, but tin losses were high. After-ard sluices from 6 to 12 ft. wide and om 2 to 5 ft. deep were introduced, ving a fall of about 6 to 9 in. in 12 ft. allow riffles from 2 to 4 in. high were t in every 15 or 20 ft. at the start, d one or two men kept at work keep-g the sand loose.

When the layer of sand at the bottom box between the riffles became arged with tin ore, and tin ore was und to be traveling down to the last ction of the sluice, other 2-in. riffles ere added covering the tin ore with other layer of barren sand, which was ain covered when charged. Sluicing as stopped when the sluice became led to the top, and the contents of the uice were then run off with a little ater, the workmen taking out the rif-s one by one from the tail of the uice and shoveling back the sand and n against the current until a fairly ncentrated product was made, to be moved for final cleaning. Sluicing was en resumed.

This is what is known as the Tas-anian system of tin saving and it is aimed to be most efficient. My own perience leads me to the opinion that undercurrent device should be used the end to save fine tin ore which has t time to settle in a heavy current in a uice only 100 to 150 ft. long.

New Scheme in Malay States

An American engineer on the New openg mine, Malay States, has evolved other system said to be equally effi-ent in saving tin with a volume of 750 .ft. of water per min. flowing through 4-ft. sluice. About 400 ft. of the sluice lined on the bottom with reversed rails paced from 1 to 1½ in. apart, forming ffles. These are kept from packing or scraped out by coolies armed with picks. A cleanup is made as soon as pannings show that the tin ore has reached the end of the race. A small hole is bored in the bottom of the race at the end of the sluice, and the sand coming out is collected and washed at intervals.

Any attempt to run the race after tin ore appears at the end leads to loss of tin. One would imagine that such a race could not hold much over a ton of tin ore before fine ore began to go away, and that much time would be lost in frequent cleanups. It is probable, however, that there is a long ground sluice leading to the race which retains the bulk of the ore, as the arrangement is said to be a most satisfactory one.

Use of Undercurrents

Owing to working under different conditions I adopted a method intended to combine both systems. To deal with 200 cu.yd. of gravel and overburden in 18 hours, using about 200 cu.ft. of water per min., the line of sluices shown in Fig. 1 was put down. The boxes were 6 and 7 ft. wide. A 4x6-ft. grizzly, spaced 1½ in., was at the top end to remove grass and large stones, and on the bottom was an undercurrent. The hight of sides was only 9 and 12 in. over the first portion, and several drops were arranged between the boxes. The boxes had a fall of 7 in. in 12 ft. Eight natives were employed: one shoveling off the grizzly; one looking after undercurrent, and six picking or hoeing in the sluice.

Two-inch riffles were first put in the sluice and raised two or three times to a total hight of 6 or 9 in. Even using such wide boxes with constant hoeing and several falls, fine tin soon began to come over the boxes despite the use of a ground sluice 400 ft. long in front of the boxes. This is especially so in hydraulicking with unskilled labor as it is impossible to give the water a regular and average load of gravel; at one time the sluices may be heavily loaded, and at another they may carry more water than necessary. The undercurrent boxes were then added with successful results.

The main undercurrent box was 6 ft. wide and 8 ft. long. The floor of the first portion consisted of a ¼-in. plate, 4x6 ft., pierced with ¼-in. holes in staggered rows set 1½ in. center to center. The second portion consisted of a similar plate with ½-in. holes. The finer gravel and heavier tin ore were sucked down through the holes and delivered to two boxes, 3½ ft. wide, placed one on each side. A native worked these over with a hoe. Fine tin ore had thus the favorable conditions of flowing in classified stuff, agitation and a gentle current for its settlement. The losses were thus small.

In another line of boxes, rails placed longitudinally wrong side up and spaced about ⅜ in. apart made a splendid undercurrent. Where fall can be obtained by the use of hydraulic or centrifugal pump elevators, the system of grizzlies and undercurrents could be designed to quite do away with any long lines of sluice boxes, reducing the time taken to clean up and saving the maximum amount of tin. Such a system is, of course, already in use in some bucket dredges for working tin ore where terminals are used for sizing and the products treated in short boxes in which sometimes mechanical stirrers worked on an endless chain are employed; but the system should at any rate be always used at the end of sluices to act as a "save-all" and to enable the cleanup to be made more rapidly with the use of more water and without fear of losing tin ore.

Rough concentrates are dressed in a hand jig, shown in Fig. 2, on a sieve 2½x2 ft., with a mesh of ⅛ in. This jig is somewhat similar to that used at Santa Barbara, Mexico, described in the Journal, May 1, 1909. Clean tin ore is taken off the sieve, coarse iron and quartz being scraped off. The hutch product is then treated at the rate of 300 lb. in 15 min. in the spitzlutten shown in Fig. 3. The coarser tin is taken from the underflow by varying the upward current. Fine ilmenite and sand are washed over into the second tank. The second product from the underflow is dried, classified on sieves, and retreated in classifier to eliminate ilmenite, the chief impurity of fine tin ore. By careful classification it is, however, possible to make a fair separation in an upward current. Magnetic separators may also be used and the Swaziland Tins, Ltd., is importing one for making a final separation.

The coarser tin ore is spread out when drying, and picked over to take out any larger pieces of corundum, monazite, etc. When the ore is dried it is placed in double sacks in lots of 112 lb. and shipped to Europe. It is highly probable that owing to the growing production of the northern fields a smelting works will be erected at some central point.

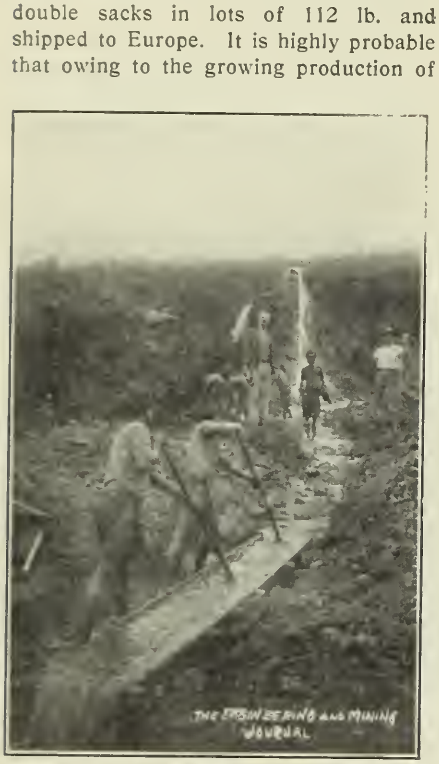

THE ENGINEERING AND MINING JOURNAL

Fig. 4. Ground Sluicing

Hydraulic Plant

Owing to the shallow nature of the deposits and the low heads of water available, monitors and pipe lines are rendered as portable as possible. Light riveted pipe is most suitable. The monitor is attached to 50 ft. or more of armored hose, 4 or 5 in. in diameter, from the end of the pipe line, thus giving a large radius for work. To guard against the reaction iron spikes are driven through the bed log into the semi-decomposed bottom.

I found it a good plan to attach 5 or 6 ft. of pipe to the entrance nozzle of the monitor so that the reaction tended merely to press it against the ground. Where the bottom is too soft to allow the large volume from a single nozzle to run over it, an ideal arrangement with 100 to 150 ft. head would be to take several 3-in. armored hose, with 1- to ¾-in. nozzles, from the end of one pipe line, and allow a native to work one to supply a series of smaller sluices, which being portable, could be kept close to the working face.

(To be continued.)

An Employees' Benefit Association

An employees' benefit association has been formed by the Copper Queen Consolidated Mining Company, Bisbee, Ariz., whereby the company and such employees as may desire coöperate in forming a fund for the payment of death, accident and sick benefits to the members of the association. The Copper Queen company pledges itself to contribute $15,000 at the end of each year if the average membership in the association during that year has equaled 50 per cent. of the average total number of employees of the company, and $25,000 if such average membership has equalled 75 per cent. of the total number of employees. The company further agrees to advance money temporarily when necessary for payment of benefits, to guarantee the safety of the fund, and to pay semi-annual interest on the average balances at 4 per cent.

The handling of the fund is to be vested in a board of nine trustees, all members of the association, of which the general manager of the company shall be, *ex officio*, the chairman. Four of the trustees are to be chosen by the employees who are members of the association, and the remaining four are to be chosen by the directors of the company. A superintendent, appointed by the trustees, will have charge of all business of the association.

All claims are to be adjusted and paid only upon the recommendation of the association's medical examiners, who are to be the regular physicians and surgeons of the company's staff. Physical examination of applicants is to cost not over 50c. Eligibility rules are as follows:

An employee in service on or before Jan. 1, 1910, may become a member of the association without medical examination at any time prior to Jan. 1, 1910, and without age limit at any time prior to March 1, 1910.

Thereafter, any employee not over 45 years of age may, upon passing a satisfactory medical examination and upon approval of his application by the superintendent, become a member.

Further, any employee over 45 years of age may, upon passing a satisfactory medical examination and upon approval of his application by the superintendent, become a member under the same regulations, except that the death benefits in such cases shall be only $100. Provision is made for reinstatement without examination after a lay-off not exceeding 90 days.

Low Cost of Insurance

The cost of the insurance is 2 per cent. of the member's wages, to be deducted the first of each calendar month, or may be paid in cash in advance. The maximum compensation is on the basis of $2000 per year.

Benefits are classified as follows: Sickness, half wages for each working day, except the first seven days of disability, not exceeding 52 weeks; accident, half wages for each working day, not exceeding 52 weeks. No benefits are payable for sickness beginning or injury occurring after the member has left the service of the company. A special provision is made for the continuance of membership for death benefit alone regardless of employment. The loss of one hand or foot entitles the member to one year's wages; both hands or feet or one hand and one foot, two years' wages; one eye, one-half year's wages; both eyes, two years' wages; death from sickness, one year's wages; death from accident, two years' wages. Medical attendance and hospital services are furnished by the company.

This is a laudable attempt on the part of the Copper Queen to secure low-cost insurance for its employees. Provision is made to prevent the evil of malingering (so great under ordinary systems of insurance as to cause their abandonment in many cases), and such practice is further discouraged by the fact that the physicians and surgeons are in the employ of the mining company, not of the benefit association, and any radical increase in the accident rate will be promptly called to the notice of this medical staff. It will be of interest to note the degree of success attained by this plan. It is certainly a favorable one for the employees; will it be so for the company?

Prospecting in South Australia

In South Australia a miner's right authorizing its holder to prospect on mineral lands for minerals or metals, and peg claims and leases costs 5s. per year. Gold leases have a maximum area of 20 acres (one man to every five acres) mineral leases of 40 acres (one man to every 10 acres) and miscellaneous leases of from 40 to 640 acres. Gold claims—30x30 ft. alluvial, and 100x600 ft. reef—must be constantly worked. Leases are granted for a term of 42 years; gold and mineral leases at a yearly rental of 1s. per acre and a royalty of 6d. per pound of net profit. The rental on oil and coal leases is 6d. per acre per annum until coal or oil is found in paying quantities after which 1s. per acre and a royalty of 6d. per pound of net profit are payable.

The London Gold Market

The annual circular of Pixley & Abell or 1909 furnishes the following notes n the somewhat peculiar course of the ,ondon market for gold during the year: The bank rate, which stood at 2½ per ent. at the beginning of the year, was aised to 3 per cent. on Jan. 14, but owered again to 2½ per cent. on April , at which rate it remained until the een demand for sovereigns for Egypt o finance the cotton crop reduced the eserve to a low point and caused the Bank of England to take steps to pre-ent any further depletion by raising the ate successively on Oct. 7, to 3 per ent., on Oct. 14, to 4 per cent., and on Oct. 21, to 5 per cent., and further, in rder to make this rate effective, the Bank was obliged to borrow freely to educe the supply of money.

The drastic measures proved successul, and in the next six weeks the Bank eceived nearly £7,000,000. The posion was then apparently considered trong enough and the rate was lowred on Dec. 7 to 4½ per cent., at hich it stood for the remainder of e year.

The average rate for the year was .105 per cent.

Among the many causes contributing the loss of control by the Bank of ngland over the money market, may e noted the growth in power of the joint ock banks and their occasional unwillgness to support the action of the ank; the larger claims of other nations n the world's gold, due partly to their icreasing share of the world's trade, nd the growth of their investing power a rate proportionately more rapid than urs; the fact that every nation with the xception of China is seeking either to stablish or to strengthen its gold reerves, and also that the money supplies London are increasingly foreign ioney and largely dependent therefore n the good will of the countries to hom these supplies belong.

It is worthy of note that for the third iccessive year the Bank of France has een willing to come to the rescue and aned substantial amounts in sovergns during October and November on erling bills repayable in sovereigns ithin three months. One of the joint ock banks appreciated the necessities the case and on two occasions bought old in the open market when obtainable 77s. 9d., and placed it in its own reerve, reselling the gold at a profit when reign demands had raised the price.

The difficulty experienced by the Bank England in making its rate effective is rong evidence of the necessity for some iange in the system of our money maret. The growing doubt as to the suffiency of our gold reserves caused the ondon Chamber of Commerce to appoint a committee in February, 1908, to examine into the whole question, and in July, 1909, they delivered their report.

The committee recognized the desirability of strengthening the gold reserves, and among their recommendations the most important were that notes issued by the Bank of England against government debt and securities formed an undue proportion of the whole and should be reduced and that all banks in the United Kingdom should at certain periods issue a statement of their liabilities and assets on the basis of weekly balance sheets for some preceding period, showing their liabilities on current and deposit accounts and notes in circulation, also their holdings in gold and Bank of England notes and balances at the Bank of England.

The Bank of England on several occasions offered a small premium to secure gold when there was a doubt as to whether it would arrive in the usual way, not only for bars but also for American gold coin which was expected to come from Paris.

During the year the Bank secured about £15,000,000 in bar gold, France took about £2,500,000, Austria £7,500,000, Russia £2,250,000, and Germany £2,000,000. At the beginning of the year the price stood at 77s. 10⅜d. per oz., but gradually fell to 77s. 9d. in February, at which it remained until the middle of April, when a demand for Paris and later for Austria raised it to a small premium. By the end of May the price was again 77s. 9d. and there was no change until the first week in September when Russia became a buyer and the price advanced to 77s. 11⅝d., the highest of the year. From this it gradually declined until the end of October when it again stood at 77s. 9d., from which rate there has since been no alteration.

The demand for India, in consequence of exceptional crops and high prices, has been large, and shipments of small bars alone amount to £4,450,000, an increase of £1,300,000 over 1908. In addition they took over £1,000,000 in sovereigns from this country, £500,000 direct from Paris, and about £2,500,000 from Egypt, when exchange rose to over 1s. 4 1/16d. and the gold held in India against the note issue, which at one time had fallen to only 2 lacs, has now risen to over 195 lacs, while on the other hand, silver in the gold-standard reserve has fallen in the course of the year from 18 crores to 7¼ crores.

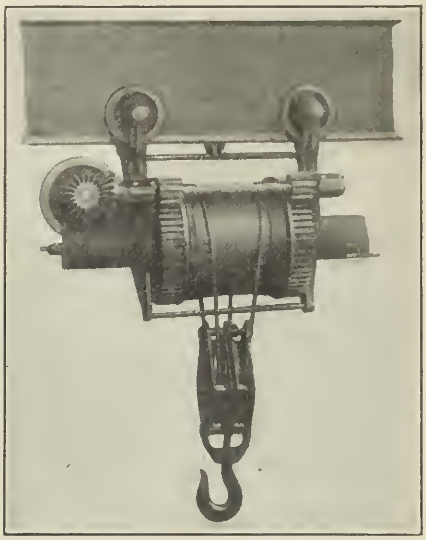
The Straits Settlements in September offered to exchange notes and dollars against sovereigns in transit from Australia, and in pursuance of this policy the Bank of England has earmarked so far £70,000 for this purpose.

Egypt sent £3,600,000 in the spring, and withdrew £4,100,000 in the autumn, an increase in the latter case of £2,000,000 over last year. Brazil made large demands in this market for gold in payment for coffee, and took close on £3,000,000. Argentina has taken about £7,000,000 from this country, while in addition over £12,000,000 has been sent there from New York.

Total arrivals in London from all quarters amounted to £53,000,000 during the year.

Rasmus Electric Hoist

Among the advantages claimed for this hoist which, as shown, has a capacity of five tons, is the extremely low head room required for a hoist of this size. This is due to the employment of a worm and wheel, driven by an electric motor. This transmits power through the bevel gears and pinions shown to the drum carrying the load. The close head room will be noted when it is stated that on a five-ton hoist it is but 34 in. from the bottom of the I-beam to the bottom of the hook.



Rasmus Electric Hoist

The drum of the hoist and the field of the motor are in one piece. The pole pieces from a standard motor are mounted on the inside of the hoisting drum and the armature and brushes suitably connected to drive the worm gear and transmit current to the motor. This does away with all castings and braces necessary to hold a motor in alinement and reduces the total weight of the hoist.

The worm is keyed to the armature shaft which eliminates the necessity of a brake of any kind, as the motor is electrically controlled for speed, and when the motor is not running, all gears are locked in position by the worm, effectually preventing the load lowering when current is shut off from any cause. The whole hoist is only 16 in. wide, 38 in. long overall, and weighs 500 pounds.

The worm runs in oil and is provided with suitable thrust bearings. It is built by Gustav Rasmus, 514 West Fifty-seventh street, New York City.

Mine Explosion at Stearns, Kentucky

The Concussion Was Not Noticed by Those on the Surface, and it Was Several Hours Later When the Accident Was First Discovered

BY HENRY M. PAYNE*

The Stearns Coal Company of Stearns, Ky., operates 5 mines on the Kentucky & Tennessee railroad. The entire output of these mines is hauled over the Kentucky & Tennessee railroad to the Queen & Crescent system at Stearns. The company also owns 150,000 acres of coal and timber land in Scott and Fentress counties, Tenn., and Whitley, Wayne and Pulaski counties, Kentucky.

Stearns lies at the head of the south fork of the Cumberland river and the line of the Kentucky & Tennessee railroad from Barthell to Stearns, a distance of four miles, is a 3 per cent. grade against the loads. There are in this district, 3 workable seams of coal, lying in the conglomerate sandstone, the typical rock of this section. They are numbered from the limestone up, and seams 1 and 2 are being worked by this company, each averaging from 4 to 5 ft. in thickness, with a general southeast dip of 1 per cent.

At Stearns, in addition to the general offices of the company and the railroad shops of the Kentucky & Tennessee railroad, there is a model sawmill with a capacity of 250,000 ft. per day. The refuse from the sawmill is used to furnish steam for the complete central power plant, which provides light and heat for the town of Stearns, operates the sawmill and furnishes power to operate the mines along the Kentucky & Tennessee railroad, by means of a high-tension transmission line carrying 13,000-volt alternating current which is then transformed to 575 volts at the mines. This current is used to operate the pumps and fans, while for haulage purposes the alternating-current motor is belted to a direct-current unit which delivers the current at 250 volts.

The company operates 6 commissaries, and has over 400 houses occupied by its employees in addition to a considerable number now under construction. Each mining camp is supplied with churches and schools, and the ultimate development provides for by-product coke ovens, a coal washery, and an enormous tonnage.

The total daily output of the 5 mines now in operation is from 1200 to 1500 tons, and from the No. 1 mine at Barthell is 500 tons per day. The coal at this mine is shot on the solid with Aetna FF black powder, and the coal being very hard, a considerable amount of powder is necessary. Shot-firers were employed but it was the custom of a limited number of the miners to go in at night and shoot coal for the following day. This was against the rules of the company, but the lessee who removed the coal under contract did not positively prohibit the miners from doing so.

General View of Sawmill Plant

Offices of Stearns Coal Company

Miners Entered Workings at Night

On Tuesday night, Feb. 8, there were 8 men known to have gone into the mine after 6 p.m. These men were 7 miners and a mule driver. The mule and driver were in to remove slate from the head of the main entry. This being completed, they left the mine.

From his own statement, it appears that the miner at the head of the sixth left entry fired his one shot at the same time that two others on the same entry fired theirs. Two other miners were gobbing a slate shot on the same entry and all came down the entry together to await the shots.

This first miner on the sixth left entry went on out of the mine and testifies that he knows positively that the sixth left-entry shots exploded before he left the mine. It therefore points conclusively to the fact that the explosion originated on the main entry. The miners driving the main entry and air course had slate to load, as referred to above, and were boring holes in the head of the air course 18 ft. beyond the last break-through, and two "breaker" shots were placed, one in the center and one to the right.

The Explosion

It appears that on hearing the sixth left-entry shots, the miners on the main entry then fired and came down to the mouth of the sixth on the main. The sixth left-entry miners came about half way down that entry to the main. The latter were evidently instantly killed as they were all mangled considerably, badly burned, their limbs broken and their skulls crushed. The two men from the main entry, who stopped at the mouth of the sixth left, were likewise considerably burned, but not so badly charred as those farther up the sixth left.

A peculiar thing is that all the shots in both these entries seem to have pulled completely. It is also a most astonishing fact, but well authenticated, that the direction of the explosion was not against the intake but apparently in the direction of the return. In this connection it may be stated that all the brattices on the sixth left were blown back into the rooms on the left of this entry toward the return airway, while those on the main were lown across to the right of the main. xamination of the evidence thus indites that the force of the explosion was etween the sixth left and the main, and me across the seventh left, whereas the atural supposition would be that it ould follow the main to the intake.

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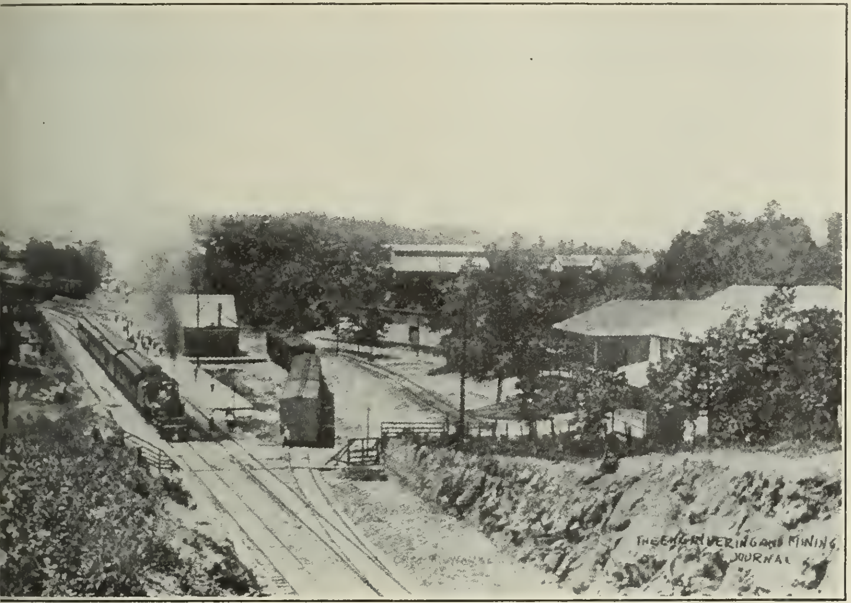
*General sales agent, the Hydraulic Mining [illegible] Company, 12 Broadway, New York; [illegible] mining engineer, [illegible]

The in-bye side of the timbers was ated with charred coal dust, and in me sections with coke splashes, while e out-bye side held a thick deposit of ot. In the burned district included beeen the first room neck on the right the sixth left entry, and down the main om the sixth left for several rooms, the al showed "flame areas," being deeply ked, and the roof covered with short ot strings.

Outside the "flame area" the entire reaining surface of the mine was covered ith soot, roof and sides, intake and all.



The Railroad Station and Partial View of Stearns Looking South

The four men killed on the sixth left ere opposite the rooms which broke rough from seventh left and received e full force of the explosion. Loose)-lb. rails, standing endwise in the room eck, were thrown across the entry, but ot badly twisted.

The two men at the mouth of the sixth ft were mangled and burned, but an ened can of powder in the third breakrough was upset and not ignited, and o other kegs on the same entry near e last right-hand room were also rolled er but not damaged. In the same eak-through where the can of powder y, there were a roll of fuse and a roll cartridge paper, which remained unjured.

The last three brattices between the xth left and its air course were intact. he fourth was burned up, and all the hers blown out. All the brattices beeen the seventh left and the head of e main entry were intact, while all between the sixth and seventh lefts were destroyed. In one case a rock wall built outside a wooden brattice was thrown across the main-entry track and the brattice simply burst.

The mine was ventilated by a 72-inch American blower fan, 5 horsepower, belted to an alternating-current motor, and gave 20,000 cu.ft. of air per minute. The fan shaft was provided with hinged explosion doors, closed by gravity; the fan was not stopped by the explosion. To this latter fact is due the possibility of entering the mine so quickly, without oxygen helmets.

The Explosion Not Noticed at the Surface

The explosion occurred at 9:30 p.m. on Tuesday evening, Feb. 8, but the fan being still in operation, and the yard engine doing some switching just below, caused no attention to be paid to the concussion. The alarm was not given until 1:30 a.m., when the wife of one of the miners became alarmed at the absence of her husband and sent a boarder to investigate. He and his companion entered the mouth of the mine and went about 2000 ft. when they were stopped by the smoke still remaining. They returned and called the bank-boss and foreman and steps were at once taken to rescue the men. At 6:30 a.m. the brattices and doors were temporarily replaced and the bodies removed.

By 9 a.m. Supt. J. E. Butler, Chief Engineer George Humble, Foreman Thos. Reynolds, Assistant Engineer Jas. King, and John Monroe, a miner, made a cursory examination of the whole mine. These men distributed themselves at intervals along the entry, and when the front man had communicated with those back of him, an advance was made, and the operation repeated. This inspection indicated that the explosion originated in the shot at the head of the main-entry air course. When Superintendent Butler and Mr. Humble entered the room neck on the right, at the head of the sixth left, Mr. Butler's light was extinguished by black damp, and a hasty retreat was attempted. The alarm was given to those stationed farther out, but before they could reach Mr. Butler, he had been compelled to leave Mr. Humble, and was himself unconscious. As soon as Mr. Butler had been removed to the mouth of the sixth left, help was brought from outside and in about 12 min. Mr. Humble was carried out. He was found frothing at the mouth and was resuscitated with difficulty. The value of an oxygen rescue apparatus would here have been apparent, as all the men who entered the sixth left were more or less affected by the blackdamp, and were unable to assist each other.

The mine was never considered gaseous although small feeders have been discovered occasionally but soon died out. About 5 or 6 years ago, five colored men were killed in this mine by a blown-out shot and dust explosion. Four years ago a slight explosion from the same cause occurred, and the one man killed lost his life by losing his way. He had gone in at night against the rules of the company and was drunk. Three years ago an overcharged shot at the No. 2 mine of the same company killed two shot-firers, but the Nos. 3 and 4 mines have never had any explosions, and this recent one is the only one of any consequence that the company ever had. Shot-firers have been employed for the last two years.

German Fuel Production and Trade

Coal production in the German Empire in 1909 is reported below, in metric tons, with comparative figures for the preceding year:

	1908.	1909.	Changes.
Coal	148,621,201	148,966,316	I. 345,115
Brown coal	66,450,144	68,355,954	I. 1,905,810
Total mined	215,071,345	217,322,270	I. 2,250,925
Coke made	21,174,956	21,407,676	I. 232,720
Briquets made	18,222,667	18,748,713	I. 526,046

The foreign coal trade of the German Empire for the year 1909 is reported as follows, in long tons:

	Exports.	Imports.	Excess.
Coal	23,350,730	12,198,634	Exp. 11,152,096
Brown coal	39,815	8,166,479	Imp. 8,126,664
Coke	3,446,981	673,831	Exp. 2,773,150
Briquets	1,620,560	211,058	Exp. 1,409,502
Total	28,458,086	21,250,002	Exp. 7,208,084
Total, 1908	26,291,747	21,011,784	Exp. 5,279,963

The large imports of brown coal are all from Austria, chiefly from the Bohemian mines into adjoining districts of Germany. Peat and peat coke appear in the returns, the imports in 1909 being 13,208 tons, and exports 23,579 tons.

Problems Confronting the Coal Industry

Fifty Per Cent. of the Pittsburg Seam Is Wasted. Safety and Efficiency Are Attained through Better Education of the Miners

BY S. A. TAYLOR*

The necessity for the conservation of coal and the safety of the men engaged in the production thereof have been probably more talked and written about than many other conditions in our country in times past, and are constantly being brought to the attention of the public by statisticians announcing in bold headlines the short time over which the present available coal supply will last. While these statements as to the length of time the coal supply will last are much at variance, because of new coal seams having been discovered from time to time, and also the greater recovery of coal obtained by the methods used now as compared with those of past times; this variance in time has been so great as to lead the general public to believe that the question of the time when the coal will be exhausted is sufficiently far in the future that they need pay little attention thereto. Indeed, this is the general conclusion reached by the average person; therefore, the method of bringing this matter to the attention of the public along the lines of scaring them into the consideration of the question may possibly be condoned.

It has been stated by those in connection with the U. S. Geological Survey that in the production of about 415,000,000 tons of coal during 1909 in the United States, 250,000,000 tons were lost or destroyed; at least rendered impossible of recovery for future generations.

When we consider that the output of coal is doubled on an average every 10 years, and we consider the loss of coal, which in some cases, I am sure, was greater than that given by the statistics of last year, it at once becomes an appalling question as to what the future may be. The result is certain to be impressed upon one's mind that this "wilful waste will in the future bring a woful want" if it is not checked and new methods of recovery, as well as new uses of coal, introduced in order that not only what we now produce, but also what is lost under the prevailing practice, be saved to the future generations.

Fifty Per Cent. of the Pittsburg Seam Is Wasted

It is also apparent to all those who are familiar with the mining practice in the Pittsburg region that an average of 50 per cent. of all the coal in the Pittsburg seam is wasted. This, of course, includes the roof and bottom coal, and the ribs and stumps, that are lost in the mining of the main body of the coal. What is true of the Pittsburg district is true to a greater or less extent of other districts, and hence the necessity of more conservation.

In this connection we might mention another fact of waste of all those poorer grades of coal, especially during times of restricted market, as based on the practice carried out in general by the U. S. Government in the purchase of its coal, namely, the purchase thereof on the B.t.u. basis. During the past two years a great many of the large individual coal consumers have adopted the same method, and the operators or producers of coal have been forced into selling coal on this basis, for the reason that the scarcity of trade compelled them to submit to many conditions which they would not otherwise be willing to do under normal conditions. Inasmuch as with this method, nothing but a high grade of coal would fill the requirements, all the poorer grades of coal were eliminated from the production, and nothing but the strictly first-class, high-grade coals could enter into competition.

I do not wish to be understood as claiming that this method is not based upon scientific principle; for we concede this. What we do claim is that it tends to a waste of a large part of our fuel resources by limiting the market to such coals as will stand such a test and yet leave a margin of profit to the producer after paying a fair and living wage to those employed in the production of the coal, both of which are very necessary if any stable economic position is to be maintained.

The Government's Present Policy Causes Waste

It resolves itself, therefore, into this condition: One branch of the government, whose chief aim is the conservation of the fuel, is diametrically opposed by another branch of the government, whose chief aim is to get together fuel at as low a price as possible; but, in the practical operation of their specifications, cause a greater waste than the other department, with all its suggestions, can accomplish toward conservation.

It is, therefore, of importance, and pertinent for us to inquire whether some other method of using coal from that now in general use might be introduced which would give as good or better results than are now obtained, and yet enable the poorer grades of coal to be used? If so, then we will be able to take a step in advance so far as the conservation of the fuel resources are concerned.

This question has not escaped the attention of those in the service of the Government who are investigating these problems; for the U. S. Geological Survey has shown that the coal which is contained in the roof-coal of the Pittsburg seam will, when passed through gas-producers, render almost as many heat units per lb. of coal as that of the main body of the coal. To use this portion of the seam by passing it through gas-producers, and using it through gas-engines, will, at the least calculation, give twice the efficiency of the ordinary steam boiler and engine plant.

In this connection also, in addition to the conservation of the fuels, there is another item of conservation which has been before the public of the large cities in recent years, to a more or less extent, which would be largely solved by the use of fuels in gaseous form. I have reference to the smoke nuisance. In a newspaper report recently published of the researches made by a committee of the Chamber of Commerce of Cleveland, it is claimed that the losses due to the smoke nuisance in Cleveland alone for one year amount to practically $6,000,000. If to this amount is added the loss sustained in other cities, such as Pittsburg, Cincinnati and Chicago, all large users of bituminous coals, and to this the loss of coal in the seams now mined, we would be appalled by the magnitude of the amount that this would aggregate and how much could be saved by the practical application of a proper method.

In this connection, another question which confronts the public is the adoption of methods of more complete exhaustion of the coal from the seams. In connection with this subject I think the record of the transactions of this Institute will show that it has done much already in this direction. Many methods have been suggested to take the place of those generally practised today, while a large part of the coal is left in the mine because the cost of recovery is more than can be secured for the coal in the market. It is, therefore, not so much a lack of knowledge as to how to secure

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NOTE—Abstract of article read before the winter meeting of the Coal Mining Institute of America, Dec. 16, 1909, at Pittsburg, Penn.

*Mining engineer, Lewis block, Pittsburg, Penn.

larger proportion of the coal in a given ein, as it is of how to get for the coal nough to permit the expenditure necesary to the recovery thereof.

I will also call attention to one other onomic problem that deserves careful ought. There is a rapidly growing ecessity for the establishment of some ethod of providing means to take care those dependent upon persons maimed killed in and around mines that will equitable between the mine owners, e employees, and the public. I believe, om a study of this subject, that it can accomplished by a coal-tax insurance nd, assessed and operated in some ch manner as I have heretofore outied in a previous paper on this subct.

The Problem of Securing Greater Safety

There is also another matter of equally eat economical importance to the pub, which is the securing of greater fety in mines, so that fewer accidents id deaths shall occur, as well also that ss property be destroyed; for, aside om the humanitarian side of these aclents and deaths, there is a financial d civic loss to the community which to some extent a matter susceptible of lculation.

Some methods of accomplishing good sults along this line have been recently inted out by the technological branch the U. S. Geological Survey. In adion to these, there is a matter faraching in its effect as to safety, etc., hich has been the subject of special ention by Mr. Roderick, chief of the ning dept. of Pennsylvania, especially it applied to the anthracite mines, and obably is equally applicable to the ndition of the bituminous mines. I ve reference to the lack of discipline the men in and around the mines.

Better Education of the Miners

Another matter which is coming to the ont rapidly is the better education of miners. This is very much to be deed, for the future of mining is going require men of a higher grade of inligence than has been required in the st. Just how this may be accomshed may be a question of some diion of opinion; but the work which has en done, and is now being more vigously planned, through the Y. M. C. A., certainly commendable, and should reve the hearty support of all interested.

After all of these and other matters rtinent to the coal industry have been roughly discussed and studied by those able of handling the matter from the ndpoint of the miner, the mine owner d the public, this conclusion I believe l be forced upon them: In order to ry the most of these matters into ictical operation will require that the al shall bring a higher price at the tipple; for without this, the majority of the mines would be compelled to close down because of lack of money with which to pay. While at present I cannot say just how many operators have lost money or how many have made money, the published statements of those companies which have their securities listed on the Stock Exchange, and from other information which I have, I know there are very few companies that have broken even for several years past.

The question of what to do to relieve this situation is not such a difficult matter as is the question how to accomplish it. There is no question but all matters which confront the industry can be overcome if only a price can be obtained sufficient to permit of the necessary expenditure to effect their solution.

It is necessary, however, in order to secure this higher price under all conditions, to form some sort of association to maintain the price of coal, as well also to regulate the amount of coal produced, for if there be no regulation of the amount of coal produced there can be no maintaining a living price for the coal industry. In forming a combination such as referred to above, it is impossible of accomplishment openly without coming in conflict with the provisions of the "Sherman anti-trust law," and to form such a combination secretly is something very undesirable even if it could be accomplished, and remain within the pale of the law.

The Sherman Anti-Trust Law Should be Modified

It seems, therefore, clear that it would be for the best interest of all concerned that the "Sherman anti-trust law" should be so modified as to permit of such a combination as referred to, so that the price of coal could be raised to such an extent as will permit of a reasonable profit over and above the cost of producing the coal, together with such added costs as may be necessary to put into practical operation such economical advantages as may be pointed out and recommended from time to time, as well also a sinking fund large enough to pay for the property as it is exhausted.

There is a danger to the public from permitting such combination as above mentioned unrestricted, from the fact that they might deem it necessary to raise the price to a higher point than necessary, and thus secure an exorbitant profit, and in order to protect the public against such a condition, it seems entirely feasible to authorize by law the creation of a commission, under the Department of Commerce and Labor, or some other department of the U. S. Government—something after the style of the Interstate Commerce Commission—who would have the power conferred upon them to review the actions of any combination fixing prices, and if said prices were found to be exorbitant to reduce them to such a price as would be determined to be fair and equitable, and might be patterned in a general way after the scheme now in practice in Germany. This is a legal matter, and in the final analysis must be arranged by those versed in the law; but a discussion of the question, in order to bring out the facts and conditions necessary to be met in a clear and forceful manner, will enable the lawyers to work the matter out to a more successful conclusion.

If these and other similar matters can be worked out and put into practical operation, I feel sure that not only will the coal business in all its aspects be improved over the present, but posterity will be greatly benefited by the conservation of life and property, as well also by the prolongation of the time over which the fuel of this country will last, and if this can be accomplished, the end will justify the endeavor.

The Hydraulic Mining Cartridge in Actual Service

The hydraulic mining cartridge is being tested in American mines with considerable success. Henry M. Payne, who is general field manager for the American company, reports that the cartridge has been adopted by several western companies operating on both longwall and room-and-pillar systems.

The Rombauer, Nos. 3 and 4 mines at Novinger, Mo., are to be put on the cartridges as soon as the machines arrive from England. The coal seam in the Rombauer mines is 42 in. thick and is undercut 40 in. with electric chain machines.

The official tests in the West mine of the Rombauer company were as follows: A 3-in. cartridge was used; holes were drilled 30 ft. apart; three holes brought down 83 ft. of longwall face. The average time consumed for each thrust was about 10 minutes. On the following day, (Jan. 24), a second test was made and three holes brought down 77 ft. of face. The time consumed at each hole was 3, 9 and 5 min., respectively. In both tests the coal broke clean and the roof rock was not disturbed in the slightest; the top coal came down clear and clean.

Eleven Tons Were Brought Down Per Thrust

The seam in this mine gives 1¼ tons of coal to the yard of face, so that 66⅔ tons were brought down with 6 shots, or 11 tons per hole in an average of 8 min. per shot.

In another mine of the same company, one shot brought down in 6 min., 22 ft. of coal on the right and 18 ft. on the left. This thrust therefore produced 16⅔ tons of coal. The tests at the mine of the Milan Coal Company, Milan, Mo., were as successful as those at the Rombauer mines. In all of the longwall mines, the 3-in. 8-piston cartridge was used, but in room-and-pillar mines, where the coal is tough, as is the case in many Illinois mines, the 4-in. 5-piston machine is often employed. The smaller machine produces a pressure of 60 tons; the larger cartridge exerts a thrust of 110 tons. In narrow entries where the coal is 6 ft. or more in thickness, a still stronger cartridge is supplied. Such a machine has been ordered by the Pittsburg-Buffalo Company, for use in the entries of its Marianna mine, where it is hoped to abolish powder altogether.

The tests in the Marianna mine showed that the cartridge produced 19 per cent. more lump coal than was mined in the same room with powder. The Pittsburg seam breaks up in fine shape when hydraulic pressure is applied.

Tests with the cartridge in this country show that the machine does not work to good advantage in a soft spongy seam, for in such a bed, the whole face is likely to be brought down in one mass and does not break up sufficiently.

A small slate parting of an inch or two such as occurrs in the Pittsburg seam, is a help rather than a hindrance to the machine, since this slate holds the coal long enough under pressure to permit the mass to be well cracked, and thus prevent the coal rolling out in too large lumps.

The most recent tests reported in room-and-pillar mines were made in the mines of the Marion County Coal Company, Centralia, Ill. The 4-in. 5-piston cartridge was used and brought down a 30-ft. room in three shots in 10, 13 and 13 min. respectively, with a splendid showing of lump coal. The results at Centralia are described by E. E. Fyke, the general manager, as being highly satisfactory. He says in a letter under the date of Feb. 3, that as soon as satisfactory local arrangements have been effected, the company expects to order enough cartridges to do their work. It is further stated that the board of directors of the Marion County Coal Company has passed a resolution adopting the machine for use in their mines. In narrow entries this company will use the 4-in. 8-piston cartridge and in rooms, the 4-in. 5-piston.

The cartridge is now being tested in Kentucky mines, and the results of these tests will be published in the JOURNAL.

The foregoing data have been abstracted from reports and letters in the files of the Hydraulic Mining Cartridge Company, 42 Broadway, New York. Permission to publish same was obtained from the Cartridge Company.

The Briar Hill shaft of the Cambria Steel Company at Norway, Mich., is constructed of concrete and is circular in shape. The concrete now extends nine levels to 800 ft. The only woodwork in the shaft is the runners for the cage.

Precautionary Suggestions to Alabama Coal Miners

SPECIAL CORRESPONDENCE

The State mine inspectors of Alabama have issued circular letters of warning to both mine foremen and the miners, looking to a reduction, if possible, in the fatality list this year in coal mines. The warning to foremen reads:

"To the Mine Foremen of Alabama.

"Gentlemen: This department respectfully calls your attention to the large number of fatal accidents that occurred in this State in the last year from falls of rock and coal, and requests that you coöperate with us in our efforts to reduce the fatal accidents from these causes this year.

"The following is the number of fatal accidents that occurred in this State in 1909 and the causes of each:

Falls of rock	55
Falls of coal	10
Falls of rock and coal	6
Tram cars	14
Explosions of gas	6
Explosions of coal dust	18
Explosions of powder	2
Explosions of dynamite caps	1
Electrocuted	4
Electric motor	2
Fell through coal chute	1
Cross collar on slope	1
Coal blown from shot	4
Coal shot	1
Suffocation	2
Tram car and cross collar	1
Premature shot	2
Total	130

"You can see from these figures that nearly three-fifths of the fatal accidents last year were caused by falls of rock and coal. Ninety per cent. of these accidents could have been prevented if the proper precaution had been taken by the miner and mine officials.

"This department is aware of the fact that it is the miner's duty to keep his working place safe, but we also know from experience and observation that the miners become careless and indifferent as to the dangers that surround them. Therefore, the mine foreman or someone in authority should visit the working places each day to see that they are securely timbered, and warn the miners of the danger caused by the failure to properly timber their working places. If this is done we are sure that the number of fatal accidents that occur from falls of rock and coal will be greatly reduced, as well as protecting the property of the company by preventing the rooms from caving in before they are worked out.

"This department is going to keep a record of all mines in this State this year as to ventilation, drainage, haulage ways, number of accidents, companies operating and the name of superintendent and mine foreman in charge. The miners will be classified in four classes, namely: First, second, third and fourth class, and will be published in the annual report of this department. We are going to publish the names of superintendents and mine foremen in our annual report also. We hope that every mine foreman will do all in his power to prevent accidents in his mine this year. Alabama has an unenviable record in regard to the number of fatal accidents that occur in our coal mines each year, which we believe has something to do with the scarcity of labor in the mines at present.

"If mine operators, mine officials, miners and mine inspectors will work together we are sure we can reduce the number of accidents to a minimum which will redound to the best interest of the entire mining industry of this State."

The warning to the miners reads as follows:

"To the Miners of Alabama.

"Gentlemen: This department desires to call attention to the large number of fatal accidents that occurred in this State during the last year from falls of rock and coal.

"Out of 130 fatal accidents that occurred last year, 71 were caused by falls of rock and coal. While some of these accidents happened because the danger was unforseen, 90 per cent. of them could have been avoided, if the deceased had taken the necessary precaution and timbered their places or taken down the loose material.

"It is the duty of every miner to keep his working place safe and securely timbered. It is the duty of the owner or operator of each coal mine to keep a sufficient supply of props and other timber used by the miners at all times, so that the miners can keep their working places propped.

"Section 1034 of the mining law contains the following rules governing the operation of mines:

"Rule 1. No unauthorized person shall enter the mine without permission from the superintendent or mine foreman.

"Rule 2. All employees shall inform the mine foreman, or his assistant, of the unsafe condition of any working place, hauling road and traveling ways, or damages to doors, brattices, stoppings, or obstructions in the air passages, when known to him.

"Rule 3. Every workman employed in the mine shall examine the working place before commencing work, and after any stoppage of work during the shift, repeat the examination.

"Where gas is given off, the miner should look for the fire boss' mark before entering his working place, and look for the date of examination at face of working place. If the fire boss' mark cannot be found, he should notify the mine foreman.

"EDWARD FLYNN,
"Chief Mine Inspector.
"JAMES HILLHOUSE,
"Assistant Inspector."

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specification of any of these
patents issued by the United States Patent
Office will be mailed by THE ENGINEERING
AND MINING JOURNAL upon the receipt of 25
ents. British patents are supplied at 40
ents. In ordering specifications, correspond-
nts are requested to give the number, name
f inventor and date of issue.

ANTIMONY

ORE TREATMENT—Process of Treating
ntimony Ores. Henri L. Herrenschmidt,
aris, France. (U. S. No. 948,545; Feb. 8,
910.)

COAL AND COKE

COAL CAR — Self-Clearing Bottom Coal
ar. David L. Knowles, John Marvel and
harles Heselden, Danville, Ill. (U. S. No.
47,682; Jan. 25, 1910.)

COKE—Improvements in or Relating to
pparatus for Discharging and Conveying
oke or the Like from Coke or Like Ovens.
rederic W. C. Schniewind, New York. (Brit.
o. 10,483 of 1909.)

COKE—Method of Treating and Handling
oal Preparatory to Coking. William J. Pat-
erson, Pittsburg, Penn. (U. S. No. 948,074;
eb. 1, 1910.)

COKE-OVEN CONSTRUCTION. William
. Blauvelt, Syracuse, N. Y., assignor to
emet-Solvay Co., Syracuse, N. Y. (U. S. No.
47,524; Jan. 25, 1910.)

COKE-OVEN DOOR. James F. Peters,
igonier, Penn. (U. S. No. 948,936; Feb. 8,
10.)

COKE OVENS—Construction of Gas-Dis-
arging Devices for Retort Coke Ovens. Wil-
am H. Allen, Jr., Grosse Ile, Mich., assignor
Semet-Solvay Co., Syracuse, N. Y. (U. S.
o 947,522; Jan 25, 1910.)

COKE OVENS—System of Heating Flues
r Retort Coke Ovens. William H. Blauvelt,
racuse, N. Y., assignor to Semet-Solvay Co.,
racuse, N. Y. (U. S. No. 947,525; Jan.
, 1910.)

PEAT—Apparatus for Treating and Utiliz-
g Peat Fuel. Wilbur L. Shepard, Elmwood,
d Horace J. Wickham, Manchester, Conn.
. S. No. 946,788; Jan. 18, 1910.)

SAFETY LAMPS—Apparatus for Igniting
iners' Safety Lamps. Ernest A. Hailwood,
orley, near Leeds. England. (U. S. No.
6,670; Jan. 18, 1910.)

UNMINED COAL—Method of Utilizing
mined Coal. Anson G. Betts, Troy, N. Y.
. S. No. 947,608; Jan. 25, 1910.)

COPPER

CONVERTER — Copper-Matte Converter.
ias A. C. Smith, Baltimore, Md. (U. S.
. 13,080, reissue; Jan. 25, 1910.)

ORE TREATMENT—Improvements in the
eatment of Copper Ore. Charles H. N.
illiams, Johannesburg, Transvaal. (Brit.
. 14,434 of 1908.)

PYRITIC ORE TREATMENT—Treatment
Pyritic Copper and Copper-Nickel Ores.
mes T. Carrick, Johannesburg, Transvaal.
. S. No. 947,789; Feb. 1, 1910.)

SINTERING FURNACE. George G. Vivian,
ntic, Utah. (U. S. No. 948,981; Feb. 8,
10.)

SMELTING APPARATUS. Edward Fink,
lwaukee, Wis. (U. S. No. 948,468; Feb.
1910.)

GOLD AND SILVER

CHLORINATION PROCESS—Treatment of
es for the Extraction of Metals Therefrom.
gues Rosalt, Paris, France. (U. S. No.
8,827; Feb. 8, 1910.)

CYANIDATION—Apparatus for Treating
e Pulp. Bernard MacDonald, Guanajuato,
xico. (U. S. No. 948,766; Feb. 8, 1910.)

DREDGING SLEEVE. Wiley P. Sugg,
kland, Cal. (U. S. No. 947,046; Jan. 18,
10.)

FILTER for Metallurgical and Other Pur-
ses. Clarence G. Patterson, Berkeley, Cal., assignor to the Butters Patent Vacuum Filter Co., Inc. (U. S. No. 946,862; Jan. 18, 1910.)

FINE GOLD—Apparatus for Recovering Fine Gold. James H. Alling, San Francisco, Cal. (U. S. No. 947,958; Feb. 1, 1910.)

FINE GOLD—Process of Recovering Fine Gold. James H. Alling, San Francisco, Cal. (U. S. No. 947,957; Feb. 1, 1910.)

PLACER MINING—Cofferdam for Placer Mining and Pier Building. Leander F. Gilman, Spokane, Wash. (U. S. No. 946,841; Jan. 18, 1910.)

IRON AND STEEL

BLAST FURNACE-CHARGING DEVICE. Charles P. Turner, Harrisburg, Penn. (U. S. Nos. 947,136 and 947,206; Jan. 18, 1910.)

BLAST-FURNACE GAS — Apparatus for Purifying Blast-Furnace Gas. Hugh Savage, Seraing, Belgium. (U. S. No. 948,664; Feb. 8, 1910.)

COATING—Method of Depositing Copper and Other Metals on Iron and Steel. Alfred Sang, Sewickley, Penn. (U. S. No. 948,662; Feb. 8, 1910.)

DRY-AIR BLAST—Improvements in the Method of and Apparatus for Drying Air, Particularly for Metallurgical Work. James Gayley, New York. (Brit. No. 13,553 of 1909.)

GAS-CLEANING APPARATUS. Joseph Morgan, Westmontborough, Penn., assignor to Cambria Steel Co. (U. S. No. 948,062; Feb. 1, 1910.)

REDUCTION—Process of Reducing Iron Ores. Charles B. Morgan, Oakland, Cal. (U. S. No. 947,448; Jan. 25, 1910.)

SCRAP—Method of Utilizing Steel Scrap. John P. W. Beckman, Parnassus, Penn. (U. S. No. 947,031; Jan. 18, 1910.)

STEEL, Comprising Iron, Titanium, Vanadium, Nickel and Carbon. John W. Evans, Belleville, Ontario. (U. S. No. 948,166; Feb. 1, 1910.)

NICKEL

NICKEL-COPPER ALLOYS — Method of Treating Nickel-Copper Alloys. John F. Thompson, Bayonne, N. J., assignor to International Nickel Co., New York, N. Y. (U. S. No. 947,067; Jan. 18, 1910.)

NICKEL-COPPER ORE—Process of Recovering Nickel and Copper from Ores and Mattes. Adolphe Chalas, Philadelphia, Penn. (U. S. No. 947,791; Feb. 1, 1910.)

TIN

ALLOYS—Improved Treatment of Tin Alloys Containing Silver to Separate the Metals. Chas. Henry Stewart, London, Eng. (Brit. No. 28,509 of 1908.)

DETINNING—Apparatus for Extracting Tin from Tin-Plate Waste. Heinrich Brandenburg, Kempen-on-the-Rhine, Germany. (U. S. No. 948,679; Feb. 8, 1910.)

ZINC

MANUFACTURE of Zinc. Oscar Loiseau, Sclaigneaux, Belgium. (U. S. No. 947,831; Feb. 1, 1910.)

SMELTING PROCESS—Process for Obtaining Zinc from Zinkiferous Materials. Hermann Pape, Hamburg-Billwärder, Germany. (U. S. No. 948,740; Feb. 8, 1910.)

ZINC OXIDE—Apparatus for Production of Zinc Oxide. William Simm and Henry Simm, Portico, near Prescot, England. (U. S. No. 946,668; Jan. 18, 1910.)

ZINC OXIDE—Process for the Preparation of Zinc Oxide for Reduction. Hermann Pape, Hamburg, Germany. (U. S. No. 947,399; Jan. 25, 1910.)

MINING—GENERAL

DRILLS—Improvements in Detachable Bits for Rock Drills or Bores. John Henry Thomas Bodmin, Cornwall. (Brit. No. 1732 of 1909.)

MINE CARS—Journal Box for Mining Cars. William H. Bines, Barnesville, Ohio, assignor to Watt Mining Car Wheel Co., Barnesville, Ohio. (U. S. No. 948,03; Feb. 1, 1910.)

MINE PROP. Emanuel Schäfer, Dusseldorf, Germany. (U. S. No. 916,879; Jan. 18, 1910.)

MINE SURVEYING—Means for Attaching Surveyors' Plumb Lines to the Roofs, Sides, or Floors of Mine Workings, Tunnels, or for Similar Purposes. Thomas Peacock, Jerome, Ariz. (U. S. No. 946,579; Jan. 18, 1910.)

ORE DUMP CAR. Charles H. Clark, Crafton, Penn. (U. S. No. 944,232; Dec. 21, 1909.)

SAFETY DEVICE for Mine Shafts. Watson H. Gregg, Cambridge, Ohio. (U. S. No. 946,-350; Jan. 11, 1910.)

TRANSIT—Mountain and Mining Transit. Frank Heitzler, Denver, Colo. (U. S. No. 946,602; Jan. 18, 1910.)

ORE DRESSING

MAGNETIC SEPARATION—Apparatus for Electrostatic-Magnetic Separation. Henry M. Sutton, Walter L. Steele and Edwin G. Steele, Dallas, Tex. (U. S. No. 948,599; Feb. 8, 1910.)

ORE FEEDER—Combined Ore Feeder, Sampler, Classifier and Separator. Howard G. King, Denver, Colo. (U. S. No. 946,759; Jan. 18, 1910.)

ORE-SAMPLING APPARATUS. Joseph A. Van Mater, Plainfield, N. J., assignor to the New Jersey Zinc Co., Newark, N. J. (U. S. No. 946,744; Jan. 18, 1910.)

SCREEN SIZING and Separating Machine. John M. Callow, Salt Lake City, Utah. (U. S. No. 947,331; Jan. 25, 1910.)

SCREENING—Improvements in or Relating to Machinery for Screening and Elevating Crushed Stone, Ore, Refuse, Clinker and the Like. William Henry Baxter, Leeds. (Brit. No. 21,796 of 1909.)

STAMP BATTERIES — Improvements in Stamp Batteries. Edgar J. Laschinger, Kensington, near Johannesburg, Transvaal. (Brit. No. 18,277 of 1909.)

WASHING — Improvements in Draining Washed Coal, Ore and the Like. John Anderson and Geo. Anderson, Coatbridge, Scotland. (Brit. No. 2156 of 1909.)

WASHING AND SCREENING—Improved Means for Washing and Screening Coke, Gravel, Sand and the Like. James Mason, Oakham, Eng. (Brit. No. 6436 of 1909.)

METALLURGY—GENERAL

CHARGING APPARATUS—Improvements in Apparatus for Charging Gas Retorts, Coking Ovens and the Like. E. Masters, Westminster, London, and John Hansford, New Barnet. (Brit. No. 14,411 of 1909.)

CHARGING DEVICE for Shaft Furnaces. Fabrik für Dampfkessel- und Eisenkonstruktionen, Heinrich Stahler, Lothringen, Germany. (Brit. No. 12,572 of 1909.)

ELECTRIC FURNACE and Method of Operating the Same. Augustin L. J. Queneau, Philadelphia, Penn. (U. S. No. 948,343; Feb. 8, 1910.)

ORE-ROASTING FURNACE. Henry W. Kent, Milwaukee, Wis., and Erich H. Lichtenberg, Chicago, Ill., assignors to Kent Ore Reduction Co., Chicago, Ill. (U. S. No. 947,337; Jan. 25, 1910.)

SMELTING FURNACE. John S. Loder, Reno, Nev., assignor to Loder Smelter and Refiner Co., Reno, Nev. (U. S. No. 948,098; Feb. 1, 1910.)

SMELTING SULPHUR ORES. R. Fleming, Swampscott, Mass., assignor to General Electric Co. (U. S. No. 945,926; Jan. 11, 1910.)

TIN-COPPER ALLOYS—Improved Treatment of Alloys of Tin and Copper to Separate the Metals. Chas. Henry Stewart, London. (Brit. No. 28,508 of 1908.)

ANALYTICAL CHEMISTRY

ASSAYING COMPOSITION. Joseph C. Hames, Goldfield, Nev. (U. S. No. 938,849; Nov. 2, 1909.)

ASSAY FURNACE. Bruce E. Tennent, Knights, Transvaal. (U. S. No. 944,470; Dec. 28, 1909.)

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Rensselaer H. Toll, of Denver, Colo., is in New York on business.

E. H. Nutter left San Francisco recently on his way to London, England.

Frederick T. Williams has been making an examination of the producing mines at Park City, Utah.

Edwin E. Chase, of Denver, Colo., has gone to the Lake Superior region to examine copper property.

C. E. Morris has left London to resume the management of the Santa Francisco mine in Nicaragua.

W. H. Wiley and Lafayette Hanchett left San Francisco on the steamer "Cleveland" Feb. 5, on a trip around the world.

H. W. Hardinge is now making a professional trip through the Lake copper district of Michigan and to Cobalt, Canada.

E. C. Vigeon has been appointed manager of the United Rhodesia Goldfields, Ltd., by Pearse, Kingston & Browne, of London.

Ebert Bush, recently of Butte, Mont., has been appointed mine superintendent for the Twin Buttes Copper Mining Company, Arizona.

Paul C. Ray has been placed in charge of the plant of the Central Foundry Company at Bessemer, Ala., by the receiver of the company.

Gerald M. Browne, of Pearse, Kingston & Browne, London is on a visit to the mines of the Rio Del Oro Company, Ltd., in Venezuela.

S. H. Steele has been chosen president of the General Chemical Company in place of E. H. Rising, who remains with the company as first vice-president.

M. H. Wickhorst, Aurora, Ill., has been appointed chief chemist in charge of rail tests by the American Railway Engineering and Maintenance of Way Association.

Charles Wild, of Eureka, Cal., has gone to Prince William Sound, Alaska, to take charge of the Alaska-Gladhaugh copper mine near Ellamar on Gladhaugh bay.

F. M. Kuric, of Philadelphia, has been retained as consulting engineer by the Highlander Mill and Mining Company, owner of lead-silver mines in British Columbia.

Selwyn Goldstein has taken the management of the Tominil mine in Mexico for Pearse, Kingston & Browne, of London. E. D. Armstrong has been appointed mine accountant.

C. W. Pritchett and T. W. Hamilton have formed a partnership as consulting mining engineers under the name of Pritchett & Hamilton, with offices at 642 Colorado building, Denver.

K. Landgrebe, who has been with the Bethlehem Steel Company, has resigned to become superintendent of blast furnaces for the Tennessee Coal, Iron and Railroad Company, at Ensley.

Charles Wittig has resigned his position as general superintendent and engineer in charge of the Bankers Mining and Development Company, operating at Santla, Puebla, Mexico, and will leave for Europe early in March.

P. G. Spilsbury, of New York has associated himself with Spurr & Cox (Inc.), and will be identified with the metallurgical department of that firm. His new address is Chamber of Commerce building, El Paso, Texas, with Godfrey Doveton.

W. A. Forbes, of New York, secretary of the Coke Committee of the United States Steel Corporation, and several other members of the committee last week inspected the coke plants of the Tennessee Coal, Iron and Railroad Company in Alabama.

J. L. W. Birkinbine, Philadelphia, is on a visit to his home after an absence of 18 months in Mexico. As chief engineer of the Oaxaca Coal and Iron Company, he has been prosecuting extensive exploration for coal in the mountains of northwestern Oaxaca.

W. H. Oldham has been appointed general superintendent of blast furnaces for the Birmingham Coal and Iron Company, with headquarters at Birmingham, Ala. He was recently superintendent of Alice furnace of the Tennessee Coal, Iron and Railroad Company.

A party of foreign iron and steel experts has been visiting and inspecting the blast furnaces and mills in the Birmingham district in Alabama. The party consists of Dr. F. Schniewind and Herr Northmann, of Germany, and Count Alexandre Talleyrand, of France.

L. C. Hammond has left the Denver Engineering Works Company, where he has been for five years past secretary and sales manager, to become manager of the sales department of the Central Colorado Power Company, whose main office is in Denver, Colorado.

J. W. D. Moodie has opened an office in the Story building, Los Angeles, Cal., as consulting engineer, his specialty being mining transportation. He was until recently chief engineer of the Mexican Milling and Transportation Company and the Guanajuato Development Company; and was also constructing engineer of the Moctezuma Copper Company's railroad.

OBITUARY

John Means died at Ashland, Ky., Feb. 14, aged 80 years. He was one of the pioneer ironmasters of the Hanging Rock district in Southern Ohio and at one time was president of Low Moor Iron Company, and later removed to Kentucky, and was president of the Ashland Iron Company.

SOCIETIES *and* TECHNICAL SCHOOLS

Missouri State School of Mines—The Legislature has appropriated money to improve the equipment of this school at Rolla. A complete ore-dressing plant is to be installed, under the direction of Prof. D. Copeland.

Stevens Institute of Technology—At the ninth annual dinner of the alumni at the Hotel Astor, New York, Feb. 12, President Humphreys presented his program for the development of Stevens and made a plea for the money necessary to carry out his plans. The other speakers included H. S. Pritchett, Col. E. A. Stevens, Hosea Webster, H. M. Brinckeroff. President Humphreys announced that he expects to raise $1,250,000 for the improvement and extension of Stevens Institute.

State College of Washington—This college at Pullman, Wash., has opened a winter school, including courses in coal and metal mining and in metallurgy. The object of these courses is to assist men of practical experience in searching for or mining metal or coal, by giving them an insight into the principles underlying the work, and by affording them an opportunity to gain practice and experience in special lines not readily gained in the field. A seriousness of purpose, with the ability to read and write intelligently and to work ordinary problems in arithmetic, are the only requirements for entrance to these courses, except that no one under 21 years of age will be admitted.

University of Illinois—The department of mining engineering of this university at Urbana has recently issued a circular descriptive of the course in mining engineering. The department is fortunate in having located at the university the first substation of the general testing station of the Technologic Branch of the United States Geological Survey. At this station, mine bosses and others are trained in the use of oxygen helmets. The station is a great advantage to the students, as it brings them in contact with the men engaged in mining practice from all parts of Illinois and the surrounding States. The department stands ready at any time by lectures or other means to coöperate with and assist any organizations in the State that aim to help those who are preparing to take the examinations for mine manager, examiner or hoisting engineer, or which aim to assist the ordinary miner to understand his daily work better.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Feb. 17—At Nevada City the new owners intend to pump out the Champion mine to the 2400-ft. level, the deepest in the mine. While this work is going on in the lower levels ore will be taken from the new flat vein recently found on the 800 level. New machinery and more machine drills willl be put in and plans formulated for an entirely new central shaft. Manager George E. FitzGerald is now working 70 men and 40 stamps, and in addition a number of leasers are at work. It is also expected that operations will soon again be started on the Murchie, one of the old and promising mines of the district. A company has been formed in New York to finance the mine, and a settlement will be made which will remove the lien on the property.

It is reported that Goldfield, Nev., men re about to take hold of the famous old Allison Ranch mine south of Grass Valley. For many years this property was one of the best producers in Nevada county. Following the death of Mr. Mackay the mine was closed and the machinery sold and removed, though it was known that the mine was in good ore at hat time. It has been estimated that by pumping out the mine to the 400 level, ore could be obtained to keep a 10-stamp mill running while the remainder of the underground works are being unwatered.

Since the building of the Western Pacific railway through Plumas county, numbers of persons have gone into that section in order to buy or bond mines. The activity in the neighboring county of Sierra has shown that these high mountain counties are rich in both gravel and quartz mines, and that only development s needed to prove them up. Plumas has lways needed capital and hundreds of mines have lain idle for lack of it. Patnted mines have remained idle and other mines have been held by assessment work nly, without development. Now that apital has turned that way, however, the wners of the prospects and claims want o be paid for all their waiting as well s for the claims themselves. People who have gone up there complain of the igh prices asked. Offers of $10,000 to 25,000 are refused by men who have een holding these claims for 30 or 40 ears and they want to talk in six figures nly, and this for claims with little deelopment work done upon them.

It is reported that the owners of the magnesite properties on Red Mountain, in Santa Clara and Alameda counties, have arranged to haul out about 450 tons per month to be sold to paper mills in Oregon. The mines are 32 miles southeast of Livermore and the material must be hauled to that point for shipment by rail. Most or nearly all of the magnesite mined has been for some years from Porterville or Tule Basin, Tulare county, and it has been supposed, since the report got about concerning the shipments from Red Mountain, that these Tulare deposits were worked out. This is not the case, however. The Porterville deposits were given up but the furnaces have been put on the Tule Basin mines, and those mines continue as productive as ever.

The new pipe line for oil from Coalinga to Port Costa, built by the Associated Oil Company, has been tested and oil is now being pumped through it. A contract has been let for another pipe line from Coalinga to McKittrick. Oil companies in California paid out $632,561 in dividends in January.

Butte

Feb. 17—Butte is in the throes of another labor trouble, this time a conflict between the unions themselves, and as a result only a few of the mines are operating. The discharge by the Anaconda Copper Mining Company of one George Whetstone, an oiler employed at the Neversweat mine, is the immediate cause of the trouble, although back of that is a long-standing difference between the Western Federation of Miners and Butte Union No. 138, International Engineers. The mill and sme1termen's union is a branch of the Western Federation, and it claims that all oilers should belong to its organization. The engineers' union also claims these men and Whetstone elected to join them. The mill and sme1termen's union, through the Western Federation, thereupon requested the Anaconda company to discharge Whetstone, and since under a contract entered into between the Western Federation of Miners and the Amalgamated company the company agreed that it should recognize the Western Federation, the request was complied with and the oiler discharged. At a meeting of the engineers' union held two days ago, it was decided that the reinstatement of Whetstone should be demanded, and if not complied with, that the members of Butte Union No. 138 International Engineers, should quit work this morning. The Anaconda company, deeming itself bound by contract with the Western Federation, refused to reëmploy Whetstone, and as a result the members of the engineers' union walked out this morning.

The majority of hoisting engineers in the camp belong to that organization, so with few exceptions, all of the mines have suspended operations. The Western Federation has promised the companies that it will supply the engineers necessary for the mines and it now remains to be seen just how successful it will be in doing so. The hoisting engines in Butte are of the most powerful and complicated type and it takes time to break in new men; so the engineers appear confident that it will be a matter of some little difficulty to fill their places. How long the shut-down will continue is problematical. Many take the view that a long and bitter struggle will follow, but there have been so many troubles of a similar nature, all of which at the time caused grave apprehension and but few of which lasted for any length of time, that it is quite probable the present difficulty will be settled within a week or ten days.

John P. Haggerty, who has an unsatisfied judgment for $14,000 against the Hypoka Mining Company, has brought suit asking that a receiver be appointed for the company. This is one of the old Heinze companies, which formerly owned and operated the Minnie Healy mine, now owned by the Butte Coalition. During the days when Heinze was fighting the Amalgamated he organized new mining companies with great frequency and transferred his mines from one to the other so that it was extremely difficult to know which company happened to be operating any particular mine at any particular time, and he was then able to confuse litigants in a surprising degree.

Denver

Feb. 19—The American Eagles in the Cripple Creek district continues to produce from the remarkable system of drifts and crosscuts which were originally planned by the late W. S. Stratton, to whose estate the property now belongs. The collar of the shaft of this Bull hill mine is at 10,538 ft. elevation, and the deepest workings are about 1500 ft. below the surface. Though not generally known, it is a fact that the workings on the properties of the estate on Bull hill alone comprise a length of about 12 miles. The American Eagles mine is now operated by the Colorado Mines Investment Company, under lease: sub-lessee Anderson has just sent out 25 tons of ore that returned $23 per ton in gold, and sub-lessee Baker 20 tons that yielded $65 per ton. Ore is being produced now from seven different levels of this mine. The Isabella is now under new management and the superintendence of R. P. Russell, a miner of large experience in the Cripple Creek district. The mill has been closed temporarily, pending a close examination of the orebodies and their grade. The mine will be worked under the leasing system.

While the high mines in the Ouray district are still in the grasp of winter and not able to ship, they are all busy underground, and not much, if any, mining news is coming out. North of Ouray, or below town, where the elevation is only from 8000 to 7000 ft., all the mines are busy. In the quartzite belt, the American Nettie and Jonathan are shipping gold ore, and the Bright Diamond below them is developing under the new management and ownership. Lower down the valley the Wedge, Calliope, Bachelor, Newsboy and Black Girl are all working, stimulated by the promise of the building of the smeltery in their vicinity. This smeltery is expected to blow in some time during the coming summer.

Salt Lake City

Feb. 18—At the regular monthly meetings of the Knight companies, held in Provo, Feb. 10, quarterly dividends were declared for both the Colorado and the Iron Blossom. The Colorado distribution amounts to 10c. per share, or $100,000, payable March 20, books to close March 15. The Iron Blossom dividend is 8c. per share, or $79,200, payable March 30, books to close on March 25. These are the first dividends to be declared since the Knight companies decided to pay quarterly instead of monthly. The rate is somewhat lower than that paid during the last year. The policy of both companies is said to be for more extensive prospecting and development than has heretofore been attempted. Directors' meetings of the Apex, Miller Hill, Mineral Flat and Sioux Consolidated mining companies were also held in Provo, this month.

Louis S. Cates, former mine manager for the Boston Consolidated, and A. J. Bettles, former mill manager for the same company, have been added to the staff of the Utah Copper Company. The accountants in the old offices of the Boston Consolidated are closing up the books as rapidly as possible. Since the first of the month, when the merger went into effect, all accounts have been carried on the Utah Copper books.

A meeting of the Utah branch of the American Mining Congress will be held at the Commercial Club in this city on Saturday, Feb. 19. The meeting is called for the puropse of electing three directors to fill the vacancies caused by the expiration of the terms of John Dern, David Keith and Duncan Mac Vichie.

The taking of evidence in the case of the Silver King Consolidated *vs.* the Silver King Coalition was continued during the last week. The evidence is being taken before Examiner John W. Christy in the United States Circuit Court. The attempt on the part of the plaintiffs is to find out, as far as possible, the tonnage and value of the ore taken from the Parsons stope in the Vesuvius claim which is owned jointly by both companies. This is a difficult matter on account of the thoroughness with which the stope was cleaned out and on account of subsequent caving. It is claimed by the defendants that no record or account of the ore was kept. The contention of the Coalition company is that the material mined from the Parsons stope was nearly all mill ore and waste, the first-class ore occurring only in small quantity. Ore was taken from the Parsons stope from 1902 to 1908. A large cave occurred in the stope in December, 1906, when according to the defendant company, nearly all of the ore had been mined. Subsequently, and just before the suit was begun, as stated by the assistant manager of the Coalition in his testimony, parts of the workings were dynamited and caved by him and the foreman for the purpose of controlling the ventilation. The time allowed the Silver King Coalition in which to give evidence in support of its account expired Feb. 15. An extension to March 6 has been granted.

Scranton, Penn.

Feb. 21—The miners at a colliery at Forest City are protesting to the point of striking against the character of the powder with which they are supplied by the company. They assert that it takes twice the quantity of the new powder to fire a shot as with the old. They further aver that the new powder saturates the atmosphere in the mine with such deleterious fumes that they are unable to work in it. Last week the men held a meeting in which they formulated their protest and appointed a committee to await upon the district superintendent. It was suggested to the miners by one of the officers of their union that they should have the powder analyzed or tested at the Government testing station at Pittsburg and probably this step will be adopted if the company does not withdraw the supply.

To insure a water supply that will be continuous throughout all seasons of the year, the anthracite mining companies have decided to expend a large sum of money on water conservation. The disastrous drought last year compelled them to shut down the mines through prolonged periods. Many of the collieries were entirely without water for any purpose, even for watering the mules. The present plan involves the construction of reservoirs and the laying of miles of pipe. The reservoirs will conserve the water when it is not needed at the mines, so that in periods of drought—which are not infrequent at present owing to the denudation of forests and other causes—it can be brought through the pipes to the points needed and regulated according to the needs of the particular colliery.

Cobalt

Feb. 21—The report that Adolph Lewisohn, who is closely identified with the Kerr Lake mine, has bought a large interest in the Wetlaufer mine in South Lorraine, has been confirmed. Doctor Wetlaufer states, however, that he has not obtained control. Negotiations for this deal have been under way for some months, but it was only a short time ago that they were concluded. It may be safely assumed that the getting of this interest is only preliminary to acquiring control, as the Lewisohns not in the habit of holding a minority interest. The Wetlaufer is capitalized at $1,500,000 and is the best property in the South Lorraine district. The shaft has been put down about 150 ft. and there is high-grade ore in the bottom. The mine has a well equipped plant, and when the Mines Power, Ltd., is in a position to deliver power to the South Lorraine district, mining costs should be substantially reduced.

Petitions are being circulated in Cobalt and the surrounding camps with a view to obtaining an eight-hour working day in the mines. Nearly 2000 signatures have already been received and the petitions will in due course be sent to the Provincial member for this district, who, it is expected, will bring the matter up at the next session of the legislature. It is doubtful, however, if any action will be taken, as the Mine Managers' Association is exceedingly well organized. At the present time one or two companies are working eight hours, but most of the mines are working a 10-hour shift.

The high-grade shipments coming from Gowganda are again bringing that district into prominence; this is warranted by the condition of the mines, which has much improved the last few months. A company has been organized to run a line of automobiles next summer between Elk lake and Gowganda.

Following close upon the news that the Lewisohns had taken over a large block of Wetlaufer stock, South Lorraine has received an additional impetus in the discovery of high-grade ore in the Haileybury Frontier mine. The vein is supposed to be a continuation of the Keeley and where discovered shows about 8 in. of calcite carrying considerable native silver. Unlike Cobalt the conglomerate area has so far not been found to be productive.

the veins occurring mostly in the Keewatin and diabase in close proximity to the contacts between these two formations.

Toronto

Feb. 21—The statement which has obtained extensive circulation that negotiations are in progress looking to the merger of the principal iron and steel interests of Canada, is emphatically denied so far as the Lake Superior Corporation is concerned. J. F. Taylor, vice-president of that company, states that there was absolutely no foundation for the report that the corporation contemplated a merger of any kind.

The House of Commons Committee on Mines and Minerals at Ottawa gave a hearing to John Patterson, of the Hamilton Nickel and Steel Company, on Feb. 16, with reference to the development of the Sudbury nickel deposits. He gave evidence as to the attempt made by the company some years ago to finance a million-dollar nickel-steel industry. The chief difficulty encountered, he claimed, was the competition of the International Nickel Company, which apparently had control of the whole nickel business, both in the matter of production and markets.

At Halifax, N. S., Feb. 15, the preliminary examination of the coal operators charged with conspiracy, was concluded. General Manager G. R. Cowans, of the Cumberland Coal and Railway Company, and General Sales Agent Alexander Dick, of the Dominion Coal Company, were committed for trial in the Supreme Court. They are accused of conspiring with James Ross and others to unduly prevent or lessen competition in the production and sale of coal in Nova Scotia, and to unreasonably enhance the price thereof.

Fritz Cirkel, mining engineer of Montreal, writes that a Canadian syndicate is planning to hydraulic a gold placer in Beauce county, 240 miles east of Montreal. These deposits have been known since the 17th century and have been worked intermittently in a primitive way.

Mexico

Feb. 18—During the last year, mining activities throughout central Mexico were most encouraging, particularly in the silver camps of Pachuca and Hostotipaquillo. This latter camp has won its way into the same catagory as Guanajuato and Pachuca. The El Favor mill is ready for power, and will be second large mill to build and start up within six months. The Cinco Minas deal has been closed. Operations on Santo Domingo have been again commenced, and at Mina Grande it is but a question of days before it will be under development. The towers for the electric power are placed as far as Hostotipaquillo. Daily stage service connects with the Southern Pacific at Magdelena. The Cinco Minas is arranging for the construction of its tram line from the mine to the railroad. The indications are excellent that at least two new mills will be started during 1910.

The Santa Rosalia mine in the Arizpe district, Sonora, Mexico, was abandoned by a California company about 1899 and remained idle until Sept., 1908, when a new company was organized. Active operations were begun in the spring of 1909 and the mine is now being worked aggressively. The mine has been unwatered and cleaned, one old shaft has been straightened and retimbered, drifts graded, tracks and tramcars installed. A three-compartment shaft is completed to 400 ft. The old shaft is being used temporarily for development. A hoist that will carry development down to a depth of 2000 ft. has been ordered, also compressor and condensers. A steel headframe for shaft, larger skips and other equipment have been contracted for and will be installed on completion of the road from Cananea. The company is employing 75 men at the mine and 100 men on the wagon road.

London

Feb. 16—At the annual meeting of the Exploration Company, the large interest of the company in copper-mining companies brought out a review of the copper outlook and of the statistical position, prepared mainly from the figures given by the ENGINEERING AND MINING JOURNAL, to the value and accuracy of which the chairman made a flattering acknowledgement. In forming an opinion as to the state of the copper market, attention was called to the difficulty of arriving at a reliable figure as to the stocks of copper, the deliveries of copper not representing of course, necessarily copper consumed. Mr. Bayliss, chairman, remarked on the stability of the price during the last year, which has not varied more than 1½c. per lb., in New York, or in round figures £5 per ton in London. He also pointed out that the average price of copper in 1909 was somewhat below the average of the last twenty years. After reviewing the situation, the conclusion was reached that the present position of the copper industry will be at best maintained and probably materially improved in the current year.

With regard to the company's interests in Mexico, it was mentioned that one of the new mines acquired under option was an old gold-silver-lead mine in the state of Zacatecas, which had previously been favorably reported on by Victor Clement. Another option was secured on two silver-lead mines in the Santa Eulalia district of Chihuahua. The Cometa property at El Oro has also been acquired under a three-year option and work is to be carried on to ascertain whether the Mexico-El Oro vein traverses the property. From what has been said it is clear that the company has several promising irons in the fire, and that the exploration work of the Exploration Company is being conducted on sound, businesslike principles.

At the general meeting of the Tanganyika Concessions Company, the usual optimistic speeches were made as regards the mineral wealth of the Katanga district in the Congo Free State. The production of copper on a large scale is now said to be in sight. The railway which is being bulit to the Star of Congo mine from Rhodesia reached the Congo frontier Nov. 16, 1909, and is expected to arrive at the Star of Congo mine by October of this year, or even June if the wet season is favorable. The principal copper mines in Congo territory are the Star of the Congo and the Kambove, and in Rhodesia the Kansanshi, where copper has already been smelted.

The great resources of the country in copper are the mines in the Congo state. There are two kinds of ore, smelting and silicious. According to Allan Gibb, the head engineer, there are 200,000 tons of metallic copper in sight at the Star of Congo and Kambove mines, with a probability of a further 200,000 tons if the drilling results are to be trusted. The smelting works proposed for the Star will give an output of 12,000 tons of copper per annum, and it is estimated that there is sufficient smelting ore at this mine and at the Kambove to last 30 years at this rate of production. Then there is the silicious ore which Allan Gibb claims can be treated profitably when it contains more than 4 per cent. copper. This class of ore exists in great quantity.

What with the smelting ore and the silicious ore, an output of 30,000 tons of metallic copper per annum is considered probable.

Robert Williams, the managing director, was still more optimistic and considered it safe to reckon on a production of from 60,000 to 90,000 tons of copper per anuum within three years, a production which could be improved on steadily by further development of other mines.

It is scarcely necessary to add that the probable nature of these operations was similarly depicted in glowing colors, and, to avoid the danger of any shareholder going away disappointed, attention was called to the possibilities of a diamond mine being found. The diamond prospects are however, described only as hopeful, and shareholders are given to understand that they can well afford to do without the diamonds and that they ought to be thankful for what they have got, or, as it might have been put, for what they are (perhaps) going to get.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY·
INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

Joseph H. Houston and associates have secured control of about 3000 acres of mineral land along the Alaska Northern railroad, about 23 miles from Seward. Dredges and steam shovels are to be purchased, and it is planned to carry on mining operations upon a large scale.

Shoup Bay—The free-gold quartz property of this company, near Valdez, is to be developed by sinking a 100-ft. shaft from the tunnel.

Haiditarod Camp—It is expected that this new camp will prove to be about the same as the Innoko diggings, the latter camp producing about $250,000 in 1909. In the Haiditarod, which is about 100 miles from the Innoko, the diggings are shallow, but the formation and the grade of pay are similar to Innoko. About 500 men are in the Innoko country, most of them on the Gane, Ophir, Spruce, Yankee and Little creeks. These were the principal producers during the last year.

Magnesite—These mines in the Atlin district have been sold to James A. Moore, of Seattle, who will work the property on a large scale.

Arizona

COCHISE COUNTY

The Copper Queen Reduction Works at Douglas produced 10,001,000 lb. of copper in January, of which 6,355,000 lb. came from Copper Queen ores, 2,113,000 lb. from Moctezuma Copper Company, and 1,533,000 lb. from custom ores.

Cochise Gold Mining and Milling Company—This new company is developing a group of 14 gold-quartz claims three miles from Cochise.

Calumet & Arizona—Production for January from company ores was 2,331,000 lb. of blister copper.

Superior & Pittsburg—Production for January was 2,166,000 lb. of blister copper.

GILA COUNTY

Lost Gulch United Mines—A 10-stamp mill with concentrators and Pierce Amalgamator is being installed.

Miami—In the No. 4 shaft timber sets are being put in for the second tramming level 150 ft. below that at the 420 ft. level. Whether or not a third tramming level will be installed at greater depth will be determined by the future development work. The No. 4 shaft will be sunk 700 ft. An exploratory drift is being driven southwest on the 370-ft. level to open the ore discovered by the churn drills on the Captain claim. A force of 600 men is employed.

Superior & Boston—This company made its first shipment of 50 tons of 9 per cent. copper ore to the Arizona-Commercial smeltery Feb. 8. Ore is being extracted on the 600-ft. level. The pump station at this level of the McGaw shaft has been completed and a 30,000 gal. sump is being cut. A 1000-gal. Prescott pump will be installed Feb. 15. Sinking will be resumed as soon as possible from the present depth of 635 ft. to 800 ft. About 100 men are employed.

GRAHAM COUNTY

Arizona Copper—Production for the month of January was 2,646,000 lb. of copper.

MOHAVE COUNTY

Bi-Metal—Negotiations for the purchase of this mine by people represented by John Hays Hammond, were discontinued on account of disagreement regarding the price. E. W. Lamont is enlarging the mill by aditional stamps and Huntingtons.

Golconda—This mine shipped 7100 tons of zinc ore in 1909, containing 6,532,000 lb. of zinc and netting $136,000. The mine is now producing 900 tons of ore per month.

C. O. D.—This mine will be operated by P. F. McLaughlin, of Goldfield, and John Boyle, of Kingman.

PINAL COUNTY

Copperosity—This Houston, Texas, company is developing a property near Casa Grande.

Vekol—A New Orleans company is operating this old mine near Casa Grande.

YAVAPAI COUNTY

United Verde—At the annual meeting the directors were reëlected. According to the daily papers, a proxy for 254,059 shares of the total of 300,000 was voted in the name of William A. Clark, three proxies for 10,516 each were voted in the name of W. A. Clark, Jr., and one for 12,000 shares was voted in the name of James A. Macdonald, the vice-president of the company. H. H. St. Clair and J. H. Anderson, directors, voted five shares each. The gross income for 1909 was $5,368,672, but the net earnings and other detailed figures, including cost of operation, have not been made public. Twelve dividends of 75c. each were paid in 1909, aggregating $9 a share, or 90 per cent., the par value of the stock being $10. The monthly production of copper is at present about 3,000,000 pounds.

YUMA COUNTY

Clara Consolidated—The railroad from Bouse has been completed to Swansea and on Feb. 21 the first train arrived at Swansea.

California

AMADOR COUNTY

Cooper—This mine at Oleta, idle for some years, is being reopened by a new company.

Mitchell—An air compressor and drills are to be installed.

CALAVERAS COUNTY

Nelson—This old hydraulic mine, owned by Rigney & Norman, is now in readiness and water has been turned into the giants.

Grizzly Flats—This mining company's property at Grizzly Flats has been sold to Albert Myer, E. L. Morey and others.

INYO COUNTY

Casa Diablo—Machinery has been ordered to increase the mill to 40 stamps.

KERN COUNTY

Golden Jack Rabbitt—The mill at Amalie, has been started up on $12 ore.

Gold Peak—The mill on this property at Amalie has been started but better power is to be put in.

MONO COUNTY

Dunderburg—This old mine in Castle Peak district, 12 miles from Bridgeport, will shortly be reopened by its English owners who will run a long tunnel from the Green Creek side of the mountain.

Benton—The company is running a tunnel through Blind Springs hill. It is now in 1300 ft., and at 2000 ft. will tap the Cornucopia vein. The tunnel is to be equipped to be run 5000 ft. in all.

NEVADA COUNTY

Pittsburg—In this Nevada City property the vein has been caught at both ends of the mine beyond the faulted ground.

Mountaineer—At this Grass Valley mine, John Becker, manager, the new shaft has been timbered to the 400 level and foundations have been put in for new hoisting and pumping machinery.

Blue Lead—A raise is about to connect with the channel 9000 ft. from the mouth of the tunnel at this mine, Relief hill; J. O. Jones, manager.

Morydena—This Grass Valley mine, Edward F. Hilton, manager, is about to resume operations.

Banner Ridge—At the mine near Grass Valley, C. A. Bailey, president, work has been resumed on the tunnel to open the gravel channel.

Plumas County

Gunn—At this property at Johnsville, T. G. Elgil superintendent, the face of the tunnel is all in quartz. A large mill is to be built in the spring.

New York and Arcadia—H. D. M. Harvey has organized a company to purchase and develop these properties near Greenville.

San Bernardino County

There are now four producing mines in the Dale district and 35 stamps are dropping.

Shasta County

Igo District—The Climax, a silver property owned by W. W. Robinson, is having a new hoist put in and a 50-ton cyanide plant is to be installed. The Rogers silver mine in the same district is shipping ore to the smeltery at Kennett.

Evening Star—This mine, four miles from Redding, has been sold to German investors represented by George Bayha.

Trinity Dredge Company—This company will build a dredge on the Trinity river near Lewiston as soon as weather permits. R. E. Whitcomb of Orville, is superintendent. The company has bought the ground of the old Poker Bar Dredging Company.

Shasta County

Sky Blue—W. Oberlin and R. F. Lind, of Ohio, have purchased this mine near Middle Creek station, not far from Redding.

Simoni—In the old mine, between Redding and Shasta, a 4-ft. vein of sulphurets has been struck by H. O. Cummins who has it under bond.

Sierra County

Kate Hardy—This mine at Forest is expected shortly to resume operations.

Tuolumne County

Longfellow—Anton Lutz, of Pittsburg, will put a complete milling plant on this mine as soon as weather will permit.

Yuba County

Tarr Mining Company—This company, working the Paddy Campbell mine near Smartsville, is hauling lumber and materials in order to start operations.

Colorado

Lake County—Leadville

Robert E. Lee—It is now stated that this large producer of silver in former days has immense bodies of zinc ore, which are now to be worked.

San Juan County

Bonner—This mine in the Silverton district, under Superintendent Sturgeon, has its power plant installed and working, and will now be developed by machine drills.

Teller County—Cripple Creek

Ethel Louise—This company, owning the Corundum and Mary Ann on Bull hill, has installed the Worcester ventilating system and work has been recommenced. Two carloads of ore have just been shipped.

Pinnacle—In this mine, near Cameron, an important strike is reported to have been made at 300 ft. depth. The ore-bearing rock is said to be about 4 ft. in width, and there is also said to be a streak of nearly solid calaverite from ¼ to 1 in. in width.

Isabella—The strike made by the Western Investment Company, lessee, in a raise between the 500- and 600-ft. levels of the Empire State shaft, is said to have exposed from 4 to 5 ft. of or which assays from 15 to 20 oz. gold pr ton.

Trail—Development of the strike made several weeks ago in the lower workings of this Bull Hill property has been steadily carried on, and it is reported that the orebody now measures from 12 to 14 ft. between walls, shipments made giving returns from $10 to $20 per ton.

Idaho

Coeur d'Alene District

Monarch—The 854-ft. raise, the longest in the district, has broken through on the 600-ft. level. The management states the mill will be started at once and heavy shipments begun.

Caledonia—Shipments have just been increased from 25 tons daily to 33 tons and will be further increased to 40 tons about March 1. The property adjoins the Last Chance mine and is one of the new producers.

Black Horse—There is said to be in sight a body of galena ore 600 ft. long, from 4 to 14 ft. wide and proved to a depth of 1000 ft., the ore being of milling grade. Development has been stopped and as soon as the mill is completed shipments will be begun.

Stewart—General Manager M. W. Bacon says a basis of settlement of the difficulties between the Stewart and Cœur d'Alene Development Company has been arranged.

Reindeer—Over 5 ft. of shipping ore appears in the face of the crosscut of the ledge.

Michigan

Copper

Seneca—The Kearsarge lode has been reached with the crosscut from the 3d level. The width of the lode has not been ascertained, but the face of the crosscut is well mineralized and of a substantial character. This is decidedly encouraging as the lode exposed at the points above was badly shattered and carried but little copper.

North Lake—Is operating two drilling outfits which are working in Nos. 5 and 7 holes; No. 5 hole is vertical to cut the Lake and Indiana lodes. This hole is now about 970 ft. deep. No. 7 hole, perpendicular to the formation, is down about 1275 feet.

Calumet & Hecla—A fire was discovered in an abandoned stope at the 38th level of No. 4 Calumet shaft recently. Practically no damage was done. The mouth of the stope was walled up with sand bags and allowed to burn itself out.

Adventure—The new vertical shaft, sinking to cut the three lodes exposed in drill work, is down 385 feet.

Franklin—This company has secured from the St. Mary's Mineral Land Company 640 acres in Section 6, giving in exchange 33,333 shares of Franklin stock. This brings the total acreage to 4080 acres, and gives a length on the Pewabic lode sufficient to accommodate five shafts about 2000 ft. apart. There are now about 166,000 shares outstanding of the 200,000 shares of authorized capitalization. No. 3 shaft is down to the 29th level and will cut the lode by crosscutting in the near future.

Bohemia—Has rigged up a diamond-drill outfit and will start sinking.

Copper Range—At the Champion mine the deepest workings continue to open good ground. Shipments amount to about 2800 tons daily. B and C shafts are opened down to the 15th level, D to the 16th and E to the 17th. At the Baltic, No. 2 shaft is opened to the 17th level, Nos. 3 and 4 to the 20th and No. 5 to the 16th. The Trimountain is opening a much improved grade of ground at depth, especially so at the No. 4 shaft which is down to the 15th level. No. 2 shaft has come into a better grade of rock at the 20th level. No. 1 shaft is down to the 21st level, but conditions are not good.

Indiana—The drilling outfit which put down the No. 2 hole in which the rich copper find was made, has been moved to a point about 600 ft. southwest of No. 2 hole, and will operate in No. 6 hole to cut this same formation at an estimated depth of 800 ft. Four drilling rigs are at work at various points.

Iron—Marquette Range

Drill holes put down on a 40-acre tract adjoining the American mine, 10 miles west of Ishpeming, show the existence of an orebody, the extent of which is still to be determined. The ores show a hard specular ore of bessemer quality and high iron content, at a depth of 500 ft. The tract is owned by George J. Maas, of Negaunee, and Theodore M. Davis. The Cleveland-Cliffs Iron Company has also found ore on its lands west of Ishpeming, at Dexter and North lake, and has begun to build an extension of its railroad, six miles long, to reach those points where extensive explorations are to be made.

Iron—Menominee Range

Diamond drilling has been going on for some time in the Randville district to the north of Iron mountain. The drilling was started in the lowest level of the Groveland, owned by the Huron Mining Company, of Cleveland, O. The work has shown hard bessemer ore, and shaft sinking and drifting are to be started at once. Explorations have also been started on adjoining lands, owned by Edward T. Breitung, of Marquette, John T. Jones, of Iron Mountain, G. A. St. Clair, of Duluth, and the Beaver Iron Company.

Montana

Broadwater County

Santa Anita—The company was organized the latter part of the year with a capital of $300,000, shares $ 1. On the property, in the Radersburg district, the tunnel has recently encountered 3 ft. of lead and silver carbonate.

Keating Gold—The installation of the new surface plant is in progress.

Butte District

Davis-Daly—The west crosscut on the 1800-ft. level is now supposed to be less than 150 ft. from the main vein. About 150 ft. of drifting has been done on a smaller vein in the same level which was encountered near the shaft. A crosscut has also been started east on the 1800-ft. level and has encountered a 2-ft. vein carrying zinc. The second raise from the 1400 to the 1500 level is nearly completed.

North Butte—It is rumored that a crosscut may be driven into the North Butte ground at a depth of 2800 ft. from the adjoining High Ore and Diamond mines. There is also talk that a winze may be sunk on the Edith May vein from the 2200-ft. level to ascertain whether the present poor showing is due merely to a barren zone or whether it continues with depth. Nothing definite can be learned from the management.

Deer Lodge County

French Gulch Mining Company—This company has recently been incorporated with a capital of $1,500,000. W. R. Allen, of Anaconda, is president. The company's property consists of 22 quartz claims and 480 acres of placer ground with water rights near French gulch.

Jefferson County

Montana-Corbin—The station on the 400-ft. level has been cut and is being timbered. A crosscut will be started and it is thought will cut the vein within 30 ft. of the shaft.

Corbin Copper—The foundation for the concentrator has been completed and the machinery is on the road. The Dewey tunnel drift is in 800 ft., and on the Bonanza the tunnel is in 400 feet.

Lincoln County

Silver Cable—John H. Town has secured a lease and bond from John L. Hartt for a period of two years. The group consists of five patented quartz claims and two unpatented placers, 23 miles from Libby. About 2000 ft. of tunnelling has already been done and considerable gold ore disclosed. A 50-ton concentrator is now on the property.

Madison County

Apex Mining Company—This company has recently been incorporated with a capital of $1,000 divided into shares of a par value of $1. The company is operating the Apex mine at Summit.

Missoula County

Kansas City Commercial—The company has spent $400,000 on equipment for the Lacasse placers near Iron Mountain. Operations were recently begun and two cleanups have been made, the first netting $5000 and the second $10,000.

Yellowstone County

Davis Coal Company — Temporary boarding and bunk houses have been built, and two slopes, the main entry and air course, are being driven. They are now in about 80 feet.

Nevada

Esmeralda County—Goldfield

Goldfield Consolidated—Manager J. R. Finlay states that the rumors of the Consolidated turning into a copper mine at the 1000-ft. level are either silly or dishonest. He is quoted as saying: "In the raise above the 1000-ft. level we have a body of ore that runs from $20 to $90 per ton. We do not know how big the orebody is, but it is bigger than the raise. On the 1000-ft. level we have no pay ore yet. Our sum total of openings there in vein matter is not over 50 ft. When it is considered that this vein is over a mile long and 200 to 400 ft. wide on each level, it may be seen how much importance may be attached to such developments. However, I am confident that we shall soon have ore on the 1000-ft. level. I have looked into the occurrence of copper in this vein and cheerfully express the opinion that there is just as much copper at the 100-ft. level as there is at the 1000-ft. level."

Humboldt County

The National Mining District lies about 60 miles north of Winnemucca. This camp has some very rich ore and about 65 men are working in the camp. Some of the principal operators are John Pelton, of Reno; J. L. Workman, of Winnemucca; Rinehart Brothers, and the Stall Brothers of Winnemucca.

Excitement has been caused by the oil indication 50 miles west of Winnemucca, and several companies have been formed to drill for oil.

Nye County

Mayflower Consolidated — A four years' lease on this property has been given to the Mayflower Leasing Company, a new incorporation.

Nye County—Tonopah

Tonopah-Liberty—A contract for a 25-stamp mill has been let by this mine about 20 miles south of Tonopah.

Storey County

Mexican—The station on the 2400 level of the winze from the 2200 level, has been completed.

Yellow Jacket—The incline has been reopened and repaired for 412.5 ft. below the 1100 level.

Ophir—Production for the week ended Feb. 5 was 273.89 tons, assaying $39.96 per ton. The three-compartment winze has reached the 2400 level.

Comstock-Mohawk—The purchase of the Conlan claims by this company has been completed, and extensive work is planned.

White Pine County—Ely

Giroux—The upraise in the five-compartment shaft has reached the surface and the great shaft is found true. In the Alpha shaft, which is connected with the Giroux by a crosscut 700 ft. in length, the orebody is still being prospected by diamond drill. The spur tracks running out to the main workings from the track of the Nevada Northern are approaching completion.

New Mexico

Sierra County

Bimetallic Mining and Milling Company—This company will develop a group of gold-silver claims near Kingston.

Pole Star—High-grade gold-silver ore has been opened. It is understood that the Colorado men who recently became interested in this property will develop it extensively, and have placed an order for boiler, steam hoist and compressor.

Kelly—This mine is shipping about 40 tons of lead-zinc concentrates per week.

Graphic—The 100-ton concentrating

ill is being completed with all possible aste. A 3-rail gravitation tram will de-iver the ore to the mill. Joseph Brown, f Kelly, is manager.

Nit—The Tri-Bullion company is pros-ecting this property with a diamond rill.

North Carolina

LINCOLN COUNTY

Portis Gold Mining Company—This ompany, organized last year, has bought tract of 500 acres in Franklin and lash counties, part of which was worked ver by placer miners many years ago. he ground is being tested, and the com-any intends to work it by dredging. The ffice is in the Empire building, Philadel-hia. Maurice Brooks is secretary and lexander P. Rogers consulting engineer.

Oregon

DOUGLAS COUNTY

Nicodemus—This company has been ncorporated and will operate in the Bo-emia district. It is in the market for a tamp mill. R. G. Black, Cottage Grove, at the head of the company.

JOSEPHINE COUNTY

Murray—This company will install this pring new machinery, including com-ressor, drills, 5-stamp mill and rocks rusher. M. G. Womack, Williams, has harge of the work.

Texas

Charles M. Schwab and associates, ho purchased iron-ore lands in Camp nd Morris counties a short time ago, are roceeding with preliminary work. Ex-ensive tests have been conducted upon ne lands with the view of determining ne extent of the ore deposit. The re-ults show that there are approximately 0,000,000 tons of ore available and that o unusual difficulties are to be met with n mining. The ore is to be shipped to he plant of the Bethlehem Steel Com-any, and a tentative contract for the ransportation of a certain stipulated ton-age per annum from the mines to the ulf port Bolivar, opposite Galveston, vas entered into by Mr. Schwab and as-ociates and the Santa Fe railroad. Sur-eys are now being made for a branch ine from the Santa Fe at Longview to he ore lands, about 50 miles.

Utah

BOX ELDER COUNTY

The Park Valley district is reported enerally active. At the Century consid-rable prospecting and development work s being done. The new mill of the Su-anna company adjoining the Century, is eported to be making a good saving.

Deer Trail—Two fissures have been cut n the lower tunnel. B. H. Hunt is nanager.

SALT LAKE COUNTY

Ohio—Two units of the Ohio Copper mill at Lark are in operation and are treating 1000 tons of ore per day. The ore concentrates about 20:1. The concentrates average about 23 per cent. copper. Other sections of the mill are being put into shape as rapidly as possible. Practically all of the line shafting, floors, tanks, etc., are in place for the other half of the mill. About 220 men are employed in the mine and 130 in the mill and on construction. Colin McIntosh is manager.

Utah Apex—This company is developing a new orebody along the Dana fissure on the 400-ft. level. This has been opened for 250 ft. along the strike and is 15 ft. wide. About 75 tons of ore are being mined a day from this orebody. A total of 150 tons per day is being mined, which is the present capacity of the mill. At present 90 men are employed in the mine and mill and on construction work. R. S. Oliver is manager.

Columbus Consolidated—A new orebody, distinct from any heretofore encountered, is reported to have been developed on the 400-ft. level. The ore was found about 1500 ft. west of the shaft, and has been followed about 100 ft. Shipments of from 40 to 50 tons per day are being made regularly.

Thor—A face of lead-carbonate ore is reported at a depth of about 150 feet.

SUMMIT COUNTY

Park City ore shipments for the week ended Feb. 12 were as follows: Silver King Coalition, 1,226,720 lb.; Daly-Judge (zinc), 117,130 lb.; Daly-West, 1,350,000 lb.; Daly-Judge, 56,900 lb.; Little Bell, 30,000 lb.; total, 2,780,750 pounds.

Little Bell—During January this mine made three shipments aggregating 1,002,695 lb. The ore carried 21.68 per cent. lead, 7.6 oz. silver, 0.047 oz. gold and 2.36 per cent. copper. The new orebodies below the 700-ft. level are opening up in a manner satisfactory to the management.

Silver King Consolidated—The second shipment of ore amounted to 63,140 lb. The ore carried 40.1 per cent. lead, 65.8 oz. silver, 0.15 oz. gold and 1.4 per cent. copper. This ore was mined from development work on the 1550-ft. level. A new fissure carrying lead and rich in silver, has been cut on the 1600-ft. level. Solon Spiro, of Salt Lake City, is manager.

Silver King Coalition—About 340 men are being worked in the mine and mill, three shifts being worked underground and one in the mill. Ore from the Alliance is being hoisted from the 500-ft. level while development work is in progress on the 9th and 10th levels. Some ore, mostly of milling grade, is being stoped above the 7th, but the greater part of the mine's output, especially of first class, is coming from the Jewell stope above the 1300. The average output is 80 to 90 tons of first-class and about 200 tons of milling ore.

Daly-West—Since the connection with the Ontario tunnel was made in October, 1909, this tunnel has been used to drain the mine. The shaft has been sunk from the 1900 to the 2100 or drain-tunnel level. A sump is being sunk below the 2100, but much difficulty is experienced on account of the excessive amount of water to be handled.

TOOELE COUNTY

Bullion Coalition—This company which has taken over the old Honerine and neighboring mines of Stockton, has awarded a contract for extending the main Honerine tunnel 500 ft. Should the development warrant, plans will be made for remodeling the old Honerine mill.

Buffalo Consolidated—Two to three feet of ore carrying lead and silver with some gold, is reported to have been found below the tunnel level. This company has recently taken over several properties on Lion hill and is pushing development work. Samuel Pollock is manager.

Daisy Combination Mining and Milling Company—The old Daisy mine and mill have been taken over by this company. The mine has been cleaned out and retimbered, a hoisting plant erected, the old pipe line from Ophir repaired and the mill completely remodeled.

Washington

FERRY COUNTY

New Republic—About 300 men are employed on this property under Manager R. J. Howard. Weekly shipments average about 100 tons.

KITTITAS COUNTY

Bituminous coal in paying quantities has been found in the Taenum canyon, near Ellensburg. The prospect will be opened in the spring.

OKANOGAN COUNTY

Lucky Knock—W. E. Ingram and A. E. Whicher, of Riverside, have opened a deposit of tungsten and molybdenite. They have a tunnel 150 ft. long.

STEVENS COUNTY

American capitalists have obtained control of the Northport smeltery. Enlargement and improvements costing $300,000 will be made, increasing the capacity from 200 to 600 tons per day.

Old Bonanza—This property, leased by Frank J. Davey, Bossburg, is now shipping a car of ore each day to the smeltery. The old workings have been opened to a depth of 400 ft., and a new ore zone has been opened.

Wisconsin

ZINC-LEAD DISTRICT

The Mineral Point Zinc Company has taken fee and leasehold on the Fox mine, and has purchased the Esch farm at Highland. It has also acquired control of the fee and mining right of the Winnebago at Hazel Green. The Old Mexico struck 4 ft. of high-grade disseminated jack on the James Tracy land near Platteville. The Wisconsin Zinc Company has leased the Best mine at Cuba City and will move the old mill of the Pittsburg Lead and Zinc Company to the Drumm shaft south of Benton. The Vinegar Hill company has commenced construction of a 100-ton mill south of Hazel Green. Jack was found by the churn drill on the Horn land, within the city limits of Platteville, at 109 and 119 feet.

Canada

ONTARIO

Lost Mine—A 4-ft. quartz vein showing visible gold has been discovered at a depth of 25 ft. on this mine in the Manitou Lake district.

Timmins Brothers Claims—A large force of men is engaged on the Hollinger and McMahon claims, Porcupine, which are being developed under option. Three shafts are being put down, one of which has reached a depth of 60 ft. A complete plant will be installed, including compressor, two boilers and two hoists.

Frontier—A 7-in. calcite vein, rich in native silver, has been found in a crosscut at a depth of 65 ft. on this South Lorraine property.

ONTARIO—COBALT

Shipments—Ore shipments from Cobalt for the week ended Feb. 11 were as follows: Cobalt Central, 41,687 lb.; Crown Reserve, 124,154; Kerr Lake, 180,239; La Rose, 306,902; Nipissing, 129,080; O'Brien, 65,800; Temiskaming & Hudson May, 62,365; total, 909,627 pounds.

Colonial—This property has started shipping again, following the starting up of the mill. This is the first shipment for over a year.

Silver Cliff—A new vein of high-grade ore, about 2 in wide, has been discovered.

Coniagas—The regular quarterly dividend payable in February was passed.

Century—The management states that a high-grade vein has been cut with the diamond drill.

Last Chance—This company has struck a large niccolite vein carrying a little silver.

Temiskaming & Hudson Bay—Another 300 per cent. dividend, payable Feb. 23, has been declared. This makes the second for the year.

Crown Reserve—A diamond drill operating toward the Drummond Boundary has cut two absolutely new veins, showing high-grade ore.

ONTARIO—GOWGANDA

Burke-Remey—A test shipment of 2 tons has been made to the Chippewa smeltery.

Le Roy Syndicate—Two plants are being installed, one on the property on Lost lake and the other at Le Roy lake.

Ottawa-Gowganda—This company is completing the installation of a steam plant.

Mexico

CHIHUAHUA

Yoquivo—The 60-ton cyanide plant will be in operation in March.

Exploration Company of England and Mexico—This company has begun sinking at its San Gregorio property in the Santa Eulalia camp under the direction of C. A. Burne.

Alfarena—The Alfarena Mining Company has been organized to operate the old Alfarena mine in the Santa Barbara camp. F. C. Morehouse and other Parral mining men are the organizers. The old machinery is being overhauled and a milling plant will be installed.

Almoloya—Diamond-drill outfits have been ordered for the Cigarrera and Iguana mines.

Socorro—The Socorro mines of the Socorro Mines and Development Company, which lately succeeded the International Gold Mines Company, have been closed down pending reorganization of affairs.

DURANGO

Avino Mines—Tests are being made with Wilfley, Woods and Deister tables. The experimental mill is now in operation, and the results of the tests will decide whether the company will enlarge its plant to a capacity of 150 to 200 tons per day.

Era Coneto—High-grade silver and gold ore has been opened at the 128-ft. level.

JALISCO

Tajo—Water flowing from the long tunnel being driven to cut the Tajo vein will be used to generate electric power. Equipment for trebling the capacity of the 30-ton reduction plant has been shipped.

Matarańa—Drifting on the vein recently cut by tunnel is showing shipping ore. A reduction plant will be built this year.

PUEBLA

Bankers Mining and Development Company—Results at the mines have not come up to expectations and but little work is being done.

SAN LUIS POTOSI

El Mesquite—Active operations on this quicksilver mine near Tierra Nueva have begun. A 15-ton furnace is in course of construction.

SINALOA

Palmarito—An order for a 20-stamp mill, tube mills and cyanide equipment has been placed for these mines near Mocorito.

SONORA

Greene-Cananea—Preliminary work on a new reverberatory furnace has been started by this company.

Santa Fe—Encouraging returns were received from a recent experimental shipment. The deepest shaft is 356 feet.

South Tigre—This company, in the Moctezuma district, shipped its first car of gold-silver ore to the Douglas smeltery recently.

Minneapolis Copper Company—Plans have been drawn for a 50-ton Partridge smeltery to be placed near the company's Archipelago mine. Thomas West is manager.

Espiritu Santo Gold Mining Company—The supreme court of Mexico rendered a decision in the suits that have retarded work for over two years, granting every contention of the shareholders. Work will be resumed in March.

Asia

KOREA

Oriental Consolidated—Cabled advices report that the January cleanup was $126,800.

Australia

QUEENSLAND

The gold return for December shows a total of 42,200 oz. This makes for the year 1909 a total of 450,937 oz. fine, or $9,320,868; being a decrease of 10,422 oz., or $215,423, as compared with the preceding year.

South America

BRAZIL

Fifty-two outcrops of hematite have been examined in Minas Geraes. These deposits were estimated to contain 12,000,000,000 tons of ore containing 60 to 75 per cent. iron. In connection with the development of iron and steel industries. Marcellimo de Souza Aguiar, general of engineers, has just arrived in Europe with a view to studying these trades in the principal centers, and also in the United States.

COLOMBIA

A consular report from Barranquilla states that a Canadian company, which has been at work six miles from Puerto Colombia, has found oil at a depth of less than 1000 ft. The oil has a paraffin base and is of good quality.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Feb. 23—In the East the bituminous coal trade is affected considerably by short car supply and delays in transportation. There is a tendency to improvement, but it is hindered by uncertain deliveries. The anthracite trade is steady and without incident.

In the West the wage scales are the chief topic. Trade has been kept up by the demands of the railroads and other arge consumers, who are accumulating stocks of coal, to provide against a possible stoppage of mining in April. Car supply is causing some trouble, but it s much better than on the eastern lines. Current trade continues generally good, especially for steam coals.

The Anthracite Trust Case—The hearng in the Government suit against the alleged Anthracite Trust began in the Circuit Court at Philadelphia this week. The proceedings will probably take some ime.

COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, month of January, short tons:

	1909.	1910.	Changes.
nthracite........	1,007,890	1,045,274	I. 37,384
Bituminous......	3,010,696	3,624,729	I. 614,033
Coke..............	863,353	1,413,157	I. 549,804
Total............	4,881,939	6,083,160	I. 1,201,221

The total increase in tonnage this year was 24.6 per cent.

The Southwestern Interstate Coal Operators' Association reports shipments for November as below, in short tons:

	1908.	1909.	Changes.
Missouri..........	264,488	289,107	I. 24.619
Kansas...........	512,590	568,354	I. 55,764
rkansas.........	211,327	256,432	I. 45,105
Oklahoma........	313,407	264,279	D. 49,128
Total...........	1,301,812	1,378,172	I. 76,360

The only decrease noted was in Oklahoma. The total gain in 1909 was 5.9 per cent.

New York

ANTHRACITE

Feb. 23—There is no special movement n the anthracite trade. Business is steady and the movement of coal is asier.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.85@2; barley, $1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Car supply is the burning question still in the seaboard bituminous trade. It varies on different roads, but only in degree; it is nowhere good, and mines are unable to make the deliveries that are needed. Transportation has been slow and irregular, so that tidewater deliveries are highly uncertain.

Business seems to be improving a little, both from the Sound and in New York harbor. The Far East is not in evidence yet, but will soon be coming into the market. All-rail trade is as good as car supply will permit. Prices are unchanged, fair grades of steam coal selling about $2.60 at New York harbor points. Better grades bring up to $3, but are not much in demand.

Talk about yearly contracts, which usually run from April, has begun, but not much has been done. Consumers want to retain the low rates of 1909 contracts as a rule.

The coastwise trade is unchanged, except that vessels are in a little better supply and more willing to charter. The current rate is 85@90c. from New York to points around the Cape.

Birmingham

Feb. 21—The coal production in this State continues heavy. There is a big demand on and no intimation is given that a cessation of operations in the least is proposed in the near future. There is need of miners in the Alabama coalfields. Agents are still working in adjoining States in quest of men. No effort is being made to bring in foreigners on a large scale to do mining work.

No change in the coke situation is to be reported. The production is holding its own right along with a demand for the entire output.

Chicago

Feb. 22—Under the stimulus of colder weather the coal market has revived in the last week, the demand for domestic kinds being strengthened. There is little prospect of continuance of this strength, however, for the market changes with the thermometer. The domestic market is a falling one from now until the April discounts on anthracite begin. Steam sales, however, continue heavy, and seem bound to increase with the expansion of general business. Transportation conditions are such that an abundance of coal may be counted on, barring extraordinary weather, until mild weather becomes permanent. Shipments to this market, therefore, should be cautiously made, or there will be again overstocking of the market and forced sales at profitless prices.

Illinois and Indiana lump are weakening slowly, bringing now $2@3; run-of-mine is in relatively strong demand, at $2@2.35, and screenings continue in abnormally large demand for the time of the year, at $1.60@2 per ton.

Eastern coals show little change in prices, smokeless being still in somewhat too large supply for the maintenance of firm prices, lump bringing $3.65@3.90 and run-of-mine $3.30@3.40. Hocking is steady and well regulated at $3.15. Anthracite is selling a little more freely, though orders are of small size.

Cleveland

Feb. 21—Coal trade is active, as large consumers have begun to stock up in preparation for contingencies, while current consumption continues good. Cars are scarce and railroad transportation poor, so that deliveries are much delayed.

Lake rates for next season are about settled at 30c. to the head of the Lakes and 35 or 40c. to Chicago and Milwaukee.

Prices are about the same as last week. There are reports of premiums paid to secure certain deliveries, and there is little doubt that advances have been offered where the coal is badly needed.

Indianapolis

Feb. 23—The tendency to accumulate coal by large consumers continues, and mines have orders enough to keep them on full time. The railroads are also looking out for reserve stocks. There is some complaint about car supply, and shipments are rather irregular. Active discussion over the new wage scales is still going on, but no new step has been taken toward a further conference.

Pittsburg

Feb. 22—A convention of miners from Pennsylvania, Ohio, Indiana, Michigan and possibly Illinois will be held in Cincinnati tomorrow (Wednesday) to issue a call for a new joint conference of miners and operators to discuss a wage scale. The situation has become quite complicated, and the trend seems to be in the direction that whatever may be said, both parties will actually desire to bring about a suspension of mining for a month or so. Already there is some tendency on the part of consumers to stock up, using coal from nonunion districts. The bad weather has produced a decided shortage of coal all along the lakes from Detroit to Buffalo. The car supply in the Pittsburg district has been very bad the past fortnight, and normal shipments have hardly been maintained. Prices are firm and unchanged; mine-run and nut are $1.15; ¾-in., $1.25; domestic 1¼-in., $1.40; slack, 85@90c. per ton.

Connellsville Coke—The market has shown no activity, nor could any be expected. Prices are purely nominal, and are quotable roughly at $2.25 for furnace and $2.75 for 72-hour foundry, but these figures could doubtless be shaded.

A meeting of a number of operators was held in Pittsburg, Feb. 19, to discuss a central selling agency. There does not seem to be any possibility of such a movement being a success.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Feb. 12, at 466,344 tons, and shipments at 4875 cars to Pittsburg, 8369 cars to points west of Pittsburg and 875 cars to points east of Connellsville, a total of 14,119 cars.

St. Louis

Feb. 21—The severest blizzard in many years swept over this part of the country this week. Tuesday night the weather turned very cold and was accompanied by a severe snow storm which lasted for nearly 48 hours. About 2 ft. of snow fell this time which is the heaviest fall in recent years. This was followed by a driving wind which drifted the snow 6 or 8 ft. deep in many places. Of course, this paralyzed traffic and for several days every mine in the district was shut down. In most instances the railroads were unable to deliver empties to the sidings and in the few instances where cars were already on the track snow had drifted so deep around the mine that operation was impossible.

This, of course, produced a shortage of coal and those whose stocks were low and who were depending on day-to-day shipments, found themselves in dire need; consequently spot coal rose as high as $2 per ton at mines. There was practically nothing mined from Wednesday until Saturday and consequently those who had coal in transit reaped a small harvest in these three days. While the weather has eased off somewhat and all the mines have been able to run today yet coal is still very short and prices are unusually stiff. If the weather is very warm in the next week there may be a slight easing off in prices. However, it is anticipated that weather conditions from now on will have no material effect on the market as the demand now is for railroad and storage coal.

Current quotations are as follows, the first being in each instance at the mines and the second f.o.b. St. Louis. Standard 6-in. lump $2 or $2.52; 2-in. lump $1.90 or $2.42; mine-run $1.50 or $2.02; 3-in. nut $1.50 or $2.02; nut and pea $1.40 or $1.92; screenings 75c. or $1.27; pea and slack 60c. or $1.12. Screenings for Chicago shipment are bringing $1.10 per ton mine, or $2 Chicago.

Springfield, Mt. Olive or Staunton 6-in. lump $2.10 or $2.62; 2-in. lump $2 or $2.52; mine-run, $1.60 or $2.12; screenings $1.10 or $1.62 per ton.

Franklin County 6-in. lump $2.20 or $2.87; 3-in. nut $2 or $2.67; 1¼-in. screenings $1.25 or $1.92.

Carterville 6-in. lump or egg $2 or $2.67; 3 to 2-in. nut $1.90 or $2.57; 1½-in. screenings $1 or $1.67.

The demand for anthracite is exceptionally good considering the lateness of the season. Stocks of anthracite coal are all low and it seems that there will be very little if any carried over till next season.

FOREIGN·COAL·TRADE

New South Wales Coal Strike—The strike difficulties in the New South Wales field are still unsettled, notwithstanding the action of the arbitration court, and the passage of a special law regulating strike conditions. While negotiations have reached a promising point several times, they have been broken off each time. The State government has imported several cargoes of coal from India for use on the government railroads.

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for the use of steamships in foreign trade, month of January, long tons:

	1909.	1910.	Changes.
Coal	4,308,635	4,183,230	D. 125,405
Coke	75,761	92,637	I. 16,876
Briquets	110,108	131,613	I. 21,505
Total exports	4,494,504	4,407,480	D. 87,024
Steamer coal	1,500,743	1,486,130	D. 14,613
Total	5,995,247	5,893,610	D. 101,637

The larger exports were 774,600 tons to France, 707,766 to Italy, 437,423 to Germany and 236,357 tons to Argentina.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Feb. 12: Best Welsh steam, $4.02; seconds, $3.96; thirds, $3.84; dry coals, $3.96; best Monmouthshire, $3.60; seconds, $3.48; best small steam, $1.92; seconds, $1.68. The market is easier. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Feb. 23—The iron and steel markets generally hold their waiting attitude, and new business has not been heavy. Contract specifications come in quite freely, as for some time past.

Pig-iron purchases in the West have again been on a moderate scale only. Buyers are, apparently, not willing to make larger commitments on the present scale of prices, while sellers have not come to the point of making concessions. In eastern territory also new buying is light, and the situation has been further disturbed by the fact that all the speculative southern iron has not been cleared off the market, and some of it is still offered at low prices. Some Virginia foundry has also been offered at concessions.

In finished material some small orders for railroad bridges and equipment have been placed; also some small orders for structural steel. There is some inquiry for trolley rails, with more in sight. Otherwise, new business has not been large.

There is much complaint of poor transportation, and of delays in delivery of material, owing to bad weather and railroad delays.

Great Northern Ore Royalties—The United States Steel Corporation in 1909 took only a small quantity of iron from the properties included in the Great Northern lease. The rental, consequently, was the minimum, which was 2,250,000 tons at 91.8c. per ton royalty. The amount, therefore, was $2,065,500 for the year.

Lake Freight Rates on Ore—The Cleveland *Iron Trade Review* says: "An understanding has been reached between shippers, dock operators and vessel owners regarding freight rates and handling charges for 1910. The vessels will get the same rate as prevailed in 1907, though not in quite the same way. The rate from the head of the Lakes will be 70c. as against 75c. paid in 1907, but unloading charges will be 15c. as against 20c., which has been paid for several years past. This is equivalent to a 75c. rate to the boat. The freight rate has, therefore, been marked up 5c. all around over last year's schedule, being now 70c. from the head of the Lakes, 65c. from Marquette and 55c. from Escanaba."

Birmingham

Feb. 21—Southern pig-iron manufacturers, despite the quiet market, are not offering any of their product, delivery during the balance of the year, under $14 per ton, No. 2 foundry. Some resale iron is to be had at scaled prices. There has been no change in the output and no addition was made to the accumulated stock last week. An opinion has been ex-ressed here that with prices down a lit-le more the buying would start up in eal earnest. There have not been many ales of iron made recently. Inquiries re coming in steadily. The foundries and nd machine shops in this section have a atisfactory line of orders in hand and a trong set of inquiries. The needs of hese interests are of large quantity. Cast-iron pipe makers in the Southern erritory report all prospects bright. It s not believed that the troubles of the Central Foundry Company, will in any nanner demoralize the pipe trade. As ar as can be learned, all deliveries by outhern pig-iron makers are up to contract. There are some troubles with ransportation facilities of raw materials hough no serious delays have been aused.

Baltimore

Feb. 22—Imports for the week included 250 tons manganese ore from Brazil, nd 11,100 tons iron ore from Cuba. Exorts included 112,000 lb. lead to Antwerp; 1498 tons steel rails to Guaymas, Mexico.

Chicago

Feb. 22—The iron market continues ull, with signs of weakness in the reorted general selling of No. 2 Southern t $13.50 Birmingham, or $17.85 Chicago. gainst this is Northern of the same rade at $19@19.50, making Southern referable by nearly $1 where either kind an be used. Most Southern furnace gents are making an effort to hold up rices, but the situation has become one hat calls for the moving of pig iron at ome price. Foundrymen are still in the aiting mood; they buy in small lots for he needs of the second quarter. Such ales as extend into the third quarter r over the second half are few but ometimes at prices 50c. above the lowst quotations. That melters are generally pprehensive of a condition of overprouction seems to be the case, and in this rame of mind they will buy only cauously until their idea is removed. Conumption of pig iron continues large and here are no signs that it will be sudenly checked.

Sales of iron and steel products ontinue good. Coke is sluggish at 5.50 for the best Connellsville.

Cleveland

Feb. 21—There has been no buying of on ore, although it is believed that furaces are not fully supplied yet. Buyers re waiting.

Pig Iron—The Steel Corporation purhase puts the price of bessemer pig at 18.90 Cleveland, which is more in corespondence with the price of other rades. There seems to be no disposition o reduce prices on basic and foundry, hough there has not been buying enough o test the market.

Finished Material—There is little new buying, but specifications on contracts keep most mills busy. About the only business has been in plates and shapes, which have been taken on the basic of 1.55c., Pittsburg.

Philadelphia

Feb. 22—As to inquiries for pig iron for the past week there were very few and there is no sign today of any early improvement. Leading makers and brokers report a generally quiet condition and less disposition to buy for future delivery. More interest is being shown by some of our people in Southern iron. It is known that offers have been made by certain large consumers, particularly for foundry iron, and it is believed that negotiations will result in the sale of considerable outside iron in its market. Basic iron is again in demand for early delivery. Users of basic iron feel that the situation warrants and will result in an ultimate reduction. Forge is offered at $17.50; Northern No. 2 X at $19, and basic at $18.50 per ton.

Steel Billets—The market for billets is quiet. Prices are firm.

Bars—Orders flow in with encouraging regularity. Car builders have been quiet buyers for summer deliveries.

Plates—The market has been unusually quiet.

Scrap—The dealers have been aroused from their drowsiness by a few large buyers of heavy scrap and No. 1 yard scrap who took a good share of the immediately available supply of one or two yards.

Pittsburg

Feb. 22—The trend in the iron and steel market is generally unfavorable. Pig iron has continued to weaken in a very clear manner, while finished-steel prices do not strengthen, and here and there show slight additional weakness; wire products, which have been shaded $2 to $3 a ton, being joined by plates and shapes, which are being shaded $1 a ton by Eastern mills, although the Pittsburg and Western markets are reported firm.

Pig Iron—Word has been quietly passed around that $18, Valley, is to be maintained on bessemer pig iron for the present and that any holder feeling nervous will be taken care of. An inquiry is just out for 3000 tons for equal deliveries March to June, inclusive, which will likely develop the situation. Basic is nominally $16.50, Valley, being offered at that figure by several sellers, but two or three forced sales have been made in the past two or three weeks at less. They do not represent the market. Several thousand tons have lately been offered at $16, Valley, but this hardly represents the market either. Strictly speaking, there is none. Consumers are holding off strictly, although they will need to buy some large tonnages within a short time, and the complexion of the market may change over night. A sale of 500 tons of No. 3 foundry iron has just been made for prompt delivery, at $15.45, Valley. The market is quotable roundly at $16.25@16.50 for No. 2. Consumers regard pig iron as too high, considering present conditions as calling for as low prices relative to production cost as were made in May and June of last year and October, 1908, when basic and foundry iron got down to $14 or $14.25, Valley. Coke adds perhaps 50c. to those prices, but ore adds nothing, as last season's ore will run the furnaces for months to come. New ore, at the 50c. advance, has not sold freely, except bessemer grades. There has been a large increase in the inquiry for pig iron in the past 10 days, but it is noticeable that it is going most largely to the occasional operators who handle speculative and resale iron and the indication is that consumers are merely looking for bargains.

Steel—The market for unfinished steel is purely nominal, former prices remaining because no new demand of importance has appeared. We repeat former quotations of $27@27.50 on bessemer billets, $27.50@28 on open-hearth billets, $28.50@29 on sheet-bars and $33 on wire rods, all f.o.b. maker's mill, Pittsburg or Youngstown districts.

Ferromanganese—The market continues weak and slow, quotable at $43.50, Baltimore, for prompt and $44@44.50 for extended delivery, freight to Pittsburg being $2.30 per ton.

Sheets—The market for ordinary black and galvanized sheets and corrugated roofing has become very dull. One mill in the Mahoning valley is reported down and another running part capacity. There is a good demand for specialties, like electrical sheets, stamping sheets, etc. Prices are maintained, but there are no premiums whatever on regular stock with the exception of blue annealed, and even in that case the premiums are less in evidence. We continue to quote black sheets at 2.40c. and galvanized sheets at 3.50c., with corrugated roofing at $1.70 per square for painted and $3 for galvanized. The official price of blue annealed is 1.75c., 10 gage, and slight premiums are sometimes obtainable over this figure for prompt delivery.

St. Louis

Feb. 19—The pig-iron market is showing some activity now and a number of inquiries have been received. More interest is being shown this week than has been for some time. While prices at $15 Birmingham or $18.75 St. Louis for No. 2 foundry are nominally being held, yet some concessions of 50c. per ton are being made which is probably responsible for the additional interest shown this week.

METAL · MARKETS

New York, Feb. 23—The metal markets continue quiet and uninteresting, with no change in the situation from recent reports.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1910..	$ 6,163,132	$ 2,131,357	Exp. $ 4,031,775
" 1909..	7,865,356	3,420,183	" 4,545,173
Year 1910..	6,163,132	2,131,357	" 4,031,775
" 1909..	7,865,356	3,420,183	" 4,445,173
Silver:			
Jan. 1910..	4,498,304	4,248,354	Exp. 249,950
" 1909..	4,542,094	3,664,752	" 877,342
Year 1910..	4,498,304	4,248,354	" 249,950
" 1909..	4,542,094	3,664,752	" 877,342

Exports from the port of New York, week ended Feb. 19: Gold, $525,200, chiefly to Argentina; silver, $1,046,354, principally to London. Imports: Gold, $37,273; silver, $56,851, from the West Indie and South America.

Gold and silver movement in Great Britain, year ended Dec. 31:

	Imports.	Exports.	Excess.
Gold	£54,691,829	£47,249,536	Imp. £7,442,293
Gold, 1908...	46,146,314	49,969,099	Exp. 3,822,785
Silver	11,814,889	12,785,182	Exp. 970,293
Silver, 1908.	10,326,889	13,283,888	Exp. 2,956,999

Of the silver imported in 1909 a total of £9,966,146 was from the United States.

Gold—The price of gold on the open market in London was a little firmer at 77s. 9⅛d. per oz. for bars and 76s. 5d. per oz. for American coin. In New York the outward gold movement was resumed, $1.250,000 having been taken for shipment to Argentina.

Platinum—The market is quiet, but steady. Dealers continue to quote $28.50@29 per oz. for refined platinum, and $34.50 per oz. for hard metal.

Our special correspondent writes from St. Petersburg, under date of Feb. 3, that the market has sensibly improved and demand is good. At Ekaterinburg 5.80 rubles per zolotnik—equal to $21.81 per oz.—is quoted for crude metal, 83 per cent., platinum, but offers at this price are small. In St. Petersburg, late in January, 4 poods of crude platinum were sold at 23,500 rubles per pood; but later dealers advanced their prices to 24,000@24,500 rubles per pood—average, $23.77 per oz. These prices are subject to negotiation.

Silver—The market has remained steady, but without much animation. China banks have both bought and sold. Prices close firm at 24d. in London.

SILVER AND STERLING EXCHANGE

Feb.	17	18	19	21	22	23
New York...	[illegible]	52	[illegible]	52		52
London...	[illegible]	24	[illegible]	24	[illegible]	24
Sterling Ex.	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]

New York quotations, cents per ounce troy fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Feb. 10, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£ 519,560	£1,061,400	I. £ 541,840
China........	80,000	202,000	I. 122,000
Straits.......	61,000	......	D. 61,000
Total......	£ 660,560	£1,263,400	I. £ 602,840

India Council bills in London sold at an average of 16.09d. per rupee.

Copper, Tin, Lead and Zinc

Feb.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
17	13⅝@13¾	13¼@13⅜	59	33⅜	4.50@4.60	4.35@4.40	5.25@5.30
18	13⅝@13¾	13¼@13⅜	59⅛	33¼	4.50@4.60	4.35@4.40	5.25@5.30
19	13⅝@13¾	13¼@13⅜	....	33¼	4.50@4.60	4.35@4.40	5.25@5.30
21	13⅝@13¾	13¼@13⅜	59⅜	33⅛	4.50@4.60	4.35@4.40	5.25@5.30
22	......	......	....	....	......	......	.....
23	13⅝@13¾	13¼@13⅜	59⅜	33	4.50@4.60	4.35@4.40	5.25@5.30

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has continued quiet and dull. Manufacturers both here and abroad are busy and are believed to be not well covered ahead, but new orders for the moment are not coming in so fast as they were early in the year and the manufacturers have consequently been holding back. A fair business was done during the week Feb. 17-23 with domestic manufacturers, who bought electrolytic at 13½c., delivered, 30 days, and a shade under. Sales for foreign delivery were naturally small under the existing circumstances, but some were made at prices netting less than current quotations. Transactions in Lake copper were insignificant. The market closes at 13⅝@13¾c., for Lake, and 13¼@13⅜c. for electrolytic in cakes, ingots and wirebars. Casting copper is quoted nominally at 13⅛@13¼ for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill.

The London standard market has fluctuated within narrow limits, but the general tendency has been firm. The market closes at £59 7s. 6d. for spot, and £60 5s. for three months.

Refined and manufactured sorts we quote: English tough, £63; best selected, £63@£63 10s.; strong sheets, £73@£74 per ton.

Copper exports from New York and Philadelphia for the week were 4513 long tons. Our special correspondent gives the exports from Baltimore at 2439 tons copper.

Tin—The London market, although transactions have been fairly large, has remained stationary. Extreme fluctuations did not amount to more than about 10s. The close is cabled as easy at £151 10s. for spot, and £152 17s. 6d. for three months.

The feature of the New York market was the readiness at which dealers were offering and selling futures at a considerable discount from import prices. Consumers are, however, as yet not showing any interest in the metal. At the close quotations are made at about 33c. per pound.

Tin output of the Federated Malay States in January was 4382 long tons in 1909, and 3599 in 1910; a decrease of 783 tons.

Messrs. Robertson & Bense report receipts of Bolivian tin ore (concentrates) at Hamburg, Germany, in January at 643 long tons; 408 tons direct and 335 tons through other ports.

Lead—The market remains dull and without special feature. There has been no change in prices, and the close is quoted at 4.35@4.40c. St. Louis, and 4.50@4.60c. New York.

The London market for Spanish declined to £13 5s, and English lead is quoted at £13 7s. 6d. per ton.

Spelter—The market is quiet and demand continues poor. Stocks of the metal and also of the ore continue to increase. It closes dull at 5.25@5.30c. St. Louis, and 5.40@5.45c. New York.

New York quotations for spelter Feb. 17-23, inclusive, were 5.40@5.45 cents.

The London market is unchanged, the close being cabled at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc is $7.50 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market continues quiet, with only a small business transacted. Cookson's is unchanged in price at 8½c. per lb. Other sorts are weaker, U. S. at 7⅞@8c., while 7⅜@7⅝c. is named for outside brands.

Aluminum—The market is active and improving. The cheap lots recently offered from second hands seem to have been pretty well cleared out. Quotations are accordingly stronger, at 22¼@23½c. for No. 1 ingots. Abroad prices are still improving; large producers are generally well sold up, and are unwilling to quote for future deliveries.

Quicksilver—The market has a stronger ne, but prices are unchanged. New ork quotations are $50 per flask of 75 . for large lots. Jobbers ask 70c. per . for small quantities. San Francisco, 49@50 for domestic and $2 less for export orders. The London price is £9 10s., ith jobers selling at £9 7s. 6d. per ask.

Nickel—Large lots, contract business, @45c. per lb. Retail spot, from 50c. r 500-lb. lots, up to 55c. for 200-lb. ts. The price for electrolytic is 5c. gher.

Magnesium—The price of pure metal $1.50 per lb. for 100-lb. lots f.o.b. ew York.

Cadmium—Current quotations are 65 70c. per lb. in 100-lb. lots at Cleveland, hio. In Germany 450@475 marks per 0 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Feb. 19—Buyers of gh-grade zinc ore did not enter the mpetitive market during the week; producers, on the other hand, were not keen sell. Medium grades sold on a basis $38 per ton of 60 per cent. zinc. No les of lead ore are reported. Additional ills have closed down because of the deine in the zinc market, while a number others about to resume after the recent coal famine have postponed the te.

SHIPMENTS, WEEK ENDED FEB. 19.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
neral Point	613,100	....	....
nton	310,600	68,440	....
ghland	185,300	.....	....
ba City	168,870	....	....
wey	84,600	....	....
otal	1,362,470	68,440	....
ar to Feb. 19	11,113,590	906,169	1,942,050

In addition to the above there was ipped to the separating plants 2,090,-0 lb. zinc concentrates during the week.

Joplin, Mo., Feb. 19—The highest price id for zinc sulphide ore was $42.50, base being $38@40 per ton of 60 r cent. zinc. The highest price paid r zinc silicate ore was $28, on a base $19@24 per ton of 40 per cent. zinc. e average price, all grades, was $37.56. e highest price bid for lead ore was 4 on this week's purchases, but a large rtion of the week's shipment was setd for on prices bid last week, and for is $55@55.50 per ton was paid. The erage price, all grades, was $52.80 per .

The shipment is one of the lightest in ars, the heavy drifting snow that fell rly in the week making loading on the rs almost an impossibility. Buyers re busy this week, and there is little any ore in the district that has not had bid of a $40 base placed upon it this ek.

SHIPMENTS WEEK ENDED FEB. 19.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,412,170	905,320	$ 92,233
Joplin	842,640	67,660	19,488
Galena	703,170	26,070	14,675
Duenweg	394,590	160,250	12,137
Miami	534,780	174,480	10,418
Alba-Neck	451,920	.....	9,490
Granby	476,560	14,650	6,775
Badger	303,050	......	6,364
Oronogo	195,550	128,630	5,966
Spurgeon	188,270	67,980	4,025
Aurora	167,180	......	3,343
Quapaw	131,080	.....	2,621
Cave Springs	113,000	......	2,147
Stott City	74,850	......	1,497
Carl Junction	65,970	......	1 385
Sarcoxie	60,330	......	723
Wentworth	40,000	.....	720
Seneca	......	18,000	455
Totals	8,155,110	1,563,040	$194,462
8 weeks	79,115,790	14,277,960	$2,112,702

Zinc value, the week, $153,187; 8 weeks, $1,711,581
Lead value, the week, 41,275; 8 weeks, 401,121

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	......	34.37	......	50.50	......
March	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, Feb. 23—The general market is not active, but not at all weak, and the tone is good in most lines.

Copper Sulphate—The market is firm and there is no deviation from recent prices, which are $4.10 per 100 lb. for carload lots, and $4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—Quotations are steady at 2.10c. per lb. for spot and 2.07½c. for futures. Sales are reported better than for some time past.

Arsenic—No sales of any importance are noted, business being rather of a retail character. Prices are unchanged at $2.50@2.75 per 100 lb. for white arsenic.

Potash Salts—Exports of potash salts from Germany for the year ended Dec. 31 are reported as below, in metric tons:

	1908.	1909.	Changes.
Kainit, kieserit, etc.	818,677	946,515	I. 127,838
Potassium chloride	174,345	219,870	I. 45,525
Potassium sulphate	48,807	63,107	I. 14,300
Pot.-magnesium sul.	133,168	138,347	I. 5,179
Total	1,174,997	1,367,839	I. 192,842

The total increase in 1909 was 16.4 per cent. The total exports to the United States, included above, were 551,144 tons in 1908, and 700,558 in 1909; increase, 149,414 tons, or 27.1 per cent.

MINING·STOCKS

New York, Feb. 23—The slow and partial revival in the general stock market was broken by a holiday yesterday. It can hardly be called a revival, for prices have been halting and irregular for the most part, though the heavy liquidation of the previous week is over. On the surface changes have turned largely on the probable decision of the Supreme Court in the Tobacco Trust case, and on other action at Washington.

The Curb has been weak and irregular with moderate fluctuations in the copper stocks, and an inclination to weakness. Other mining stocks were not especially active, really rather slow.

Boston, Feb. 22—Copper stocks have maintained a firm tone and are slightly above the prices of a week ago. The Lake issues still stand in the lead and there has been a quiet absorption of same, particularly of Lake Copper stock. The price of this specialty was $80.75@84. The extreme high awhile ago was just above $94., while a setback followed to $60, so that it can be seen that the recovery has been of good proportions. There is very little floating stock on the market and apparently there are some strong believers in the ultimate value of the property.

Official announcement that the Utah Consolidated dividend was to be passed had little effect on the price of the shares as such action had been pretty effectually discounted. Accumulation seems to be going on in Parrot, although little evidence is seen in the market price of the stock.

North Butte after a $2.25 break to $31.75 rallied to $36.25. There is less pressure in this stock, even though it is generally expected that the next dividend will be reduced if not passed altogether.

Amalgamated had an extreme rise of $2.25 to $77.25, reacting to $76. The transfer of this stock from the unlisted department of the Stock Exchange to the regular list ought to have a reassuring effect. Other strong stocks have been North Lake and U. S. Smelting.

Assessments

Company.	Delinq.	Sale.	Amt.
Bader, Cal	Feb. 24	Mar. 14	$0.10
Belcher, Nev	Mar. 9	Mar. 29	0.10
Bullion, Nev	Jan. 11	Mar. 1	0.05
Caledonia, Nev	Feb. 16	Mar. 9	0.10
Challenge Con., Nev	Feb. 17	Mar. 10	0.10
Chollar, Nev.	Mar. 8	Mar. 28	0.10
Crown Point, Nev	Mar. 8	Mar. 28	0.10
Hale & Norcross, Nev	Mar. 9	Mar. 31	0.10
Julia Con., Nev	Feb. 17	Mar. 10	0 03
King Philip Copper, Mich.	Mar. 10	... ...	1.00
Mexican, Nev	Feb. 21	Mar. 17	0.15
New Arcadian, Mich	Mar. 10	....	1.00
Ojibway, Mich	Mr.Oct.	....	2.00
Oneco, Mich	Feb. 15	....	1.00
Rexall S. & C., Utah	Feb. 13	Mar. 15	0.01
Savage, Nev	Feb. 10	Mar. 8	0.10
Seg. Belcher, Nev	Mar. 8	Mar. 28	0.10
Union, Nev	Mar. 7	Mar. 31	0.10
Wabash, Utah	Feb. 21	Mar. 15	0.05
Western Monitor, Utah	Feb. 1	Mar. 1	0.00½
Winona, Mich	Mar. 10	... .	1.00
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Curb trading showed slight setbacks during the week with later general recoveries. Boston Ely broke $1.25 to $3.50 after a rather rapid advance. Bohemia continues weak while Live Oak rose $2.75 to $21. South Lake, Chino and Oneco continued firm.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II, 1909	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672

VISIBLE STOCKS.

	United States.	Europe.	Total.
II, 1909	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	......	23.706	......
March	50.468	......	23.227	......
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52..38	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949		13.295		57.688	......
March	12.387		12.826		56.231	
April	12.56[illegible]		12.93[illegible]		57.363	
May	12.893		13.238		59.338	
June	13.214		13.518		59.627	
July	12.880		13.363		58.556	
August	13.007		13.296		59.393	
September	12.870		13.210		59.021	
October	12.700		13.030		57.551	
November	13.125		13.354		58.917	
December	13.298		13.647		59.906	
Year	12.[illegible]		13.335		58.732	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	......	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	......	3.868	......	13.313	......
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	......	4.739	......	21.563	......
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	......	16.09	......	15.90	......
March	16.40		15.84	......	15.62	......
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Feb. 21

Name of Comp.	Bid.
Listed:	
Acacia	.05⅝
Cripple Cr'k Con.	.02¾
C. K. & N.	10
Doctor Jack Pot	.08
Elkton Con	68⅝
El Paso	67½
Fannie Rawlins	06
Findlay	.10
Gold Dollar	.10½
Gold Sovereign	.03¾
Isabella	.17
Mary McKinney	.46
Pharmacist	03
Portland	1 03
Vindicator	80
Work	06
Unlisted	
Golden Cycle	1 50
United Gold Mines	08½

SALT LAKE Feb. 21

Name of Comp.	Clg.
Carisa	.56
Colorado Mining	.80
Columbus Con.	.83
Daly Judge	3.25
Grand Central	1.72½
Iron Blossom	86
Little Bell	1 62½
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	1.92½
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.50
New York	‡.13
Prince Con	‡.78
Red Warrior	‡6.00
Silver King Coal'n	2.50
Sioux Con	.35
Uncle Sam	.40
Victoria	1.10

SAN FRANCISCO. Feb. 21.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.15	Belmont	1.60
Belcher	1.20	Jim Butler	.11
Best & Belcher	.75	MacNamara	.27
Caledonia	.82	Midway	.26
Challenge Con.	.44	North Star	.03
Chollar	.26	West End Con.	.29
Confidence	‡1.50	Atlanta	.15
Con. Cal. & Va.	1.70	Booth	.15
Crown Point	1.20	C.O.D. Con.	.05
Exchequer	.28	Columbia Mt.	.05
Gould & Curry	.34	Comb. Frac.	.30
Hale & Norcross	.56	Goldfield Belmont	‡.90
Mexican	1.70	Goldfield Daisy	...
Ophir	2.05	Jumbo Extension	.30
Overman	.92	Oro	.06
Potosi	.69	Red Hill	.05
Savage	.56	Sandstorm	.03
Sierra Nevada	.72	Silver Pick	.09
Union	.81	St. Ives	.10
Yellow Jacket	1.35		

N. Y. EXCH. Feb. 21

Name of Comp.	Clg.
Amalgamated	76⅛
Am. Agri. Chem.	46½
Am.Sm.&Ref.,com	83½
Am. Sm. & Ref., pf.	107½
Anaconda	49⅞
Bethlehem Steel	28
Col. & Hock. C. & I.	20⅛
Colo. Fuel & Iron.	39½
Du Pont P'd'r, pf.	85
Federal M. & S.	81
Great Nor., ore ctf.	70
Nat'nal Lead, com.	81¼
National Lead, pf.	108
Pittsburg Coal	20¾
Republic I&S, com.	39⅛
Republic I & S, pf.	101⅝
Sloss Sheffi'd, com.	76
Sloss Sheffield, pf.	‡118
Tennessee Copper	32⅝
Utah Copper	49¼
U. S. Steel, com.	80½
U. S. Steel, pf.	120
Va. Car. Chem.	54¾

N. Y. CURB Feb. 21

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19½
Braden Copper	4½
B. C. Copper	7
Buffalo Mines	3½
Butte Coalition	24
Chino Copper	13⅝
Cobalt Central	.22
Combination Fra.	.32
Con. Ariz. Sm.	2 13/16
Cumberland Ely	9
Davis-Daly	3⅜
Dominion Cop.	7
Ely Con	⅞
El Rayo	2½
Florence	3⅛
Gila Copper	8½
Giroux	10
Gold Hill	1¾
Goldfield Con.	7⅝
Greene Cananea	9¾
Guanajuato	1¾
Guggen. Exp.	225
Kerr Lake	.09¼
La Rose	4½
McKinley-Dar-Sa.	.83
Miami Copper	24
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1 7/16
Newhouse M. & S.	‡3½
Nipissing Mines	10¼
Ohio Copper	4⅛
Pacific Sm. & M.	1 1/16
Silver Queen	.20
Standard Oil	625
Stewart	½
Tonopah	6⅞
Tonopah Ex.	.68
Tri-Bullion	15/16
Utah Apex	‡5⅛
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4 7/16

LONDON Feb. 23

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	7	6
Esperanza	2	18	9
Tomboy	0	17	6
El Oro	1	8	6
Oroville	0	10	0

BOSTON EXCH. Feb. 21

Name of Comp.	Clg.
Adventure	8¼
Allouez	53
Am. Zinc	30½
Arcadian	7
Arizona Com.	38½
Atlantic	9
Boston Con.	19¼
Calumet & Ariz.	71
Calumet & Hecla.	630
Centennial	26
Con. Mercur	.10
Copper Range	77
Daly-West	8
East Butte	9⅝
Franklin	20
Greene-Can.	9½
Hancock	27
Isle Royal	22½
Keweenaw	4½
La Salle	16¾
Mass	7
Michigan	6
Mohawk	65
Nevada	22¾
North Butte	35
Ojibway	9½
Old Dominion	44¼
Osceola	151½
Parrot	20¼
Quincy	89
Shannon	15
Superior	57½
Superior & Bost.	13½
Superior & Pitts.	13⅞
Tamarack	73
Trinity	8½
U. S. Smg. & Ref.	45
U.S.Sm. & Re., pd.	50
Utah Con.	31
Victoria	4
Winona	9½
Wolverine	141
Wyandotte	2¾

BOSTON CURB Feb. 21

Name of Comp.	Clg.
Ahmeek	210
Bingham Mines	‡2¾
Boston Ely	3¾
Calaveras	5¾
Champion	.07
Chemung	‡12
Chief Cons.	2⅝
Chino	13⅜
Corbin	.09⅞
Cactus	4⅝
Crown Reserve	3¾
First Nat. Cop.	4¾
Gila Copper	8½
Indiana	‡34½
Inspiration	8⅝
Majestic	1
Ray Central	3⅜
Ray Con.	‡21⅝
Rawhide Coal	.16
Rhode Island Coal	10
San Antonio	8⅜
South Lake	12¾
Trethewey	‡1¾
Vulture	9⅝
Yuma	1 7/16

ST. LOUIS Feb. 19

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.08	.07
Center Cr'k	1.75	1.50
Cent.C.&C.	84.00	83.00
C.C. & C. pf.	83.00	82.00
Cent. Oil	111.00	100.00
Con. Coal	20.00	18.00
Doe Run	105.00	100.00
Gra. Bimet	.25	.20
St. Joe	12.00	11.00

‡Last quotation.

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**Illustrated.*

The Indian Tax on Silver

A wholly unexpected turn in the silver market came this week, when the Indian government announced that the duty on silver imported into that country would be increased on March 1 from 5 per cent. in the value of the metal to 4 annas per troy ounce. At current exchange the anna is worth about 2c., so that the new duty is very nearly 16⅔ per cent. The immediate effect of the announcement was a drop of 1½c. per oz. in the price of silver, and the anticipation of a further fall.

The price of silver is regulated by the Indian demand, which absorbs between 50 and 60 per cent. of the silver production of the world. A sudden advance in the price of the metal in India is sure to produce a check in this demand, although a gradual rise will have little effect, provided conditions are good, as they have been in India for some time past. For this reason it is probable that the fall in prices will not reach the full extent of the increased duty; it may go a cent or two further, but it may also be followed by a partial recovery. Much depends on the spring crops in India; a good season will increase the buying power of the people, or a poor one diminish it.

The unsold stocks of silver in India are not believed to be very large. On the other hand, Chinese stocks are large and there has been some apprehension that the Chinese banks would send considerable quantities of the metal to India in settlement of rice bills and other accounts payable. It is possible that this may have had something to do with the advance in the duty. No explanation has been given by the government so far for the imposition of the higher tax, and we do not know whether it was done for revenue purposes only, or for other reasons. Its chief interest to us is in the way in which it will affect our own producers.

The decline in the value of silver affects the silver-lead smelting companies in two ways: First, by depreciation of the large stock in ore and base bullion that is necessarily carried at all times; second, by restricting the ore supply, in the smelting of which profits are chiefly derived. The custom smelter reckons that fluctuations in metals will balance in the long run. This generally happens unless some radical change in conditions, such as the close of the Indian mints in 1893, precipitates a metal to a new low level from which it does not materially recover.

However, except for such a cataclysm, the effect of a decline in silver is apt to be overestimated. Taking the American Smelting and Refining Company as an example, it probably has about 20,000,000 oz. of silver in ore, etc., at all times. A decline of 1c. per oz. corresponds to $200,000 on this stock. The recent decline may or may not be recovered; it is probable that at least a part of it will be. Moreover, silver is not the chief metal handled by the American Smelting and Refining Company, nor is it a large producer in the proper sense, its function being chiefly that of the broker or middleman. It may suffer seriously, however, by a decline in silver which restricts production of ore by other interests and consequently subtracts from the supply offered to the smelting company. Of late the supply of ore, particularly in Colorado and Utah, appears to have diminished, and any decline in silver which promises to extend over a long period will inevitably increase that tendency.

Accidents in Metalliferous Mining

In his contribution published in this issue of the JOURNAL Mr. Hoffman has done a real public service. For a long series of years there was no summary of the accidents occurring in coal mining in the United States, except those prepared by Mr. Hoffman and published annually in the JOURNAL. In the recent direction of attention to this important subject, all investigators have been obliged to revert to Mr. Hoffman's work, for which proper credit has not been given to him.

The same kind of reports for metalliferous mining has heretofore been lacking. When a few months ago we requested Mr. Hoffman to take up this matter he responded with alacrity and the present paper is the result. The deficiencies of this report are frankly recognized by Mr. Hoffman. He has made the most out of the data available, but unfortunately, to the discredit of our mining industry, the available data are scanty. For only six States has it been possible to secure statistics extending over a long series of years. The other States do not report them. Consequently, the figure finally reached by Mr. Hoffman must be regarded as indicative rather than as absolute.

The probability is, however, that the actual ratio of fatal accidents in metal mining is larger than the figure reported by Mr. Hoffman, because his figure is based chiefly upon the States which have provided the best mining laws and the best systems of mine inspection. The good of these things is clearly shown by the statistics. Thus, in Colorado and Montana, which among the western States are conceded to have the best laws, the general tendency of the fatality ratio has been downward. We are led to believe that if those States and Territories like California, Nevada, Arizona, New Mexico and Utah, which have not had either adequate mining laws or systems of mine inspection, could be summarized in the same way, the general ratio of lives lost per 1000 men employed would be increased.

Anyway, Mr. Hoffman clearly establishes one thing, which formerly was not believed but lately has been strongly suspected, namely that the loss of life in metal mining in the United States is fully as great as in coal mining. Mr. Hoffman has arrived at the average of 3.09 per 1000 in metal mining, as compared with 3.13 in coal mining. Bearing in mind the condition that we have mentioned above and the fact that the statistics for coal mining are far more complete than for metal mining, we surmise that the loss of life in metal mining in the United States is actually larger, proportionally, than in coal mining. This emphasizes the importance of the work that is now being done by a committee appointed by the American Mining Congress in drafting a new and modern law governing metalliferous mining that will be recommended to the several States.

The Potash Salts Question

The regulation of the potash salts industry seems at last to be in a fair way to settlement, with due regard to the rights of holders of contracts in this country. It will be remembered that the old Kali-Syndikat was broken up last year, chiefly on account of the controversy arising from the purchase, through German representatives, of an important mine by an American company. Advantage was taken of the temporary cessation of the agreement by another American company, which made a contract for its supply at reduced prices, running over several years. The different mine operators finding it impossible to renew the old agreement, the Prusian government, which is itself a large owner and miner, intervened, and insisted on the formation of a new syndicate. After some discussion and many propositions—one being the imposition of an export tax on the products of the potash mines—it was agreed that the whole question should be submitted to Imperial control, and a bill for that purpose was introduced in the Reichsrath. The provisions of this bill included the abrogation of the American contracts either immediately, or at the end of two years. It may be noted that the mine above referred to as owned by an American company, has a nominal German ownership—which is required by the German law—coupled with a contract by which all its output is taken by the company at fixed prices, which are understood to be lower than those of the old syndicate.

When matters had reached this point, the American companies appealed to the State Department at Washington, asking for some action to protect their contract rights. While little has been made public on this point, it is understood that the Washington authorities took the matter up, and that certain representations were made at Berlin, in connection with the negotiations pending on tariff matters. At any rate the proposed export tax was abandoned, and the latest despatches state that the bill now pending in the Reichsrath has been modified. While still providing that the new syndicate, under government control, shall have an absolute monopoly of the production and sale of potash salts, members holding contracts made prior to Dec. 19, 1909, will be allowed to fill those contracts for their full term; and will not be required to cancel them at the end of two years, as at first proposed. Mine operators, however, will be required to pay a *pro rata* assessment on any production in excess of the quantity allotted to them by the syndicate. This provision may possibly be used to make trouble for the so-called "American" mines.

This bill, as it now stands, may be taken as the final settlement on the part of the German government. While it apparently admits the contract rights of the American companies, it is evident that the monopoly of potash salts production which Germany now holds is to be most jealously guarded for German profit.

Rail Production in 1909

The production of rails in the United States in 1909—which is reported by the American Iron and Steel Association in advance of the make of steel—was rather larger than had been expected. It reached a total of 3,062,582 tons, which was 1,140,971 tons more than in 1908, but 601,043 tons less than in 1907. It was less by 915,315 tons than in 1906, when our maximum production of rails was reached.

The remarkable point in the rail production of 1909 was the great increase in the make of open-hearth steel rails. The long discussion, extending over two years, of the defects of bessemer-steel rails resulted in a general turning to the open-hearth furnace as a producer of rail metal. In 1909 the make of open-hearth steel rails was 1,255,961 tons, which was two and one-half times that of 1908, and five times that of 1907. The proportion of bessemer-steel rails fell from 93 per cent. of the total in 1907 to 70.5 per cent. in 1908 and to 60 per cent. in 1909. It is not unlikely that it will be below 50 per cent. in the current year. The change has been helped by the opening of the steel works at Gary, by the substitution of open-hearth furnaces for bessemer converters at the Carnegie works and the larger use of open-hearth steel at the Bethlehem and the Maryland steel works. Up to last year the greater part of the open-hearth rails were made in Alabama, at the Ensley works of the Tennessee Coal, Iron and Railroad Company; in 1909 Indiana and Pennsylvania both exceeded Alabama in their production.

The statistics of output by sections show that in 1909 only 8.4 per cent. of the rails made were under 45 lb. per yard; 34 per cent. were between 45 and 85 lb.; while 57.6 per cent. were 85 lb. or over. Open-hearth steel went largely into the heavier sections; it was used in 52 per cent. of the rails over 85 lb.; in 29.4 per cent. of the medium sections, and in only 12.5 per cent. of the light rails.

An interesting statement—the first report of the kind ever made—is that 50,505 tons of alloyed-steel rails were made. In these titanium steel led, nickel-chrome coming next. There were only small quantities of nickel-steel and manganese steel.

The iron-rail industry has disappeared. In 1907 there were 925 tons of iron rails made; in 1908 only 71 tons, and in 1909 none at all. In recent years the only iron rails made were of very light section, for mine and industrial use.

Respecting Press Agents

Our attention was called a few days ago to a paragraph in a newspaper that there was great competition and wire-pulling in the environs of Wall Street for the position of press agent for the promoters of the copper combination which has as yet not been formed. So the world, and particularly that part of it which has money to invest, may shortly expect to be informed of the blessings to come through the agency of a certain great person and the shekels to be raked in by the shrewd. Thus is advertising elevated to the acme of the art.

But seriously we wonder to what extent the public is alive to the insidious insinuations of the press agent? All of the advertising brokerage houses that issue their so-called "market letters" maintain one, according to the financial resources of the concern. This furnishes a regular and lucrative field of employment to the "mining writer." Among the more trifling concerns that cannot afford one of these gentry, some of whom command high salaries, the head of the house (perhaps the whole house) may be his own writer. Their greatest ambition is to smuggle items into the columns of the regular press, but in this they have no great success, except with the prostitutes.

So we say to the guileless investor, shun the "market letters," beware of the items and stories in "financial" papers, and listen not to the tipster, for these things are all manifestations of the press agent, who serves persons that are anxious to sell something which is usually of little value. And if that thing be a mine, buy not unless it be vouched for by an engineer of recognized standing.

Just a Business Proposition

Two years ago a committee of Senators and Congressmen spent some months investigating the postal situation. They took nothing for granted but looked into every nook and cranny that was open.

This commission decided that no reliable data were available and that most of the figures given were "estimates."

They found that very few improvements in the business methods of the Post Office Department had been made in a hundred years.

They found the largest business in the world run with antiquated methods, that the responsible positions in this vast machine were in the hands of politicians, that red tape clogged the wheels of progress and that, unlike any other business concern, this one is trying to economize by cutting down the volume of its business rather than increasing it.

This committee offered a bill to Congress, known as the Overstreet bill—but Congress had other fish to fry and no action was taken.

This bill provided for the appointment by the President of a non-political Director of Posts, who shall not be removed except for cause, and for a reorganization of the Postal Department along modern business lines.

Senator Carter has reintroduced this bill, and it ought to pass. It makes no snap judgments on "estimates." It provides that the department be put on a business footing first and remedies applied after it is known what is the matter with it.

The increase of magazine postage is not needed—the deficit increased $18,000,000 on a *decreasing* second-class mail.

There is something rotten in Denmark—we think it is just departmental dry rot.

There have been some 17 Postmasters General in the past 20 years. To change the head of any big private business concern so often would break it. Fortunately the Postmaster General just rattles around in his job and the clerks carry on the work and make out their reports—and his.

Then he proposes—but the people dispose.

And the people of this country want their newspapers and magazines just as cheap as they can get them and they are getting tired of some things in our antiquated post office.

For instance, they are wondering why our department can make arrangements to carry a parcel from Seattle via New York and on to London or Paris or Berlin for 12c. per lb. *and charge 16c. per lb. to carry the same package to Tacoma, or even across the street.*

They are tired of the trade our post office made with Canada, increasing the rates on second-class matter to our neighboring country to the detriment of our trade there. They are tired of such acts as the recent reduction of 80 *per cent*, on foreign-going letters—and a howl about a deficit in the same breath.

If parcels posts are good for the foreigner they are good for us.

If the postage on the letter that carries the money order back to Italy should be less, why should the postage on the paper that tries to make an American citizen of another Italian be more?

A respectful letter from any business man to his representative in Congress asking him to support the Carter Bill (Senate Bill 6287) will receive attention. We urge our readers to write such letters.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS AND THE EXPERIENCES OF READERS

Bore Holes as Safeguards in Coal Mines

I have followed with the deepest interest the numerous articles and reports on "Rescue Work" and "Safeguards in Coal Mines." In the JOURNAL, Dec. 25, 1909, is a most useful suggestion of installing a system of boreholes. I feel sure if this suggestion of putting down drill holes in suitable positions is carried out, it will be the means of saving many lives.

Many years ago a serious fall of ground took place in a coal mine in the Newcastle district, New South Wales, and 20 or 25 men were entombed. The fall extended over such a large area that it was impossible to cut through in time to save the lives of the men. The coal seam was in shallow ground (only 80 or 90 ft. of horizontal covering of compact fine sandstone and shale). As perfect maps of the workings were available, and it was known where the men were working at the time of the fall, I at once strongly urged that four or five drill holes should be started, and working at top speed I estimated the holes could be put through in from 40 to 50 hours. My suggestion was not agreed to and work was carried on to drive through the broken ground. It was several weeks before this work reached the sound part of the mine, and of course all the men and horses were found dead. By means of the bore holes communication would have been established with the entombed men, and food could have been sent down. Medical instruction could also have been communicated in case any of the men were badly injured. It is more than probable, if this suggestion had been carried out, all the lives would have been saved.

Along the Main Reef, and on some of the coal mines, a system of "first aid" teaching is now being carried out, and steps are being taken to organize the men, so trained, into regular units of the St. John Ambulance Brigade, which will render their services more efficient, and the men will be the more readily available in any extreme emergency. Later we shall be able to add to the "first aid" teaching the important training of "rescue work" to which I notice much attention is being devoted in the coal-mining districts of Pennsylvania. It is in the coal-mining areas, and not on the mines of the Main Reef, that the suggestion of bore holes might well be considered. I should be glad to be put into communication with one of the leaders of this work in Pennsylvania to whom I shall be pleased to forward particulars of our methods in the Transvaal.

T. S. PARROT.

Johannesburg, South Africa,
Jan. 28, 1910.

Sodium-Hyposulphite Method for Determination of Copper

I have just read the article in the JOURNAL of Feb. 5, by C. A. Heberlein, describing the use of sodium hyposulphite for the precipitation of copper. As I have used this process for a long time and have found it highly satisfactory, it seems possible that a more detailed description may be of value. I first used the method when working on a roasting and leaching process. Some of the amounts of copper to be determined were exceedingly small but I have found the method to be satisfactory when it is applied to the amounts of copper met with in ordinary practice.

The method as I commonly use it is as follows: Dissolve the ore or slag in $HNO_3 + HCl$. Evaporate nearly to dryness, or if dryness is reached take up with a few drops of HCl. Add H_2SO_4 and evaporate until white fumes are evolved. Cool, add about 25 c. c. water and about 1 gram sodium thiosulphate ($Na_2S_2O_3$). Heat to boiling and add more thiosulphate in small quantities until a permanent white precipitate is formed. Boil until the precipitate becomes granular and the solution is clear. Filter, wash with hot water, allow to drain for a moment and pour a little alcohol over the paper and precipitate. Fold the paper, place in a crucible and burn. If the precipitate is well granulated it may be washed by decantation. Dissolve in HNO_3, add a little water and then add Na_2CO_3 or NaOH in strong solution until a permanent precipitate is formed. More of the alkali may be added to dissolve the copper precipitate, but it is not necessary. Add 1 c.c. strong NH_4OH, or more than 1 c.c. but always the same amount. Cool and titrate.

This method is a little slower than the precipitation by aluminum, but I believe it to be appreciably more accurate, and it is more rapid than the electrolytic method unless the revolving cathode is used. The solution to which the thiosulphate is added should be slightly acid. A small amount of the precipitant is added before boiling to avoid the dangerous foaming which will take place if the salt is added to a boiling acid solution. To insure complete precipitation the precipitant is added until a precipitate of free sulphur appears after the black copper precipitate has been thrown down. Boiling until the precipitate becomes granular prevents clogging of the filter and the clear filtrate runs through the paper almost as rapidly as clear water. The addition of the alcohol is an expedient to save time. It removes nearly all of the water and makes it possible to burn the paper without any further drying. I have sometimes used this rapid method of drying with other precipitates and find that it is often of considerable advantage. The ignition removes the paper and frees the copper from the sulphur in which it may be inclosed.

The use of Na_2CO_3 or NaOH avoids the necessity of neutralizing with NH_4OH. The success of the cyanide titration depends upon the presence of an equal amount of free ammonia in each portion titrated. It is difficult to secure this equality when the acid is neutralized with ammonia because, though the same amount of HNO_3 may be added in each case, the different amounts of copper present will consume different amounts of acid. The presence of an excess of the sodium salt does no harm. The addition of the ammonia gives the blue color of the copper-ammonia ion. The ammonia should be accurately measured. The addition of only 1 c.c. may not make the solution clear but this is not necessary as the first addition of cyanide clears it. The method is easy, rapid and accurate.

C. M. YOUNG.

Lawrence, Kan., Feb. 7, 1910.

The Yampa Coalfield, Colorado

As already indicated in the Colorado correspondence of the JOURNAL, the people of Routt county and those owners of patented coal tracts in the Yampa coalfield who live in various places in the United States are annoyed by the long-drawn-out endeavors of the Government agents to prove criminality and take their lands away from them. This effectually blocks the development of the seams and the production of the fuel. Now in the light of the Glavis evidence they seem to have lost all hope, for should it be shown that the lawmakers are coal-land grabbers, what chance has the coal owner, without capital and without "pull," to prevail against their efforts to deprive him of his holdings. Most of these were patented long before a railroad was built, or even commenced building.

I know one sad case, where an old couple have been living on the coal land and working it in their small way for 20 years, waiting and hoping to hear the whistle of the locomotive. The locomotive is still 100 miles away, kept back by the pernicious activity of competitive railroads and their affiliated coal companies in order to retain their monopoly of the coal trade, and keep the 1200 square miles of Yampa anthracite and bituminous coal out of the market. And last, but not least, by the efforts of the Government, a cloud has been cast over the title of the whole field, and capital scared away. People who have hitherto looked on a United States patent as title absolute, like the British freehold, are beginning to feel like the Scotchman who said, "I hae me doots." And this is a more serious matter than can easily be grasped. T. B. C.

Denver, Colo, Feb. 11, 1910.

California Gold Output

The daily press of San Francisco pays but scant attention to the gold-mining industry of California, mainly, perhaps, because there are no stock-dealing features connected with it. At the same time many columns are printed weekly relating to the petroleum industry, and this is given in great detail. Recently some of the papers have taken up the gold-dredging industry and its advantages to the State, but in doing so some wild statements are being made which are far from true and therefore do more harm than good. Among other things it is stated in bold headlines that the dredges are now producing more than half of all the gold being mined in the State. They are doing nothing of the kind and never have done it. According to the mine-production report of the U. S. Geological Survey for 1908, which furnishes the latest available statistics of gold production in detail, the deep or quartz mines of California yielded $10,530,187 while the placers, including the dredges, yielded in the same period $8,231,187. Of this placer gold, the yield from dredge mining was $6,536,189, or 79 per cent. of placer-gold output, the other $1,694,998 coming from hydraulic, drift and surface placers. This shows that while in 1908 the dredges produced gold valued at $6,536,189, the other gold mines yielded $12,225,370, or almost twice as much as the dredges. Therefore, on examination, it is seen that the statement that dredges are producing more than half of California's gold output is wrong, and that they are really producing only about one-third. Moreover the deep mines produce $873,057 silver at commercial value while the dredge yield of silver with the gold is only $12,070. The dredges are doing well and are increasing their output in some fields, though in other fields no increase is expected. The quartz mines meanwhile are increasing their yield also and it will be some years, if ever, before the dredges catch up with the deep-mine gold yield in California. M. F. H.

San Francisco, Cal., Feb. 23, 1910.

The Copper River Railroad

I wish to congratulate the JOURNAL on the issue of Jan. 8, 1910, and particularly for the quick publication of statistics which are practically correct for the few cases with which I am familiar. There is one instance, however, where I do not think just credit was given. In the article on Alaska, M. J. Heney, who is the contractor for the construction of the Copper River & Northwestern Railway, is given the entire credit for constructing that railroad. While it is true that a large portion of the construction work accomplished on the Copper River & Northwestern Railway is due to Mr. Heney's energetic operations, much credit is also due to the work of E. C. Hawkins, who is the chief engineer and general manager of Copper River & Northwestern Railway, and under whose direction Mr. Heney is working. L. WERNECKE.

Cordova, Alaska, Feb. 6, 1910.

Canadian Iron Production

Figures collected by the American Iron and Steel Association give the production of pig iron in Canada for two years past as follows, in long tons:

	1908.	1909.	Changes.
Basic pig..........	335,410	357,965	I. 22,555
Bessemer pig	112,811	169,545	I. 56,734
Foundry and forge	115,451	149,580	I. 34,129
Total..............	563,672	677,090	I. 113,418

The make in 1909 was the largest ever reported. Of the total for the year 660,856 tons were made with coke and 16,234 tons with charcoal and electricity. In 1909 the Canadian furnaces consumed 1,311,796 tons of iron ore and 58,731 tons of mill cinder, scale, etc., in the manufacture of pig iron. In addition they consumed 470,080 tons of limestone for fluxing purposes. The raw material consumed averaged 2.02 tons ore and 0.69 ton flux to the ton of pig.

On Dec. 31, 1909, Canada had 16 completed furnaces, of which 11 were in blast and 5 were idle.

February Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during February, 1910, by a number of mining and industrial companies in the United States, Canada, and Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Alaska Mexican, g.	Alas.	$0 40	$ 72,000
Alaska Treadwell, g	Alas.	0 75	150,000
Alaska United, g	Alas.	0.15	27,300
Amalgamated Copper,	Mont.	0.50	769,439
Arizona Copper(com.)	Ariz.	0 30	455,969
Bunker Hill & Sul., l.	Ida.	0.20	60,000
Elkton Con., g	Colo.	0 01½	37,499
International Nickel, pf	U. S.	1 50	133,689
Mohawk, c..	Mich.	1 00	100,000

Foreign Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Buffalo, s............	Ont.	0.03	$30,000
Dolores, g..........	Mex.	0 22½	90,000
Dominion Coal, pf...	N. S.	3.30	175,000
Lucky Tiger, g......	Mex.	0 05	35,750
Mines Co. of Am.....	Mex.	0.03	60,000

U. S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
Jeff. & Clearfield C.& I, com..............	Penn.	$2.50	$37,500
U. S. Steel, pf.......	U. S.	1.75	6,304,919

Chronology of Mining for February, 1910

Feb. 1—Explosion in Browder mine of Elk Valley Coal Company near Drakesboro, Ky.; 34 killed. Fire destroyed tipple and shaft buildinngs at Scholl Brothers' mine near Bartonville, Ill.

Feb. 2—Explosion at Palau mine, Las Esperanzas, Mex.; 68 killed.—Western coal miners' wage-scale conference met at Toledo and adjuorned next day without agreement.

Feb. 5—Explosion at Ernest No. 2 mine of the Jefferson & Clearfield Coal and Iron Company at Indiana, Penn.; 11 killed.

Feb. 8—Explosion in the mine of the Stearns Coal Company, Stearns, Ky.

Feb. 17—Strike of the engineers' union at Butte, Mont., the mines resuming after a few days with engineers furnished by the Western Federation of Miners.

Feb. 19—Meeting of Utah branch of American Mining Congress at Salt Lake City.

Feb. 25—Arguments in the Trust suit against the anthracite-coal-carrying companies were closed in the U. S. Circuit Court in Philadelphia, and the court took the case under advisement.

Feb. 26—Indian tariff increase on silver from 5 per cent. to four annas per oz., (about 16 per cent.) announced.

Feb. 27-28—Avalanches at Mace and Burke, Ida., caused large loss of life.

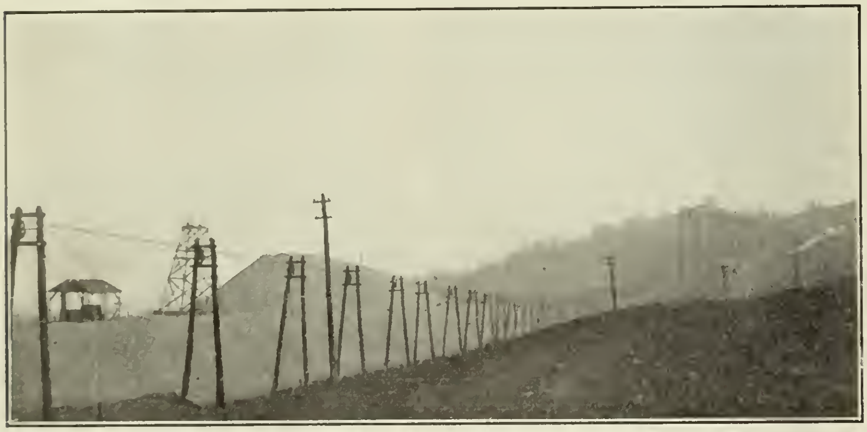
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Constructing a High Stock Pile

The accompanying photograph shows a high stock pile of red ore being accumulated by the Tennessee Coal, Iron and Railroad Company at its Muscoda ore-mines at Readers, Ala. An auxiliary hoist and frame carrying sheaves are used in building this stock pile up to the required hight; the hoist and frame, being set on timber bases, are moved along the stock pile as the face of that portion which is being built up advances. The use of an auxiliary hoist enables the pile to be built up to a greater hight than could be done by ordinary tramming. The ore on being hoisted from the slope passes through pockets and down to the track leading to the ore heap. It is trammed to the base of the portion of the heap being built up, where the hoisting cable is connected to the car which is pulled up the incline and dumped at the end where the tracks are shown extending beyond the brow of the pile. The cars can, of course, be run back down the incline by gravity.



ARRANGEMENT FOR BUILDING STOCK PILE IN BIRMINGHAM DISTRICT

Compressed Air in Mines[*]

BY W. L. SAUNDERS[†]

In his review of the modern conditions in mining and metallurgy in the United States Mr. Brunton said: "The ventilation and cooling of metal mines have not yet received the attention which their importance demands. In this respect Western engineers could take profitable object lessons from their brethren in the coalfields."

The importance of this subject can scarcely be overestimated. It should surely be the province of the mining engineer not only to excavate material and treat it properly and economically, but in doing this he should study how to protect and conserve the lives of the miners. John Mitchell's figures show that four times as many men are killed in mines in the United States, in proportion to the number of men employed, as in any other country in the world. Explosions are responsible for much of this, but where explosions occur human life might be saved, provided there is a complete system of ventilation in the mine, and provided certain safeguards are employed.

UNDERGROUND HAULAGE

Under section VI., "Underground Tramming," Mr. Brunton, in the same article, refers to the air and electric locomotives which have come into general use, and he makes the statement, which no one can dispute, that each has its own field. Following this, however, the claim is made that "where the openings are dry and the roof sufficiently high and firm to carry the trolley-wire insulators, there is no question as to the desirability of using electricity." This seems to be a rather slender hook on which to hang the interests of the compressed-air locomotive. The members of this institute recently visited the Anaconda smelteries, where we saw air locomotives doing useful service throughout the works. The superintendent, when asked why he used air in preference to electricity, answered, because it was better and cheaper. This is only one notable instance where air is preferred for traction purposes. There are many others, as, for instance, the Homestake, the largest and richest single gold mine in the world, where air locomotives do useful service not only in the yards but in the mines themselves. These installations, Anaconda and Homestake, are of the old type; that is, the simple compressed-air locomotive. Notwithstanding this, the results are satisfactory and economical.

There is a new type of locomotive, built by the H. K. Porter Company of Pittsburg, which should be able to add 50 per cent. to the saving in air economy. This new type uses the natural heat of the mine as a reheater to expand the air between the high- and the low-pressure cylinders. Under the old system of simple compressed-air locomotive it was frequently true that the fuel required to furnish the power for the air and the electric systems was almost exactly the same. With the new system it is claimed that under the same conditions the fuel requirements in air will be but two-thirds of that made necessary in an electrical installation. There are some conditions where the electrical installation might prove more economical even than the compound compressed-air locomotive. Much depends upon the load factor. With a good load factor of from 30 to 40 per cent. of the rated power of the engines and generators furnishing the current, and with mining conditions which permit operating locomotives at rated speed and power, it should be possible with electric locomotives to obtain efficiencies approximating those found in connection with the operation of large street railways; but in ordinary mining conditions there is much starting and opping, tracks are crooked and curves requent, and the poor load factor results an efficiency in mines even below that f the simple compressed-air locomo- ve.

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[*] Discussion of D. W. Brunton's paper, "Mining and Metallurgy in Western United States," read before the Spokane meeting of the American Institute of Mining Engineers; *Bull.* No. 37, A. I. M. E.

[†] President, Ingersoll-Rand Company, New York.

Disadvantages of Trolley Wires

Trolley wires in mines are always more r less a source of danger, annoyance nd expense. This is especially true in old, silver and copper mines, where any of the levels are operated simul- neously, and where the output per level comparatively small. In such cases it equently requires the services of sev- al men and large quantities of copper ire and insulators to keep the haulage comotives in close touch with the va- ous working places. Even in cases here the openings are dry and the roof gh and firm, the trolley wire becomes a enace when there is a wreck on the ad or any other accident resulting in short circuit.

Wherever the wires are carried near e chutes, or places which require oc- sional or frequent blasting, they are danger of being ruptured or put out of rvice. Furthermore, the danger from re cannot be overestimated, inflamma- e material being frequently in proxim- to the wires.

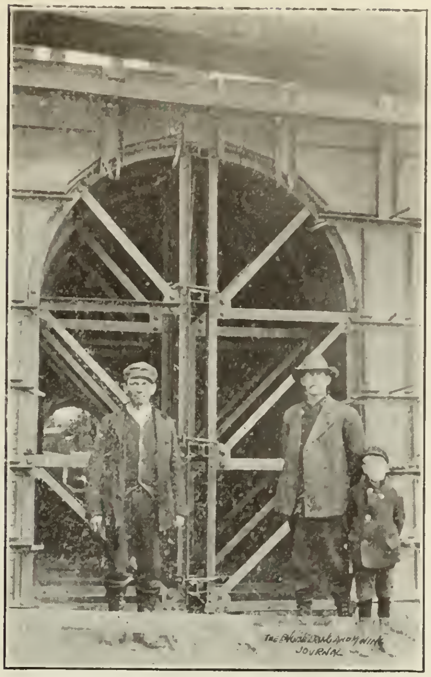
The long entry to the mine obviously n be best equipped electrically, but in e various ramifications of the mine mpressed air has been proved to be fest and best.

The argument that the air locomotive ses time in charging has some merit, it observation of the performance of e electric locomotive in mines proves at the time lost in handling the trolley le under ordinary mining conditions is proximately as great as that due to arging the air locomotive. In narrow ifts it is sometimes found impossible to rn the trolley pole, and the locomotive is to be run a considerable distance th the trolley pole in advance of, in- ead of trailing behind, the support. nder such conditions slow speed and eat caution are required in order not to break the poles or tear down the wiring. Ordinarily charging a compressed-air locomotive means the loss of about a minute and a half for every 4000 ft. of travel.

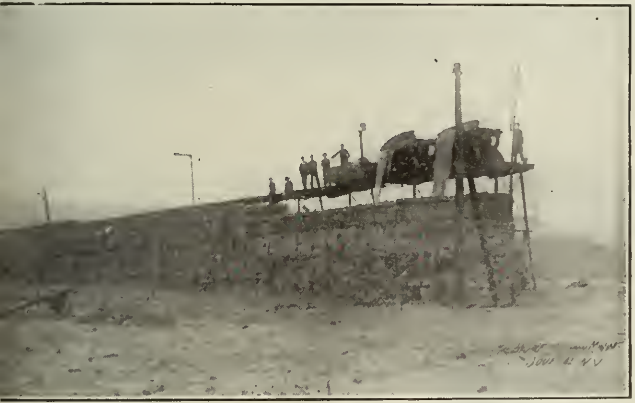
It is to be regretted that Mr. Brunton dwelt so briefly upon rock drills, for surely this valuable adjunct to the miner deserves serious consideration. The rock drill has made the mining and smelting of low-grade ores profitable. Development work, tunnel construction, drifting and stoping are all pursued today to a greater extent than in olden times, because the rock drill has been perfected to that stage of simplicity where it may be used profitably and economically. It is difficult to find in the list of mechanical appliances a machine which has been subject to greater wear and tear, or in the building of which experience is of more importance, than the rock drill. The design of a rock drill is not by any means everything to be considered in looking for the best. Material and workmanship are of the greatest importance, and the skill which can only come of experience when applied in the construction of this important mining tool should surely be of value to the miner who is seeking a reliable machine for permanent service.

Slag-Wall and Culvert Construction

The accompanying engravings illustrate the building of slag walls and culverts at the Butte Reduction Works at Butte, Mont. The method of building up the walls, is shown in the photograph to the left. The plant is situated on flat land adjacent to Silver Bow creek. It is therefore necessary to exert precautions so that the concentrator tailings will not encroach upon the stream. Slag walls are built on either side of the creek to protect it. They are built up by dumping the molten slag between cast-iron plates as shown.



Forms for Slag Culvert at Butte Reduction Works



Making Slag Wall at Butte Reduction Works

Slag Culverts at Butte Reduction Works

The photograph at the right shows the end of the slag culverts built at this plant after the designs of James Doull. A reinforced-concrete culvert was first built, but cost about $70 per lineal foot. Later the reinforced-slag culvert was substituted and proved cheaper and just as satisfactory. The illustration shows the molding forms used in connection with the construction of the culvert.

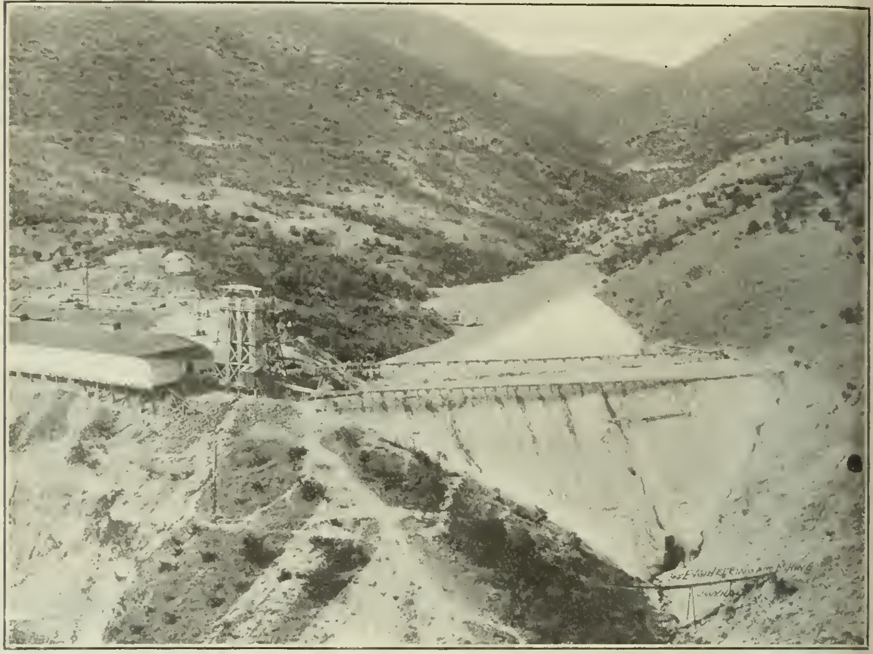
The 200-stamp mill for the City Deep is being shipped from England to South Africa. Every effort is being made to have the milling begin before Oct. 1, 1910. The extraordinary bonus of $500 per day is to be paid to the Rand Mines Power Supply Company for every day of saving on the contracted time of delivery of power from its new plant now under construction.

Tailings Dam of the Cananea Consolidated Copper Company

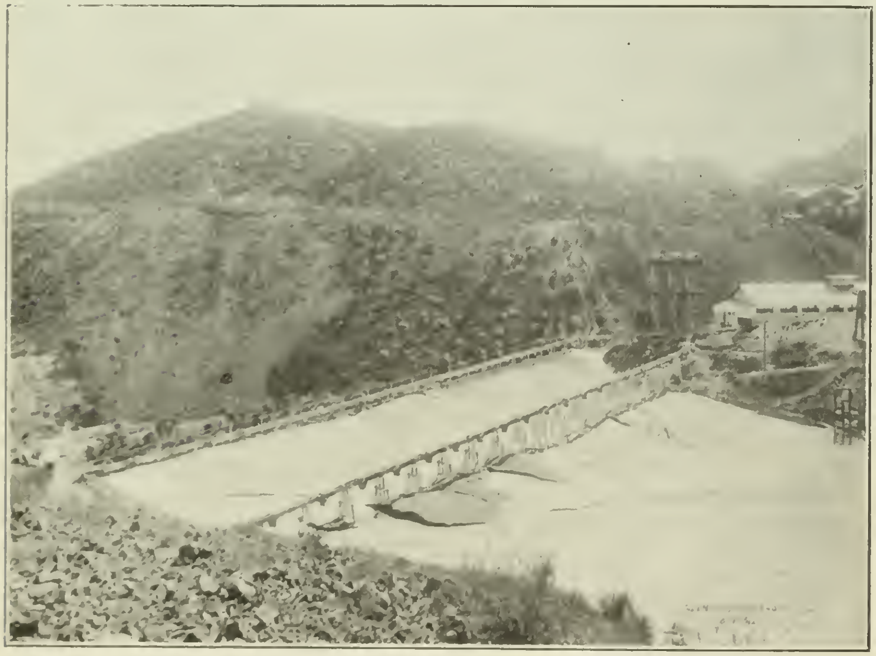
By L. D. Ricketts[*]

The accompanying views of the tailings dam of the Cananea Consolidated Copper Company show plainly the method of construction, which simply consists in separating the coarse sand from the general tailings, making a dam with the sand and allowing the slime and most of the water to flow into the upstream side of the dam. A tunnel through the hill, with an uptake, provides for diverting flood waters. The general plan of forming this dam was worked out by Samuel Storrow, consulting engineer, of Los Angeles, Cal. There is nothing particularly novel in building this kind of a dam, but it is useful in calling attention to the fact that this company is taking steps to impound tailings, which, while they cannot be further beneficiated at the present time, still contain nearly $2 per ton gross value. The tailings are impounded partially to prevent pollution of the streams, but mainly because it is considered that some process will later develop by which they can be retreated as a profit.

At the time these photographs were taken the highest portion of the dam was 65 ft. above the lowest point of the cañon. The elevators to the left, Fig. 1, will continue to raise the dam, and when the dam is raised to a higher level the elevators will be extended. Ultimately this dam will be about 110 ft. high. It is estimated that this small basin will impound the tailings of the Cananea Consolidated Copper Company for a year or longer.



Tailings Dam at Cananea. Elevators at the Left



Tailings Dam, Showing Launders in Foreground

Fig. 2 shows plainly the method of building up the dam. Two parallel launders have spitzkastens at intervals. The thick sands with a minimum quantity of water, are drawn from these spitzkastens. To the right of the picture, back of the launder and next to the crest of the dam, one can see where a row of tailings is kept piled up on the crest of the dam so that any water coming in with the sands will drain into the basin in front of the dam. By the use of two launders the foot of the dam can be kept quite steep, say 25 deg. from the horizontal. It would be useless to give the grade of the launders as a standard as this has to be determined empirically and will vary according to the conditions of the tailings. In this case but 3 per cent. is used for the reason that there is a large amount of slimes with the sands, and these form a lubricant which aids greatly in transporting same. The clarified water is pumped back to the mills for re-use, or allowed to flow through the waste tunnel as desired.

While there is nothing extraordinary in this method of building a dam, it is cheap and is of interest because I believe that every large establishment engaged in dressing ores should store its tailings. If this were done there would be a great deal of valuable material available as ore in the future.

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[*] General manager, Cananea Consolidated Copper Company, Cananea, Sonora, Mex.

A Face Protector

A screen used for the face in the Joplin district, is made of a piece of ordinary screen-door wire cloth. The piece of cloth is about 14x16 in. A string is fastened to two corners and tied back of the head so as to allow the wire to hang from the cap over the face. This screen is used by the men at the grizzlies when breaking large pieces of ore with hammers. The hard, cherty character of the ore causes pieces of rock to fly off when struck with the hammer, and unless the face is protected it causes more or less annoyance to the laborer and he is at the same time liable to have his eyes seriously injured.

Goldfield Consolidated Mines Company

The directors of the Goldfield Consolidated Mines Company at the regular quarterly meeting Feb. 24, declared in addition to the regular quarterly dividend of 30c. per share, an extra dividend of 20c. This payment will call for a distribution of about $1,800,000.

The directors attending the meeting were: George Wingfield, J. H. McKenzie and A. H. Howe, of Goldfield; J. H. Carstairs, of Philadelphia, and W. C. Ralston, of San Francisco.

Mr. Howe said that there was no news of importance to give out concerning conditions at the 1000-ft. level from the Clermont shaft. He declared that while the drift that is being driven from the shaft toward the big oreshoot is in some good ore, it has probably 50 ft. yet to go before it reaches the point where the main orebody is expected to be found.

W. C. Ralston said: "There's nothing in that copper story. Neither is there anything in the report that we have lost the vein in the Mohawk. It is true that the dip of the oreshoot has changed, has flattened out slightly between the 900- and 1000-ft. levels. But the ore was picked up by a winze from the 900-ft. level and it is of the same character as above. This is not unusual in the Goldfield district, the dip of the Mohawk vein having changed on the upper levels."

Work in January

Manager J. R. Finlay submitted a preliminary report on operations for January.

JANUARY TONNAGE.

	Dry Tons.	Per Ton.	Approximate Production.
Combination........	6,193	$18.41	$114,093
Mohawk...........	7,928	15.27	121,088
Red Top...........	6,243	36.36	227,122
Clermont...........	3,716	87.00	323,195
Total............	24,080	$32.62	$785,498
Loss in tailings.......			55,898
Estimated recovery...			$729,600

"The amount indicated as recovered was not all precipitated and turned into bullion at the end of the month. Owing to the increased tonnage treated in the mill there was a larger amount of concentrates in process at the end of the month than at the beginning. Mr. Hutchinson estimates that about 60 tons of concentrates, containing 1000 oz. of gold, belonging to January ore, had not been treated.

"The total cost has come down a little, principally in the item of general expense. The cost of mining and development is a few cents lower than for December, and the cost of milling a few cents higher. On the whole I think it is safe to say that the reduction in costs, due to a production of 25,000 tons per month as against 20,000, will be almost entirely in the overhead charges. It is too early to figure on much reduction in other directions, but when our difficulties at the mill are fully overcome there should be some reduction there.

"As to the cost of mining, it is difficult to see much opportunity for lower costs; possibly we should anticipate somewhat higher costs on account of the necessity of providing equipment for operating at greater depth than heretofore.

JANUARY EXPENSES.

		Amount.	Per Dry Ton.
General expense........		$28,200	$1.18
Mining—			
Pay roll and salary..	$53,256		
Power...........	4,416		
Supplies........	35,400		
Departments......	7,972	101,044	4.21
Railroad...........		2,000	0.08
Milling—			
Pay roll and salary...	$14,838		
Power.........	7,848		
Supplies...........	32,500		
Departments.....	2,603	57,789	2.41
Marketing concentrates	23,000		0.96
Total cost........		$212,033	
Less miscellaneous earnings.........		1,713	
Net cost..........		$210,320	8.73
Loss in tailings.......			2.32
Total costs and losses.			$11.05
Profit per ton........			21.57
Total value of ore...			$32.62
Total profit for month..........			$519,300

Results of Development Work

"The total advance made in development headings is, so far as I know, the largest on record, being as follows: Combination, 840 ft.; Mohawk, 1020; Red Top, 1328; Jumbo, 1375; total, 4563 feet.

"Of this development a total of 858 ft., or somewhat less than 20 per cent., was in ore. Most of this work, however, was simply following orebodies that were already presumed to exist and cannot be said to add anything to ore in sight. In the Combination and Mohawk I do not consider that any new ore was developed during the month. In the Clermont, on the 750-ft. level, developments were made in three new places exposing ore of a total area on that level of 1254 sq.ft. Of this amount 780 sq.ft. is due to the extension of the sill floor in the large stope No. 401. Since no equivalent developments were made on the levels above and below, I am forced to estimate that this ore should be considered only to extend half the distance to the 600-ft. level upward, and half the distance to the 900-ft. level downward. In other words, a reasonable estimate of ore put in sight by these developments should not be calculated on a vertical extent of more than 120 ft., but this will allow an estimate of approximately 12,000 tons put in sight at the Clermont as against 3700 tons extracted. The average grade of this ore I calculate roughly at $70 per ton.

"In the Red Top, out of a total of 217 ft. in ore, only 96 ft. belongs to drifts on main levels putting new ore in sight. The total amount may be roughly calculated at 4000 tons of an average value of $15. In round numbers I should say that the developments of the month have put in sight 16,000 tons, with a total value of $900,000, as against 24,000 tons mined with a total value of $785,000, showing a surplus of value put in sight for the month, but a shortage of tonnage.

The Situation at Depth

"On the 1000-ft. level of the Clermont, the main crosscut has reached the vein, but thus far no ore has been encountered. The silicified mass in which the ore is to be expected is found with its usual attitude and appearance. We are now drifting on a seam which we think will undoubtedly soon lead to an ore shoot. For the last few days we have been getting assays of from two to eight dollars per ton. We expect to find here a continuation of the large oreshoot already developed on the 750- and 900-ft. levels, but on studying the maps it is evident that this oreshoot should be further east in the direction in which we are now going.

"We are hampered in conducting the proper amount of development work in the lower levels of the Clermont by a shortage of hoisting capacity. Extensive development work that we cannot now attempt ought to be done on the 600-, 750-, 900- and 1000-ft. levels in the large tracts of unexplored ground both north and south of the territory we have at present opened. I look forward confidently to finding large amounts of ore on all of these levels. The difficulty in pushing work comes from the shortage of air. We are depending on our compressors to supply air not only for the machine drills but also for the Mohawk and Clermont hoists. The result is that the compressors are taxed to their utmost capacity and we cannot attempt further development work until we can replace one or both of the hoists with electric hoists. This will take several months.

"The explosion of an oil tank on Jan. 26 caused a loss of about $5000. The machine shop and carpenter shop at the mill were consumed, together with a carload of oil and some lime. The incident was much exaggerated in the newspapers. We are taking additional precautions against fire throughout the property.

"In spite of difficulties caused by the weather and fire, the mill has a most gratifying record for the month. It has proved its capacity for treating up to 900 tons but we should count on 850 tons for normal. The increased output is obtained without any loss in metallurgical efficiency. The mine is in good condition to maintain its present output without any great effort. The principal limitation both on ore production and development is the capacity of the compressors, as above mentioned.

Note Explaining Cost Statement

"Heretofore this company has published its complete costs only in the annual reports, but it has made a practice of publishing at intervals its operating costs, namely, mining, transportation and milling. In this statement, however, the effort is made to show the total deductions that must be made from the gross value of the ore, calculating gold at $20.67 per oz., to arrive at net profits applicable to dividends. Few companies issue such statements.

"The items that are stated as costs now, that were not so stated formerly, are the general expenses, of which, at least half are bullion taxes and the cost of realization of bullion. Further, the cost of smelting residues from the concentrate plant is now included as an operating expense under the head of milling.

"The sum total of costs and losses will vary according to the grade of the ore. The bullion tax and tailings losses vary directly with the grade, and the cost of marketing concentrate residues varies also but not in direct proportion to the value contained.

"This explanation is intended to dispel the surprise caused by a statement showing the total costs and losses instead of the direct operating costs. The former are about $11 per ton and the latter somewhat less than $7. It is perhaps worth while to state that the sum total of costs and losses is apparently less than that of any other gold-mining company in the world that produces an ore of similar grade."

Explosion in the Pettebone Mine

Six men were so badly burned by an explosion of gas in the Pettebone shaft at Dorranceton, Penn., at 10 o'clock, Tuesday morning, Feb. 22, that five will probably die.

On account of the colliery being idle for Washington's birthday, the injured men had to walk nearly two miles underground to the foot of the shaft before they received assistance. The flesh was hanging in shreds from their faces and hands, and their pain was almost beyond endurance. Their travel from the point where the explosion occurred to the foot of the shaft was most difficult. The explosion not only blew out their lights, but scattered their lamps in all directions, and they had to grope their way in the dark.

A pocket of gas was burning in the mine on Monday afternoon, and these six men went in on Tuesday to build brattices and doors to change the air current to drive out the accumulation of gas. They had finished the job and thought the place was safe when the explosion resulted. The Pettebone is a Delaware & Lackawanna colliery. The explosion occurred in the "Gem" slope.

The Anaconda Statement

In its application to have its stock transferred to the regular list of the New York Stock Exchange, the Anaconda Copper Mining Company submitted its profit and loss account for the six months ended June 30, 1909, and balance sheet at that date, both of which are given below:

PROFIT AND LOSS ACCOUNT.

SIX MONTHS ENDED JUNE 30, 1909.

Sales of copper, silver and gold	$6,060,028
Royalties and precipitates sales	46,110
Dividends on investments	16,847
Rental of water rights	25,000
Miscellaneous receipts	4,478
Net profit of subsidiary departments, after depletion of coal and timber lands and depreciation of plants and equipment	95,063
Interest	62,814
*Copper, silver and gold on hand at end	5,931,690
Total	12,242,033
Deduct:	
*Copper, silver and gold on hand at beginning	6,169,244
Mining expenses, including development and depreciation	2,720,908
Ore and scrap copper purchases	104,162
Transportation of ore from mines to reduction works	77,955
Reduction expenses at Anaconda, including depreciation	1,362,113
Transportation of metals, refining and selling expenses	562,600
Administration expenses	23,138
Total	11,020,123
Profit for the six months ended June 30, 1909	1,221,910

*Copper at cost; silver and gold at net selling price.

BALANCE SHEET, JUNE 30, 1909.

Assets:	
Mines, saw mills, townsite property and water right	$20,443,350
Buildings and machinery	3,112,235
Investments	534,113
Insurance unexpired	44,207
Materials and supplies for future operations	2,158,502
Merchandise for sale	534,606
Copper, silver and gold on hand	5,931,690
Accounts receivable	1,278,032
Loans and advances to associated companies	2,147,557
Cash in banks and in hands of selling agents	907,556
Total	37,091,852
Liabilities:	
Capital stock	$30,000,000
Taxes accrued	120,753
Accounts payable	857,373
Wages payable	539,631
Dividend warrants not presented	7,740
Dividends payable July 11, 1909	600,000
Balance December 31, 1908	1,911,142
Profit for six months ended June 30, 1909	1,221,910
Deduct dividends	1,200,000
Total liabilities	37,091,852

The output of the Anaconda Copper Mining Company for the year ended Dec. 31, 1909, as compared with three previous years is presented herewith, together with some of the principal items of costs and the dividends paid for the last four years:

	1909.	1908.	1907.	1906.
Copper, lb.	75,860,194	64,869,176	63,055,661	94,963,835
Silver, oz.	2,363,184	2,071,246	2,001,350	2,979,908
Gold, oz.	7,466	8,395	8,290	15,885
Min. exp. dev. dep.	$2,720,908	$4.505,529	$5,241,704	$5,870,439
Trans. ore to reduc.	77,955	136,593	153,140	234,150
Reduct. ex. at Anaconda	1,362,113	2,940,175	3,640,295	4,424,278
Trans. ref. and sell.	562,600	989,562	997,939	1,721,965
Admin. ex.	23,138	59,529	53,649	57,672
Net min. profits	1,159,096	945,963	3,147,773	8,584,169
Dividends.	1,200,000	2,400,000	6,300,000	6,900,000

Through its application to the Stock Exchange, many interesting facts are made public. The Anaconda company was incorporated June 15, 1895, since which time to Dec. 31, 1909, the company has paid in dividends $45,900,000. The company owns in Cascade county, Montana, 2605 acres of coal land and in Ravalli county, Montana, 30,471 acres of timberland, together with various timber holdings in other counties throughout the State.

Its copper-mining properties approximate 1168 acres. Mines are operated by means of 11 shafts, all of which, except one, are deeper than 2200 ft. The operations all indicate extensive bodies of commercial ore. Crosscuts are now being driven from the lower levels, and the results thus far obtained are satisfactory. During the last two years large orebodies of an excellent grade have been discovered on the lower levels of some of the properties, the existence of which had never been indicated by developments above.

President B. B. Thayer says that it has never been considered a wise policy to endeavor to put in sight extraordinary measurable ore reserves on account of the cost of maintenance of development shafts and drifts when carried beyond the scope of regular stoping operations. It is the opinion of engineers, however, that there is as much ore blocked out as at any time in company's history.

The company, aside from mines and claims near Butte, also owns sawmills, timber lands, coal mines, townsites, water rights, electric railroads, electric lighting plant, hotel, foundry and brick yard, all in Montana, and it supplies the city of Anaconda with water.

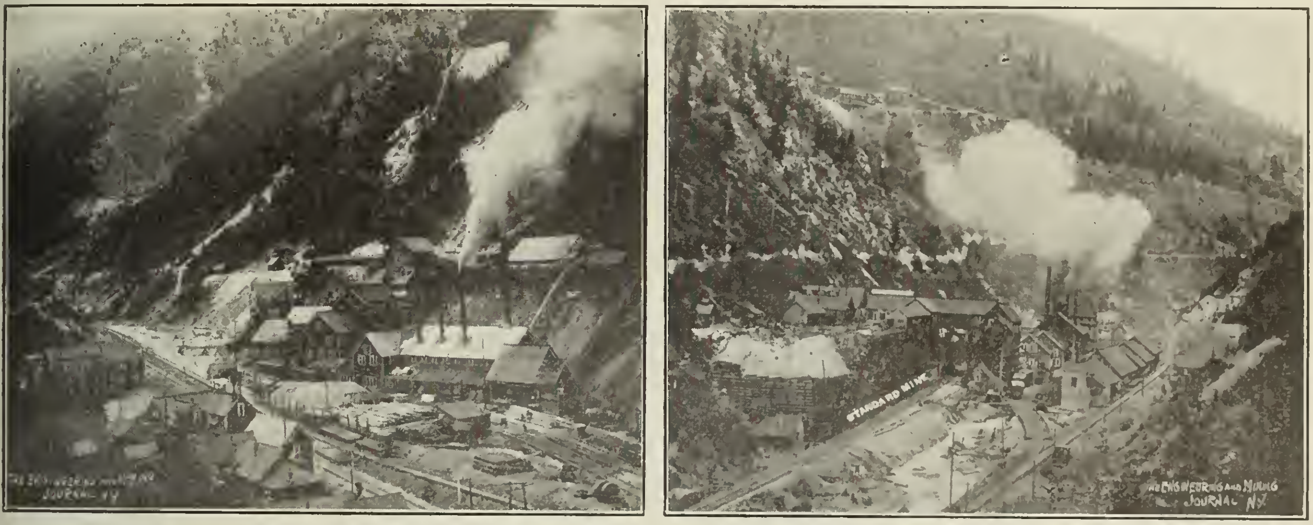
The company owns 51 per cent. of the stock of the Butte, Anaconda & Pacific Railway. Coal properties at Belt, Mont., have been operated for about 20 years, a portion of the product going to both Anaconda and Great Falls.

The fact is made known that the lease under which the Anaconda company operates the Washoe smeltery, owned by Washoe Copper Company, will expire in 1912. The works have capacity for treating 10,000 tons daily.

Snowslides in the Coeur D' Alene District

Twenty-four persons are reported to have lost their lives in snowslides in the Cœur d'Alene district, Idaho, Feb. 27 and 28. The most disastrous slide occurred at the little town of Mace, which is situated in a narrow canon. Fourteen are reported dead, and eleven injured there. The slide demolished the houses in its path, and stopped a short distance beyond the wrecked home of Ira Pascoe, superintendent of the Standard-Mammoth mine. Mr. Pascoe and his son and daughter were killed. Mrs. Pascoe was rescued almost uninjured.

The town of Burke was the scene of another slide in which five bodies have been found, and the men who have been digging tunnels since Sunday morning expect to find more dead. Two slides occurred near Wallace and five persons are reported to have been killed by them. The snow in the Cœur d'Alene district is said to be deeper than at any time since 1888, when 60 people were killed by an avalanche at Burke. Old-timers in the district had been sounding warnings to Mace and other towns that slides were imminent because of the record depth of the snow, the Chinook winds and warm rains.


THE ENGINEERING AND MINING JOURNAL N.Y.
STANDARD MINE
THE ENGINEERING AND MINING JOURNAL N.Y.

HELENA-FRISCO AND STANDARD MINES IN THE COEUR D'ALENE DISTRICT, IDAHO, WHERE SNOWSLIDES HAVE BEEN RUNNING

The Standard-Mammoth mine at Mace lies between precipitous mountain sides, as shown in the accompanying illustration. The Helena-Frisco mine is in the same cañon, a short distance below the Standard. The boarding house of the Standard mine was missed by 120 feet.

Irving K. Farrington & Co. inform us that their reference to J. Parke Channing in connection with Tularosa Copper Company, to which we referred recently, was a typographical error, which they corrected as soon as possible.

Rail Production in the United States

The American Iron and Steel Association reports that the production of all kinds of rails in the United States in 1909 amounted to 3,062,582 tons, against 1,921,611 in 1908, an increase of 1,140,971 tons, or 59.3 per cent. The production in 1907 was 3,633,654 tons. Rails rolled from purchased blooms, crop ends, scrap and seconds, and rerolled and renewed rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. The maximum production of all kinds of rails was reached in 1906, when 3,977,887 tons were rolled.

The production for 1908 and 1909 is shown in the accompanying table.

RAIL PRODUCTION IN UNITED STATES.

	1908.	1909.	Changes.
Bessemer	1,354,236	1,806,621	I. 452,385
Open-hearth	567,304	1,255,961	I. 688,657
Iron	71	....	D. 71
Total..............	1,921,611	3,062,582	I. 1,140,971

Of the total make of bessemer-steel rails last year 1,723,964 tons were rolled by makers of domestic ingots and 82,657 tons by companies which did not operate bessemer converters. Included in the total by makers of domestic ingots are about 62,000 tons of rerolled rails. Almost all the open-hearth rails in 1909 were rolled from basic steel, and virtually all were rolled by producers of open-hearth ingots. The maximum production was reached in 1909. Indiana was the largest maker of open-hearth rails in 1909, followed by Pennsylvania, Colorado, Alabama, Ohio, New York, Illinois, Maryland and New Jersey in the order named. In previous years Alabama had always been the leading producer.

Included in the 3,062,582 tons of steel rails rolled in 1909 are 50,505 tons of alloyed-steel rails, as follows: Titanium rails, 35,945 tons; manganese rails, 1028 tons; nickel-chrome rails, 12,287 tons; and nickel-steel and electric-steel rails, 1245 tons. The 50,505 tons of alloyed-steel rails produced in 1909 were rolled by eight works in six States. Of the total 36,809 tons were rolled from alloyed bessemer steel and 13,696 tons from alloyed open-hearth steel. The above are the first alloyed-rail statistics gathered by the association. Open-hearth rails were used chiefly for the heavier sections. For those of 85 lb. and over to the yard the make of open-hearth rails exceeded that of bessemer steel.

Transvaal Mines

The number of producing mines contributing to the January gold output was 71; there were 9625 stamps at work in the various mills. The force of unskilled labor employed in January, 1909, was 173,585, of whom 162,540 were Kafirs and 10,045 Chinese. In January, 1910, the number reported was 179,393, all Kafirs. The Chinese force, which was gradually reduced during the last year to 1910 in December, practically disappeared in January.

American Institute of Mining Engineers

The American Institute of Mining Engineers held the opening session of its spring meeting in the Carnegie Library at Pittsburg, Tuesday, March 1. On Wednesday, a visit was made to the testing station of the Technologic Branch of the U. S. Geological Survey. Thursday is to be devoted to a visit to the steel works at Homestead. The meetings will be concluded on Friday. The headquarters of the Institute during this meeting are at the Hotel Schenley.

The Oliver Continuous Filter at Minas del Tajo

Cyanide Costs on Slime Reduced from $1.21 to 91c. per Ton; Daily Capacity 400 lb. Slime per Sq.Ft.; Canvas Lasts Three to Five Months

BY G. A. TWEEDY AND R. L. BEALS*

The filter plant of the Minas del Tajo at Rosario, Sinaloa, has two Oliver continuous filters, each of 60 tons capacity. These filters consist of drums, 11 ft. 6 in. in diameter by 8 ft. wide, revolving on horizontal axes in boxes or tanks. The outer surface of the drums is divided into sections and covered with the filtering medium. The drums are partly submerged in the pulp to be filtered (kept from settling by air agitation) and, as they revolve, a vacuum applied to the sections builds up a cake of slime on the surface. As the sections leave the pulp they are dried by the vacuum and then a water wash is applied and drawn through the slime. Just before the section enters the pulp again, air, under pressure, is admitted to the chamber and the cake is discharged. The cycle is then repeated, the whole work being continuous and automatic. A comparison of the cost of slime treatment before and after the installation of filters is given in the accompanying table.

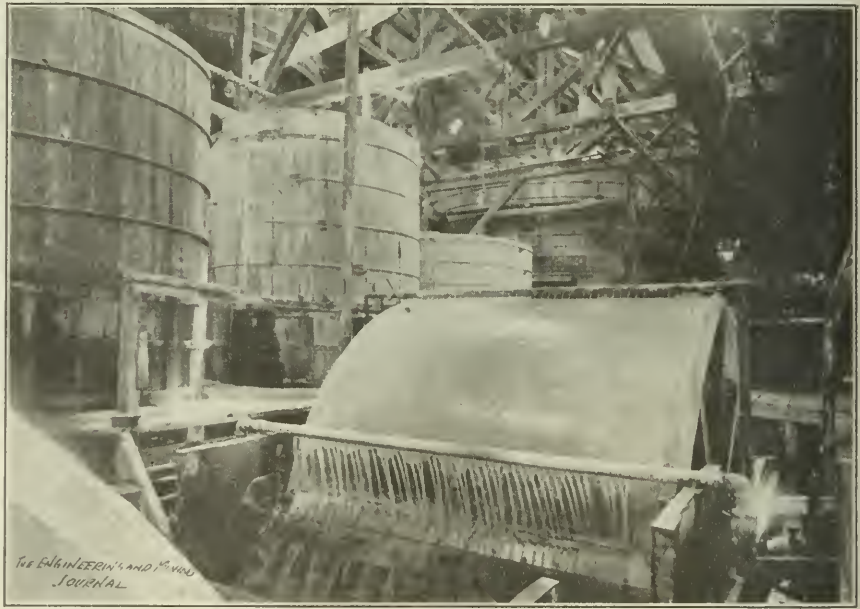
COST PER TON OF TREATMENT OF SLIME.

Item.	Before Installation of Filters.	After Installation of Filters.	
		Slime-Plant.	Filters.
Native labor	$0.0803	$0.0890	$0.0372
Supervision	0.0513	0.0497	0.0215
Cyanide	0.6007	0.3434	......
Lime	0.1710	0.1035	.....
Pumps, piping	0.0036	0.0013	0.0012
Belts, lacing	0.0085	0.0084	0.0067
Lubricant	0.0088	0.0022	0.0033
Miscellaneous	0.0364	0.0099	0.0066
Total	$0.9606	$0.6074	$0.0765
Power	0.2534	0.1419	0.0835
		0.7493	0.1600
Total	$1.2140	$0.9093	
Tons treated	17,510	11,126	

Construction of the Filter

The construction of the filters is shown in the accompanying drawings. The drum is built of 3.5-in. staves firmly bolted to the spiders. The perimeter of the drum is divided into 24 sections by 1-in. strips. Small strips 0.5x0.5 in., nailed 1 in. apart, form channels for the passage of solution in each section. Two 0.5-in. pipes are connected to each section, which pass through the hollow shaft supporting the drum to a plate at the end.

The plate has two circles of 24 holes each, to which the pipes are connected. Facing this plate is a second plate, having a groove or channel opposite the outer circle of holes. An adjustable bridge in this groove covers one hole, so that, the channel being connected to the vacuum pumps, a vacuum is applied to 23 of the sections. Air under pressure, passing through the pipe connected to the inner circle of holes in the plate, is admitted to the section that is cut off from the vacuum by the bridge. As the drum revolves the vacuum is cut off from each section in turn and air is admitted.



Oliver Filter, Showing Removal of Caked Slime by Water Jets

A screen is placed on the strips forming channels in the sections. The strips dividing the drum into sections are planed level with the surface of the screens. A layer of burlap covers the screens and on this the canvas is placed. The canvas is drawn tight and calked into a groove around the edge of the drum. To bind the canvas firmly to the division strips, the drum is wound with steel wire.

Operation of Filter

The drums are submerged for three-fifths of a revolution. Every section as it enters the pulp is connected to the vacuum pumps. As the drum revolves the section picks up a cake of slime and upon leaving the pulp, this cake is dried by the vacuum. A water wash is then applied in the form of a drip, in much the same manner as clean water is added in cleaning the concentrate on a vanner. This water is drawn through the cake until the vacuum is cut off and the cake discharged. The discharge takes place just before the section enters the pulp for a repetition of the cycle. The drums revolve once every 4 minutes.

The air and solution from the sections go to a chamber that is connected to the wet- and dry-vacuum pumps. Here the solution and air are separated, the wet-vacuum pump being connected to the base of the chamber, the dry-vacuum pumps to the top.

Two one-cylinder dry-vacuum pumps and one double-cylinder solution pump are used. (These wet- and dry-vacuum pumps have been displaced by a wet-vacuum pump which maintains a 26-in. vacuum and takes less power.) A small compressor furnishes air at from 5 to 10 lb. pressure to discharge the slime and agitate the pulp in the filter boxes. To operate the pump, compressor, and drums, 13 h.p. are required. With this equipment the capacity of the filters is 125 tons of dry slime per day.

The vacuum, maintained at 25 in., yields a cake of slime varying from 3/16 to ⅜ in. thick, depending on the character f the slime filtered. Between the time section leaves the pulp and the appliation of the water wash, the slime is ried to 35 per cent. of moisture. The mount of water drawn through the cake practically equal to the moisture in the ime. As the pulp ordinarily filtered as a specific gravity of 1.24, the amount f solution passed through the filters is rge, the ratio of solution to slime in the ulp being 2.3 to 1.

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*Rosario, Sinaloa, Mexico.

NOTE—Excerpt from a paper, "Cyanide Plant and Practice at the Minas del Tajo, Rosario, Sinaloa, Mexico," *Bull.* No. 38, A. I. M. E., Feb., 1910.

In treating oxidized ore, 33 per cent. f moisture is discharged in the residue, hich is chiefly clay having the character a colloid. A certain quantity of tailgs from the former pan-amalgamation ant has been retreated in the slime plant. nese tailings contained a large amount fine sand from the pans, and the filrs reduced the moisture in this material 25 per cent.

The water wash almost completely disaces the gold, silver and cyanide in the ke. The quantity of cyanide disarged is from 0.1 to 0.3 lb. per ton of y slime. The undissolved content of e slime filtered is practically equal to e content of the discharged residue, the fference between the two being 0.1 oz. silver.

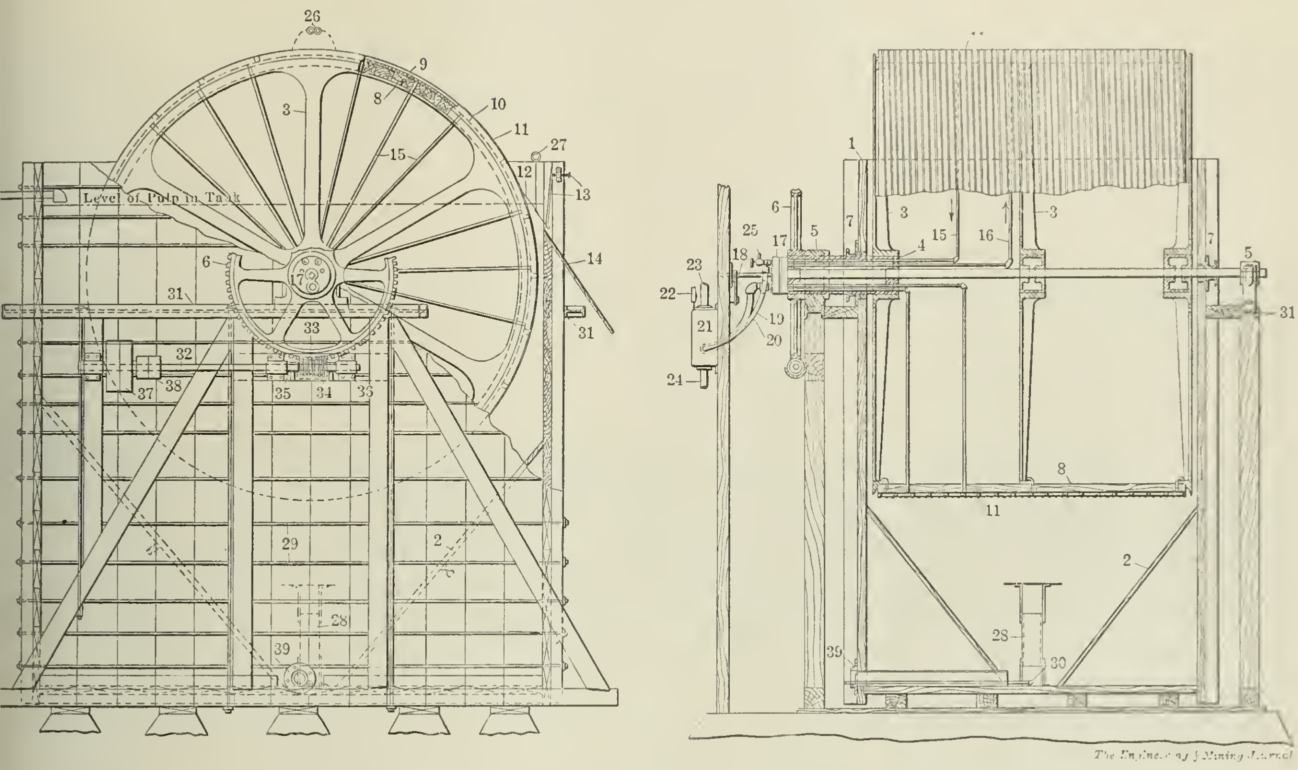
The lime in the solutions gradually desits in the cloth and cuts down the caicity of the filters. To rectify this, the oth is washed once every two weeks with dilute hydrochloric acid. The washing takes an hour, and 7 lb. of acid is used in treating one drum.

There are 290 sq.ft. of filter surface on each drum. Filtering 60 tons per day, per drum, each square foot handles 400 lb. of dry slime. The canvas lasts from three to five months. To re-cover and re-wire a drum takes from 12 to 18 hours.

The cost of re-covering a drum is $33.83. The tons filtered by the cloth being approximately 4000, the recovering cost is $0.0084 per ton filtered.

One *peon* attends the filters and machinery, an expense which would not be necessary in the United States, where labor is efficient, since the greater part of the time no attention is needed, beyond the oiling of the machinery.

The cost of the operation of the filters given in connection with the slime plant includes a proportion of the charges for supervision of mill, shiftmen, timekeeper, watchmen and shop charges for mill. The direct cost of operation per ton of dry slime filtered is: Labor, $0.0161; covering drum, material, $0.0060; covering drum, labor, $0.0022; repairs and supplies, $0.0112; lubricant, $0.0033; power, $0.0835 (filters running under capacity); total, $0.1233. This does not include cost of supervision or other overhead charges.



Transverse and Longitudinal Sections of the Oliver Filter

The reference numbers represent: 1, Redwood tank; 2, false bottom; 3, cast-iron spiders supporting filter drum; 4, hollow trunnion arrying spiders, piping, etc.; 5, main bearings; 6, worm drive gear; 7, stuffing boxes; 8, Redwood staves for filter drum; 9, filter medium;), division strips dividing filter into sections; 11, steel wire protection for filter medium; 12, steel scraper; 13 adjusting screw and lever or scraper; 14, tailings apron; 15, vacuum pipes from filter sections to automatic valve. 16, pressure pipes from filter sections to automatic valve; 17, automatic valve; 18, adjusting lever for valve; 19. flexible vacuum hose for working solution; 20, flexible vacuum hose or wash solution; 21, vacuum chamber containing float check valve; 22, vacuum gage; 23, pipe to dry vacuum pump; 24, pipe to solution ump; 25, pressure pipe for blowing filter sections; 26, wash spray pipe; 27, discharge spray pipe; 28, agitator pipe; 29, tie rods; 30, agitating air nozzle; 31, I-beam frame; 32, worm shaft; 33, worm; 34, oil well for worm; 35, thrust collars for worm; 36, post bearings for orm shaft; 37, driving pulleys; 38, high-speed pulleys for wiring; 39, flange for drain.

Utah Copper Company

The report for the fourth quarter of the year 1909 states that during November and December none of the plants were operated at full capacity on account of inefficient railroad service. During the quarter the lowest grade of ore was treated that has ever been mined by the company, being slightly less than 1.5 per cent. copper. The character of the ore, however, was more favorable for concentration because of the lesser proportion of oxidized material, resulting in a higher percentage of recovery.

The accompanying costs, the report states, include not only all direct operating expenses, but also the proportion of all fixed and general expenses, and the usual per-ton charge for the retirement of prepaid stripping expense, and are based upon net product after smelter deductions and allowances. The sales of copper for the quarter were satisfactory, no copper

COPPER PRODUCTION IN 1909.

	Copper Produced, Pounds.	Cost per Pound, Cents.	Profit.
1st quarter..	12,107,549	9 68	$382,470
2d quarter ..	13,774,412	9.19	482,748
3d quarter..	15,299,674	8 07	721,683
4th quarter.	13,291,210	8 48	596,317

available for delivery remaining unsold at the end of the quarter.

The tonnage of underground ore mined during the quarter was only about 3 per cent. of the total, underground mining being practically discontinued. The ore delivered to the plants in January was of a better grade than that treated during the preceding quarter, due to more favorable mining conditions and a greater area of stripped ground on which to work. All the plants and equipment are in condition to accommodate full tonnage capacity without interruption.

Since the close of the fiscal year 1909, the company has acquired the ownership of the entire capital stock of the Boston Consolidated Mining Company, and its property will be transferred as soon as legal formalities can be completed, and thereafter these two contiguous properties, constituting one enormous orebody, will be operated as a unit. The consolidated operation of these properties will permit economies and enlarged production at increased profit, which it is impossible to obtain when operating singly.

Quantitative versus Qualitative Thinking

BY R. W. RAYMOND

The wider significance of this gathering of alumni of the various schools of science is twofold. It illustrates, first, the specialization of the engineering professions, each requiring its own preparation. It was not so very long ago that the catalog of a certain college announced the Rev. ——— D. D. as president, and professor of ancient and modern languages and history; of mental, moral and natural philosophy and applied science! A small and in some respects, a ludicrous beginning—but it contained at least the aspiration, which was a prophecy, of the manifold and multiform training which our best universities are now equipped and competent to furnish.

In the second place, this gathering emphasizes the underlying unity of all these specialties: Mining, metallurgical, civil, mechanical, electrical, chemical engineers—you are all engineers. Even the architects are engineers or else they are not fully accomplished as architects. You must, methinks, all possess something in common which makes you engineers, and which, as engineers, you are bound to make effective for the benefit of your generation.

I am not going to excite your ridicule, or aid the somnolency of your digestion of such a feast as this, by offering you a complete, inclusive and exclusive definition of an engineer. Certainly, it means more than simply a man who runs an engine. Somewhere in the '70s of the last century, when the American Institute of Mining Engineers held its first meeting in Baltimore, a leading manufacturer of that city said to one of us, "If you have any influence with your brethren in that engineers' convention, I hope you will urge them not to order a strike. In these times, $2.50 a day is really all that we can afford to pay our engineers." Of course, he was told that ours was not a labor union, but a union of laborers, who never struck for high wages, but simply earned them and got them; and that our chief purpose was not to increase the wages but to improve the work.

Quantitative Thinking Essential

While I do not propose to define the engineer, I beg to suggest one element which characterizes, I think, all true engineers. And I will use as a name for it a term borrowed from the laboratory. The engineer's thought and work are quantitative, not merely qualitative. Engineering lies at the base of the edifice of civilization; but the progress of civilization is often erroneously measured by mere inventions. Now inventions may sometimes be made and must always be perfected and utilized by engineers. But inventors who are nothing more fare badly, as they ought to.

How often we hear the accusation that the world has ill repaid the first propounder of an idea which in the hands of another has proved greatly profitable. But, in truth, it is not the happy thought about a thing, but the practical doing of the thing, that deserves reward. No doubt the first man, looking at the first bird, wanted to fly, and tried to fly, but the trouble was, he couldn't fly. Should we now hunt up his heirs, and pay them for the invention of their ancestor? His work was merely qualitative.

Once upon a time, a pale, inspired inventor climbed up to my office, and asked me to help him to go to Colorado. He had invented the idea of using electricity in mining and metallurgy; and he wanted to go to the Rocky mountains, because at their summits electricity was so abundant. His notion was a qualitative one. Yet, no doubt, if he is still alive, he cherishes the notion that he has been robbed of the glory justly due to him for his bright idea.

Inefficiency of the Merely Qualitative Thinker

These qualitative enthusiasts grow more and more numerous every year, with the increase in half-educated practitioners of "applied science." And the old errors continuously crop out anew. After every big snowstorm, we have a number of qualitative proposals to remove the snow from our streets by thawing it with steam jets, and letting it run away of itself. What is still more remarkable, the editors of our leading newspapers gravely publish such communications, under the impression that there may be something in the notion, and that they had better not disparage it lest haply they be found fighting against science.

After the great blizzard a storekeeper in Brooklyn undertook to apply quantitatively this qualitative proposition. Having a 16-ft. heap of snow opposite his store, and a cellar full of old boxes under it, he dug in the drift a chamber with a chimney, crammed this stove with the kindling wood from the cellar, lit the fire, and waited for the mountain to disappear in fervent heat. He, being a qualitative thinker, did not know the difference between temperature and heat units, or dream of the amount of work he was expecting his little fire to do. When he had burned all his wood, he abandoned his faith in science.

I could multiply such illustrations indefinitely. But I may be permitted, in conclusion, to say generally and inoffensively, that qualitative thinking is one of the dangers of our day. Great popular manias, fads of special reform, exposures of public evils or hardships, appeals for governmental interference, all are, or are likely to be, merely qualitative. I think it was Thomas Jefferson who said, in substance, "A free people never loses its liberties by surrender to force. It gives them away in moments of enthusiasm."

It is the duty of engineers, who have been trained to regard and handle things quantitatively, to contribute this needed element to the thought and action of their time.

Let them make no haste to conclusions; let them count the cost, measure the means, weigh the sacrifices, appraise the gains and the losses—in a word, hold fast to the distinction between heat units and mere degrees of temperature.

NOTE—Excerpts of an address given at the dinner of alumni of the Schools of Science and the School of Architecture of Columbia University, on Feb. 2, 1910, at the Hotel Astor, New York.

A Modern Mine at Auboné in French Lorraine

Blast Furnaces Situated at the Iron Mines; Shafts Lined with Cast Iron; Three Types of Pumps in the Mines; About 1600 Men Employed

BY E. WALCH

GENERAL VIEW OF THE MINE AND FURNACES AT AUBONÉ

The exploitation of the oölitic iron-ore posits of the French Lorraine by deep afts is entirely in the hands of iron and eel producers, and in most instances e mines and furnaces are in close connction. A general description of the posits was given in the JOURNAL, June , 1909, and a brief description of a odern surface plant as installed at ubone in the Briey district will be of terest.

This installation includes an iron-ore isting plant and blast furnace. It longs to the Société Anonyme des auts-fourneaux et Fonderies de Pont à ousson.

HOISTING AND RESCUE SHAFTS

Three shafts are sunk, two of which Nos. 1 and 3) are used for hoisting and e third one (No. 2) for ventilating and scuing. The No. 1 shaft was started in 97 and sunk by freezing the ground; isting started in 1901. The two other afts were started successively afterard, and the No. 3 is just completed. e plant is now equipped for an annual tput of 2,400,000 metric tons.

The No. 1 shaft has a diameter of 5 m. d is lined with cast-iron panels. Steel ides made of rails are used. The o. 2 is only 3 m. in diameter and lined th slag bricks. The No. 3 is 4.25 m. in ameter, lined with cast-iron panels and ted with steel guides as the No. 1 shaft.

The No. 1 shaft is equipped with a steam hoisting engine using flat ropes and a Reumaux safety appliance. The No. 2 is equipped with an electric winch and steel-wire ropes. The No. 3 shaft is the most recent and is equipped with an electric hoisting engine of the Ilgner system using steel ropes. The headgear of this shaft is 40 m. high from the ground to the axis of the upper sheave, the sheaves being 5 m. in diameter. The single-floor cages used on this shaft offer room for two cars holding 1500 kg. of ore each. Every hoisting engine is fitted with a Karlik speed recorder.

Cages are hoisted to the upper platform of the headgear at 10 to 15 m. above ground, and cars are tipped into large ore bins, having an aggregate capacity of 10,000 tons. Tipping is done either by hand with special tipples or more often by mechanical appliances, such as tipping traveling bridges. The railway cars are run under the ore bins and loaded directly by gravity.

The gray seam, which is 2.5 to 5 m. thick, supplies 95 per cent. of the ore, the balance coming from the brown seam which constitutes a silicious flux for the blast furnaces. Drilling underground is done with electric drills, and haulage is by 40-60 h.p.-electric locomotives using a 250-300-volt continuous current.

The flow of water in the mine is 6500 l. per min. As usual in the district three types of pumps are installed: (1) A Cornish steam pump, worked from the surface, having a capacity of 10,000 l. per min.; (2) a first-class, underground, duplex, steam pump having a capacity of 13,000 l. per min.; and (3) a set of two Sultzer centrifugal pumps having each a capacity of 5000 l. per min. The whole capacity of the pumping plant is therefore 33,000 l. per min, against a head of 140 m. at which mining is done. Ventilation is effected by a Mortier aspiratory fan of 30 cu.m. per min. capacity.

POWER FROM FURNACE GASES

Steam for the mine is produced by eight semitubular boilers having an aggregate heating surface of 1300 sq.m. The electric power is derived from a central power station which utilizes gas from the blast furnaces. This station contains gas engines furnishing a total of 2700 h.p. and one 500-h.p. steam engine, this latter driving the electric hoist of No. 3 shaft.

The output of the mine since 1901 is given in an accompanying table.

OUTPUT OF THE AUBONE MINES.

	Metric Tons.		Metric Tons.
1901........	36,970	1906.......	912 210
1902........	212,500	1907.......	1,034,075
1903........	403,116	1908.......	854,825
1904........	553,834	1909*......	555,584
1905........	605,154		

*First six months only.

One thousand men are employed in the mine alone, and they live in 386 lodgings erected by the company at a cost of over $400,000. The smelting plant includes two blast furnaces, each producing 120 tons of pig per day, and eight Cowper gas heaters, 7 m. in diameter and 30 m. high. The tapping hall has an area of 2120 sq.m. The number of workmen employed at the furnaces is 250, and 350 perform the services which are common to the mining and the smelting plants.

Headgear at Shaft No. 3, Auboné

Blast is supplied to the furnaces by three 300-h.p. blowing engines utilizing the furnace gas, one 300-h.p. Eberhardt compound steam blowing engine and a 1000-h.p. compound steam blowing engine. Gas cleaning is done first by means of centrifugal fans with water jets, and further by the Theisen process. Steam is produced by eight Babcock & Wilcox boilers having an aggregate heating surface of 1680 sq.m. Three 550-h.p. Poetter gas producers are kept in reserve.

The Société Anonyme des Hauts-fourneaux et Fonderies de Pont à Mousson owns its principal iron works at Pont à Mousson where it erected five blast furnaces, the production of which is almost entirely made into pipes. It also owns at Pont à Mousson a large brick plant producing over 100,000 bricks per day, and a cement works to utilize the slags of the blast furnaces. This company owns also a large smeltery at Foug, the product of which is used in the manufacture of pipes of small diameter and sundry cast-iron pieces.

Cobalt Lake

The annual report of the Cobalt Lake Mining Company showed a loss of $41,906 on the operations of the last fiscal year; this with the balance on the debit side of profit and loss account, brings the total debit up to $233,690. The report, however, was of an encouraging character as regards recent operations in the opening up of a vein from which rich shipments are anticipated. Total shipments from July 31 to Dec. 31 gave a profit of $51,700.

The Mining Census

Special Correspondence

In pursuance of an agreement arrived at between the Census Bureau and the Geological Survey, it has been arranged to have only one set of schedules sent this year to mine and quarry operators. The act authorizing the thirteenth census provides for a census of mines and quarries, and this would presumably result in some duplication of work were the Geological survey to continue sending out its schedules as in former years.

Under the present plan, the supplementary schedules which have been prepared by the Census Bureau will be supplied to the special agents and enumerators of the census. These schedules will be filled out and will be returned to the Census office which will transfer them to the Survey. The Survey will then do the work of tabulation and will supply the completed figures to the census upon an agreed plan. These returns, as prepared by the Survey, will be accepted by the Census and will be published as census returns. None of the information will be collected by mail except in a few large cities where some of the concerns have general offices to which the schedules may safely be sent for intelligent filling out. In all other cases, a special agent will make a personal visit to the mining operation concerning which it is desired to get information. The complete list of such operations in the possession of the Survey has been turned over to the Census Bureau for use in the work of collecting data.

This is a decided innovation upon the methods which were employed at the time of the last census when the collection of these statistics was effected by mail, only the delinquents being visited by special agents. The improvement expected lies along the line of greater uniformity and harmony in the statistics as well as in obviating a good deal of the correspondence which would otherwise be necessary.

The supplementary schedules which have been prepared by the Census and are now ready to be placed in the hands of the special agents cover the following topics: Anthracite coal; bituminous coal; asphalt and bituminous rock; auriferous and argentiferous deep mines; bluestone; clay; copper smelters; copper refineries; granite; gypsum and gypsum products; iron mines; coke; copper mines; lead smelters and lead refineries; limestone; manganese and manganiferous iron mines; marble; mica; millstones and chasers; miscellaneous mining industries; natural gas; non-argentiferous lead and zinc mines; petroleum; phosphate rock; placer and surface mines; pyrites; quicksilver; the rare metals; reduction mills; sandstone; slate; talc and soapstone; trap rock; zinc smelteries.

Fatal Accidents in American Metal Mines

Need of Efficient Legislation. Fatalities 3.09 per Thousand as Compared with 3.13 for Coal Mines. Comparison of International Statistics

BY FREDERICK L. HOFFMAN*

The occurrence of fatal accidents in merican metal mines has heretofore atracted less attention than the importance f the industry demands. It may be conervatively estimated that metal mining n the United States in 1910 employs pproximately 150,000 persons, exclusive f salaried officials and clerks. The cenus report on mines and quarries for 1902 eturned the number employed in metal ines at about 110,000, but it is doubtful hether the total number of wage earners as accurately enumerated for some of e mining States. The rapid progress f the industry during the intervening eriod makes it practically certain that e number employed at present is not uch less than 150,000. The principal ranches of metal mining in the United tates, in the order of their quantitative nportance, are iron, copper, gold and ilver, lead and zinc, and quicksilver. In 902, before the copper industry had atained its present importance, the disibution of mine labor was as follows: 8,851 men employed in the iron mines, 6,142 in the gold and silver mines; 26,07 in the copper mines 7881 in the lead nd zinc mines and about 1500 persons mployed in the mining of quicksilver.

TABLE 1. NUMBER OF PERSONS KILLED BY ACCIDENT IN THE METALLIFEROUS MINES OF NORTH AMERICA, 1894–1908.

	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total.
olorado	...	...	97	110	108	103	107	121	82	67	101	109	82	77	64	1,228
laho	...	...	...	...	...	...	...	...	...	20	10	20	17	18	10	95
lichigan—Dickinson County	...	6	14	10	11	9	19	27	10	16	9	9	15	7	4	166
" Houghton County	22	46	19	26	23	27	36	33	44	33	45	58	44	49	58	563
" Marquette County	...	...	...	17	19	26	24	29	29	23	15	22	22	37	16	279
issouri	17	23	13	16	29	27	52	41	14	17	30	49	58	42	46	474
ontana	27	41	64	52	48	49	47	35	47	39	41	48	52	42	21	653
outh Dakota	...	...	...	...	...	...	...	...	13	8	...	8	7	6	6	48
ewfoundland—Copper	...	...	...	...	...	...	3	...	1	4	2	...	2	...	...	12
" Iron and pyrites	...	...	...	...	...	...	...	1	5	2	1	6	1	...	...	16
ova Scotia—Gold	...	1	2	1	4	...	...	1	1	...	...	.1	6	2	...	19
ntario—Silver and cobalt	...	...	...	...	1	...	1	...	...	...	1	...	2	15	24	44
" Gold	...	...	2	1	2	11	10	...	...	2	6	...	...	...	3	37
" Iron ore	...	...	...	...	...	...	...	3	3	3	...	1	2	...	3	15
" Copper and nickel	...	...	1	...	2	3	7	9	7	2	1	6	3	4	15	60
ritish Columbia	...	...	...	...	6	16	13	14	12	15	14	14	17	20	21	162
nited States	66	116	207	231	238	241	285	286	239	223	251	323	297	278	225	3,506
anada	...	1	5	2	15	30	34	28	29	28	25	28	33	41	66	365
Grand total	66	117	212	233	253	271	319	314	268	251	276	351	330	319	291	3,871

Eed of Effective Legislation for Metal Mine Inspection

For most of these industries the presnt information regarding the occurrence f fatal accidents is very limited and of ore or less doubtful value. Official eturns are available for only a few of the ore important metal-mining States, but ven for these the data, as a rule, are resented in the aggregate and not with a ue regard to the various branches of the metal-mining industry. The corresponding returns for the Canadian provinces are in greater detail, and they have therefore been included in the present discussion for the purpose of convenient comparison. While every effort has been made to make the returns complete, it has been impossible to secure the necessary data for South Dakota for 1904. No returns are available for the metal mines of California, Nevada, Utah, Arizona and a number of other States in which the industry is of sufficient importance to warrant official supervision of mining operations and the official publication of the essential facts regarding the industry.

Table 1 exhibits in detail for the several States and the Canadian provinces the number of fatal accidents in metal mines officially returned since 1894. For some of the States and provinces the information is available for only recent years, while for others the data are not available for the entire period. The lack of accurate information is not to the credit of the various States, which have been decidedly derelict in this matter. There are no satisfactory reasons why returns should be required to be made of the accidents occurring in the coal mines of Utah and not in the metal mines of that State, nor why there should be a complete absence of public interest in this matter on the part of such important mining States as California, Nevada and the Territory of Arizona. It is reasonable to suppose that the total of 3871 fatal accidents in metal mines reported as having occurred in the different States of the United States since 1894 is, therefore, a substantial understatement of the actual facts. In all probability not much less than 5000 deaths have occurred during the period covered by the table. In the Canadian provinces during the same period of time it is estimated that there have been about 500 deaths as the result of metal-mining casualties.

The incompleteness of the table, therefore, precludes an accurate summary account of mining fatalities for recent years. Upon the estimate that about 150,000 wage earners are employed in metal mining at the present time, and that the average fatality rate throughout the United States is not less than 3 per thousand, it is reasonable to assume that the total number of fatal accidents in American metal mines at the present time is not much less than 500 per annum.

Table 2 exhibits in detail the fatality rates for the various American States and Canadian provinces for the years for which the information is available. There are some reasons to believe, however, that the number of persons employed is overestimated for some of the States by the inclusion of men at work in ore milling, smelting and refining, without a corresponding inclusion of the fatalities occurring in this group of employees.

Fatality Rate in United States

The table shows that between 1894 and 1908 the fatality rate in the United States has varied from 4.79 per thousand in 1895 to 2.37 per thousand in 1908.

The rate was as high as 8.28 per thousand in metal mining in Montana in 1896; 7.79 per thousand in iron mining in Dickinson county, Mich., in 1901, and 6.35 per thousand in copper mining in Houghton county, Mich., in 1895; while the rate was as low as 1.45 per thousand for the metal mines of Montana in 1908. The information at present available is not sufficient for a precise differentiation of the accident liability according to the predominating metallic products of the different States. When the returns are combined for the different mining fields and assumed to represent the predominating branch of the mining industry, it would appear that the fatality rate in gold and silver mining as determined by the combined returns for Colorado, Idaho and South Dakota was 2.75 per thousand for the period considered, while the corresponding rate for lead and zinc mining in Missouri was 3 per thousand; for copper mining in Montana, 3.53; for copper mining in Houghton county, Mich., 2.94; and for the iron mines of the same State 4.17 per thousand. Averaging the data for all the States, and for all the years for which the information is available, the fatality rate in metal mining in the United States has been 3.09 per thousand, which compares with 3.13 per thousand for the coal mines of North America during about the corresponding period of time.

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*Statistician, Prudential Insurance Comany, Newark, N. J.

Fatality Rate in Canada

The average fatality rate for the metal mines of Canada during the same period was 3.78 per thousand. The average rate has been as high as 6.64 per thousand for the silver and cobalt mines of Ontario, and as high as 6.54 per thousand for the gold mines of that province. The average rate was lowest for the iron-ore mines of Ontario, or 1.44 per thousand, and as high as 3.57 for the copper and nickel mines of Ontario, and 3.50 per thousand for the copper mines of Newfoundland. The rate has been comparatively low for the iron and pyrites mines of Newfoundland, or 1.93 per thousand, while it has been above the average, or 4.23 per thousand, for the metal mines of British Columbia. Some of the extremely high rates for individual years, and particular mining fields, are due to the small number of men employed and do not indicate with accuracy the true occupation hazard of the industry. The information however, apparently would seem to be sufficiently complete to warrant the conclusion that the average fatality rate in American metal mines, or 3 09 per thousand, is less by as much as 0.69 per thousand, than the corresponding rate for the metal mines of Canada, which is conservatively calculated at 3.78 per thousand.

TABLE 2. FATAL ACCIDENTS IN METALLIFEROUS MINES OF NORTH AMERICA, 1894-1908.

Ratio of Persons Killed per 1000 Employed.

	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	Total.
Colorado	....	....	3.80	3.77	3.57	2.63	2.67	3.25	2.33	2.08	2.86	3.18	2.36	2.33	1.96	2.80
Idaho	....	....	....	....	....	....	....	....	....	2.86	1.67	3.33	2.43	2.57	1.83	2.47
Michigan—Dickinson County	....	3.02	5.57	4.63	4.45	3.13	5.91	7.79	2.54	4.00	2.95	2.80	4.30	2.06	1.64	4.01
" Houghton County	2.99	6.35	2.33	2.98	2.20	2.07	2.58	2.44	3.11	2.42	3.14	3.78	2.67	2.79	3.37	2.94
" Marquette County	....	....	....	4.09	4.33	4.60	3.62	5.58	5.26	3.83	3.73	4.35	3.77	5.49	2.98	4.32
Missouri	3.36	3.70	2.65	2.51	3.81	2.46	4.49	3.73	1.23	1.37	2.20	3.93	4.38	2.79	2.88	3.00
Montana	3.81	4.68	8.28	5.29	4.33	3.98	3.36	2.90	3.41	2.75	2.83	3.27	3.47	2.71	1.45	3.53
South Dakota	....	....	....	....	....	....	....	....	3.71	2.39	....	2.26	1.88	1.71	1.69	2.25
Newfoundland—Copper	....	....	....	....	....	....	7.46	....	2.23	6.41	3.51	....	4.44	....	....	3.50
" Iron and pyrites	....	....	....	....	....	....	....	1.05	4.92	1.83	0.71	4.36	0.63	....	....	1.93
Nova Scotia—Gold	....	1.90	3.59	1.40	6.49	....	....	1.13	1.31	....	....	1.99	11.61	4.14	....	2.70
Ontario—Silver and cobalt	....	....	....	....	16.95	....	20.00	....	....	....	2.88	....	1.89	7.36	9.94	6.64
" Gold	...	...	10.58	2.33	3.45	18.00	13.33	....	....	3.87	26.09	....	....	....	8.38	6.54
" Iron ore	....	....	....	....	....	....	....	8.33	7.73	9.26	....	0.51	1.54	....	1.38	1.44
" Copper and nickel	....	....	2.06	....	3.14	3.58	4.85	3.94	4.04	1.39	0.94	5.11	1.84	2.19	8.71	3.57
British Columbia	....	....	....	....	3.96	4.57	3.48	3.24	3.25	5.45	4.04	3.77	4.27	5.07	5.68	4.23
United States	3.39	4.79	4.24	3.82	3.59	2.87	3.18	3.47	2.74	2.40	2.76	3.41	2.98	2.83	2.37	3.09
Canada	....	1.90	3.69	1.11	4.28	5.91	4.13	2.85	3.29	4.13	2.77	2.79	3.07	4.11	6.08	3.78
Grand total	3.39	4.73	4.22	3.74	3.63	3.04	3.26	3.40	2.79	2.52	2.76	3.35	2.99	2.85	2.69	3.14

Metal Mine vs. Coal Mine Fatalities

It is made apparent by the preceding analysis that the fatal-accident liability in metal mining is certainly not much less than the corresponding accident liability in coal mining. It is quite probable that if the subject were thoroughly inquired into and if all doubtful data were eliminated, it would be shown that the fatal-accident liability is really greater in metal mining than the corresponding liability in coal mining. In this connection it has been pointed out by E. T. Corkill[1], Ontario inspector of mines, that:

"In metalliferous mining an accident seldom occurs in which a considerable number of men are killed, the fatalities usually being one or two at a time, though in the course of a year they may amount to a large total. Public opinion is, therefore, not aroused; the management of the mine is not so much impressed with the importance of careful supervision; the miners are awakened for a few days, and then forget, and the same conditions prevail as before. It is a common belief among most metal miners that the fatalities in coal mines far exceed those in metalliferous mines. This is a great mistake, and, while it is not proposed to argue that metal mining is as hazardous a calling as coal mining, still the writer desires to impress upon all metal miners that only care and close supervision of their work will lessen the number of accidents and place metalliferous mining on the list of the less hazardous occupations."

Comparisons of International Statistics

International comparisons have their inherent limitations but they serve the useful purpose of bringing into contrast at least the apparent differences in conditions which may demand further inquiry and qualified research. Where the liability to error is as serious as in the case of mining-accident statistics, due to the absence of information, or varying methods of reporting casualties according to the degree of seriousness, an international comparison may be seriosuly misleading. But, subject to this caution, the following rates are included for the principal mining countries of the world. The rates, with few exceptions, are for the period 1899-1906 and they have been derived from the annual reports of the chief mine inspectors of the United Kingdom.

Algeria, chiefly iron mines, average rate 1.38 per thousand.

Austria-Hungary, iron mines, 1.48; other metal mines 3.11 per thousand.

Bohemia, iron mines, 1.67; other metal mines 0.81 per thousand.

Bosnia and Herzegovina, iron mines, 1.84; other metal mines 0.82 per thousand.

Belgium, metal mines, 0.75 per thousand.

France, metal mines, 2.02 (for men working underground the rate was 2.49 and for men working overground, 0.92 per thousand).

Germany, ore mines and smelting works, 1.07; Prussia considered separately, 1.08, and Saxony, 0.81 per thousand.

Italy, metal mines, including sulphur, 1.73. In Italy the fatal-accident liability in sulphur mines alone during the 10-year period ending with 1899 was 2.84 per thousand.

Japan, metal mines (1903-1906), 1.50 per thousand.

Portugal, metal mines, 0.95; but for underground workmen alone the rate was 2.15 per thousand.

Spain, chiefly metal mines, but including some coal mines, 2.65 per thousand.

Russia, gold mines (1901-1903), 0.55 per thousand.

United Kingdom, metalliferous mines, 1.14; but underground workmen alone, 1.67, and workmen overground 0.39 per thousand.

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[1] *Eighteenth Annual Report* of the Bureau of Mines of Ontario.

New South Wales, alluvial gold mines, 0.54; gold quartz mines, 0.87; silver and lead mines, 2.49; copper mines, 1.22; tin mines, 0.38; and other metal mines, 0.83 per thousand. (In the Broken Hill district the percentage of cases of lead poisoning averaged during the decade 1897-1906, 0.32, but the ratio was as high as 1.12 per cent. in 1902.)

Tasmania, metal mines (1901-1906), 1.19 per thousand.

Queensland, gold mines, 1.70 per thousand.

Victoria, gold mines, 1.08 per thousand.

Western Australia, gold mines, 2.15 per thousand.

British Guiana, gold mines, 0.28; alluvial placer gold mines in 1895, 8 per thousand.

Kimberley, diamond mines (white miners only), 1.36; underground workmen considered alone, 5.28; and workmen above ground, 0.47; (Colored miners, only), 3.60; workmen underground, only, 7.27, and above ground, 1.71 per thousand.

South African Republic (1895-1898), white miners, 5.41; colored miners, 4.44; total, 4.56 per thousand.

Ceylon, metalliferous mines, mostly plumbago, 0.37; underground, 1.01; overground, 0.07 per thousand.

Gold Coast, gold mines (1898, 1903-1906), 2.41; workmen underground, 6.03; overground, 0.54 per thousand.

India, gold mines, 2.24; underground, 3.23; overground, 0.70 per thousand.

India, mica mines, 0.75; underground, 1.18; overground, 0.13 per thousand.

India, manganese (1901-1906), 0.37 per thousand.

India-Mysore, gold mines, 2.51 per thousand.

New Zealand, alluvial gold mines 1.53; quartz gold mines, 1.32 per thousand.

Transvaal (1902-1906), gold mines, white labor, 4.15; colored native labor, 4.74; Chinese labor, 6.50 per thousand.

It requires no further discussion to emphasize the practical importance of a qualified inquiry into the whole subject of fatal accidents in metal mining corresponding to the amount of public attention which is being given to the occurrence of fatalities in coal-mining operations. The same neglect of metalliferous mines is characteristic of English mining legislation, which has never been as effective in the case of metal mines as in that of coal mines. There can be no question of doubt but that a qualified inquiry would bring to light many facts of great practical importance, and there can be no excuse for the derelict mining States of the far West, which at present give no publicity whatever to the facts of accident occurrence in the metal mines of their respective States.

Mount Lyell Mines, Tasmania

The report of the Mount Lyell Mining and Railway Company, Ltd., operating in Tasmania, for the half-year ended Sept. 30, 1909, gives the production of its Mount Lyell mine during the period at 132,656 tons of ore, and that of the North Mount Lyell at 65,746 tons. The Mount Lyell sent 6922 tons of its output to the company's superphosphate works for acid manufacture, the remainder being sent to the smeltery.

The interesting feature of this company's operations is its application of pyritic smelting to its ores. The ores won from the Mount Lyell mine, containing 0.98 per cent. copper, 2.25 oz. silver and 0.046 oz. gold per ton, do not pay the costs of mining and treatment, but are necessary to form a smelting mixture for the richer ores of the North mine which carried, during the half-year, 6.20 per cent. copper, 1.49 oz. silver and 0.0025 oz. gold per ton.

The reduction works treated 190,482 dry tons of the company's ores made up as follows: Mount Lyell mine ore, 124,843 tons; and North Mount Lyell mine ore (including Lyell-Tharsis), 65,554 tons; a total of 190,482 dry tons containing 2.81 per cent. copper, 1.98 oz. silver and 0.031 oz. gold per ton. Metal-bearing fluxes, precipitates from the mine water and purchased ores brought the tonnage treated to 191,137 tons. This yielded 9650 tons of matte, which in turn produced 4538 tons of blister copper. The costs per ton are given as follows: Mining, 6s. 6.5d. ($1.59); smelting, 7s. 7.28d. ($1.85); converting, 1s. 1.79d. ($0.28); total, 15s. 3.60d. ($3.62).

The ore reserves of the Mount Lyell mine are given at 3,101,455 tons containing 0.533 per cent. copper, 1.96 oz. silver and 0.028 oz. gold per ton; of the North Mount Lyell mine at 777,594 tons containing 6 per cent. copper, 1.33 oz. silver and 0.005 oz. gold. Underground mining has been commenced on the pyrites of the Mount Lyell mine, a little less than 6000 tons having been produced in this way. On the North Mount Lyell, a large amount of development was done, necessitated by the fact that the orebodies are isolated and the problem at each level becomes one of finding new ore, rather than driving to intersect downward continuations of the bodies discovered above. Diamond drilling was extensively resorted to, especially in the lower levels, and resulted in the finding of a new body of payable bornite ore at the 1100-ft. level. Some work was done on the company's outlying properties.

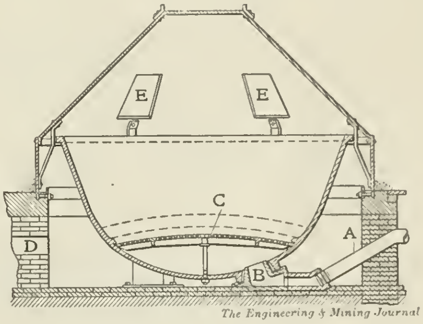
In the reduction works there are six blast furnaces, an average of 3½ of which were in continuous operation during the half-year period. It is found that furnace No. 6, with a higher smelting column than the other five, has continuously given better results, and it is proposed to similarly increase the hight of the others.

In addition to the mines and smeltery, the company owns the Mount Lyell and the North Mount Lyell railways, chemical works for the manufacture of superphosphates and other fertilizers, and a coking plant.

The net profit for the half-year was £139,851 after deducting all charges. The total metal output is given at 100,244 tons of copper, 8,587,601 oz. silver and 280,443 oz. gold.

Ore Roasting Pot

Frank D. Baker, of Denver, Colo., has secured United States Pat. No. 942,810, on an ore-roasting pot in which the hood is without connecting flues at the top and provision is made for a seal around the lower edge of the hood for preventing air from entering. As the hood is fitted with air-tight doors and its lower edge sealed, the gases, after escaping from the pot, may be forced by pressure from the blower, through flues *D* into the atmosphere without the aid of a stack or other means of supplying draft.



BAKER ROASTING POT

The accompanying figure is a sectional elevation of the improved ore-roasting pot. A blast of air is delivered from the conduit *A* and tuyere *B* to the hearth *C* and passes out with the gases through the flue *D*. When it is necessary to rabble or stir the ore, gate valves in *A* and *D* are closed, and the doors *E* opened giving access to the ore. As soon as the rabbling operation is completed the doors are closed, the valves in *A* and *D* are opened, and the roasting process continues. After the ore is roasted, the hood is lifted and the pot removed and dumped. Instead of a sand or other granular seal for the hood, a liquid may be adopted. By having a minimum number of close-fitting rabbling doors and a seal for the hood, it is aimed to reduce the volume of air to be handled by the flue and stack and thus reduce the size of these elements.

Ore Dressing in the Coeur d'Alene District—VI

Free-settling Classifiers Provide Jig Feed; V-Tanks Are Inefficient for Settling and Classifying; Vibration of Tanks Hinders Settlement

BY EDWARD S. WIARD*

I deem it best to treat the subject of classifiers and settling tanks together because some of the points discussed are applicable to all. In the Cœur d'Alene mills below the trommels there are free-settling classifiers for furnishing jig feed. Three plugs and an overflow is the common arrangement. At the Hercules mill none of the jigs was fed with classified products, the feeds to the jigs being all screen sized. For supplying the concentrating tables with feed, V-tanks were at first tried but a pocket launder was afterward substituted. In the Federal mills shallow classifiers are only employed in jig work. Of the forms of free-settling classifiers employed the Richards-Coggins or Lake Superior type, or a modification of it, has given the most satisfaction. The Richards hindered settling classifier is being introduced into the district for retreatment table work and I understand is making closely classified products.

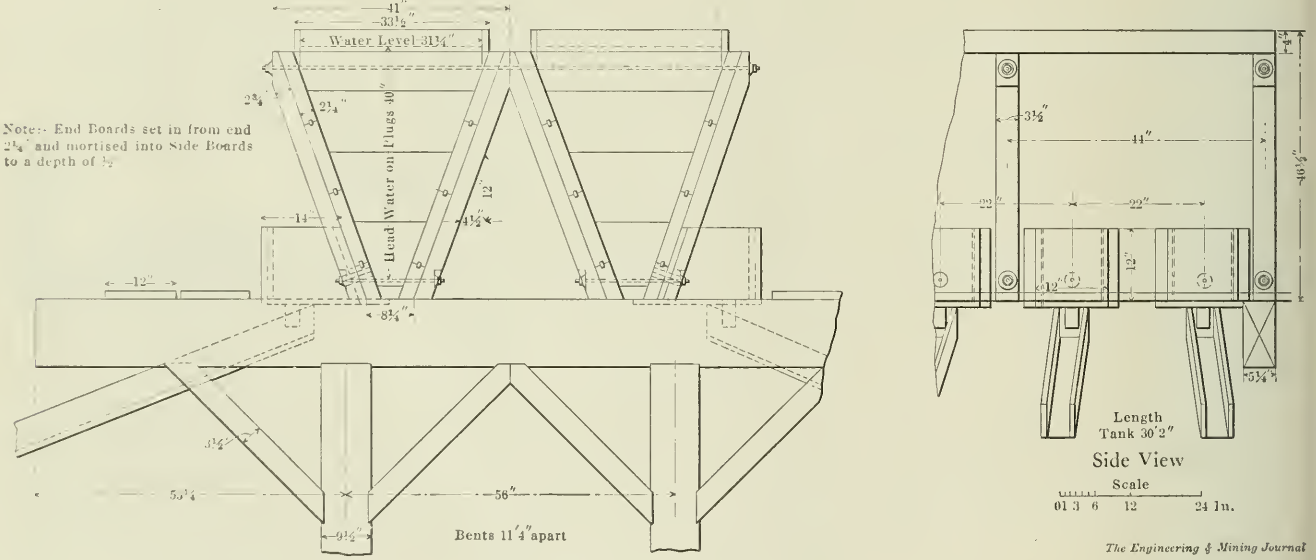


FIG. 1. DOUBLE CLASSIFYING TANKS AT MAMMOTH MILL

DILUTE PULP TREATED

The overflow from the jig classifiers passes into long, deep tanks of V-shaped cross-section which are poor settling and thickening devices and worse classifying ones. The volume of water arriving at these tanks is enormous. It must be admitted that with the jigging and screening starting at so high a limit as it does in this district the flow of pulp down the mill must frequently receive large accession of water. I am not prepared to admit, however, that much more might not be accomplished in dewatering before the sands and slimes reach the jig classifiers than is at present done. It has been my experience that in districts where water was scarce, dewatering operations were used in all parts of the mills. This was done not on account of any particular idea of a beneficial effect on the concentration, but to save pumping. The millman in these arid districts was always prepared for a classifying operation. If he had to use rising water to do this effectively it had no nightmares for him, for the moderately dilute pulp entering the classifier would either be little affected by the increase of water, or a dewatering operation below the classifier would serve to remove any excess. He would have scorned to use a deep V-shaped tank because he could use a shallower and better classifying device, and settlement was readily obtained with the classification.

In the Cœur d'Alene the contributing factors to the extreme dilution of the pulp are the large volumes of water introduced by the jigging and screening operations and, as compared with most concentrating mills, the comparatively small percentage of sand and slime, the bulk of the ore receiving complete treatment on jigs. If dewatering operations are not practicable before the ore arrives at the jig classifiers they certainly are after the pulp leaves them. Even if we admit that dewatering operations prior to the ore reaching the classifiers would entail too great complications there is no reason why they should not be practised immediately before classification for the tables. That provisions to this end were not installed when the mills of the district were erected must have been due either to expediency or an idea that a rough classification was good enough for table work and even this totally unnecessary for the vanners. I find that the view still obtains that the evil of poor classification in table feeding can be overcome by gathering up the slimy water from the tables, thickening and retreating it on another machine. I am not prepared to say why the V-tank system has not been replaced by something better. It will suffice to point out its defects.

FEW SLIME-FORMING MINERALS IN COEUR D'ALENE ORES

Cœur d'Alene ores offer no great difficulty in settlement. The colloidal theory of slime cannot apply to them because they do not contain any of the substances usually assigned as forming colloids with the possible exception of small amounts of sericite which is found in the country quartzite. Carl Barus[1] as far back as 1884 made experiments with finely divided tripoli powder, a highly silicious material, to determine its rate of settlement and the factors affecting its subsidence. He found that particles 0.00005 to 0.00007 cm. in diameter settled to the bottom of tube, in both water and ether solu- ions, before the surface of settled ma- erial had fallen 0.05 cm. This is bout the limit of vision with the nost powerful microscope. A screen vith wires of the diameter of par- icle given, and so spaced as to just ass such material, would contain about 0,000 meshes to the linear inch. Of the otal lead and silver minerals fed into a œur d'Alene mill, the amount which by he comminuting operations would arrive t the sands and slime department in so ine a state of division as to pass a 200- esh screen would be on an average 15 er cent. The amount of ore which would loat away from properly settled and lassified material would be negligible in the present state of the art of ore dressing.

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*Mining engineer, Denver, Colo.

[1] *Bull.* 36, U. S. Geol. Surv. The Subsidence of Fine Solid Particles in Liquids.

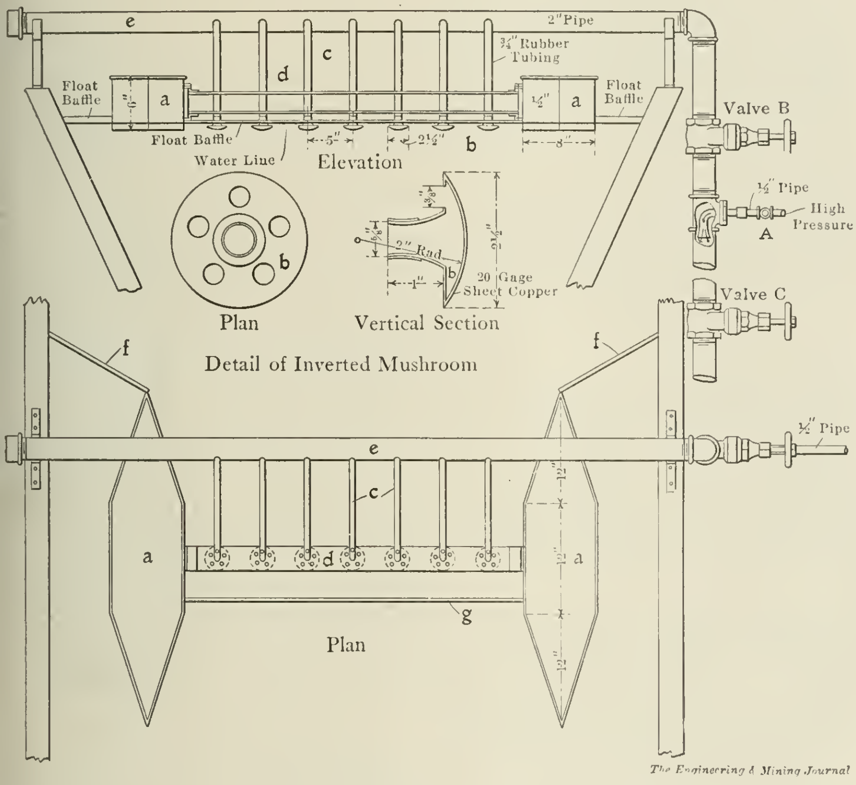


Fig. 2. Siphon Device for Removing Slimes

In Fig. 1 are shown end and side views of the double tanks at the Mammoth mill. The overflow from the classifiers passes directly into the end of these tanks. At the point where the pulp discharges into the tanks, the launders are about a foot above the water surface in the tanks and vertical pieces of spouting are inserted in the bottom of the launders to deflect the pulp. One of the tanks receives the overflow from the main classifier and the other that from the middlings classifier. On the flow sheet of this mill the direct-tank system is indicated by a single figure. The dropping of the pulp vertically from a considerable hight into the water of the tank causes boiling and a large amount of rich slime is constantly rising around the eddies formed by this action. About 13 ft. from the end of the tank where the pulp enters is a baffle submerged 5 in. below the surface of the water. The function of this is to stop the high-grade material from floating away, but before the baffle is reached most of mineral has settled. Near the baffle there is to be found an accumulation of bits of wood, pine needles, etc. I believe the rising of this trash brings most of the high-grade mineral to the surface. At the Sweeny mill I encountered the same phenomenon. An examination of the floating material showed that it consisted largely of tiny bits of wood to which clung finely divided galena. On agitating some of the material in a beaker the galena separated readily from the wood and settled promptly.

Siphon Device for Removing Scum

The siphon device I used for removing this scum floated in the water about two-thirds the way from the feed end to the overflow end, but it would have been possible to have placed it much closer to the feed end of the tank and obtain water free from low-grade slime. For the purpose of merely removing comparatively clean water, a number of devices could have been used.

As shown in Fig. 2, two float tanks *a* serve to carry the intake end of the siphon, which consists of a number of copper mushrooms *b*, connected to the main siphon pipe by rubber tubes *c*. My floats were made of No. 30 sheet iron heavily coated with bitumen, but thin sheet aluminum would be better. The rubber tubing should be thin-walled, so as not to interfere with the free vertical movements of the floats. The bracket between the floats *d*, supporting the tank end of the tubes and the inverted mushrooms, is made of light strips of wood stiffened by four little angle irons in the corners. The inverted mushrooms or strainers are made of No. 24 copper plate.

With the form of strainer used, the pull due to the siphon action draws the top layer of water downward and in from the sides firmly and gently. With a simple tube in the water a current would be created from the bottom of the tank that would stir up the low-grade slime below the upper layers of water. The float tanks are prevented from moving from their position by strings, not shown in the drawing, fastened from their points to the nipple pipe *e*. The little strips of wood *f*, from the points of the floats to the sides of the tank, are in the nature of baffles to cause the floating material to converge toward the mushrooms and prevent its passage between the floats and the sides of the tank. A similar strip *g* floats behind the mushrooms to prevent material from floating by them.

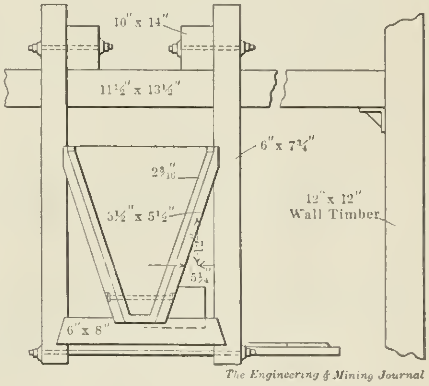


Fig. 3. Suspended Tank

The siphon device is started by opening the valve *A* from the high-pressure supply; after it is started, the valve is closed and regulation is effected by the valve *B*. To avoid a climb to the tank, a second valve *C* for starting or stopping the siphon may be placed on the vanner floor. The coarser bits of trash are removed by a fine screen as the pulp enters the V-tank.

Tank Arrangement at Mammoth Mill

At the end of the duplex tanks of the Mammoth mill the pulp of the south tank flows into the companion tank through a shallow slot cut in the top of the tanks. It then flows into a launder 12 in. wide, the launder being enlarged to a width of 23 in. at the slot cut in the side of the north tank. From the launder the pulp flows into the suspended tank illustrated in Fig. 3. The supports for this tank are 6 ft. apart, plugs 36 in. apart, hight of tank 54½ in., width of bottom 9 in., and width at top 45 in. From this tank the overflow passes by a launder into a third tank having about the same dimensions as a single tank of the duplex series. Fig. 4 shows the number and diameter of the plugs in this tank system. The final overflow is about 150 gal. per min. The head of water on the plugs in the duplex tanks is 40 in. and that on the plugs of the suspended tank 46½ in. The diagram shows that the tanks are usually run with every other plug closed and the common spacing is thus 44 in. Most of the openings in the tanks are equipped with ordinary plugs of the types shown in Fig. 5. The one shown at the left is the more satisfactory. The curved opening is especially helpful where there is a notable amount of wood pulp in the slime. It is a good idea where plugs are used to keep a plentiful supply of the various sizes on hand and replace the old by new ones at periodical times. When the old plugs are removed they should be destroyed; otherwise they will be liable to be put back in the tanks. Fig. 6 shows a form of gate used on the Mammoth tanks at some of the tank openings as a substitute for the ordinary plug.

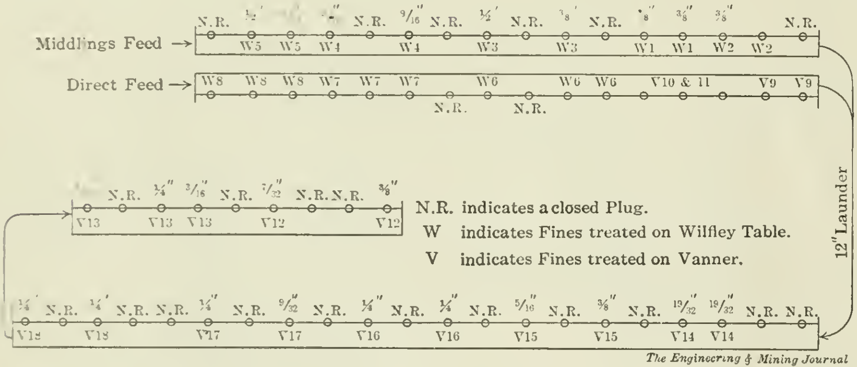

Middlings Feed
Direct Feed
N.R.
½"
9/16"
⅜"
3/16"
7/32"
¼"
9/32"
5/16"
19/32"
W5 W5 W4 W4 W3 W3 W1 W1 W2 W2
W8 W8 W8 W7 W7 W7 W6 W6 W6 V10 & 11 V9 V9
V13 V13 V13 V12 V12
V18 V18 V17 V17 V16 V16 V15 V15 V14 V14
N.R. indicates a closed Plug.
W indicates Fines treated on Wilfley Table.
V indicates Fines treated on Vanner.
12" Launder
The Engineering & Mining Journal

Fig. 4. Key to Plugs Used in Tank System

There is considerable vibration of the tanks, notably of the suspended one, and this motion hinders quick settlement and classification. In erecting a mill every effort should be made to give spitzkasten supports free from vibration, even to the extent of resting them on posts independent of the main vertical mill-members if these will be set in vibration by the motions of the Wilfley tables and vanners. I noted at one time that samples of pulp in barrels showed remarkable differences in the rate of settlement. With barrels set on a concrete floor laid on the solid rock, the addition of a little acid caused the pulp to settle completely in a few hours, while in those resting on the suspended portion of the same floor, after 24 hours of settlement the solutions were still turbid; and the vibration was far from being of as great amplitude as that of the Mammoth tanks.

Defects of Classifying System

The faults of such a settling and classification system as that described are: (1) The tanks are too long to be good surface-current classifiers; (2) the formation of slime hoppers between plugs causes a serious reduction in the cross-section of the tank; (3) plugs are continually stopped up or the material delivered contaminated from accumulations of slime between plugs sliding down into the discharge orifices.

Seldom if ever in Cœur d'Alene mills is care exercised to introduce the current of slime into the tank so as to get the best results from surface current classification. The pulp is usually dumped into the tank. In these long tanks a surface current would not long persist but would break up into subcurrents heading to different parts of the tank and tending to set up flow in the whole cross-section of the water. To get the best settling result it is of course desirable to set the whole body of the water in motion but such a result spoils the classification.

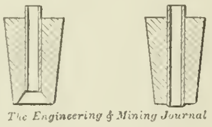


Fig. 5. Details of Plug

Slime Hoppers between Plugs

The section of a V-tank varies from a minimum given by a hyperbolic expression involving d, α, θ and s to a maximum given by the expression d_2 *tan.* θ where θ is the angle of the sides of the tank from the vertical, α the angle of repose of the slime with the horizontal, d the depth of water in the tank and s the spacing of the plugs. The minimum cross-section diminishes as α, d and s increase. Between the plugs the slime builds up portions of conical hoppers of the tank. The intersections of the portions of the hoppers with one another form hyperbolas. The minimum cross-section is thus an area bounded by a hyperbola, a portion of the sides of the tanks and the surface of the water. In a tank where $d = 40$ in. and $\alpha = 20$ deg. 3 min., the section varies from 2.85 to 4.16 sq.ft. where $s = 44$ inches.

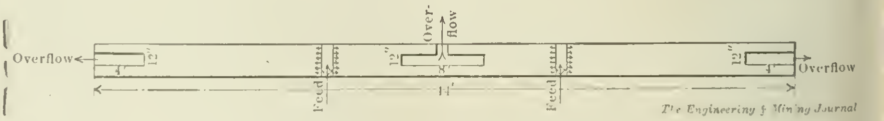


Fig. 7. Plan of Hunter Tank

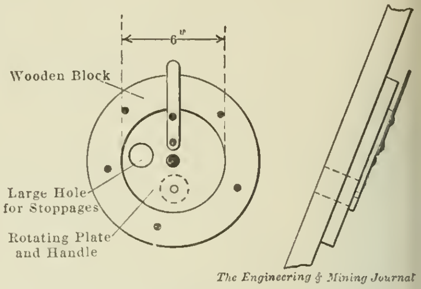


Fig. 6. Gate for Plug Openings on Tanks

If the plugs were 22 in. apart the minimum cross-section would be increased to 3.83 sq.ft. I have assumed that the angle of repose is 45 deg., as I have found by measurement that the finest slime will settle to an angle of 38 deg. with the horizontal. The slime hoppers will build up highest at the feed end of the tank and lowest at the far end. The contractions and expansions of the flowing stream due to the slime hoppers create eddies which tend to send fine slimes to plugs to which it does not belong and to carry grains too far. If the flow in the tank is of a steady, uniform current the classification will be poorly defined because portions of the entering stream of pulp will descend as a whole to the bottom of the tank and pass out of the plugs in an unclassified condition. The creation of eddies by the changes in cross-section of the tank tends further to confuse the definition of the classification.

Wide Spacing of Plugs

The spacing of the plugs widely is done to make the pulp thick. Within certain limits of spacing increased thickening is obtained as the spacing is increased. If the plugs be close together the reduction of section between them is small because the slime hoppers build up in the point or narrowest portion of the tank, but as the spacing is increased the reduction of area increases rapidly, for each successive increment of spacing carries the hopper up into wider portions of the tank. If the spacing were carried to an extreme the cones projected would meet at some point above the tank. In such a case there would be a depression over each plug and between solid masses of sand and slime flattened on op, over which the pulp would flow with a current strong enough to carry all the grains forward. Goose necks are never employed on the Cœur d'Alene V-tanks for reducing the head of water on the plugs.

All the ores of the district as they reach the mills contain a large amount of wood. A portion of this reaches the sands and slimes departments in a pulp of shredded particles. It is claimed by he millmen that only a comparatively

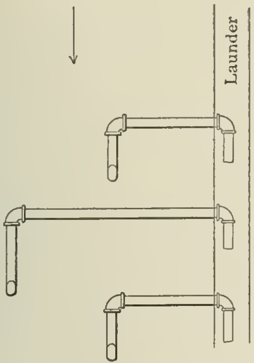


Fig. 8. Inclined Pipes

great head of water or large plugs will prevent this material from lodging in the ank openings. There appears, however, a wide difference of opinion among the millmen as to how far they can go in reducing the head and diameter of the plugs.

It should not be overlooked also hat if the vanner man is left to follow his own bent he will settle the matter of the right size of plug to use in the way most comfortable for himself. The use of screens for removing the bulk of he woody particles is not general in the district. I am not an advocate of putting feed on vanners as thick as can be obained. The recent work of Doctor Gahl at the Detroit Copper Company's mill at Morenci, Ariz., shows the fallacy of that mode of feeding, but the watery feeds which come from these V-tanks are too hin for the best results.

The accumulations of sand and slime between the plugs are constantly sliding, ending to stop the plugs or carry down to hem notable amounts of the finest slime. This effect is more harmful at that part of the tank where the coarsest sand setles.

On casual thought one would be disposed to think that the accumulation in he tank near the entry end of the feed would consist almost entirely of sand, but t is surprising how much fine slime adheres to the faces of ore between plugs and is carried down with the sand when an avalanche takes place.

Classification at Other Mills

At the Hunter mill classification by shallow classifiers is employed for furnishing feed for the jigs and to some extent for the tables. The overflow from the final classifiers flows into tanks placed along the walls of the mill building. The rear of these tanks is vertical. The front has an angle of slope with the horizontal of 54 deg. The spacing of the plugs is 48 in. and the head of water on the plugs, 51¾ in. The plugs are placed vertically in the bottom of the tanks and feed machines placed below. Fig. 7 shows how the feed is distributed in the tanks and the mode of overflow.

A similar overflow arrangement consisting of a launder submerged in the water of the tank and set parallel to and equidistant from the sides is used on one of the V-tanks at the Standard mill. This device works continuously. At tap-off times of the jigs, they are comparatively deeply submerged and the desired effect of skimming off the clean surface layer of water is not obtained. The ordinary variations in the flow also interfere with the skimming operation.

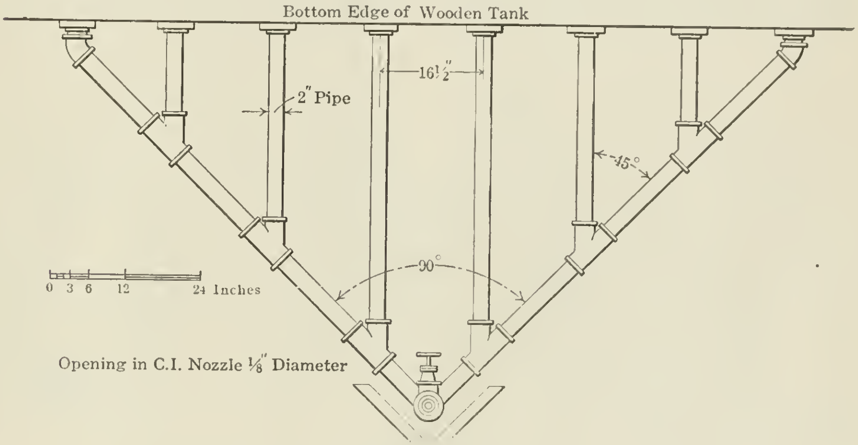

Bottom Edge of Wooden Tank
2" Pipe
16½"
45°
90°
0 3 6 12 24 Inches
Opening in C.I. Nozzle ⅛" Diameter
The Engineering & Mining Journal

Fig. 9. Device on V-Tank, Bunker Hill Mill

Bunker Hill V-Tanks

The Bunker Hill tank is placed athwart the long axis of the East mill. The feed enters the side of the tank and the head of water on the plugs of the west portion, which is somewhat different in construction from the remainder, is 62 in. The spacing of the plugs is 36 in.; the diameters range from 5/16 to 9/16 in. In addition to the overflow produced by the great series of inclined pipes illustrated in Fig. 8 there was at the time of my visit a discharge of about 100 gal. per min. through a slot in the side of the end of the tank. It is stated, and I am inclined to believe, that the amount of solids which go to waste from this tank is very small. In a long tank of this kind with plugs and cross-section large enough, the amount of overflow can be reduced to any desired amount.

The Morning mill has an enormous V-tank system. The overflows from the classifiers on both sides of the mill discharge into the same V-tank. The east overflow enters the tank about 30 ft. from the east end; the west overflow about 20 ft. from that end. The flow of the pulp is to the east. At the extreme east end the tank discharges into a parallel tank of the same length. At the west end the second tank discharges into a third parallel one. These tanks are about 100 ft. long, the spacing of the plugs is 42 in. and the angle of the sides with the horizontal 62½ deg. At the time of my visit to the mill it was shut down and the water had been drained from the tanks. I could not measure the depth of water on the plugs but I did note that the reduction of cross-section between the plugs due to the accumulation of slime was great.

In the lower part of the mill for feeding vanners and settling tailings for retreatment, there are a large number of V-tanks equipped with the device shown in Fig. 9. At first sight this seems an excellent device for thickening the pulp and reducing the hight of accumulations of material between openings.

The head of water on the ⅛-in. nozzle is about 98 in. As shown the contrivance has eight openings in the tank and covers a tank length of 132 in. With eight plugs of ⅛-in. diameter in the bottom of the tank the pulp would be discharged with about 4½ times as much water as from the single ⅛-in. nozzle. On climbing to the top of the tanks I found stretches 8 to 10 ft. long filled solid with sand and slime. It may have been that this was due to neglect in the bustle of shutting down the mill. At the Hercules mill the device was tried and discarded because of frequent stoppages. Above each pipe was suspended a rod for the purpose of loosening accumulations.

SETTLING TANKS AT SWEENY AND MAMMOTH MILLS

For settling the material from the floor drains, the overflow of elevators, concentrate tanks and bins, shallow tanks are provided at some point outside the mill buildings. The same style of tank is to be found at the Sweeny and Mammoth mills. At the latter mill the tank consists of four sections about 3 ft. deep, 10 ft. wide and 40 ft. long. The water enters the section nearest the mill, then at the lower end flows into the second section. At the head end of section two the water passes into section three and so on, zig-zagging through the tank until finally it goes to waste through a passage 22¾ in. wide. The head of water on the discharge is 2¼ in. or approximately 230 gal. per min.; the passageways at the end of the sections were 40 in. wide and cut in top of the partitions. Means are provided to divert the flow from the first section to the second when it is desired to clean up the former.

At the Sweeny mill the outdoor tank consists of four sections 5 ft. wide, 30 ft. long and about 2 ft. deep; 1700 tons of water, containing 1.2 ton of slime averaging 30 per cent. lead, enter the tank in 24 hours. The final overflow is through a passage 24 in. wide. When it is considered that in this pattern of settling tank all the water at the end of each section must pass through narrow slots into the next it is difficult to conceive of any material settling in any compartment except the first.

NEW SETTLING TANKS AT BUNKER HILL MILL

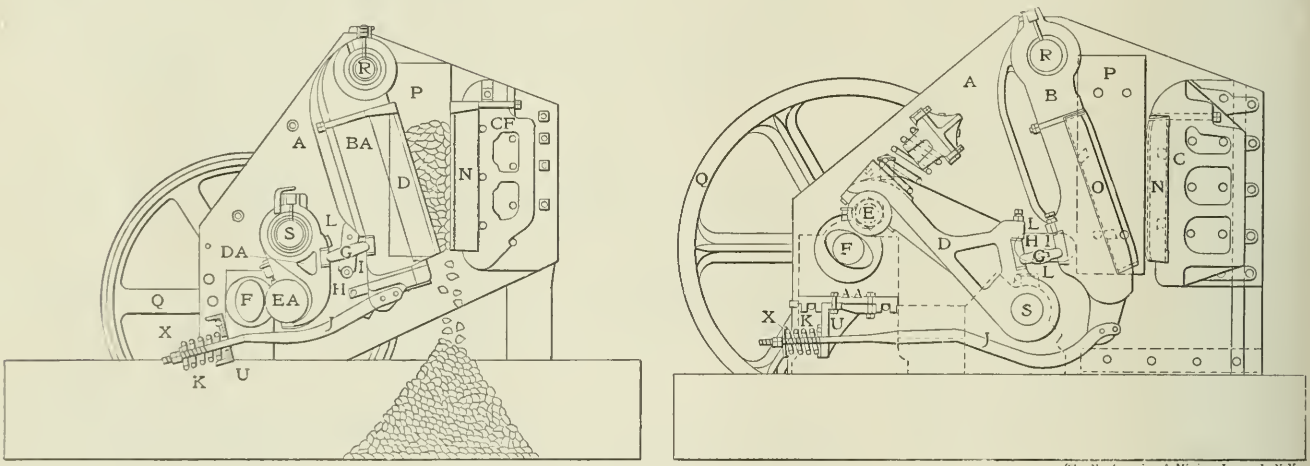
At Bunker Hill mill there is an immense spread of outdoor settling tanks. Some tanks which had been constructed just previous to my visit were far better than the rest. They received water containing high-grade material and had compartments 3 ft. deep, 20 ft. wide and 20 ft. broad. The water was split up so as to give each compartment an equal amount and an attempt was also made to distribute the water evenly across each compartment. At the discharge end I raised some of the settled material with a stick and found the grains still coarse enough to reflect the light from countless crystalline facets.

At the Hercules mill the overflow from the coarse-concentrates bin goes to waste. That from the slime tank is pumped back into the wash-water system. Some of the high-grade material so returned must go to waste with tailings. In my opinion it is far better to settle and ship high-grade material than to resubject it to the cycle of the mill.

The Champion Rock Crusher

The main shaft of the Champion crusher, shown in the accompanying sections, is elliptical in shape so that each revolution produces two movements of the jaw. By this means the speed of operation is halved and much wear is saved. The main frame *A* of the crusher, in order to stand the tensile strain to which it is subjected, is constructed of rolled steel. Cast iron is used for the stationary and swinging jaws, which must withstand compression strains.

The solidity and rigidity necessary for a crushing machine are obtained by having all bolts double nutted and the side plates planed with grooves into which tongues on either side of the stationary jaw fit. This makes the sides and front end of the machine practically one solid piece. Care is taken to provide against lost motion by slightly tapering the arbor *R*, from which the moving jaw is suspended so that when necessary to rebabbitt the bearing arbor can be driven out easily. The arbor is tightly secured to the side plates of the crusher but can be taken out for repairs and quickly replaced. The Champion rock breakers are built by the American Road Machine Company, Kennett Square, Pennsylvania.



TYPES OF CHAMPION ROCK BREAKERS

San Toy Mining Company

The San Toy Mining Company, operating a silver-lead mine in the Santa Eulalia district, Chihuahua, Mex., sold 29,509 tons of ore during the year ended Dec. 31, 1909, from which a gross income of $655,465 was realized. After deducting all expenses, including heavy development and construction charges, net earnings to the amount of $326,483 remained. The company closed the year free from debt and with $137,783 in undivided profits in the treasury.

The ores of this company occur in lime or on the contact between lime and a porphyry capping, the deposits including both vertical fissures and flat chamber deposits. The production of the last year was almost entirely from the latter class. A new shaft was sunk for the purpose of opening the vertical fissure discovered in 1908. This shaft was sunk to the first level (474 ft.), equipped and placed in operation early in January, 1910. Electric power is in use at the mine, furnished by a generator actuated by a Koerting-type gas engine.

The president says that new development will now proceed rapidly with special reference to the vertical fissure, that under the circumstances the production for the year was satisfactory, that though good ore is exposed the reserves cannot be measured on account of the irregularity of the deposits, and, finally, that a continuation of these bodies is fully anticipated.

The Chester County Historical Society in Pennsylvania will with appropriate exercises celebrate next summer the 100th anniversary of the starting of the first boiler-plate mill in America. This was the Brandywine mill, near Coatesville, which was built in 1810 by Dr. Charles Lukens. This was the foundation of the extensive works now owned by the Lukens Iron and Steel Company.

Sprague Process for Treating Furnace Gases

Used Successfully at Midvale, Utah; Sulphuric Acid Neutralized by Zinc Oxide, Lime or Magnesia; Fumes Removed by Filtration through Fabric

BY C. B. SPRAGUE*

The Sprague process has for its object the removal of all fume, solid matter and sulphuric acid from furnace gases, by filtration through fabric, after a preliminary chemical treatment of the gases to make filtration possible. The necessity for the removal of these substances is two-fold:

(1) To prevent possible damage to vegetation.

(2) The recovery of valuable metals, otherwise lost as fume.

Until recently, practically all damage suffered from furnace emanations was ascribed to sulphur dioxide gas. A study of these emanations and of conditions surrounding smelteries has shown that such damage is due, if at all, only in minor degree to this gas, and that when sulphur dioxide is admitted into the atmosphere in a state of sufficient dilution, it is not injurious.

SMELTERY EMANATIONS

These are flue dust, fume, sulphuric acid and gases, including sulphur dioxide. The flue dust represents in general the composition of the finer material fed to furnaces, although it may have undergone more or less alteration. In general, flue dust is comparatively harmless to vegetation, and with a proper system of flues may be made to settle out of gases, so that no appreciable quantity escapes into the atmosphere.

The fume is solid matter in an infinitely fine state of division, and is for the most part the result of chemical action in the furnaces. It consists of various metallic compounds—arsenious oxide and sulphide, salts of lead, copper, iron, zinc, etc.; it usually contains silver and some gold. A greater or less proportion of the salts consists of the soluble sulphates of metals.

The quantity of sulphates depends on the amount of sulphur in the ores, and on the treatment to which they have been subjected. The fume from reverberatory roasting furnaces, treating sulphide ores or mattes, is always rich in sulphates. The proportion of sulphates produced in pot or converter roasting is much less. The fume from copper-blast furnaces and converters is also high in sulphates. The smelting loss in valuable metals carried away as fume, is great. The extent of this loss depends, of course, on the composition of the ore and the metallurgical treatment.

FILTRATION THE ONLY PRACTICABLE MEANS OF TREATING FUME

The fume cannot be made to settle out of gases by means of flues. Owing to the inability of water to effect contact with the fume, all methods depending on its action are practically useless for precipitating and removing the latter. The great difficulty and cost of thoroughly subjecting enormous volumes of gas to the action of water is also apparent.

The only practical means known at present for arresting and recovering the fume, is by the filtration of gases through fabrics. This has been practised to a limited extent heretofore, especially on gases from lead blast furnaces. It has not hitherto been possible to apply this method to roasting or blast furnace treatment of copper ore, owing to the destruction of the filtering medium, due in part to the corrosive salts mentioned but especially to sulphuric acid. Sulphuric acid is produced in greater or less quantity whenever sulphide ores or mattes are roasted. For the greater part this arises from the breaking up of sulphates produced in roasting. The sulphur trioxide so produced unites with the water vapor, always present in the gases, forming sulphuric acid.

CHARACTER OF OPERATIONS INFLUENCE PRODUCTION OF SULPHURIC ACID

The method of treatment influences the amount of sulphuric acid produced. In reverberatory roasting as much as 1.5 or 2 per cent. of the total sulphur in the charge may be converted into sulphuric acid, and carried away in the gases. In pot or converter roasting the proportion converted into sulphuric acid is much less, as is also the quantity of sulphates. In blast-furnace smelting of lead ore, where the amount of sulphur in the charge is small, and a reducing atmosphere is maintained, sulphuric acid is not produced. Varying quantities are formed in copper blast-furnace smelting, depending on the amount of sulphur in the charge, and other conditions.

Sulphuric acid (or sulphur trioxide) is also produced in the converting of matte, especially in the last stages of the blow; and small quantities are given off in reverberatory smelting. The quantity of sulphuric acid produced in the treatment of sulphurous ores is relatively small as compared with the sulphur dioxide. Although the sulphuric acid so produced must be in the liquid state at low temperatures, it is at many plants so rarefied that it cannot be made to settle out in cooling chambers, nor can it be effectually precipitated by water sprays.

Where much sulphuric acid exists in gases, its amount can be determined by the chemical analysis of a measured quantity of gas, the total volume being known. If the quantity is small, the examination of a sample of manageable size, will often fail to show its presence. In such cases, large known volumes of the gas should be filtered through woolen or cotton bags. The acid is retained in the fume collected, and may be determined by analysis of the latter. Where sulphuric acid exists, even in traces, this experiment will result in a rapid deterioration of the bags.

SULPHUR DIOXIDE

The flue gases from smelting operations consist for the most part of air, more or less impoverished in oxygen, with lesser quantities of carbon dioxide and sulphur dioxide. The removal of the sulphur dioxide has no part in this process. The usually dilute condition of the sulphur dioxide in furnace gases renders its conversion into sulphuric acid impracticable, even though the product could be disposed of. Owing to its large quantity, any special chemical treatment for the removal of sulphur dioxide is not commercially practicable.

It cannot be removed by means of water, as has often been proposed, for aside from the low solubility of the gas when dilute, the enormous quantities of water and the disposition of solutions, it would be spontaneously given up from such solutions on exposure to the air. Whether or not the sulphur dioxide given off from furnaces is capable of doing damage to vegetation, any such possible damage is minimized by dilution. Gases rich in sulphur dioxide may be diluted by the admission of air into the flues before filtration. The air admitted also serves to cool gases.

NEUTRALIZATION OF GASES

The purpose of the Sprague process is therefore to neutralize the sulphuric acid in the gases, and remove, by filtration, the fume and the sulphates produced by neutralization. All the sulphur, including that combined as metallic sulphates and sulphuric acid, is eventually discharged into the air as sulphur dioxide, excepting the small amount going into the slag.

For neutralization zinc oxide, lime,

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*Research chemist, United States Smelting, Refining and Mining Company, Midvale, Utah.

magnesia or other bases may be used. In addition to neutralizing the sulphuric acid these substances have the power of decomposing the soluble salts of iron and copper in presence of water. Zinc oxide has a discriminating action toward sulphuric acid, and does not unite with the sulphur dioxide under the conditions where it is used, the process being entirely dry. In absence of water, lime and magnesia unite with the sulphur dioxide so slowly as not to interfere with the neutralization of the sulphuric acid; so that no great excess over that quantity theoretically combining with the latter need be used.

The difficulty is in effecting a thorough mixture of the neutralizing agent with the rapidly moving gases, when fed into them mechanically. A successful method, however, has been worked out. Where the quantity of acid is not excessive, it is best neutralized by zinc oxide evolved in the state of fume from zinc ores treated in special furnaces. The furnace is connected with the flue conveying the furnace gases to be neutralized. The zinc oxide being itself in a condition of fume, is carried along with gases and effects intimate mixture with them. Where the quantity of sulphuric acid is large, powdered lime or magnesia is introduced into gases, by appropriate means, and its action supplemented by that of zinc oxide evolved from special furnaces. This last is necessary because complete neutralization, by agents mechanically fed into gases, cannot always be depended upon, owing to the difficulty of effecting perfect mixture.

This combination makes it possible commercially to neutralize and filter gases containing large amounts of acid. The neutralization must be absolutely complete, as even the escape of traces of the acid will in time destroy the filtering fabric. The zinc-oxide furnaces are provided with an air blast beneath grates. The zinc ore is mixed with coal. The action is one of reduction and oxidation. The ores may be either sulphides or oxidized, and when of favorable composition, as high as 75 per cent. of the zinc, may be driven off as oxide.

Theoretically 81 parts of zinc oxide, 56 parts of lime, or 40 parts of magnesia, are required to neutralize 98 parts of sulphuric acid. More is used as a factor of safety. The amount of zinc oxide used is never sufficient to have any effect. on the metallurgy of the plant at large, and finally finds it way into the slag. Where lime is used, it is, of course, finally available for flux in the blast furnaces.

COOLING GAS BEFORE FILTRATION

Before entering the baghouse the gases should be cooled under 100 deg. C. To effect this, either air is admitted into the flues, which serves further to dilute the sulphur dioxide, or gases are conducted through steel cooling flues, or both. Although the first cost is several times greater, woolen bags are preferable to those made of cotton or other vegetable fiber, for filtration, and must be used in any case where gases are at a high temperature or contain much sulphur dioxide. Above 110 deg. C. woolen bags undergo a slow deterioration; the same is true of cotton at lower temperatures, Such materials as wire gauze, asbestos or glass cloth, are physically unsuitable and cannot be used for gas filtration.

AMOUNT OF FILTERING SURFACE

The amount of filtering surface required is determined more by the quantity of fume to be recovered than on the volume of gases. The amount of fume produced varies with the composition of the ores and with the treatment given them; and may be 1 to 2 per cent. of the weight of charge. Ordinarily not less than 25,000 sq.ft. of filtering surface should be provided per ton of fume produced per day. The neutralized gases are drawn through flues and forced through the baghouse by means of fans. The gases escape, while the fume is retained on the inner surface of bags and falls into a chamber beneath. The accumulation of fume is removed from time to time and treated for the recovery of its valuable contents.

CAPACITY

This process has been in successful operation at the lead smeltery of the United States Smelting, Refining and Mining Company at Midvale (Bingham Junction), Utah, since August, 1908.

Five or six blast furnaces are operated, having a capacity of 1100 tons of charge; 18 pot roasters with a capacity of 300 tons; and 6 hand roasters treating 72 tons of matte; besides a small reverberatory furnace for smelting matte, and an arsenic refining plant.

About 3000 lb. of sulphuric acid is neutralized daily, and the recovery of fume is approximately 20 tons. The filtering surface in the baghouse is about 500,000 sq.ft., there being 3340 bags. Those taking gases from the roasting plant are of wool, the others of cotton. The amount of gas filtered is about 350,000 cu.ft. per min. measured at 0 deg. C. The hotter gases are passed through steel cooling flues before entrance into the flue leading to baghouse. Neutralization is effected by means of lime, and of zinc oxide evolved from furnaces, two of which are kept in constant operation. Normally, no "smoke" whatever is to be seen, only invisible gases being given off from the plant.

The process is equally adapted to copper smelting, and the United States court has recently granted permission to start the company's copper plant at Bingham Junction, on the showing made.

This, in common with the other smelteries in the Salt Lake valley, was shut down early in 1908 by the injunction obtained by the farmers from the Federal court.

Prices of Manganese Ore

The latest schedule of manganese-ore prices issued by the Carnegie Steel Company, which is the principal buyer, is based on a valuation of 26c. per unit of manganese and 5c. per unit of iron for an ore carrying 49 per cent. or over in metallic manganese. This base ore must contain not over 0.20 per cent. phosphorus and not over 8 per cent. silica. Prices are for deliveries at Bessemer, Penn., near Pittsburg, or at South Chicago, to the South works of the Illinois Steel Company. The price scale is as follows:

	Per Cent. Metallic	Cents per Unit.	
	Manganese.	Manganese.	Iron.
Ore containing	49 or over	26	5
Ore containing	46 to 49	25	5
Ore containing	43 to 46	24	5
Ore containing	40 to 43	23	5

For excess of phosphorus or silica over the base, deductions are made as follows: For each 1 per cent. in excess of 8 per cent. silica there shall be a deduction of 15c. per ton, fractions in proportion. For each 0.02 per cent. or fraction thereof in excess of 0.20 phosphorus there shall be a deduction of 2c. per unit of manganese per ton.

Ore containing less than 40 per cent. manganese, or more than 12 per cent. silica or 0.225 per cent. phosphorus is subject to acceptance or refusal at buyer's option. Settlements are based on analysis of sample dried at 212 deg. F. The percentage of moisture in the sample as taken is deducted from the weight.

Alternating-Current Drill

A new, portable, breast drill for use with alternating current is being manufactured by the General Electric Company. It will take a drill bit up to ⅜ in. in diameter, or will also operate a ¾-in. wood bit. The company claims this machine will drill a ⅜-in. hole 1 in. deep in cast iron in 27 sec.; or in machine steel in 95 sec. The weight of the drill is 21 lb., and the control switch can be operated without releasing the hold on the handle; thus ease and rapidity of handling and operation are assured.

In the contract between the provincial government of British Columbia and the Canadian Northern Railway Company for the extension of its line in that province, it is stipulated that no Asiatic labor shall be employed.

Stationary versus Moving Hoisting Plants

In Opencut Mining Locomotives Cease to Be Economical When the Operation Becomes Locomotive Hoisting; Hoist the Load, not the Engine

BY J. F. JACKSON*

The attention of the mining world for some years has been turned toward open-pit mining as conducted on the Mesabi range in northern Minnesota, and lately in certain "porphyry" properties in the West producing large tonnages of copper ores. Overburden from 20 to 50 ft. or more in depth is stripped by steam shovel and train or other methods from areas often hundreds of acres in extent. The horizontal ore beds thus exposed are often 100 to 300 ft. in thickness.

Mining Has Developed the Steam Shovel

The demands of this work have developed the steam shovel from the breakable, uncertain machine of 10 years ago, to the dependable 90-ton monster of today. In the early stages of steam-shovel mining, the obvious thing to do was to bring the ore trains directly into the mining pits by means of locomotives. Many interesting and complicated systems of inclined grades, curves and spirals have been worked out; and as the mines increase in depth it has required constant ingenuity on the part of mining engineers and operators to keep the railroad grades within limits and to hoist the large tonnages required out of the mine. Tonnages of from 6000 to 10,000 tons per day from a single pit are now reported.

I first observed these open pits five years ago, and came to the conclusion at that time that the limits of grades for economical hoisting by means of locomotives had even then been exceeded.

At about the time referred to, I had under consideration the problem of whether to build a half-mile trestle on a 2 per cent. grade to gain access to the top of stamp mills about 60 ft. above the general level of the railroad, or to use steel inclines with hoisting apparatus. It was decided to use inclines, and one mill was equipped with a 20 per cent. incline up which a single ore car of 40 tons capacity is hauled by a simple, second-motion, Nordberg hoisting engine. The other mill, near and beyond the first, was equipped with an 11 per cent. incline, up which two 40-ton cars are hauled at one time. These inclines have been in operation several years without accident, handling up to 4000 tons per day at low cost per ton. Without going into deailed figures at this time, I wish to asert that the capacity of a single-track ncline on a 10 or 12 per cent. grade is much greater than that of a single-track railroad line on any grade reaching to the same vertical depth, when that depth exceeds say 100 ft., or perhaps less.

Hoist the Load, Not the Engine

In operating an underground mine having a vertical or steeply inclined shaft, it would hardly be seriously proposed to lower the winding engine into the shaft each time it was desired to hoist out a load, and to make the engine hoist itself out with the load every time. Or, let us suppose a covered or open shaft or incline on an 8 per cent. grade. Let us further suppose that an ordinary first- or second-motion hoist, such as is used around mines, and weighing say 30 or 40 tons, be mounted on a flat car, the flat car then loaded with fuel and water and the hoisting rope fastened to an anchorage above the collar of the shaft. The car and hoist are now ready to be lowered into the mine, coupled to two, three or four ore cars, and the movable hoisting plant with its train of ore can then be hoisted out of the mine.

All this sounds somewhat preposterous, but mechanically it is precisely what is done when ore is hoisted out of a mine on excessively heavy grades with a locomotive. A locomotive is capable of exerting a draw-bar pull or tractive effort of about 20 per cent. of that portion of its weight which rests on the drivers, due to the limits of the coefficient of friction of tires on rails.

A certain 10-wheel engine with tender weighs 140 tons, of which 70 tons is on the drivers. At 20 per cent. friction, it is just able to pull itself up a 10 per cent. grade. On a 5 per cent. grade it can pull itself and a load equal to itself. By the use of sand a slightly better friction coefficient can be obtained, against which a tractive or rolling resistance of 8 or 10 lbs. per ton for slow moving must be figured. Shay and saddle-tank locomotives have the advantage of having a greater portion of load on the drivers. For the sake of simplicity, I will assume 20 per cent. friction and neglect tractive resistance, curve resistance, etc.

The engine above mentioned can haul on a 5 per cent. grade: (1) The locomotive itself, 140 tons; (2) two cars, 40 tons; (3) two carloads of ore, 100 tons; or a total train of 280 tons. A 72-ton Shay locomotive with all the weight on drivers on an 8 per cent. grade will exert a total draw bar pull (20 per cent.) of 28,800 lb., and haul a total load of 12 × 28,800 lb., say 172 tons. Of this weight the engine weighs 72 tons; two cars, 30 tons, and two loads of ore, 70 tons. The above figures may be bettered slightly, but they illustrate without any complications the principle involved, viz., that it is folly to make a hoisting engine expend a great part of its energy in hoisting itself.

Cable Hoisting Recommended

Now, no one believes that any method can be found more economical than mining by steam shovel and tramming by locomotive and 50-ton cars. Can the advantages of steam-shovel mining and locomotive tramming be retained without the disadvantage of locomotive hoisting? Decidedly yes. A heavy-duty hoisting engine can be placed at the top of an incline having a grade of 9 to 12 per cent. and extending to the deepest part of the mine, with turnout at each level. These levels may be 15 to 25 ft. apart vertically, to suit convenience of stoping. Two or three loaded cars can be hoisted at one time and a corresponding number of empty cars lowered, practically all of the switching being done at top and bottom by gravity. There is no feature of the manipulation of these cars at the top or bottom of the incline which has not been successfully worked out and operated for years. The resulting economy and convenience in every phase of the work could not fail to be great. Levels would be kept nearly horizontal, sloping slightly toward the "shaft." Tramming would be by light locomotives handling but few cars at a time.

A hoisting engine with a cable having a safe working strength of 25,000 lb. will easily handle two 40-ton ore cars, weighing 60 tons each when loaded, up a 10 per cent. grade. Such a grade 1000 ft. long will reach a depth of 100 ft. When the mine is deep, grades up to 20 per cent., on which to handle single standard ore cars, may be used to attain the desired depth within a shorter distance. The necessary amount of switching at the shaft (all of which should be done by gravity) is slightly increased; otherwise the economy and daily capacity are but little affected.

In conclusion let me say that first cost, cost of operation and maintenance of a stationary winding engine will be much less than that of an auto-tractive hoisting plant, and that the continued use of the locomotive on heavy grades for mine hoisting is simply an example of a good idea carried beyond its proper limits.

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*Milwaukee, Wis., and Houghton, Mich.

Filling Abandoned Workings with Culm or Sand

Detailed Description of the Flushing System Used in Germany to Prevent Surface Subsidence and to Create a Saving in Mine Timbers

BY HENRY M. PAYNE*

The flushing method, as it originated in this country, has been adopted by many European mines with great success, and in view of the movement toward conservation now in progress, directed at the preservation of the smaller overlying veins of coal, which in another generation we shall be working, the system could well be adopted in many more American mines than are now using it.

The German government was quick to see the value of the process, especially in localities where the mining is carried on under thickly populated areas, where the least subsidence of the surface would create a complex disturbance of gas, water and sewer mains, and the construction and operation of a "Spülversatz" is a part of every German mining engineer's education.

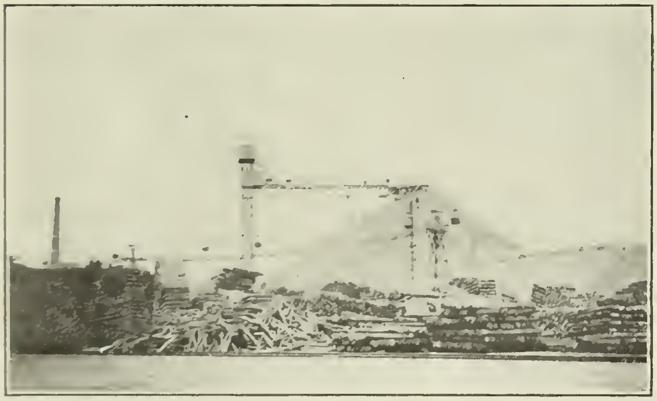

Fig. 1. Showing Method of Storing the Gob Until It Can be Used

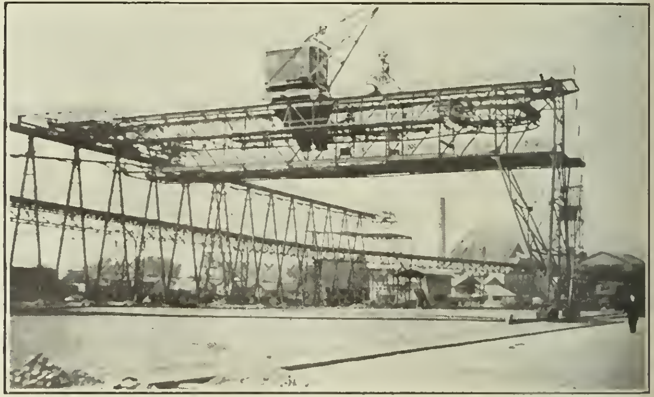

Fig. 2. One of the Terminals of the Aerial Tramway and Crane House

One of the most extensive plants in Germany using this process, is the Grube Königin Luise, at Zabrtze, in upper Silesia. The company has built a railroad some 15 miles into the country to its supply of sand, which is brought to the mine in its own hopper-bottomed cars, and run upon a trestle, as shown in Fig. 1, where it is dumped into a large storage pit. The seam which is operated here is from 29 to 32 ft. thick, so that out of a total of 8000 employees, over 1000 men are required in connection with the sand-flushing process alone.

The sand is distributed through the mine in a 3 1/5-in. pipe by hydraulic power, passing from the storage pit shown in the cut, through a 2-in. screen. The coarse gravel and rocks thus screened are shoveled into a crusher standing by, which breaks them up and feeds the crushed product back into the sluiceway. This company has over 90 miles of this large pipe in operation below ground, which costs from 5 to 12c. per ft. in place.

At the time of my visit, the plant had been in operation less than a year, and no available data on the cost of operation could be secured. It was said, however, that the cost of timbering was held down at least 33⅓ per cent. by the use of the process.

The Water Is Used Again

The water from the sand flushing drains off on the lower side of the area filled, and is pumped out and used again at the sand pit for flushing. The shaft at this mine is 975 ft. deep, the dip of the coal 6 per cent., and the pumps throw 1585 gal. per min. from the flushing process. The cost of securing and transporting the sand alone, to the storage pit, does not exceed 25c. per ton.

The Zabrtze mines are divided into the East and West fields with a total annual output of 2,750,000 tons. The accompanying sketches, Fig. 3, show the method of development and of refilling. This sand, after being washed into place and the water drained off, becomes so hard that it is necessary to use a pick to loosen or remove it. It is found in all cases fully equal to the load imposed.

At the Bergwerks Deutscher Kaiser Zweite, at Hamborn, Rheinland, the same process is used, but all the pipes are porcelain lined. The main supply pipe is 6 in. in diameter, made of iron 0.16 in. thick, cement 0.08 in. thick, and porcelain 0.60 in. thick, leaving the net inside diameter 4.32 inches.

The output of this mine requires at least 1000 tons of sand per day to replace the coal, and on a basis of 300 working days per year, it is found that the porcelain lining lasts for about 300,000 tons of sand, or just about one year.

All the timber originally set is left, and surrounded by the sand filling, making the robbed mine analogous to a railroad trestle around which the embankment fill has been made. The cost of the sand-flushing process is here about 50c. per ton of coal. The average cost of mining is $3 per ton at the top of the pit, of which the miner receives $1.75, and the balance is due to haulage, hoisting and fixed charges. The shaft is 1788 ft. deep and the pumps throw the drainage water from the flushing process from this depth at the rate of 1320 gal. per minute.

The company employs at its various mines 22,000 men, of whom 10,000 are exclusively employed at the coke ovens. Their total yearly coal output is 3,000,000 tons, and by working eight-hour night shifts, they make 320 working days per year, the mines being closed only from 6 a.m. to 6 p.m. on Sunday. The various mines of this company have a casino and club house, with separate dining rooms for the officers, superintendents, foremen, engineers, etc., and every plant is elaborately equipped with bath rooms for the miners and all modern conveniences.

In some districts, where there are large quantities of gob or culm, notably as at the Hibernia Bergwerks Gesellschaft Shamrock Erste und Zweite, at Herne, where the output exceeds 3000 tons per day, from six different levels, at depths varying from 650 to 2275 ft., a gob pile which accumulated for 35 years, was used in 15 years, for refilling the abandoned workings, at a great saving in mine timbers and expense from subsidence of the surface.

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*Mining engineer, Morgantown, W. Va.

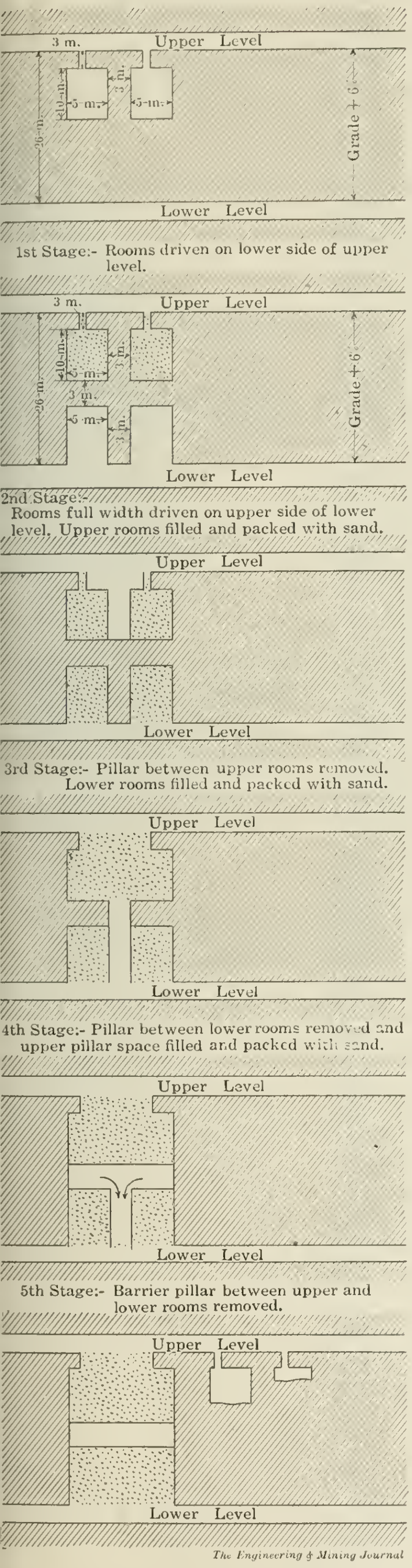

3 m.
Upper Level
10 m.
5 m.
3 m.
5 m.
26 m.
Grade + 6°
Lower Level
1st Stage:- Rooms driven on lower side of upper level.
3 m.
Upper Level
10 m.
5 m.
3 m.
3 m.
5 m.
3 m.
26 m.
Grade + 6°
Lower Level
2nd Stage:- Rooms full width driven on upper side of lower level. Upper rooms filled and packed with sand.
Upper Level
Lower Level
3rd Stage:- Pillar between upper rooms removed. Lower rooms filled and packed with sand.
Upper Level
Lower Level
4th Stage:- Pillar between lower rooms removed and upper pillar space filled and packed with sand.
Upper Level
Lower Level
5th Stage:- Barrier pillar between upper and lower rooms removed.
Upper Level
Lower Level
The Engineering & Mining Journal

Fig. 3. Sketches Showing the Method of Development and of Refilling

Fig. 1 shows the method of storing the gob until it can be used. This picture and Fig. 2 were taken at the Rhein-Elbe mine of the Gelsenkirchen Bergwerks Actien Gesellshaft.

Fig. 2 shows one of the terminals of the aërial tramway and the traveling-crane house, surmounting the coal storage yard. The main tramway is 2600 ft. long, and supplies the coke ovens whose by-products I described in a preceding paper.

The total output of the four mines of this company is 7000 tons per day, and 7000 miners are employed, averaging one ton of coal per day per man. This company averages 200 working days per year, or 1800 coal-hours.

The company's equipment cost $3,750,000, and in addition to the complete by-product plant referred to, includes an electric lighting, pumping and ventilating system, and two-stage air compressors giving 519,650 cu.ft. per hour, at six atmospheres, and a condenser for 15 tons of water from steam per hour. I am deeply indebted to Herr Bergassessor Ackermann, Freiherr von Tautphoeus, and Herr F. G. Tarrant for special courtesies and data, in my investigation of this subject.

The Foreigner in Our Mines

Special Correspondence

Recently before the Scranton Miners' Institute, Supt. Joseph P. Jennings, of the Pennsylvania Coal company, delivered an interesting address on "The Foreigner in the Mines." At the outset of his discourse, Mr. Jennings postulated the fact that we had the mines in the anthracite regions manned to a large extent by foreigners, and that being admitted, as it must be, the question that the community had to face was rather sociological than economical. The foreigner was here and here to stay, in the opinion of the speaker, and the problem to be solved was to bring the foreigner into something like harmonious relations with his immediate environment.

It is all very well to say, as many people claim, that we have a voracious capacity for assimilating the foreigner; however, people who speak in this way mean the children or the children's children of the foreigner, which is a different thing than the absorption of the foreigner as he lands on these shores, and as he arrives in the anthracite-coal regions, generally a middle-aged man, having all his habits for life irrevocably fixed.

Mr. Jennings despaired of assimilating the matured foreigner as he appeared in the anthracite regions, but he thought that something might be done to educate him, although he admitted that the undertaking was a portentous one, and he was doubtful of its ultimate issue. Mr. Jennings then passed under review the social conditions of the foreign mining population. These were far from being what they could or should be, even accepting the domestic standard of the foreigner at home. It was unfortunately a fact that the foreigner was addicted to drink, and that there seemed to be no limit to the opportunities open to him for indulging in this appetite.

At this point Mr. Jennings made a remark with which those who heard him agreed fully, and that is, that a considerable number of the accidents in the mines are the result of the drinking habits of the miners whether native or foreign. Mr. Jennings did not say that miners were permitted to enter the mines under the influence of drink, but it was morally certain that a man who was drunk or under the influence of drink on the previous night was in no position to work in the mines. Apart from the physiological effects of the drink, his brain was liable to be muddled and he was inclined to be careless where he would realize, under ordinary circumstances, that danger surrounded him at every turn. Mr. Jennings also pointed out that where a large number of foreign miners congregate, there has sprung up a class of harpies, recruited from the foreign population, who never work and who never intend to work, and whose sole occupation is to act as jackals to the hordes of petty aldermen and justices of the peace that swarm in the coal regions and live on illegal arrests and fines extorted from ignorant foreigners.

The American Institute Excursion

In its present form, the proposed excursion of the American Institute of Mining Engineers to Japan, in the autumn of 1910, provides that the members of the institute party shall meet at San Francisco (where a couple of days may be spent in sessions, etc); that the excursion proper shall start from and return to San Francisco; that two or three weeks shall be spent in Japan, ending with attendance at the celebration of the Mikado's birthday in the first week of November. This plan would require the party to start from San Francisco about Oct. 5, reaching San Francisco on its return about Nov. 25. The cost of the trip from and to San Francisco is estimated as not exceeding $500 per person. These figures are mere estimates, believed to represent a maximum, without allowance for such reductions as might be secured for the excursion.

Progress in Fuel Briquetting

BY ROBERT SCHORR*

Table No. 1 and diagrams Nos. 1 and 2 illustrate the conditions of mining and of briquetting coal and lignite between the years 1885-1909. During this period the world's fuel output has more than doubled and the production of briquets has risen from 4¾ to 26 million metric tons, or to a little over 28,650,000 short tons. The rapid growth of the German lignite-briquetting industry is

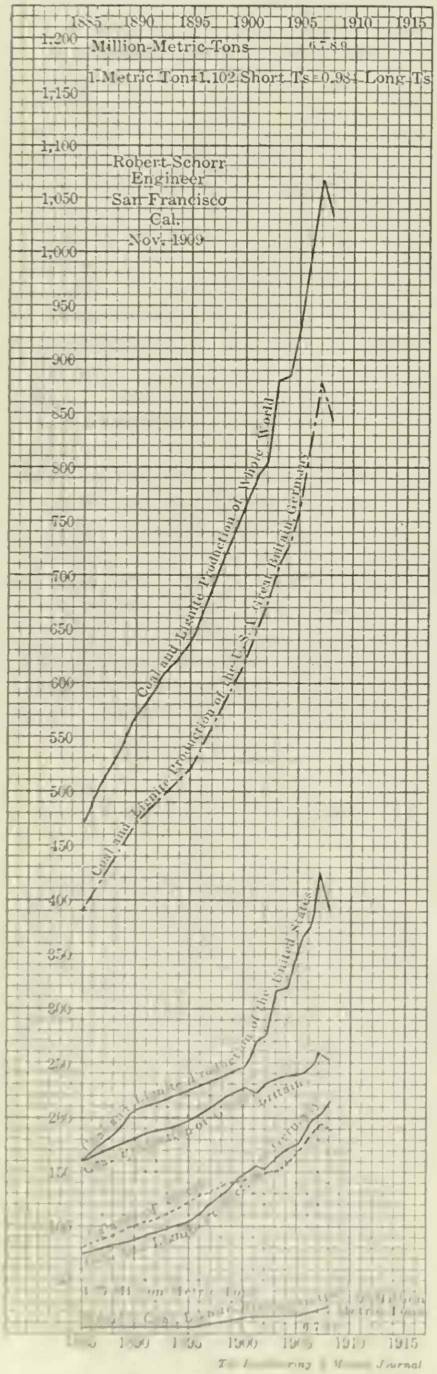
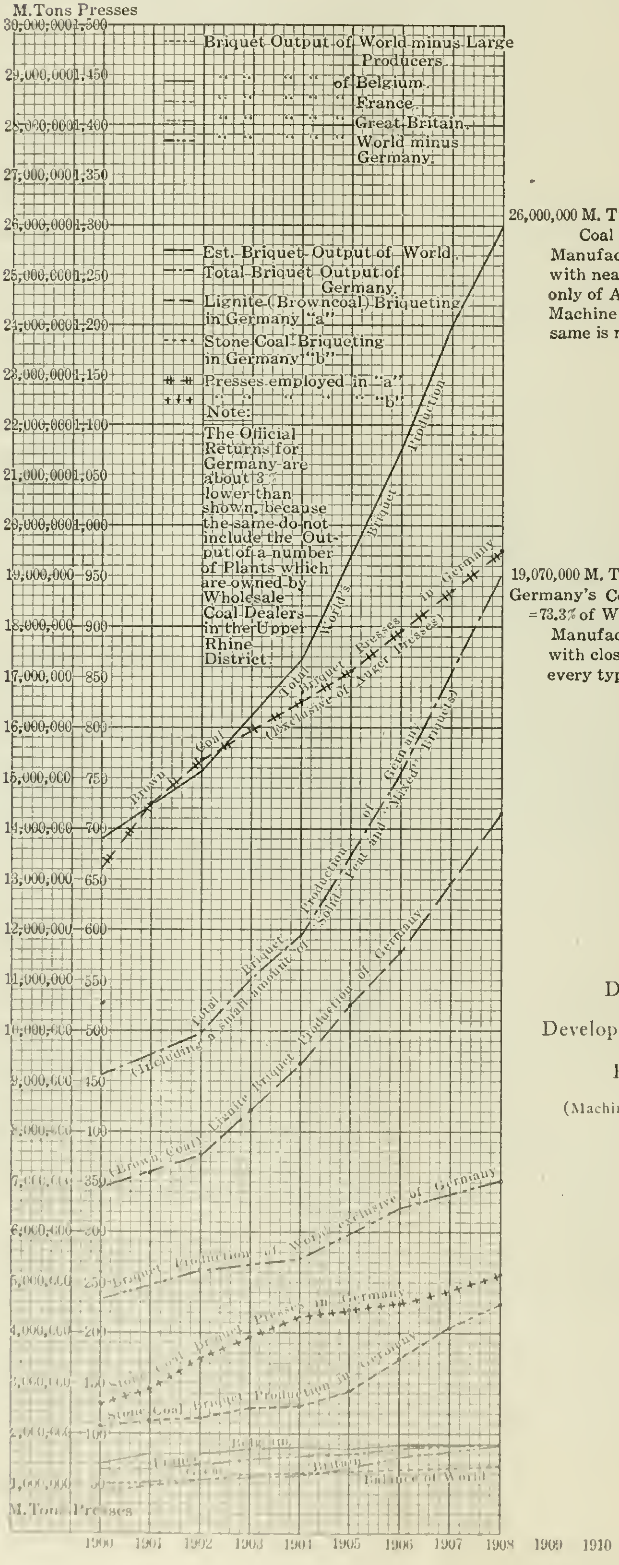


DIAGRAM NO. 1. SHOWING COAL AND BRIQUET OUTPUT OF WORLD

Robert Schorr, Engineer

World's Fuel Briquet Production in 1885: M.T's		Per Cent of World Coal & Lignite Prod'n	Briquet Prod'n of Germany
Coal Briquets	4,075,000		1885: 800,000 M. Tons, or = 1.1% of Coal & Lignite Mined there, or = 17% of World's Briquet Output.
(Brown Coal) Lignite " "	650,000		
Solid, Carbonized Peat " "	10,000		
Other "Mixed" Fuels " "	15,000		
Total in Met. Tons	4,750.000 =	1%	
World's Fuel Briquet Production in 1908: M.T's			1908: 19,070,000 M. Tons, or 8.84% of Coal and Lignite Mined there, or 73.3% of World's Briquet Output. Germany's Coal & Lignite Production of 215 Mill. M. T's = 26.0% of World's.
Coal Briquets	11,500,000		
(Brown Coal) Lignite " "	14,338,000		
Solid, Carbonized Peat " "	62,000		
Other "Mixed" Fuels " "	100,000		
Total in Met. Tons	26,000,000 = =28,652,000 Short Tons	2½%	
1-Metric Ton = 1.102 Short Ton = 0.984 Long Ton			



26,000,000 M. T's Briquets = 2.5% of World's Coal & Lignite Production. Manufactured in about 575 Works with near to 1,900 Presses, exclusive only of Auger Presses used for making Machine Peat. The Production of the same is not included in the Diagrams.

19,070,000 M. T's of Briquets = 8.84% of Germany's Coal & Lignite Production. =73.3% of World's Briquet Output. Manufactured in about 450 Works with close to 1,400 Presses of every type, as above.

Diagram No. 2

Development of Fuel Briquetting in Recent Years.

(Machine Peat is not included)

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*Engineer, San Francisco, Cal.

ainly responsible for this. My con-ributions upon this subject have been ublished in the JOURNAL, the most com-lete being "Lignite Briquetting in Ger-iany," which appeared in the issue of 'eb. 29, 1908. The only other important roducer of lignite briquets is Austria ith 130,000 tons in 1908, next to Ger-iany's 14,227,218 tons. All German rown-coal briquets are made without inder, as has been described in the forementioned article and also in my pa-er on "Fuel and Mineral Briquetting," ead before the American Institute of Iining Engineers in February, 1904.)nly brown-coal varieties containing less ian 4 per cent. and generally more than per cent. of "bitumen" (extract, soluble : CS_2) are not used for briquetting, a irge portion of the same being distilled or tar products, gas and Grude (brown oal) coke.

Table No. 1: Coal and Coal-Briquet Production of World. (See also Diagrams No. 1 and No. 2.)

1 Metric Ton = 1.102 Short Tons = 0.984 Long Tons.

Year	U.S. of America.	% of Total.	Great Britain.	% of Total.	Germany.	% of Total.	Total 3 Leading Producers.	% of World's Total.	Balance of World.	% of Total.	Coal and Lignite Production World.	Coal and Lignite Briquet Prod'n. World.	% of World's C. & L. Prod'n.	Coal & Lig.-Briq. Prod'n. Germany	% of World's Coal & Lig.-Briq. Prod'n.	% of Germany's C. & L. Prod'n.
1885	160 M.T's	33.8	159.35	33.5	73.67	15.4	393	82.7	82	17.3	475,000,000 M.T's	4,750,000 M.T's	1.0	800,000	17.0	1.1
	In	Millions	of	Metric	Tons!											
1890	204	35.8	181.6	31.9	89.05	14.8	474	82.5	95	17.5	569,000,000 “	7,000,000 “	1.23	2,750,000	39.6	3.09
1895	220	35.25	200	32.05	100	16	520	83.3	104	16.7	624,000,000 “	10,000,000 “	1.60	4,400,000	44.0	4.4
1900	243.4	31.85	228.8	29.85	149.8	19.7	622	81.4	143	18.6	765,000,000 “	13,800,000 “	1.81	9,200,000	66.6	6.16
1901	266.1	33.67	222.6	28.19	153	19.36	642	81.2	148	18.8	790,000,000 “	14,400,000 “	1.82	9,400,000	65.3	6.15
1902	273.6	34.03	230.7	28.69	150.6	18.68	655	81.4	149	18.6	804,000,000 “	15,100,000 “	1.87	9,850,000	65.6	6.54
1903	317.3	35.95	233.4	26.43	162.46	18.32	713	80.7	170	19.3	883,000,000 “	16,600,000 “	1.89	10,950,000	66	6.74
1904	318.3	35.92	236.1	26.64	169.45	19.14	724	81.7	162	18.3	886,000,000 “	17,300,000 “	1.95	11,800,000	68	6.98
1905	352.7	37.9	239.9	25.8	173.6	18.7	766	82.4	164	17.6	930,000,000 “	18,250,000 “	2.01	13,500,000	72.0	7.83
1906	372.7	37.4	247	24.8	193.5	19.4	813	81.6	183	18.4	996,000,000 “	21,600,000 “	2.16	15,050,000	69.6	7.77
1907	427.1	39.5	261.9	24.2	205.54	18.7	894.5	82.4	195.5	17.6	1,080,000,000 “	24,000,000 “	2.22	17,000,000	70.8	8.29
1908	377.1	36.4	255.25	24.6	215.1	20.7	847.5	81.7	187.5	18.3	1,035,000,000 “	26,000,000 “	2.52	19,070,000	73.3	8.84

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Brown coal, similar to the German aw material for briquetting, occurs on ie American continent—as far as I nown—only in a few places; namely, in)akota, Alabama, California, Texas and 'anama. All other Tertiary lignites re-uire binder material to yield a service-ble briquet.

About 11,500,000 metric tons of stone-oal briquets were made in 1908, and ere also, Germany is far in the lead ith a production of 4,700,000. This is bout 700,000 tons more than stated in he official reports, due to their not in-luding a number of briquetting plants hich are owned by wholesale coal ealers. See note on diagram No. 2.

The manufacture of solid, carbonized eat briquets has made no noticeable eadway until recently; two large plants re in the course of construction in Ire-and and Germany, which will employ Dr. ckenberg's new process. The same has een fully described[1] by E. Nystrom. At he present time there are only 5 peat riquetting establishments in operation; 3 are in Germany, 1 in Russia and 1 in Holland. They employ all told 6 Exter-type presses and I have estimated their output at 62,000 for last year. There are also a number of such installations in Canada, but they are on a small scale and not in steady or commercial operation. Their production is insignificant[2].

The tabulations and diagrams do not include machine nor hand-cut peat. There are in the neighborhood of 10,000,000 tons of peat used in this form[3]. Nothing definite can be secured regarding the manufacture of "mixed" briquets. There are a number of such works in the United States, in Germany and in Austria, using as raw material, mixtures of various description, consisting of coke breeze, brown coal, black lignites, bituminous coals, sawdust, etc. I have assumed that 100,000 tons of mixed briquets were made in 1908.

LOCATION OF VARIOUS BRIQUETTING PLANTS

The first commercial briquetting plant was built:

In France, 1842, at Bèraud.
In England, 1846, at Newcastle.
In Belgium, 1852, at Montigny-sur-Sambre.
In Austria, 1858, at Brandeisl, near Prag.
In Germany, 1861, at Muehlheim a.d. Ruhr.
In United States, 1870, at Point Richmond, near Philadelphia.

The history and the present state of fuel briquetting in this country form a marked contrast to the development of most of our industries. About 40 briquetting plants have been built and 15 or 16 of the same are still in existence, but either idle or operated occasionally only. Not one of these installations is really a "plant" in the European sense of the word, and not one could be termed a commercial undertaking of importance.

In 1885, the United States was credited with a production of 130,000 tons of briquets, but I do not think the output for 1908 was more than one-half of this. There are no statistics available upon the subject.

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[1] "Peat and Lignite," by E. Nystrom, De-artment of Mines, Ottawa, Can., 1908.

[2] *Bulletin* No. 1, Department of Mines, Ottawa, Can., 1908-09.

[3] "Commercial Aspects of Gasifying Peat," by R. Schorr; read before the American Peat Society, Toledo, Oct., 1908.

NOTE—For the compilation of the diagrams I have used the following references, viz.: "The Mineral Industry." ENG. AND MIN. JOURN.; "Jahrbuch der deutschen Steinkohlen Industrie," 1907; "Coal Briquetting in the United States," by E. W. Parker; also a number of bulletins of the U. S. Geol. Surv., prepared by Mr. Parker in his capacity of chief statistician; "Handbuch der Briketbereitung," by G. Franke, 1909; "Briquetted Coal," by C. T. Malcolmson, read at the July, 1909, meeting of the International Railway Association, Chicago: "Technology der Brennstoffe," by Dr. F. Fischer, 1901: "Braunkohlen Teer-Destillation," by Dr. W. Scheithauer, 1907.

The Cherry Mine Disaster and Its Lessons

BY SIM REYNOLDS[*]

The one bright spot in the St. Paul Mine disaster was the courage and fortitude shown by the survivors, courage under conditions enough to break the spirit of any man; facing death for what must have seemed ages, in a hideous form, and yet come out hopeful and cheery. This and the efforts of the men who offered and gave their lives in an effort to save, goes strongly to show that every day dangers of life for the miner breeds a fearlessness and contempt for danger quite uncommon.

Much comment has already been made on the judgment displayed by the rescuers in the methods used in handling the fire. But in this as in many other things, it is easier to criticize than to take charge of such a situation, and do it satisfactorily for the general public. Any error in judgment under such circumstances is pardonable. Precautionary measures against a similar occurrence is of more importance now.

Eternal vigilance is the price of safety about mines. We have in this case of the St. Paul mine an illustration of what a simple detail gone wrong can do.

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[*] Mine superintendent, Stewartsville, Ohio.

The Importance of Strict Discipline

The foreign commission invited to inspect and report on our mining conditions by our Government, said, among other things: "We cannot too strongly emphasize the fact that thorough discipline about the mines is absolutely essential to safety." They undoubtedly pointed out our weak link right there, because as a rule discipline in our mines is wofully lacking.

In a conversation with a close observer of all things relating to mining, the laxity of methods and discipline was touched upon by my friend and myself. I cited numerous instances that had come under my observation to illustrate our haphazard "every man for himself" way of doing things. My friend replied that it was characteristic of the American workman to chafe under restraint, and object to being disciplined, and the miner is no exception to the rule, which may be true enough; however, where this failing affects the safety of human life and valuable property it is a failing that should be eradicated as speedily as possible. Lack of care in doing things; haphazard work of any kind is of little importance if it affects only the individual. But where the recklessness of one jeopardizes the lives of many it is time to call a halt.

The committee of foreign experts were speaking from experience when they urged discipline and methodical work, as the European miners evidently realize and appreciate the benefits derived from systematical work and rigid observance of rules and regulations.

Comparison of Efficiency and Fatalities

We can produce more coal per miner and cheaper coal per ton. We can invent and utilize labor-saving machinery, which fairly staggers our European brethren, but they have us beat to a standstill so far as the conservation of life is concerned. We will no doubt come down to this after awhile, but why not hasten the time?

At the present time, Federal supervision is being talked of by the law makers at Washington. It is to be hoped that they will hasten any legislation that will bring about better conditions than we have at present.

We have our State mine inspectors, able and efficient men, honorable and ardently desirous of doing their duty as they see it and the law interprets. They make periodical inspections of our mines, suggesting and advising, and at times insisting on certain changes in our methods—or, as is more often the case—the lack of it. But their power for good is very limited; they cannot change our characteristic traits.

Furthermore, conditions in a mine can change quickly. What the inspector sees today may be altogether different in three months hence. The territory these men cover is altogether too large. Three or four, and sometimes as much as six months, is too long for any mine to be left without inspection.

Troubles of the Inspector

I believe the lives of 500 miners is of sufficient value to any State to call for the constant service of a competent man, paid by the State. If necessary place a tax of one-half cent per ton on the coal mined to pay the expense. Under present conditions, this seems to be the only quick and practical way out of a bad mess. If lives and property on the surface are worth policing, why not lives and property underground?

The following dialogue is not unusual at one of our American mines: The State inspector (who happens to be making a visit along with the foreman) goes into a miner's working place. Inspector says to miner who is loading coal from under a bad piece of slate: "Say, John, that slate looks bad, better pull it down."

John stops shoveling for a moment, looks blankly at the inspector, and not understanding, resumes his work. This rather irritates the inspector. He walks up to the miner, touches him on the shoulder, and tells him again of his danger, at the same time pointing to the bad slate. John begins to comprehend, he stops for a moment, and bumps the slate with his shovel handle, then a pick, and says: "Oh, sure; me watch um; me loadun dis waggun, maybe fix um awright," and unless prevented forcibly goes on shoveling again.

Our yearly reports are filled with paragraphs reading as follows: "John Smith was killed by a fall of slate in Room 23, 3d Left, leaves a wife and six children." Fully 50 per cent. of our fatalities come in this quiet, unostentatious form, creating no commotion on the surface nor in the public prints, but doing its awful work just as perfectly as the worst explosion ever did, for it seems gas and dust are not our only enemies.

Of course it must be admitted someone was at fault with regard to the unfortunate position of the stables in the St. Paul mine, placed as they were in such position between the two workings, and where a fire therein shut off all egress of the workmen beyond.

And the use of a naked light in the stables looks like criminal negligence of someone. But who thinks of these things or the awful possibilities lying dormant in them until something happens? This simply shows that in our calling, at least, the most trifling details should not be overlooked.

How many of us are there who are schooled in the right action to take if a fire should occur in our mine tomorrow? I saw a mine foreman—and a pretty efficient one generally—very much embarrassed the other day when asked by the general manager to detail the course he would pursue if such a thing happened in his mine; the manager outlined an imaginary fire. The result showed strongly how far we are from preparation.

Examples of Carelessness

Few men will risk the filling of a cartridge with a dangling light on their heads, yet I have seen miners who would. As an example, I will cite the following case which came under the notice of an inspector of one of the Ohio districts some time ago. A miner was changing the wick in his lamp, putting in a new one. A full keg of powder was at his side (every miner in Ohio can have 25 lb. of powder in his working place, which would permit 7500 lb. of powder for 300 miners). Needing the light of the old wick to put in the new one, he set the lamp in a convenient place, in this instance the top of the keg. By the time he had the new wick ready, he happened to notice that the paper cork in the lamp had ignited and was about ready to drop in the hole. He ran quickly around the corner of the "rib' and just got there when the powder exploded. The smoke nearly suffocated the men in that section of the mine.

A Careless Official

This is an extreme case, I know, but not worse than the officials will do at times. I remember a certain morning in a large mine in Pennsylvania, and an underground mine office, in which were congregated the foreman and one or two of the firebosses, who had just covered their sections and brought in their reports to the foreman. Presently another came in and one of his companions happened to notice that his eyebrows and the front of his hair were burnt some, and when it was mentioned he replied that in lighting the gas stove that morning at home it had exploded in his face. It came out later through another fireboss that he had been making his tests with an open light, to cover his section more rapidly and more conveniently.

I speak from experience when I say that taking the mining fraternity generally, there are not in the wide world a class of men who take more chances with their lives. This trait of carelessness—existing from trapper-boy to general manager—is responsible for the larger part of our accidents. We will have gas explosions despite the most rigid discipline. We will also have an occasional mine fire, both bringing monetary loss and destruction of human life. Slate will continue to take its toll despite the most perfect policing of our underground industry, but so let it be. Fate has in store for us in the chosen work enough of death, enough of misery. Let us not add to the list by our "high pressure" methods of running all the time along the line of danger in order "to make it pay."

Mineral Production of Idaho for 1909

Lead, $9,356,571; Silver, $3,625,317. Activity in Mining Stimulated by Railroad Building. Snowstorm Mine Main Copper Producer

BY F. CUSHING MOORE*

The mineral production of Idaho for ne year 1909, basing the figures upon ne average New York metal prices, aggregates $15,561,131, or $45,730 greater nan for 1908. The greatest source of evenue was from lead mining which roduced $9,356,571. The next metal in oint of importance was silver, the pro- uction for the year aggregating $3,625,- 17. Gold ranked third with a produc- on of $1,465,481; copper, fourth, with 1,034,651; zinc, fifth, with $104,841, and oal, sixth, with a value of approximately 20,000.

A great deal of activity was displayed y the competing railroad systems and onsiderable actual construction is in pro- ress. The railroad from Armstead, lont., through Salmon City to Lewiston completed as far as Junction on the emhi river. This road, which will be ito Salmon City within a few months, undoubtedly backed by the Hill inter- sts and will connect with the Northern acific at either Lewiston or Grangeville. umerous surveys for railways are being ade in various parts of the mountain- us sections of the State, which, if con- ructed, will materially aid the mining dustry and increase the production. laho possesses many promising mining roperties which at present are so re- otely situated that it is impracticable to arry on operations. Many would be- ome productive if brought within a reas- nable distance of a railroad.

Since the depression of 1907, Idaho as suffered severely from lack of fin- ncial assistance in prospecting and de- eloping the smaller properties. The rger properties which were on a pro- ucing basis prior to that time have been ble to operate almost continuously, as ne metal prices have been fairly good. here has been a lack of interest shown the investing public, and it is only uring the latter part of last year that re- ewed interest in the development of un- roductive properties has manifested it- elf. The fact that the tendency toward ne development of prospects is on the crease is an encouraging sign for a right future.

Lead

In 1909, Idaho produced 217,594,679 . of lead, having a value of $9,356,571, f which 99 per cent. came from the œur d'Alene district in Shoshone ounty. Practically all of this lead was erived from argentiferous-galena ore. The ore of the Cœur d'Alene district occurs in fissure veins and zones, in Pre-Cambrian quartzites. The veins have been filled largely by replacement. First-class galena is produced, varying from 45 to 70 per cent. lead. The bulk of the ore is concentrated, the ratio of concentration varying from 5 to 1 to 12 to 1; the concentrates shipped run from 45 to 60 per cent. The ratio of silver to lead varies from 4/10 to 1 oz. per unit of lead. The State of Idaho produces about 30 per cent. of the total lead of the United States and with the associated silver occupies a conspicuous place in the metal production of the world.

Silver

Every mining county in the State produced more or less silver, the bulk of which was derived from the Cœur d'Alene galena ore which produced 88 per cent. of the total production of the State, 7,039,451 oz., with a market value of $3,625,317.

The next district in importance in the production of silver was the Silver City district in Owyhee county which produced between 9 and 10 per cent. of the State's total production. There are many properties in several sections of the State with a large tonnage of dry silver ores in sight which are lying inactive owing to the lack of metallurgical processes and transportation facilities. With the advance in the price of silver and railway activity, the silver production of the future is likely to be greatly increased.

Gold

Idaho produced 70,898 oz. or $1,465,481 of gold during 1909. The Silver City district ranks first in production with $404,983; Boise Basin second with $241,277 and Elmore county third with $209,106. The greater portion of the production of this county was derived from the quartz mining operations in the Atlanta district. Custer county ranks fourth in gold production with $101,901 to its credit for 1909.

Dredging operations which are contemplated for the future will undoubtedly increase the gold production of the State in years to come.

The successful operation of a number of dredges, which have been working during the last few years, has increased interest in the opening up of large deposits of dredgeable ground in various sections of the State.

Copper

Several of the copper properties which have been productive in the past, remained practically idle during last year. The State produced 7,759,887 lb. of copper, with a market value of $1,034,651, 98 per cent. of which was from the Snowstorm mine in the Cœur d'Alene district. The other district of importance is the Seven Devils district, Custer and Lemhi counties. The Seven Devils district which has been worked in a desultory way for many years has during the last few months taken on the appearance of healthy development. The Salt Lake Copper Company, which is controlled by the Lewisohns, has taken options on some of the more important properties, with the expectation of developing them to the productive stage, and with the idea of ultimately installing a smeltery in the immediate vicinity of Homestead, the present terminus of the Huntington-Lewiston branch of the Oregon Short Line.

Zinc

The zinc production of Idaho which amounted to 1,906,200 lb. was derived mainly from the Cœur d'Alene and Wood River Districts. The Success mine of the Cœur d'Alene district produced 84 per cent. of the total production. This property was inactive during the early part of the year but made a creditable showing during the period of operation. The property has immense reserves of zinc which are associated, though not intimately mixed, with argentiferous-galena ore.

Coal

Idaho contributed but slightly to the coal production of the country, there being only two districts in which coal was mined during the year.

The only deposit of importance which contains a good grade of bituminous coal is found in Fremont county. The Brown Bear coal mine in this section produced about 1500 tons of high-grade bituminous coal during the year, which averaged approximately as follows: Fixed carbon, 55.65 per cent.; volatile carbon, 36.62; moisture, 3.13; ash, 4.10; sulphur, 0.50. Total, fuel contents, 92.00 per cent.

This property has 12 coal measures exposed upon it varying from one to ten ft. in thickness, but it is so remotely situated from transportation that its production has been confined to supplying local demand. There are no difficult engineering feats to be accomplished in the building of a railroad to this district as a water grade could be obtained with no heavy work.

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*State mine inspector, Boise, Idaho.

The coal measures are in an unaltered sedimentary formation of Cretaceous age; are a continuation of the series mined farther southeast in Wyoming, and if properly opened and equipped could supply the total coal demands of the State for years to come.

The only other producing coal property in the State is at Salmon City, which sold during the year about 2000 tons of lignite coal, all of which was consumed locally. A large portion was used by the Pittsburgh & Gilmore Railway in the operation of steam shovels. Numerous showings of lignite coal are found at various portions of the State, but upon which little work has been expended.

Phosphate Deposits

The San Francisco Chemical Company of Montpelier, Bear Lake county, owns the only productive deposit of phosphate rock within the State. From this property 735 tons of rock were shipped in 1909, averaging from 60 to 70 per cent. calcium phosphate. The company contemplates extensive operations in the future. The rock occurs in flat-dipping beds in a sedimentary formation identified as belonging to the Upper Carboniferous series. The veins range from a few inches to 10 ft. in thickness.

Other Mineral Resources

Idaho possesses many surface manifestations of a number of the commercial yet rarer minerals, including antimony, nickel, cobalt and cinnabar. From the heavy sands obtained in the placer operations in the Boise basin, Warren's, and other placer camps, monazite and other valuable minerals have been discovered, which, with the proper process of separation will be commercially valuable. Wolframite, hübnerite and scheelite are found in several districts and with the increased demand for tungsten minerals, these present prospective value.

In Idaho county asbestos was mined on a small scale, during the year. The product was used for the manufacture of pipe coverings and boiler jackets. The asbestos is of the short-fiber amphibole variety, is extremely clean and free from injurious minerals and has been tested to 4000 deg. Fahrenheit.

Platinum is also found in connection with the fine gold of the Snake river. Opals and sapphires are also known to exist in various portions of the State.

Need of Complete Record of Prospect Drill Holes

BY H. C. GEORGE *

In the Wisconsin lead and zinc district, the orebodies being worked at the present time occur in "flats and pitches" at depths ranging from 50 to 175 ft. As the topography is comparatively regular, few outcrops occur so that orebodies are found by means of the churn drill.

During the years 1904 and 1905, the large dividends paid by the Empire and Enterprise mines at Platteville, Wis., produced considerable excitement. Prospecting became one of the chief occupations. Persons from all walks of life purchased drilling machines and began the search for mines. The prevailing opinion seemed to be that all that was necessary for the discovery of a mine was the securing of a lease on a piece of land, the purchase of a drill, and the sinking of a dozen prospect holes at random.

Most of the drillers were new at the business and were primarily interested in making money, irrespective of the results secured or the records kept. Most of the prospecting companies had no one in charge of operations, and the drilling was left almost entirely to the judgment of the drillman. Holes were sunk to depths ranging from 75 to 200 ft. with little or no record kept. Whenever any ore was found, the drillman washed the drillings to make a showing, and what was really only a trace was made to appear something of importance. Based on such salted discoveries (I say "salted" for washing drillings is just as much "salting" as adding ore from another source), shafts were sunk, concentrating plants built, and mining operations begun, only to find that what was supposed to have been a good orebody was really nothing worth considering. Large numbers of these projects secured capital from many parts of the country, and the resulting failure of so large a percentage of them has not reflected credit on the district. Only since the panic of 1907, have mine operators been more careful and the prospecting reduced to a system with proper records kept. This improvement in method is producing its natural result. More mines are being found and fewer failures recorded and the mining industry is being placed on a stable basis.

In most cases all traces of the old prospect drill holes have been lost and ground that has been thoroughly drilled in the past will again be drilled because of the lack of evidence that it has already been prospected. Such conditions never should have existed. A number of State or Government inspectors should have been placed in the district to see that proper records of prospect drill holes were taken. By a proper record I mean the position of the drill hole, the elevation of the surface at that point, the thickness and position of the formations passed through, and the position and the amount of the ore passed through.

The Wisconsin State Geological Survey has furnished excellent record books for prospect-drill holes, free of charge to all mining companies or drillmen wishing them, but the persons taking advantage of this offer are usually those who would keep a good record even if no such offer had been made.

In my opinion there is no branch of the lead- and zinc-mining industry of the upper Mississippi valley that needs Government regulation more than prospecting. The State survey has directed attention to the benefit of accurate drill-hole records. But the large number of mills, hoisting and concentrating plants that have stood idle during the last three years, built on false or meager evidence of the existance of an orebody, show what a large amount of capital has been wasted simply because of the lack of a complete and accurate record of the prospecting operations.

If the prospect drill holes show the existence of a good orebody, a complete and accurate record of the drill holes aids wonderfully in the development of the mine. I call to mind one instance in this district where the "drillings" showed the existence of a large orebody but no records were kept. The shaft was sunk and drifting was commenced on what was supposed to be the orebody. But the main orebody was not discovered until part of the roof caved, exposing it. If drill records had been kept, no such mistake would have been made.

Since most of the orebodies are found in the synclines of the folded strata, the depth at which certain formations occur and their dip as indicated by the drill records will greatly aid in mining developments.

The diamond drill has not been successfully used in this district on account of the large number of open fissures and crevices existing in the rocks. The churn drill will probably continue to be the principal prospecting machine and too much emphasis cannot be placed upon securing as complete and accurate records as possible.

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*Director, Wisconsin State Mining Trade School, Platteville, Wis.

PERSONAL

Mining and metallurgical engineers are in-ted to keep THE ENGINEERING AND MINING URNAL informed of their movements and ppointments.

S. H. Brockunier, of Wheeling, is in anawha county, W. Va., on professional usiness.

Francis A. Thomson, of the State Col-ge of Washington, was a recent visitor Butte and Anaconda, Montana.

James MacNaughton, general manager f the Calumet & Hecla mines, is en-ying a short vacation in the South.

James Wilcox has tendered his resig-ation as superintendent of the Mass Cop-r Company in the Lake Superior region.

D. MacDougall has been appointed as-stant general manager of the Dominion on and Steel Company, Sydney, Nova cotia.

Morton Webber will leave New York a few days for Mexico to examine silver mine in Sinaloa for New York ients.

A. J. Beaudetto, recently at Dawson, ukon Territory, will shortly open an of-ce at Vancouver, B. C., as consulting gineer.

James M. Healey has resigned as su-rintendent of the Round Mountain Min-g Company, of Nevada. F. J. Thorn has cceeded him.

R. P. Dunlap has resigned his position vice-president and a director of the ontana Tonopah Mining Company, of nopah, Nevada.

W. P. Schuck, chemical engineer, has sociated himself with J. H. Linton in Pacific Coast Testing Laboratory, attle, Washington.

Frederick Hobart, associate editor of *Engineering and Mining Journal*, is in ronto this week, attending the meeting the Canadian Mining Institute.

D. M. Munro has resigned his position manager of El Favor Mining Company Hostotipaquillo, Jalisco, Mexico, and s gone to Canada on private business.

H. F. Bovard, for some time past dis-ct superintendent at Irwin, Penn., has en appointed general superintendent of mines of the Keystone Coal and Coke mpany.

Dr. L. D. Ricketts, general manager of Greene-Cananea Mining Company, d Harry E. Kirk, mine superintendent, ve gone to the West Indies on a six eeks' pleasure trip.

W. S. Keith, consulting engineer for Empire Smelting Company, has been aking an examination of the Gold Park nsolidated Mining Company's holdings Riverside and San Bernardino counties, alifornia.

T. A. Harper has started on an in-ection trip in Honduras, accompanied by J. A. Fortesquieu. On the completion of this work, Mr. Harper will proceed to Alaska to take charge of work there for Pearse, Kingston & Browne, of London.

Fritz Cirkel, of Montreal, has been appointed consulting engineer and H. A. Ball, formerly superintendent of the Banner Hill mines, Nevada City, Cal., superintendent of the Imperial Gold-Fields, a new corporation operating alluvial ground in Beauce county, Quebec.

F. A. Glass, at present with the Duluth Diamond Drilling Company, formerly with the Rogers-Brown Ore Company at the Kennedy mine on the Cayuna range, will engage in general mining engineering, exploration, survey, estimates, etc., at Brainerd, Minn., very shortly.

R. H. Channing has resigned as president and general manager of the Cerro de Pasco Mining Company. He will be succeeded as general manager by A. B. W. Hodges, who has resigned from the Granby Consolidated. Mr. Hodges expects to go to Peru next month.

Robert H. Richards goes to the meeting of the American Institute of Mining Engineers to read a paper, March 1, on "Developments in Ore Dressing Machinery," and on March 3 to the meeting of the Canadian Mining Institute at Toronto to read a paper on the same subject.

John A. Farwell who has, for a number of years, been secretary-treasurer and sales manager of the J. Geo. Leyner Engineering Works Company, has retired from the company and returned to Chicago to attend to other interests there. His address will be Room 305, No. 115 Dearborn street.

H. K. Masters has resigned as general manager to the Central Chili Copper Company, Ltd., operating a custom smeltery and mines in the province of Coquimbo, Chili, and is leaving for New York by way of London. H. M. McLaughlin succeeds Mr. Masters as general manager.

OBITUARY

F. M. Barrett died at Philadelphia, Feb. 20. He had been a partner in the large coal firm of Castner, Curran & Bullitt for three years, and had been connected with the firm for over 20 years.

Julian T. Alexander died at Baltimore, Feb. 20, aged 72 years. He was born in Baltimore and early became interested in coal mining. In 1867 he was chosen a director of the Georges Creek Coal and Iron Company, and since 1886 had been president of the company.

William P. Owens died at Pittsburg, Penn., Feb. 24, aged 82 years. Welsh by birth, he came to this country when a child, and started work as a coal miner when still a boy. He worked his way up gradually, and was superintendent of the mines of the New York & Cleveland Gas Coal Company, at Turtle Creek, Penn., for over 30 years. He retired from active work 15 years ago.

John Crawford Porter died at Pittsburg, Feb. 17, aged 79 years. He was born at Pittsburg and engaged in the iron business nearly 50 years ago, first as a member of the firms of McKnight, Duncan & Co. and McKnight, Porter & Co. In 1880, he became a partner in the Spang Steel and Iron Company, of which he was secretary and treasurer until 10 years ago, when he retired from active business life.

Paul A. Fusz died at St. Louis, Feb. 16, aged 63 years. He was born and brought up in St. Louis; he began business with the iron firm of Chouteau, Harrison & Valle, as a boy, and rose to be general manager of the company in 1873. He became associated with the Laclede Rolling Mills in 1885, and continued with that company until it went out of business about 1893. He was interested in several mines in Montana, and was president of the Granite-Bimetallic Mining Company for 12 years.

SOCIETIES *and* TECHNICAL SCHOOLS

Canadian Mining Institute—The annual meeting began in Toronto, March 2. The first day was devoted chiefly to the business session and to the consideration of proposed amendments to the by-laws.

Engineers' Society of Western Pennsylvania—At the monthly meeting in Pittsburg, Feb. 15, Elmer K. Hiles was reëlected secretary. J. C. Roberts, of the United States Geological Survey, read a long paper, illustrated by lantern slides, describing fully the work of the Government testing station at Pittsburg.

Scranton Miners' Institute—At the recent meeting in Scranton, Penn., John Hale, one of the oldest miners in the Lackawanna valley, told how in his youth, some 65 years ago, the firebosses in England endeavored to ascertain if there was gas in the workings with a lighted candle. The fireboss used only one of the strands of the wick and screened this with his hand. According to Mr. Hale, it was probably seeing a miner do this that suggested to Sir Horace Davey the idea of the safety lamp, for the miner's hand in a measure acted as the netting does in a safety lamp. At any rate, Mr. Hale remembers that when a miner in any English mine wished to use a safety lamp he had to purchase it himself, and as the lamps were then very dear, few miners of those days could afford the expense. Mr. Hale said that he had in his possession one of the first of these safety lamps that were manufactured for commercial purposes.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

Feb. 25—The details of the settlement of the smeltery-smoke question in Shasta county, so far as it concerns the Mammoth Copper Mining Company of Kennett, have been agreed to by representatives of the farmers and the smelting company. An amicable agreement was reached upon the matter to be incorporated in the complaint and answer in the friendly suit to be brought in the U. S. Circuit Court in San Francisco. The farmers will not waive any claim for damages already accrued or that may accrue before July 1, the date upon which the smelting company promises to have its bag house in operation.

Riley A. Boggess, whose name was at one time well known in connection with quicksilver mining in California, is taking steps to reopen and resume operations on the Abbott and Sulphur Bank quicksilver mines in Lake county. Both these mines were formerly productive, the Sulphur Banks notably so. The recent rise in price of mercury has caused renewed interest in mines of this metal and it is expected that several mines for some time idle will be started up in the summer.

There has been an abundant fall of snow in the higher mountains of California during this winter and most of it has packed quite hard. This insures an abundant water supply.

Alleghany and Forest in Sierra county continue to be the two places which are attracting the most attention from California miners and prospectors. Within a radius of five miles of Alleghany there are now 32 mines being actively developed and some are producing largely. A number of tunnels from 500 to 2000 ft. long are under way or planned. There have been thus far no wildcat companies, all those at work having promptly paid their bills. The lower crosscut in the famous Tightner at Alleghany has not cut the ledge as was expected by Feb. 1. It now seems apparent that the course and dip of the vein has changed and must be looked for further back in the ridge than was expected.

John F. Krause, of San Francisco, some time since organized the Mt. Hamilton Land and Oil Company on a non-assessment basis and sold a large amount of stock in the Eastern States to people who were assured that no assessments would or could be levied. However, whether a mining company is incorporated outside the State on that basis or not, the California laws provide for assessments to pay indebtedness by stockholders when the property is within the State. Perhaps contrary to the supposition of Krause, indications of oil were found on the lands of the company, and he then attempted to "freeze out" his stockholders by levying an assessment. In the course of his operations the Government officials concluded he had used the mails to defraud and he was arrested and convicted on such a charge. Before sentence was passed Krause got a lawyer who sought to mitigate the man's punishment by offering to make restitution to all who had been defrauded in the stock deals. The prosecution, however, called the court's attention to the fact that Krause had received over $70,000 from the sale of stock, and when prosecution seemed imminent, transferred the coin. Then when there was a seeming lull in activity on the part of the Government, he brought suit to recover the money. Sentence will be passed at the end of February.

Butte

Feb. 25—After a week's cessation of activities in the majority of mines in the camp, it now looks as though operations would be in full swing again within a few days. The members of the International Engineers who walked out, are still firm in their determination to stay out, but the Western Federation of Miners have brought in hoisting engineers from Colorado and Dakota to fill their places and the mining companies are apparently ready to try out the imported men. General Superintendent John Gillie, of the Amalgamated company, has announced that operations will be resumed with the new engineers as fast as possible. Just how adequate the new men will be to fill the responsibilities attendant upon the operation of the complex hoisting engines is a question which only the future can determine. It is thought that all of the mines will at least attempt to resume operations during the present week. It is quite probable that with the slow operation necessary with the new engineers the companies' mining costs will be increased materially as will also the liability to accident.

Federal Judge Hunt has recently handed down his decision in the case of Hugh Magone vs. the Colorado Smelting and Mining Company, et.al. The action was brought to obtain an injunction against several mining companies to prevent them from polluting the waters of the Deer Lodge river, which complainant alleged had destroyed the value of the water for the purpose of irrigating his ranch. The judge finds that the complainant's ranch has been damaged in the sum of $572.50 which sum the mining companies are required to pay within 60 days, otherwise a permanent injunction will issue.

Construction work on the Montana Rapid Transit Company's trolley line between Butte and Helena will begin May 1, and the road should be completed by autumn. Fifty-two of the 72 miles of roadbed have already been constructed, and it is estimated that the total cost of the road will be $3,500,000. It is planned to run cars on a three-hour schedule and to undercut the present rates of the Great Northern Railway.

The latest announcement of the Idaho Smelting and Refining Company is to the effect that the smeltery at Sandpoint, Ida., will resume operations March 1. President Anderson states that the company has a working capital of $600,000 and contracts enabling it to receive 600 tons of ore daily, most of which will come from the Cœur d'Alene district.

It is probable that the Gilmore & Pittsburg railway will be continued from Armstead, Mont., to Dillon, in Beaverhead county. At a recent meeting of the citizens of Dillon, arrangements were made to subscribe a $10,000 fund for the purpose of assisting the railway in obtaining a terminal in that city.

The Montana, Wyoming & Southern railway's request to have the rates on coal from Bear Creek to Bridger raised has been denied by the State Railway Commission. The commission states that while the present rate of 35c per ton may be unremunerative, yet this fact is caused by the lack of proper facilities for doing an increased business, and that were the motive power of the road sufficient, the present rate would bring good returns.

Denver

Feb. 27—In southwestern Colorado the promise of extensive railway building is acting as an impetus to the mining industry. The Denver & Rio Grande is to be broad-gaged from Alamosa to Durango, and connection is also to be made from the latter point to the Southern Pacific system, the chief object being apparently o get the coal from the Durango field nto the southern regions which are not t all well supplied with good fuel. In act, nearly all the railways in the State re preparing to extend their lines and pend large sums in betterments. The Colorado & Southern is said to be going o spend $2,000,000 for new equipment nd $3,000,000 for improvements of track nd equipment now in use. The new quipment is to include 10 passenger en-ines, five Mallet compound engines and even switching engines, 500 all-steel ondola cars of 100,000 lb. capacity ach, to haul iron ore and coal, 300 box ars, 500 stock cars, etc. Another 5,000,000 is to be spent by the Colorado Southern and Denver & Rio Grande ogether in the Pueblo-Walsenburg divi-ion, where a new double track will be uilt. On the Moffat Road, since its com-letion into the Yampa coalfield, it has een found impossible to handle the usiness with existing equipment, and st month Mr. Moffat purchased 20 more ngines, and 518 steel cars, the whole eing necessary to handle existing freight affic between Denver and Steamboat prings.

At Ouray, four small smelteries are rojected, one of 200 tons capacity at e San Antonio mines in Red Mountain istrict, and one of 500 tons at the Mono-altic mines adjoining the San Antonio, oth of these being of the pyritic type; third is the Bright Diamond smeltery, hich, with its mine in the quartzite belt elow town, has just been reported sold Eastern people and is preparing to ine and treat 200 tons of auriferous rite daily; the fourth of 200 tons ca-acity is to be of the Kuenzel type, simi-r to the plant at Buena Vista. Doubt-ss some of these will "die a' borning."

The Colonel Sellers mine at Leadville, rchased some years ago by the New rsey Zinc Company, is now about to worked again, and a new shaft is ing sunk west of the Iron Silver Com-ny's boundary. The Colonel Sellers as one of the largest and earliest pro-cers of the Leadville sulphides in the ys when zinc was highly penalized, d to eliminate the zinc from the lead a big concentration mill was erected d worked for many years. The A. Y. Minnie adjoins to the west, and situ-ed on the same oreshoot from which immense tonnage was shipped to the elteries, and the largest dump of zinc-lphide tailings in the district accumu-ted. This property was the first min- venture of Meyer Guggenheim, and difficulties at this mine brought him the West and gave the first insight to the charges then being exacted for elting Leadville ores, which in a short ne induced the old gentleman to take the business. So the A. Y. & Minnie y be said to have laid the foundation the Guggenheim fortunes.

Salt Lake City

Feb. 25—The preliminary report of the Utah Conservation Commission for 1909 has been issued. The report deals with the agricultural resources of Utah, irrigation and water power, the mineral resources of the State, manufactured food products, fish and game, forest and forest reserves. It contains interesting general information about the resources of the State. Copies can be obtained by addressing Col. B. B. Mann, chief of the Conservation Commission, Salt Lake City.

A suit was brought in the United States circuit court, Feb. 21, by the Utah Metal Mining Company against the New England Gold and Copper Company for $300,000 in the first cause for action, and $1,350,000 in the second cause, alleged to be the value of the ore illegally extracted from property belonging to the Utah Metal Company by the defendant.

The National Copper Bank, of Salt Lake City, has been granted a charter by the controller of currency. This bank was organized chiefly by Utah mining men. Over 50 per cent. of the capital stock of the bank is held by directors and officials. W. W. Armstrong is president and Eugene Giles, cashier.

The regular monthly meeting of the Utah Society of Engineers was held in the Newhouse building on the evening of Feb. 18. H. M. Sheley, of the State engineer's office, Richard P. Lyman, of the University of Utah, and A. F. Doremus, formerly State engineer, took part in a discussion of the water supply of Utah, its management, conservation and use.

Arrangements have been completed for the taking over of the Eureka City Mining Company by the Chief Consolidated, practically all the Eureka City stockholders concurring in the consolidation. The last outstanding stock of the Little Chief Mining Company has been secured by the Chief Consolidated. The company has also added to its territory by the recent purchase of the American Star, Blackbird and Triangle claims. Development work has been actively carried on during the last few weeks and the main shaft has reached the 1700-ft. level. Two cars of ore were shipped to the United States smeltery at Midvale, in the week ended Feb. 18.

In the case of the Silver King Consolidated vs. the Silver King Coalition, Thomas Kearns, vice-president and general manager of the Coalition company, was on the stand for the defendant. He acknowledged that prior to the beginning of the suit, he had never rendered an accounting for Solon Spiro, president and general manager of the Silver King Consolidated, for the ore removed from joint territory, nor had he told him that he was in his ground. When asked if he had ever intended to render an account to Mr. Spiro, Mr. Kearns refused to answer, saying that he was unwilling to swear to what he intended to do, but that he did not do it. One reason he rendered no accounting, he said, was because the ore taken out had not paid for the expense of development. On cross examination he testified that at least it had no more than paid for this cost.

Goldfield

Feb. 24—Another alleged attempt to high-grade at the Consolidated mill has been unearthed according to Clarence Sage, chief detective for the company. A constable of Goldfield, a saloon man, an assayer and an amalgamator at the mill are implicated in a conspiracy to rob the amalgam plates. The detective claims to have plenty of evidence to convict the men, and coming as it does, so soon after similar attempts, which are still pending in the courts, the case is attracting considerable attention.

That a smeltery of sufficient capacity to handle the production of all the mines in the Yerington district will be constructed by the Mason Valley Mines Company, there seems to be no doubt, according to the announcement of George E. Gunn. The site will be within 1½ miles of the Southern Pacific Railroad near Wabuska. The company owns an ample tract of land and has plenty of water developed by boring wells in the immediate vicinity. The Nevada Copper Belt railroad connects the smeltery site with the mines at Yerington. The financing of the project is said to have been consummated and plans in the process of preparation, so that actual construction should soon be started.

Indianapolis

Feb. 28—Arrangements have been made to separate the management of the coal properties in Indiana of the Rock Island-Frisco system, which will result in each branch of the system handling the output from its own mines. The output of the Consolidated Indiana Coal Company, operating block-coal mines in Clay county, which is owned directly by the Rock Island, has been taken over by that branch of the system. The Consolidated company has been reorganized with H. U. Mudge, president of the Rock Island, as president.

It is said that the development of from three to six new mines will result from the separation of the interests. The Rock Island is now in control of about 11,000 acres of coal land in Indiana.

Whether a railroad company has a right to confiscate coal turned over to it for transportation in order to avoid a tieup in the event of a strike among the coal miners, is a question to be submitted to the Railroad Commission for settlement. Reports come to the commission in the form of a complaint from manufacturers, that railroads are confiscating coal consigned to them and paying no attention to protests made by the consignees. The complainants assert that the railroad companies are not seizing the coal for immediate purposes, but that on account of a probable strike and resultant shortage, the roads are preparing against such contingency by storing large quantities of coal. The Indiana Railroad Commissioners say there is no doubt of a railroad company's right to seize coal en route and to confiscate it for immediate purposes, as an indispensable public necessity. However, the commission doubts the right of the companies to seize coal for storage purposes.

Cobalt

Feb. 26—There is again talk of a merger between Nipissing, La Rose, Kerr Lake and Crown Reserve. In an interview, Mr. McGibbon, president of La Rose, admitted that he had talked the matter over with men closely identified with the different companies, who seemed to be in favor of such a scheme. Nothing definite, however, has been done as yet. The possibilities of arriving at an equitable basis for settlement are somewhat dubious.

Crown Reserve is capitalized at $2,000,000 and has an area of 23 acres. The greater portion of this has been explored, and in the near future the company will have to go to greater depth to open up more ore. Kerr Lake is capitalized at $3,000,000 and has an area of 52 acres. Like Crown Reserve the greater part of this territory has been explored, but the mine has a greater depth than any other in the camp, and is now working at 450 ft. The ore is good at that depth, but the vein is getting smaller and the silver content less. The area of La Rose is 345 acres and the capital is $7,500,000, and although the main La Rose mine is holding up well, the outside properties have been rather disappointing. Nipissing has the largest area in the camp, 846 acres, and is capitalized at $6,000,000. A large proportion of its holdings is as yet practically virgin ground and in many parts the surface has not even been scratched. The other mines mentioned are exceedingly rich, but Nipissing, on the score of its large acreage, the splendid physical condition of the different workings, and the large area as yet unexplored, has the greatest future.

Toronto

Feb. 26—Hon. W. S. Fielding, Canadian Minister of Finance, has announced in the House of Commons, Ottawa, that the government had no present intention of renewing the iron and steel bounties which expire this year. The iron and steel manufacturers will shortly make strong representations to the government to induce it to change its decision. They are hardly likely to prevail, however, in view of the growing antagonism to the bounty system and high protection, especially among the western farmers.

The visit to Canada of Sir Edgar Speyer, of the banking house of Speyer & Co., London, who before his return will make an inspection of the Dominion Iron and Steel and Dominion Coal companies' properties at Sydney, is understood to be in connection with the merger of these two companies. Speyer & Co. are heavily interested, having taken $6,000,000 in bonds of the steel company. It is stated that the coal company is badly in need of funds to satisfy its liabilities to the steel company, and that the flotation of a loan is probable.

The Ontario government is offering for sale by tender 571 lots in the townsite of Porcupine covering 80 acres. Tenders will be received until March 16.

Mexico

Feb. 20—In January, the Ferrocarril de Teziutlan á Nautla, S. A., was formed as a stock company with a capital of 5,000,000 pesos, to construct a railroad from Teziutlan through a rich farming country to the gulf at Nautla. This will shorten the haul of the smeltery at the former place by half. The route has been surveyed and plans accepted by the federal government, and some right of way secured. Already 1,000,000 pesos have been subscribed, and the balance will be bonded. An option for the purchase of the concession and all rights pertaining thereto has been granted to an English syndicate. The engineers of this company are expected to land here about Feb. 20, to report on the project. If the option is not taken off, construction work will be begun in 60 to 90 days. Shops will be built at Tlapacoyan when track laying shall have reached that point. To build the harbor at Nautla, a separate company will be formed and bonds floated—the same method of procedure as was employed in building the Tampico harbor.

The Mexicano del Sur railroad, controlled by the National line, is extending its line from Oaxaca to Taviche. The grade is completed and track is laid to Ocotlan. Work is progressing without difficulty other than a controversy with the Oaxaca á Ejutla railroad about a crossing, which will soon be settled. The road expects to be in operation by May and will greatly help the mines in the Oaxaca section. Rails are 50 lb. in the valley and 60 lb. in the mountainous districts.

Report says that the American Smelters Securities Company has purchased the mines, smeltery and water system of the National Metallurgical Company of the Matehuala district in the state of San Luis Potosi. The price has not been made public. The National Metallurgical Company, incorporated in 1901, with a capital of $1,000,000, owns a number of copper and lead-silver mines, and has others under lease. The ore reserves of the various properties are large. The smeltery consists of three furnaces with an aggregate capacity of 550 tons daily. The company's water system, which supplies the town of Matehuala as well as the smeltery, draws its supply from the only available mountain stream in that section. It cost more than 350,000 pesos and is of the greatest importance, as in former years the scarcity of water often forced the inhabitants to desert the Matehuala camp.

London

Feb. 23—The Vancouver, B. C., mine of the Van Roi Mining Company, has been connected with the Mountain Boomer mine by a drive, 1300 ft. in length, which will facilitate the handling of ore at the proposed new mill at Granite creek. In the course of driving this level two new oreshoots were explored and a third has recently been entered. At the end of the year 100 tons per day were being put through the mill and preparations are being made to increase this capacity to 4000 tons per month. Since the company was incorporated in July, 1908, up to Sept. 30, 1909, operations have been conducted at a loss of £4000. The directors complain of the import duty into the United States of 1c. per lb. on zinc and 1½c. on lead, and are endeavoring to get the Canadian provincial government to assist in the establishment of a government smeltery for zinc ores in Canada. At present the zinc concentrates are shipped to Denver.

The Le Roi No. 2, Rossland, B. C., report records a year of prosperity, the profit for the year ended September having amounted in round figures to £50,000. The gross value of the ore shipped was $703,317, or $23.54 per ton, of which about $19 was in gold and $4 in copper. The consulting engineers say that the estimation of ore reserves in this mine is a difficult matter and that they are loth to give figures, but they think that the mine has enough ore down to the 900-ft. level to keep the present rate of production going for a year and a half. Below the 900-ft. level ore has been found by two diamond-drill holes and there is every reason to expect a considerable tonnage in depth. Mining costs were $3.36 per ton, and smeltery charges $5.70 per ton. The total cost of mining, smelting, development and depreciation was $10.55 per ton, as against $10.85 in 1908. The businesslike way in which both the technical and the financial positions are set out calls for special commendation. The affairs of the company are put before the shareholders in a clear and concise manner which many mining companies might imitate with advantage.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY·
INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

The Alaska-Treadwell reports 31,864 tons crushed during the month ended Jan. 15, yielding $3.27 per ton; Alaska United Gold Mining Company, 32,896 tons yielding about $1.95 per ton; Alaska-Mexican, 18,312 tons yielding $4.58 per ton.

Seward—Residents of Seward favor the proposed plan to lease coal lands and pay a royalty of 50c. per ton on the tonnage mined. The coal question is important to this particular region because of its proximity to the Matanuska coalfields.

Juneau—The Pearl Harbor Mining Company is considering the erection of a stamp mill.

Arizona

COCHISE COUNTY

Santa Rosalia—This company has decided to discontinue shipments to the smeltery, but will concentrate the ore at he mines as soon as the reduction plant can be placed in operation. The shaft will be sunk to the 600-ft. level.

GILA COUNTY

Inspiration—The Inspiration orebody is being blocked out from the 400-ft. level of the Joe Bush shaft, where, by means of drifts, the ground is being broken at he rate of 600 ft. each month. One raise is being advanced from the northern part of this level. The crosscut south on he 275-ft. level of the Scorpion shaft is now 280 ft. long and for 150 ft. is in ore averaging nearly 3 per cent. copper. The 80-h.p. air compressor for use in driving the extraction adits from Keystone Gulch is in place and the air pipes are being connected with the Joe Bush shaft, 2500 ft. northward. Meanwhile, he first extraction adit has been advanced 100 ft. by hand drilling. One hundred and sixty men are employed.

Arizona-Commercial—Since operations were resumed at the smeltery, 200 tons daily have been supplied from the fifth and sixth levels, as usual. In addition he Superior & Boston also ships about 0 tons of 9 per cent. ore to this smeltery daily. Crosscutting is in progress on he seventh level of the Arizona-Commercial mine, to open the Black Hawk vein. Considerable water at this level is interfering somewhat with the work. About 350 men are employed.

Live Oak—All development work, with the exception of one raise, is being done in drifts west from drift 306, which is a continuation of the sulphide adit. The raise which has been driven from the junctions of drifts Nos. 306 and 310, is 100 ft. high. All of the work is in ore averaging about 2.6 per cent. copper. A force of 40 men is employed.

Superior & Boston—This company has decided to adopt a combination of the caving and slicing systems in its mine. Extraction by the new system will first be carried on between the 600- and 400-ft. levels of the Great Eastern.

Warrior—The company is shipping about 75 tons of 10 per cent. copper ore to the El Paso smeltery daily. This ore is being stoped from the 250- and 300-ft. intermediate levels. The development work on the 300-ft. level westward is opening up ore of the same grade as that being shipped. A raise from this level is being put up about 500 ft. west of the shaft, and this is in ore also. One churn drill is prospecting the ground west of the mine workings and is in a schist carrying considerable pyrite at a depth of 639 ft. M. F. McCarthy is manager.

GRAHAM COUNTY

Arizona-Morenci Copper Company—This new incorporation will develop the properties hitherto owned by the Coppermines Company, of Arizona. The capitalization is 2,000,000 shares of a par value of $5. The properties are practically undeveloped and adjoin the mines of the Shannon, Detroit and Arizona Copper companies. Two churn drills are in operation. Henry G. Catlin, of New York, is consulting engineer.

YAVAPAI COUNTY

Cababi—This company is pushing to completion its 100-ton concentrator and expects to build a smeltery.

Gould—A 100-ton smeltery is being erected at this mine 14 miles from Tucson.

Venezia—A 10-stamp mill will be erected immediately.

California

AMADOR COUNTY

Bunker Hill—This mine, E. H. Harrington, superintendent, yielded $24,000 gross in January. The orebody on the 1750 level is 9 ft. wide.

South Eureka—The orebody in this Sutter Creek mine has been penetrated from the 2000- to the 2700-ft. level, showing good ore the entire distance.

BUTTE COUNTY

Carlisle—At this mine, Forbestown, L. Garibaldi superintendent, the 10-stamp mill has been started.

CALAVERAS COUNTY

Boston—For this mine, San Andreas, a 100-stamp mill and new hoisting machinery are being planned. Electricity will be used for motive power.

Calaveras—This copper company now has its main shaft down 780 ft., and the Keystone shaft is being cleared out.

ELDORADO COUNTY

Landecker—This old gravel property near Placerville is being worked by the drifting system by a company of which Harold T. Power, of East Auburn, and John A. Britton, of San Francisco, are directors.

Mount Pleasant—This old mine which until last April had been abandoned for some years, is furnishing ore for 10 stamps and 10 more stamps will be added as soon as the state of the roads permits hauling. A. V. Judson is superintendent.

MARIPOSA COUNTY

Grant Mines—Six sets of leasers are working in the Pine Hill and Josephine mines on the Mariposa Grant.

MONO COUNTY

Parrett—This mine at Lundy, recently purchased by the Broken Hills Mining Company, is showing up several veins of high-grade ore.

Benton—This company, operating in Blind Springs district at Benton, is expending $100,000 on proper equipment, and considerable machinery is being shipped in. C. E. Julihn is in charge.

NEVADA COUNTY

Metropolitan and Black Bear—For these mines near Moore's flat, controlled by A. L. Shinn of Sacramento and C. L. Wilson of Lincoln, a 25-stamp mill has been ordered. Moore's flat is the southern extension of the Alleghany district of Sierra county.

PLACER COUNTY

Hibbe—This copper mine near Sheridan is about to be reopened by an Oakland company recently formed.

Kenyon—On his ranch near Auburn, W. D. Kenyon has struck a 4-ft. vein of excellent ore.

PLUMAS COUNTY

Johnsville—South of this place, the Jamison mine, George S. Redstreake, superintendent, is working 50 men and keeping the 20-stamp mill steadily running. The Plumas-Eureka has 70 men at work and 20 stamps are dropping, while 20 more will soon be added. Fifty men are at work on the Four Hills mine.

SIERRA COUNTY

Rainbow—From this mine at Alleghany, L. P. Woodbury, manager, high-grade ore is being taken.

SISKIYOU COUNTY

Hawkins—This old claim on Greenhorn creek has been fitted up by Simas & Rose and giants are in operation.

Oom Paul—The new mill of this mine at Oro Fino has been completed and two shifts of men are taking out quartz.

Dredge—The gold dredge at Callahan is running steadily. The company will put on another dredge this summer.

TEHAMA COUNTY

Tom Head—The oreshoot in this copper mine, opened last year, has been cut 150 ft. deeper in tunnel No. 3. Machine drills are in use.

TUOLUMNE COUNTY

Black Oak—The mill at this mine, Soulsbyville, has been started up, and 30 men are taking ore from the mine.

Colorado

LAKE COUNTY—LEADVILLE

Humboldt—This mine in Adelaide park, under lease to Huckley & Co., is shipping about 200 tons per month of lead ore.

Printer Boy—A new plant of machinery has been erected by Andrew Hill, manager, and a good grade of ore is being hoisted.

Corona—Lessees on this mine are producing about 25 tons per day.

Gold Basin—It is stated that a small streak of ore has been found that carries as high as 9 oz. gold and 47 oz. silver. J. B. McDonald is manager.

ROUTT COUNTY

Royal Flush—This mine is opened by two crosscut tunnels, 350 ft. apart, and several promising veins have been cut. The ore carries gold and silver. Machinery has been installed and both tunnels are being driven.

Farwell Mountain Copper Company—This company is working 15 men, developing its smelting ores by shafts and tunnels, and expects to make a trial shipment soon.

SAN JUAN COUNTY

Mineral Farm—It was Gustav A. Nie[illegible]ld who discovered this mine instead of [illegible] Begole as stated in the JOURNAL of Jan. 15.

TELLER COUNTY—CRIPPLE CREEK

The shipments from Bull and Beacon hills and Battle mountain during the last week have been heavy, and some of it of exceptionally high grade. The larger proportion of the tonnage went to the Standard plant at Colorado City.

Stratton Estate—The Deerhorn mine of the above estate is shipping from four to six cars per week of milling ore of good grade.

Mary Cashen—This mine, in the city of Victor, and the Surplus Fraction mine adjoining, will be now worked by the Mary Cashen Mining and Milling Company, lately incorporated, capitalized at $50,000.

Findley—At the annual meeting of this company, the report of the general manager, A. E. Carlton, shows that 6818 tons of ore were shipped, of an average value of $22 per ton. The company is free of debt, with a good cash reserve.

Idaho

COEUR D'ALENE DISTRICT

North Bunker Hill—This company has received a deed issued by the council of Wardner, for ground in the city limits, over which there has been controversy for several years. This action gives the company possession of all surface rights. Workmen are now extending a tunnel from the Wardner side of the gulch through Haystack peak to the company's ledge, to be cut at a depth of 1000 ft.

Jack Waite Claims—At a depth of 150 ft. a ledge 30 ft. wide has been opened showing solid ore, 9 ft. of which is said to be clean shipping, and the other 21 ft. of milling grade.

Hamilton-Coeur d'Alene—This group in the Carter district is preparing to ship some of the carbonate ore found in the upper tunnel. A trial shipment of 20 tons netted $26.60 per ton.

Idaho Copper—The vein in which ore was recently found on the Reindeer strikes into Idaho Copper, and work on this property will be started at once.

Terrible Edith—The silver-lead ore recently uncovered is said to be among the richest ever taken from a mine in the district.

Reindeer—The crosscut of the ledge has gone through 10 ft. of shipping copper ore.

Bunker Hill & Sullivan—The amount of the dividend has been increased to $60,000 for February.

Alameda—Sixty inches of high-grade galena and zinc ore is exposed in the crosscut of the ledge.

Silver King—A large body of high-grade lead-silver ore has been encountered.

Gold Hunter—The mill will be closed the latter part of February, to remain shut for 60 days while the 1000-ft. winze from the No. 6 level is started. Shipments will be curtailed for two months.

Black Horse—Shipping ore and high-grade milling ore has been struck on the 1200-ft. level, the greatest depth in the mine.

CUSTER COUNTY

Sunbeam Consolidated—This gold mine, near Custer, C. E. Gable, manager, is working a large free-gold deposit, and is now installing the first 500-h.p. unit of a 2000-h.p. hydroelectric power plant.

WASHINGTON COUNTY

Arkansaw—Development work is being carried on with a force of 25 men, under the direction of Fred D. Smith, manager for the Seven Devils Copper Company. Work consists in blocking out the ore of the Decorah tunnel level and driving a drainage tunnel which will tap the orebodies at a depth of 350 feet.

Blue Jacket—Miller & Kleinschmidt have a 10-year lease and are driving a tunnel on the Queen claim, which will tap the orebodies at a depth of 200 ft. below the old workings.

Indiana

CLAY COUNTY

Michael White, superintendent of the five mines of the Vivian Collins Company, has been fined for violating the State mining laws for the protection of miners. The State mine inspector found that the men in those mines asked for props to prevent falls of slate and that Superintendent White refused to supply them.

In addition to mine No. 1, the Crafford mine No. 9, of the Brazil Block Coal Company, has been worked out, and the adjacent unworked fields will now be developed.

The Otter Creek Coal Company has discovered coal at a depth of 30 ft. north of Brazil. The vein is 4 ft. 10 in. thick and will be opened at once. Another good field is being opened by the German Coal Company on the Nance farm east of Brazil. This is a territory that is undeveloped.

GIBSON COUNTY

A fine 7-ft. vein of coal has been struck at a depth of 70 ft. by the Princeton Mining Company. The same quality of coal is being mined at a depth of 440 ft. It is said two or three additional mines will be added to this field. The vein recently found has a solid slate roof.

Kansas

United Zinc Company—This company is about to begin work on the Rogers forty at Galena where it has a deposit of shallow ore. The company has drilled the ground and determined the extent of.

ie ore, and will now install a steam iovel and work the ground by the open-it method. This company will also drain large part of the O'Neill land west of iis tract and throw the land open to nall leasers. The land has been worked i the upper levels and proved rich.

Elenita—This mine in the eastern part f the Empire camp has made its initial in and produced 70 tons of ore.

Michigan

Copper

Oneco—No. 6 drill hole is well esblished in the ledge at a depth of about 50 ft. This hole is going down to cut ie new amygdaloid formation at a depth f about 500 ft. No. 7 hole, in line with o. 6 at a point about 2000 ft. southwest, still in the overburden.

Indiana—No. 5 drill hole, sinking about 0 ft. southwest of the No. 2 hole from hich the rich core was taken, is down bout 150 ft. and should soon be estabshed in the ledge, when greater progress in be made. This hole is going down to etermine the pitch of the formation, and om the data secured a shaft site will decided upon and ground broken early the spring for a shaft.

Franklin—The diamond drill operating expose the Hancock lodes has enountered the conglomerate at a depth of bout 500 ft. and it is expected that it ill cut the No. 3 amygdaloid in the near ture.

Superior—Under the management of e Calumet & Hecla this property is eing opened in a systematic manner; the tensions of drifts from No. 1 shaft conue in good ground and No. 2 shaft getting into a much improved grade of ck. Rock shipments averaging about 0 tons daily are being made to the Atntic mill.

Hancock—No. 2 vertical shaft should ncounter the No. 2 lode soon and reults in a mineral way are being awaited ith much interest.

Laurium—The third level has been ached in the shaft with a fine grade of ck in evidence throughout. The surce equipment has been completed and of such capacity that it will take care property through the opening stages.

Osceola—Nos. 5 and 6 shafts at the ain mine have been closed down owing the physical conditions of the shafts eing such that they require extensive reirs to maintain the rock tonnage. Vaous improvements will be put into effect the rock houses tending to lessen the st of crushing and to handle a much creased tonnage. In all probability ineased production will be made at other anches of this property, especially at o. 4 Kearsarge shaft, so that the total oduction may not be materially deeased.

Missouri

JOPLIN DISTRICT

"The Mining Club" has been formed in Joplin and the members pledged themselves to raise $12,000 annually for the club. One of the missions of the club will be to investigate evasions of the new ore tariff law and to secure all kinds of statistical information which bears on the subject of zinc and lead-ore production and mining in general.

H. Gundling has let the contract for the erection of a 500-ton mill on his land at Stotts City. The cost will be about $45,000.

Don McRuer—The company is working the large pile of tailings on the Alladin lease.

Herald—This mine at Cave Springs, west of Joplin, has shut down on account of low ore prices.

Hecma Land and Mining Company—This company has incorporated with a capital of $200,000 to operate the Cameron mine which was recently purchased for $45,000.

Muskingum—This company has been organized to operate a 26½-acre lease on the Taylor & Glover land west of Joplin. The lease is at 12½ per cent. royalty, and the company has 15 drill holes and a shaft in the sheet ground. All show a face of about 20 ft. of rich sheet ore. The company is planning the erection of a 300-ton, electrically driven mill similar to the Samson mill. J. C. Squires of Joplin is manager.

Montana

CASCADE COUNTY

United States Gypsum Company—Negotiations are now under way whereby the company will acquire the gypsum claims of Gust Siegling on Belt creek.

Johannesburg—The two-compartment shaft has been sunk 300 ft. and will be continued to 500 ft. Andrew Nelson is in charge, Neihart, Montana.

LEWIS AND CLARK COUNTY

Bessie—Arrangements are being made for a resumption of operations at this mine in the Greenhorn district. A 25-h.p. boiler, engine and pump have been leased from the Red Bird property.

Missouri River Power Company—Nine hundred men are now employed at Hauser lake rebuilding the old Hauser lake dam which was destroyed by floods. About 600 men are at work at Holter building the third dam at that place.

Nevada

CHURCHILL COUNTY

The power line from Fallon to Wonder is practically assured, bids having been made for the water power from the irrigation system at Fallon.

ESMERALDA COUNTY

Montgomery-Shoshone—The report for 1909 shows the proceeds of bullion and concentrates to have been $446,224. The profit for the year was $86,703.

ESMERALDA COUNTY—GOLDFIELD

Goldfield-Annex—Compressor and drills will be installed and laterals driven from the 800-ft. level where the ore was discovered recently. The shaft will also be sunk to the 1000-ft. point.

Booth—Three shifts have been put to work, and a crosscut will be run to open the Red Top vein at the 260-ft. level.

Atlanta—A discovery of a quartz vein is reported from the Precious Metals lease at the 730-ft. level.

Black Butte—Work on company account has been started, sufficient funds having been raised by the recent assessment of one cent per share.

Yellow Tiger—A fund has been placed in the treasury and work started on company account to prospect the company's territory.

LYON COUNTY

Mason Valley—A stockholders' meeting will be held, March 14, to vote upon increasing the capitalization of the company to 500,000 shares at $5 par, and also upon a $1,000,000 bond issue. It has been decided to erect a smeltery at once, its capacity to be 500 to 800 tons per day. The bond issue is for this construction.

NYE COUNTY

Johnnie—The result of a six days' partial clean up was an 85-oz. gold brick. The new Lane slow-speed mill was started on Feb. 13, and the mill capacity is now about 100 tons daily. The 700-ft. shaft is to be sunk to the 1000 level.

NYE COUNTY—TONOPAH

Shipments for the week ended Feb. 19 were as follows: Tonopah, 3150 tons; Belmont, 650; Montana-Tonopah, 964; MacNamara, 325; West End, 120; Tonopah Extension, 840; Midway, 80; total, 6129 tons. The estimated value was $153,225.

Tonopah Mining—In the week ended Feb. 14, 3225 tons averaging $21 were crushed. Bullion valued at $47,850, and 30 tons of concentrates worth $12,750, were produced. The extraction was reported as 91 per cent.

Montana Tonopah—Extensive development work on each of the seven levels continues to reveal good ore and keeps the reserves well up to the weekly output of 1000 tons. The mill report shows an extraction of 91.6 per cent.

Tonopah-Belmont—The big orebody recently opened on the 1100-ft. level has now been followed for weeks without showing any signs of diminishing either in width or value. Much of the ore is being shipped. It is almost certain that operations at the 60-stamp cyanide plant will soon be resumed.

WHITE PINE COUNTY—ELY

Nevada Consolidated—The output is now normal at 6000 tons per day. The report of the company for the quarter ended Dec. 31 shows net earnings of $736,634 and a deficit after charges and dividends of $33,601. This deficit is accounted for by the fact that severe weather lowered the tonnage treated and increased the working costs.

Ohio

The Youghiogheny & Ohio Coal Company, of which F. M. Osborne, of Cleveland, is president, has added to its holdings by the purchase of all the interests of the Highlands Coal Company in Belmont county. There are two mines in operation upon the property, which has an area of 5500 acres. About 400 men are employed.

Oklahoma

Dudley H. Norris has bought the fee of 60 acres of the Crawfish allotment in the Quapaw camp for $8500. The Oklah mine is on the south forty of the tract.

Omaha-Petersburg—This company has shut down its mill, the old M. K. & T., and will build a modern plant of 500 tons capacity.

Edna Ray—The mine at Miami has changed hands and will now be operated by the New Hope company.

Utah

JUAB COUNTY

Utah Mine—The 265-ft. level is being extended into property which was bought during the last year. This level will pass under old workings from which shipments were formerly made. Shipping ore has been opened on all the levels. It is expected that the property will soon be on a dividend basis again. The last dividend was paid in February, 1909.

Sioux Consolidated—The annual report shows receipts during the last year were $686,482; cash on hand Jan. 1, 1909, $63,457; disbursements, $741,834; balance, Jan. 1, 1910, $8105. The company has been doing active development work on the 450-ft. level west of the present orebodies.

Bullock—Preparations are being made to sink the shaft from the 210- to the 310-ft. level.

Tintic Combination—Work has been started on this East Tintic property which has been idle for some time. A drift is being run from the shaft on the 220-ft. level to cut the Aspinwall vein. B. H. Bullock is manager.

East Tintic Development Company—Preparations are being made for stoping between the 230- and the 330-ft. levels. A winze has been sunk on ore 65 ft. below the 230-ft. level, and will be continued to the 330. Ore has been followed 110 ft. on the upper level and is said to have averaged about 6 ft. in width. A carload of ore was mined in doing development work.

Provo—This property, which is under lease to D. Roberts and associates, made its initial shipment of ore this week (Feb. 19). The ore came from a winze sunk from the 300-ft. level. Another carload of ore from development work is expected to be ready in about ten days.

North Colorado—A double-compartment shaft is being sunk and is now down over 50 feet.

Tintic Humboldt—This property, situated in North Tintic, has sunk its shaft 80 ft. with a windlass. A whim is being installed and sinking will be continued. It is expected to drift when the 100-ft. level is reached. W. F. Giles is manager.

Tintic Central—A contract for sinking the shaft to the 600-ft. level has been given. The shaft is now about 555 ft. deep.

Iron Blossom—A station has been cut at the 500-ft. level of the No. 3 or North shaft and drifting started for the orebody opened on the 400 level. About 75 tons of ore are being mined daily. The south shaft is down 134 ft., and will be sunk to the 1500 level. Frank Birch is superintendent.

SUMMIT COUNTY

Scott Hill Mining Company—At a meeting of the directors, it was decided to levy a quarter of a cent assessment for the purpose of continuing development.

TOOELE COUNTY

Buffalo Consolidated—The recent strike is reported to have widened to 5 ft. of shipping ore.

Silver Island Coalition—The last shipment sent out by this company near Wendover amounted to between 33 and 34 tons. Payment was made by the smeltery at the rate of $119.48 per ton. The ore carries lead and silver with some copper and a small amount of gold. M. E. King is manager.

Washington

FERRY COUNTY

Valley Dew—A contract has been let for 500 ft. of development work on this property two miles east of Orient.

KITTITAS COUNTY

A consolidation has been made of the Busy Bee and the Golden Gate Mining companies at Cle Elum. Both companies own valuable coal and mineral claims. As soon as sufficient work has been done to insure a daily average of 50 tons of ore a reduction plant will be installed. J. D. Medill is president of the new company.

SKAGIT COUNTY

North Coast Copper—This company will install a large amount of machinery in the near future. Edward Fredlund o Mt. Vernon is representative of the company.

STEVENS COUNTY

Liberty Copper—Preparations are being made to erect a concentrator next spring. T. H. Wilson, Chewelah, is president.

Trojan—This property on the west slope of First Thought mountain will be extensively worked in the spring.

Wisconsin

ZINC-LEAD DISTRICT

Platteville—A big strike of zinc ore was made on the John Seitz land, east of the Klar-Piquette, by a prospecting company newly organized; 15 ft. of sheet ground was penetrated in two holes by churn drill.

St. Rose—In driving a raise an 8-ft. body of heavy disseminated blende was exposed just above the cap, giving the mine a total working face 16 ft. high; the raw concentrates assay 57 to 59 per cent. metallic zinc.

Wisconsin Zinc Company—A 90-day option has been taken on the Winskill mine, at Benton, purchase price $100,000; separate option was also obtained to the fee of the land, comprising 480 acres; the property lies 4½ miles southwest of Shullsburg.

United—Edward T. Goldthorpe has taken a two-year lease on this property, at Montfort, with option to buy at $22,500.

Robart-Kickapoo—Hinkel Brothers, at Linden, have completed a new 50-ton mill and reopened the mine.

Wallace—This company will build a concentrator upon its property at Highland.

Canada

BRITISH COLUMBIA

The old smeltery at Van Anda, Texada island, which has been closed down for many years, is being reconstructed by an American syndicate. The treatment of custom ores by a new oil-burning process is planned.

Granby—These mines at Phœnix shipped 112,458 tons of ore to the Granby smeltery during the month of January, the largest output of the mines in any single month. This tonnage forced the ore receipts at the Granby smeltery up to the highwater mark of 115,084 tons.

ONTARIO

Frontenac—This lead mine in Frontenac county has been secured by the anadian Smelting Company, capitalized $500,000, in which American capital is rgely interested. It will start mining ›erations and install a smeltery.

ONTARIO-COBALT

The shipments from Cobalt for the eek end Feb. 18 were as follows: ipissing, 264,311 lb.; La Rose, 333,343; rown Reserve, 189,721; Kerr Lake, 291,-40; Buffalo, 62,440; McKinley-Darragh, ,400; Coniagas, 63,415; Trethewey, ,000; Right-of-Way, 62,830; King dward, 43,177; Cobalt Central, 2000; otal, 1,439,277 pounds.

Waldman—An oreshoot was struck on ıe bottom level. A diamond drill is orking on the bottom of the shaft to ex-ore the surrounding country.

Chambers-Ferland—A new high-grade ein has been cut.

Trethewey—At the annual meeting held eb. 23 a financial statement was pre-nted showing receipts for 1909 amount-g to $350,257, and disbursements $150,-49, leaving a net revenue of $199,807.

Hargrave—No. 1 vein, which was cut ft. from the Kerr Lake boundary at ıe 375-ft. level, has been followed up to ıe line and found to carry rich ore all ıe way. It is now being cut at the 175-. level to open up a stoping area. A ıaft is being put down on No. 3 vein ıd has reached a depth of 95 ft. At 25 ft. a crosscut will be run to strike o. 2 and No. 4 vein.

Nipissing—The shaft on the Meyer vein down about 200 ft., and the lower level ill be driven at 185 ft., where the vein ıows 6 to 8 in. of high-grade ore. On ein No. 64, a depth of 300 ft. has been tained and high-grade ore found on this vel. The two lower levels are being ›nnected with upraises preparatory to oping.

ONTARIO—GOWGANDA

Welch—These claims adjoin the Bart-tt and Reeves-Dobie. Camp buildings ave been completed and a tunnel will e run into the side of the mountain, to ıp continuations of the Reeves-Dobie eins.

La Brick—On this location between the lann mine and Gowganda lake two 60-.p. boilers and a 6-drill compression re being installed.

Transcontinental—A 50-h.p. boiler and ve steam drills have been installed.

QUEBEC

The Robertson Asbestos Company is nlarging its asbestos refining plant, four ıore cyclone units being added to the vo units already installed. The Berlin sbestos Company is installing heavy rushing machinery in its new four-cy-lone mill, 3 miles from Robertson. Oper-tions are expected to begin in June. The malgamated Asbestos Corporation con-emplates many improvements with a iew to concentration of the plants at Black Lake and Thetford; work on these will begin as soon as the snow is off the ground. The Chrysotile Asbestos Company, a new corporation, has taken over the Belmina mines and those of the Asbestos Mining and Manufacturing Company near Coleraine.

Mexico

CHIHUAHUA

Escondido Mining Company—This company has made the initial payment on the Escondido mine in the Santa Eulalia camp.

Arizona-Parral Mining Company—This company succeeds the American Zinc Extraction Company as operator of El Tajo mine in the Parral camp. The management remains with A. E. Swain.

La Republica—Production in three months ended Dec. 31 was 198,409 pesos from 3067 tons of ore. New electric pumps are being installed.

DURANGO

San Juan—The Compañia Minera San Juan is to increase its production to 200 tons daily. Aërial trams and improved hoisting plants are being installed.

GUANAJUATO

Aldana—This group has been fully paid for and turned over to the Proprietary Mines Company of America.

JALISCO

Amparo—The 1909 production was 1,445,000 pesos and a dividend of 10 per cent. was paid on a capitalization of over $2,500,000. The company recently won a lawsuit involving title to over 500,000 shares of its stock, and this stock has been retired, reducing the capital to $2,000,000. Twelve per cent. will be paid on this capital this year. The mill capacity will be increased over 1000 tons per month by installation of 2 tube mills, 2 Dorr classifiers, 1 Dorr thickener, 3 Wilfleys and 3 Pachuca tanks. The mill is now handling 5500 tons monthly. The present ore reserves are estimated at 365,000 tons, and dump ore at 45,000 tons.

Autlan Mines—The copper-gold mines formerly held and worked by the Cacoma Mining and Smelting Company, of St. Louis, are under option to Swain & Baldwin, of Mexico City, for 47,000 pesos.

Lupita—Ore, rich in silver, has been encountered in this mine in the Mascota district. The Lupita mill, idle for the last 3 years, will be placed in commission immediately. A cyanide plant has been added.

Tula Iron Mines—A fourth payment of 100,000 pesos on the purchase price of the Tula iron mines and foundry, timber and lands in the Tapalpa district has been made by the Mexico Iron and Steel Company, of Boston. The price is 1,000,000 pesos. As a result of the payment just made the Boston company is now in control of the properties, and will proceed with their exploitation. French capitalists will join with the Boston interests. Smelting furnaces, a steel plant and a tool and implement factory will be erected.

MEXICO

Mexico Mines—In January there were 11,430 tons of ore crushed for $112,740 in bullion, netting $55,790 profit. In addition to this 42 tons of ore worth $7000 net were shipped.

El Oro—Crushed 25,201 tons of ore in January, returning $229,910 in bullion. Total profit from mines and railway was $94,290, and $13,000 was spent on permanent improvements.

Esperanza—The consulting engineer estimates ore reserves, Dec. 31, 1909, at 227,578 dry metric tons which is expected to yield a profit of $2,005,215. There is additional partly developed and indicated ore. It is estimated that over $600,000 in profits will be derived from the retreatment of the tailings dump.

SONORA

Greene-Cananea—Work has started on the new reverberatory furnace. It will be of similar type and the same capacity as the old one. A sintering plant for mixing slag and flue dust is in process of erection. The section of the concentrator which was closed down for repairs several weeks ago has resumed.

Duluth-Sonora Mining Company—An experimental shipment of gold-silver ore was made from this company's property, near Nacozari, to the Copper Queen smeltery at Douglas.

Santa Fe Mining Company—A force of men has been put to work on the ground owned by this company in the Arizpe district.

Africa

WEST AFRICA

Gold production in January is reported at 22,817 oz. bullion in 1908, and 17,357 in 1909; a decrease of 5460 oz. The bullion reported this year was equal to $344,068, or 16,646 oz. fine gold.

Asia

CHINA

A consular report from Germany reports that deposits of potash salts have been discovered in China. The discovery is said to have been made by agents of the German Kali-Syndikat, and the exact situation is kept secret.

INDIA—MYSORE

Kolar Goldfield—Gold production in January is reported at 45,347 oz. bullion, an increase of 33 oz. over January, 1909. The bullion reported this year was equal to $843,584, or 40,812 oz. fine gold.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, March 2—The bituminous coal trade in the East shows little change. It is still disturbed by car shortage and railroad delays, which made deliveries slow and irregular. Steam coal demand is fair, but buyers insist on low prices.

The anthracite trade is steady as usual, but is beginning to feel the approach of spring weather.

In the West there has been some complaint of car shortage, but much less than in the East, though there has been some stormy weather. The rush to store coal in anticipation of a stoppage of mining in April still continues and is increasing trade to a marked extent. There is no change as to the wage scale discussion in the three competitive States; but there is now a fair prospect of a settlement in Illinois, which may clear up the situation. At a few distributing points, where coal has been temporarily scarce, premium prices have been paid for immediate supplies, but this condition will not last. The situation has been worst in the St. Louis district. Until some definite action is taken on the wage scales, the coal market will continue unsettled. The demand for steam coal is generally reported good.

COAL TRAFFIC NOTES

Coal tonnage of Norfolk & Western railway in January by districts, short tons:

Field:	Commercial.	Railroad.	Total.
Pocahontas	826,996	106,104	933,100
Tug River	124,270	20,805	145,075
Thacker	114,393	45,464	159,857
Kenova	61,059	16,516	77,575
Clinch Valley	67,879	5,453	73,332
Total	1,194,597	194,342	1,388,939

The total shows an increase over January, 1909, of 443,314 tons, or 46.9 per cent.

New York

ANTHRACITE

March 2—There is nothing new to report in the hard-coal market locally. Business is steady, but March opens with a warm spell, which gives a foretaste of the falling off in domestic trade which is coming with spring. However, there is time for some cold weather yet.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut f.o.b., New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.85@2; barley, $1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Car shortage and poor transportation are still the chief factors in the seaboard bituminous trade. Deliveries are slow. Mines can get only a part of the cars they need, the proportion depending on the road. The weather has been bad and has delayed shipments in transit to some extent. Added to this, two or three days of heavy fog have broken up harbor deliveries, so that conditions are difficult.

Orders continue to come from New York harbor and the Sound. As for some weeks past the call is mainly for the lower-priced coals. Prices are unchanged. Fair grades of steam coal bring $2.60 per ton, f.o.b. New York harbor, while up to $3 is asked for better coals.

Talk over contracts is more general, but buyers and sellers are still pretty far apart on prices, and very few have come to terms yet.

The coastwise-vessel market has been disturbed by the weather and boats are cautious about going out. Rates are nominally unchanged, but are a little uncertain.

Birmingham

March 1—The coal mines in Alabama are being operated on full time and the output is large. There is a continued demand for all the coal that can be mined here, no small amount going to the Gulf States. Labor is still being sought by the coal operators, indicating that a better output is desired. Contracts in hand and in sight, it is announced, will warrant a heavy production for some time to come. Coal prices are a little firmer than they were. The output in February was good. The coke production is holding up and there appears to be a need for all that is turned out. The furnace operations, of course, regulate the demand for coke. The consumption right now is equal to the make.

Chicago

March 1—Under the stimulus of the coldest weather of the winter, the coal market in the last week stiffened considerably, only to fall back nearly to its condition of previous weeks with the coming in of March. Not only domestic coals were in brisk demand, but steam coals became the subject of sudden inquiry and large sales. However, the indications now are for quiet conditions, following the coming of mild weather and the general transition conditions of March. It is certain, however, that steam coals will continue to have a large sale, for the demand is great, and domestic coals have at least another week or two of good prospects in the fact that cold weather still exists in many parts of Chicago territory. The steam coal market, indeed, may be considered active enough to hold up prices, possibly advance the prices of run-of-mine and screenings. At present the demand for these sizes is strong, and they lead the market for Western coals.

Illinois and Indiana lump and egg sell for $2.50@3; run-of-mine for $2.25@2.50 and screenings for $2.25@2.50. Eastern coals have been in better demand as a result of weather conditions, smokeless bringing $3.80 for lump and $3.30 for run-of-mine and Hocking $3.15. With the sudden demand thus boosting prices, a large amount of coal, both Western and Eastern, has been diverted to this market, and prospects are not good for a firm holding up of prices. Anthracite has been in sudden demand because of the weather, but is practically back now to its condition of scattered, light sales and with a good supply of all sizes.

The Illinois Wage Scale—After a stormy session the convention of Illinois miners agreed to meet the operators in conference without waiting for the joint conference of the competitive States; thus accepting the proposal of the operators to settle the Illinois scales independently. The conference accordingly met late last week, but no agreement was reached, and an adjournment for two weeks was voted.

Cleveland

Feb. 28—Car shortage and irregular transportation have been responsible for slow deliveries, and coal has been hard to get. The situation is improving, however, with the weather, and in a few days matters will be running smoothly again. The desire to store coal has been quite a factor.

The greatest scarcity is in slack, and in some cases, where need was urgent, premiums running from 15 to 40c. per on have been paid. This condition was nly temporary.

Quotations for Middle district coal, .o.b. Cleveland, are $2 for 1¼-in., $1.85 or ¾-in., $1.75 for run-of-mine and 1.70 for slack; No. 8 district, $2.25 for ¼-in., $2 for ¾-in., $1.90 for run-ofnine and $1.85 for slack.

Indianapolis

March 1—The situation is unchanged s far as the demand goes. Consumers re storing all the coal they can get, esecially the railroads. The weather has elayed transportation, and the mines ave hard work to get the cars they want. ll mines in this district are working ard and have plenty to do. Nothing as been settled yet about the wagecale conference.

Pittsburg

March 1—The coal market is stronger nd there is a strong demand from some uarters, presumably for stocking purposes against a suspension of mining, pril 1, which in some quarters appears o be taken more and more for granted. oal movement has been poor, the railoads suffering more from a lack of notive power than lack of cars. Some ndustrial establishments, even in the ittsburg district, have been on the verge f closing at times on account of lack f fuel. One large plant within the ity limits of Pittsburg had to haul coal y wagon from a retail dealer last week n order to maintain operations. Prices re nominally unchanged, but firmer, on nine-run and nut at $1.15, on ¾-in. at 1.25 and on domestic 1¼-in. lump at 1.40. Slack has become scarce and has dvanced fully 10c., to 95c.@$1.

Connellsville Coke—A little inquiry as appeared for furnace coke in the ast few days, but negotiations continue nd not enough has been done to fix a narket. Standard furnace coke is roundy quotable at $2 per net ton at ovens, ut this figure could doubtless be shaded trifle. Foundry coke is nominal at bout $2.75. A large tonnage of coke is eing stocked at ovens every week, and he pace cannot continue long. The ituation in a nutshell is that during the ourth quarter of last year, Connellsville oke output averaged 440,000 tons per veek, while the country was making pig ron at the rate of about 31,500,000 tons er year, whereas in the last few weeks oke production has averaged 470,000 ons per week and pig-iron production s no greater and may be a trifle less; et at the first of the year some furaces which had been using Connellsille coke changed to other cokes. With roduction increased 30,000 tons per veek and consumption decreased, there s obviously a large surplus. The operators continue to work on the idea of central selling agency, but have not developed anything definite. Thus far the talk has probably done more harm than good, by making some operators feel that they are relieved from the necessity of adjusting their production to the actual requirements.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Feb. 19 at 463,123 tons, a decrease of 3000 tons from the previous week, and shipments at 4872 cars to Pittsburg, 8303 cars to points west of Pittsburg and 875 cars to points east of Connellsville, a total of 14,050 cars, or 69 cars less than in the preceding week.

St. Louis

Feb. 28—The coal market has been such in the past three months that even the worst grumblers in the trade have been hushed. Business has been in the best shape and prices are better than at any time in years. A great deal of money has been made in the coal business in the last three months and even operators who lost heavily during the dull period have their balances again on the right side of the ledger. Some jobbers in this part of the country have cleaned up almost 100 per cent. of the capital stock in the past 90 days.

High-grade coal is in strong demand from dealers though it is scarce and exceedingly high.

Current prices are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	$2.00	$2.52
2-in. lump	2.00	2.52
Mine-run	1.60	2.12
2-in. nut	1.50	2.02
Screenings	0.85	1.37
Staunton, Mt. Olive & Springfield:		
6-in. lump	2.00	2.52
3 in. lump	1.75	2.27
Mine-run	1.25	1.77
2-in. nut	1.10	1.02
Carterville:		
6 in. lump or egg	2.10	2.77
3-in. nut	1.80	2.47
Mine-run	1.50	2.17
1½-in. screenings	1.10	1.77
Franklin County:		
6-in. lump or egg	2.20	2.87
3-in. nut	2.00	2.67
2-in. nut	1.50	2.17

We have just passed through another cold week in which the domestic demand has been enormous. The price on coal reached a new high-water mark this week when Standard lump readily brought $2@2.25 f.o.b. mines. A number of plants situated on railroads came within an ace of running out of coal and a number of buildings, hotels, etc., were completely out of coal for a time this week. Retail dealers have been straining every effort to meet the demand in spite of the disadvantageous hauling conditions. The thermometer has hovered around zero all week. While the weather has now broken, prices remain firmer than ever with indications that they will advance next week. Stocks of coal in all parts of the State are extremely low. Manufacturers are unable to accumulate any surplus and have been lucky to be able to keep their plants running.

The car shortage seems to be getting worse. This is doubtless due to the fact that a number of railroads that are taking a large quantity of storage coal are not unloading their equipment promptly or at all. This ties up thousands of cars. The Illinois Central, Baltimore & Ohio, Wabash, Iron Mountain, Chicago & Alton and Southern are all very short of equipment. The Louisville & Nashville and Belleville Electric seem to be the only ones that have a fair supply of cars.

While it is getting late for the movement of anthracite, yet weather conditions have been such as to keep the market active. All sizes are being absorbed readily and full circular is being strictly adhered to.

FOREIGN·COAL·TRADE

Austrian Coal Production—The production of coal in Austria for the full year is reported as below, in metric tons:

	1908.	1909.	Changes.
Coal	13,875,382	13,922,780	I. 47,398
Brown coal	26,728,926	25,919,969	D. 808,957
Total mined	40,604,308	39,842,749	D. 761,559
Coke made	1,902,674	2,028,990	I. 126,316
Briquets made	336,880	364,610	I. 27,730

Of the briquets reported in 1909 there were 182,803 tons made from brown coal or lignite.

Belgian Coal Production—The total output of coal in Belgium for the full year was 23,678,157 metric tons in 1908, and 23,561,125 in 1909; a decrease of 127,032 tons. Stocks at collieries, however, decreased from 917,330 tons Dec. 31, 1908, to 328,918 tons in Dec. 31, 1909, a reduction of 588,412 tons indicating an increase in consumption in 1909 of 461,380 tons.

Imports and exports of fuel for the year ended Dec. 31, were in metric tons:

	Imports.	Exports.	Excess.
Coal	5,866,070	5,080,353	Imp. 785,717
Coke	316,049	1,014,964	Exp. 698,915
Briquets	158,805	559,459	Exp. 400,654
Total	6,340,924	6,654,776	Exp. 313,852
Total, 1908	5,876,246	6,161,421	Exp. 285,175

The exports are largely to France; the imports from Germany. Exports and imports nearly balance.

Spanish Fuel Imports—Imports of coal into Spain, 11 months ended Nov. 30 were 1,796,682 metric tons, an increase of 35,713 tons over 1908; imports of coke, 271,087 tons, an increase of 16,064 tons.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Feb. 12; Best Welsh steam, $3.96; seconds, $3.90; thirds, $3.78; dry coals, $3.84; best Monmouthshire, $3.60; seconds, $3.42; best small steam, $1.92; seconds, $1.68. The market is easier. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, March 2—The iron market is still a waiting one, but with signs here and there that the long spell of inactivity may be broken soon. The consumption of iron and steel is large, and the demand for building material, which was checked by the severe winter, is beginning to revive as spring comes on. Manufacturers who bought too heavily around the close of last year are gradually working off their stocks and will soon be in the market again.

In pig iron there have been more inquiries for foundry, especially in eastern territory. Basic is neglected for the time, but there is some call for forge. Furnaces are, apparently, inclined to readjust prices, though no one likes to lead the way; but it is evident that some concessions will have to be made. The eastern market is still disturbed by offers of resale and speculative Alabama iron at low prices. The quantity of this iron seems to have been underestimated.

In finished material more business is offered. The railroads are the most active buyers just now, with orders for bridges and cars. Rail orders have also been liberal, and a large tonnage is now placed. A number of small orders for trolley rails are also coming in. In structural steel contracts are under discussion for spring building requirements, and some will be placed soon.

Export business is reported good, and a considerable quantity of material has been placed abroad, including several contracts for rails.

Rail Production—The production of steel rails for the year is reported by the American Iron and Steel Association as below, in long tons:

	Bessemer.	Open-hearth.	Total.
Under 45-lb	223,568	32,290	255,858
45 to 85-lb	735,500	305,864	1,041,184
85-lb. and over	847,553	917,987	1,765,540
Total	1,806,621	1,255,961	3,062,582
Total, 1908	1,354 236	567,304	1,921,540

There were 71 tons of iron rails made in 1908; but none were rolled last year.

Lake Iron Ore—Shipments from the two Minnesota ranges for two seasons past are reported as follows, in long tons:

Range.	1908	1909.	Changes.
Vermilion	841,544	1,108,215	I. 266,671
Mesabi	17,257,350	28,174,129	I. 10,916,779
Total	18,098,894	29,282,344	I. 11,183,450

The total shipments from the opening of the two ranges to the end of 1909 were 29,125,385 tons from the Vermillion, and 195,701,272 from the Mesabi. The largest shipper from the Vermillion in 1909 was the Pioneer, with 477,226 tons. The Mesabi mines shipping over 1,000,000 tons each were: Hull, 2,877,563; Fayal, 1,879,357; Virginia group, 1,813,440; Morris, 1,831,857; Adams, 1,829,372; Mahoning, 1,561,893; Burt, 1,238,133; Stevenson, 1,030,742 tons. Five mines were worked on the Vermillion and 84 on the Mesabi.

Baltimore

March 1—Exports for the week included 7801 tons rails and 608 tons rail joints to Mexico. Imports included 1000 tons spiegeleisen from Rotterdam; 6300 tons manganese ore from India; 22,100 tons iron ore from Cuba.

Birmingham

March 1—The Southern pig-iron market starts into the third month of the year with a better feeling than prevailed among the manufacturers during the previous month. The lull in the market and the waiting game brought about a reduction of quotations until considerable resale or warrant iron has been sold in the $13 column, No. 2 foundry. The furnace companies have been holding for $14. In the last few days a little spurt in inquiries for iron started in and the request was for quotations on iron to be delivered during the third quarter and last half of year. A few sales were made, though the manufacturers did not express a willingness to go beyond the third quarter. There is not a great amount of iron being accumulated here, in fact very little, while the warrant yards are diminishing and resale iron becoming scarce. Basic iron and charcoal iron are both in good favor and hold the prices that have prevailed for some time. Foundry-iron quotations have been reduced and there is no denying that considerable iron has been sold under $14.

The steel plant of the Southern Iron and Steel Company, at Alabama City, 50 miles from Birmingham, is being started up right along and by the middle of March will be making steel on a large scale. The steel plant of the Tennessee company, at Ensley, is in steady operation and there is a good demand for the various products.

Chicago

March 1—Little change is perceptible in the iron market, particularly the pig-iron market. The demand this week is better for most iron and steel products; it has not increased notably for pig iron. Melters are still buying cautiously in small lots, while furnace agents are undoubtedly in an anxious mood. Southern production, especially, must be disposed of and some sales are said to have been made at or near $13 Birmingham, though the greater part of the iron disposed of brings more. This means $17.35 Chicago, against $18.50@19 for Northern, which holds steady. The sales that are made are for second and third quarters, with some extending into fourth quarter. Inquiries indicate a large tonnage to be contracted for soon, and certainly the foundry output in this, chiefly a foundry market, is not now small nor does it seem about to become small. With a decided upward turn of the market there will no doubt be eager buying, for the average melter is waiting to see what his fellow melters are going to do. Northern charcoal iron shares something of the light demand, at $19, though steadier than coke iron. The finished-goods market shows better buying by the railroads and good conditions generally. Coke is in rather light demand at $5.50 for the best Connellsville.

Cleveland

March 1—There have been no sales of iron ore worth noting. Furnaces that were expected to buy have not come forward yet.

Pig Iron—Rumors of basic iron sales at low prices are heard, but cannot be confirmed. There has been hardly business enough to test the market. Current quotations are, f.o.b. Cleveland, $18.90 for bessemer; $17.25@17.50 for No. 2 foundry; $16.75@17 for gray forge; $19.50@19.75 for Lake Superior charcoal.

Finished Material—Some business is coming forward for structural steel and for bars. Otherwise everything is quiet, and specifications are coming in more slowly. Jobbers, however, report a good trade doing.

Pittsburg

March 1—Sentimentally, there is clearly an improvement in the iron and steel market. The tone is better all along the line. As to actual orders there is little change, but it seems certain that there has been a definite, though slight, increase in business placed in the last week or 10 days. This, of course, is not observed equally in all lines, and the effect is offset to an extent by the fact that some lines here and there are running out of orders. This is particularly true of shapes. The Eastern mills for several weeks have been willing to sell on the basis of 1.50c. Pittsburg, since they have had scarcely any business on their books, while in the last two or three weeks the Pittsburg mills have pretty well caught up on deliveries and are more ready to sell. The Pittsburg and Western markets remain on the basis of 1.55c. Pittsburg. Plates have been in somewhat the same condition as shapes, but are a little stronger than shapes. Shading of $1 per ton has appeared in corrugated sheets, both painted and galvanized. This is due to the extremely hard winter having greatly curtailed the consumption.

Prospects in the trade are that there will be a decided improvement as spring weather is entered upon. Actual production has not suffered to any extent, being substantially as great as in December or January, but in some lines stocks have been accumulated, particurly in wire and pipe. These may be ard from later, it being questionable ıether they can be absorbed readily en with good weather.

Pig Iron—There has been much better ying of foundry iron. The Interna- nal Steam Pump Company has taken ,000 tons for second-half delivery to ıffalo, and is in the market for 2000 ıs more. The American Radiator Com- ny has taken about 10,000 tons for de- ery at the same point, while another diator company at Johnstown has ken 4000 tons. The Westinghouse ectric and Manufacturing Company is quiring for 15,000 tons of foundry iron r second-half delivery, 10,000 tons be- g for its Cleveland plant and 5000 tons r its Allegheny plant. Prices are to submitted by Friday, March 4. The ıde is on the *qui vive*, as all the prom- ent sellers have the inquiry, and the cal market, having been dull for a long ne, stands in need of some competition e this to develop what it really will do. eanwhile foundry iron is quotable at 6.25@16.50, Valley, for nearby de- ery, with malleable 25c. higher and rge $1 lower. Basic iron remains in curious position. The only sales known have occurred in February were at 5.50, Valley, except that one of them ay have been at a slightly higher price, hough still under $16. This was all eculative iron, sold by weak-kneed ddlemen. The furnaces, on the other nd, have not openly quoted below 6.25. In the circumstances $16, Val- , may be regarded as a fair market otation, although it is really nominal. is understood that the United States eel Corporation has been negotiating ring the week for a round block of ssemer iron, 25,000 to 50,000 tons, and ere are hints that an announcement of rchase may be made in a day or two. made, it will doubtless be at $18, Val- . The bessemer average for February announced today at $18.06, Valley, ainst $19, Valley, in each of the three eceding months. The basic average announced at $16.31, Valley, against 6.87½ in January.

Steel—The market appears to be en- ely bare of new transactions, consum- s being provided on old contracts. ices are nominal and unchanged at $27 27.50 for bessemer billets, $27.50@28 r open-hearth billets, $28.50@29 for eet bars and $33 for rods, all f.o.b. aker's mill, Pittsburg or Youngstown.

Ferromanganese—The market is quiet, hough showing a slightly better tone that there is inquiry for second half. ompt lots are quotable at $43.50, Bal- nore, although occasionally this figure ght be shaded about 25c. Second arter is quotable at about $44 and cond half at $44@44.50, all at Balti- ore, the freight to Pittsburg being $2.30.

Sheets—Demand for specialties continues fairly good, but demand is extremely light for all grades of sheets involved in outdoor work, like eave trough and conductor pipe, corrugated material, etc. Corrugated sheets, as noted, are being shaded $1 per ton, and that pretty generally. Regular prices, subject to the shading noted in corrugated, are: black sheets, 28 gage, 2.40c.; galvanized, 3.50c.; corrugated, $1.70 per square for painted, $3 for galvanized, 28 gage. The regular market on blue annealed sheets is 1.75c., but for early delivery 1.85@1.90c. is obtained, depending on the urgency.

Philadelphia

March 2—A number of eastern Pennsylvania mills, foundries and other consumers of pig iron rather suddenly ordered supplies for delivery during the second quarter and in a few cases extending well into the third quarter of the year. The furnace managers today report additional inquiries from some outside markets, mostly for foundry iron.

Steel Billets—The outside figure for billets has been shaded on small orders taken this week and makers have had the opportunity presented to them of doing a big business at still lower prices. Nearly all the concerns using forging billets are still running full time and the aggregate of their orders makes a fair showing.

Pipes and Tubes—The rush of locomotive work and the great activity in boiler shops and engine plants is helping the tube mills to new business and within a week old contracts have been renewed for enough stock to run about 60 days.

Plates—Heavy orders for plates have been placed in Pennsylvania mills, some of the orders coming from ship yards. Prices have been shaded in some eastern mills a trifle but this is claimed to be only temporary and due to certain conditions. The plate manufacturers claim to be in a certain condition to maintain steel-plate quotations without trouble. Both car and ship builders have in sight all the work they can handle.

Scrap—A good many mills have made inquiries for scrap and will probably become buyers, but up to today no sales have taken place. The dealers are anticipating the usual March and April demand for steel scrap and railroad scrap and feel they are in shape to take care of the usual demand and at stiff prices.

St. Louis

Feb. 28—The market for pig iron has been fair during the week. Some small contracts have been closed. Business at present is not up to normal and does not come up to expectations. Prices remain about the same, $14.75@15.00 per ton Birmingham or $18.50@18.75 St. Louis for No. 2 foundry. However, buyers of considerable quantities would not have much trouble in getting these figures shaded.

Foreign Iron Trade

Swedish Production—The production of iron and steel in Sweden for the nine months ended Sept. 30 was, in metric tons:

	1908.	1909.	Changes.
Pig iron........	427,200	444,500	I. 17,300
Puddled iron....	113,500	83,600	D. 29,900
Converter steel ingots..........	59,700	48,300	D. 11,400
Open-hearth ingots.	263,000	190,000	D. 73,000

The decrease in production in 1909 was due to the general strike in all the Swedish industries.

German Iron Production—The German Iron and Steel Union reports the make of pig iron in Germany in December at 1,164,624 tons, an increase of 45,573 tons over November. For the year ended Dec. 31 the production was, in metric tons:

	1908.	1909.	Changes.
Foundry iron	2,254,644	2,491,919	I. 237,275
Forge iron........	635,228	652,306	I. 17,078
Steel pig..........	934,940	1,099,772	I. 164,832
Bessemer pig.....	361,472	412,118	I. 50,646
Thomas(basic)pig	7,627,227	8,261,538	I. 684,311
Total........ ...	11,813,511	12,917,653	I. 1,104,1

The total increase in 1909 was 9.3 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

German Steel Syndicate—The Stahlwerks Verband reports sales for the year ended Dec. 31 as follows: Billets, blooms and other half-finished material, 1,503,352; railroad material, 1,847,440; other rolled steel, 1,614,702; total, 4,965,494 metric tons, an increase of 201,580 tons, or 4.2 per cent., over the 1908 report.

German Trade—Exports and imports of Germany, 11 months ended Nov. 30, metric tons:

	Exports.	Imports.	Excess.
Iron and steel..	3,616,616	418,757	Exp. 3,197,859
Machinery	297,381	61,958	Exp. 235,423
Total	3,913,997	480,715	Exp. 3,433,282
Total, 1908.....	3,742,558	590,330	Exp. 3,152,228

Imports of iron ore in 1909 were 7,531,338 tons; exports, 2,578,341 tons. Imports of manganese ore, 357,056 tons; exports, 4069 tons.

Russian Iron Production—Russian production for the six months ended June 30, is reported as below, in metric tons:

	1908.	1909.	Changes
Pig iron...............	1,431,000	1,412,000	D. 19,000
Blooms, billets, ingots, etc............	1,425,000	1,488,000	I. 63,000
Finished iron and steel................	1,214,000	1,264,000	I. 50,000

Larger items of finished iron and steel in 1909 were 338,000 tons bar and merchant iron; 223,000 tons rails; 87,000 tons beams and shapes; 85,000 tons sheets; 79,000 tons plates; 65,000 tons wire.

METAL·MARKETS

New York, March 2—The metal markets have continued rather uninteresting, through a large business has been done in some lines. The chief incident has been the sharp drop in silver.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1910..	$ 6,163,132	$ 2,131,357	Exp. $ 4,031,775
" 1909..	7,865,356	3,420,183	" 4,545,173
Year 1910..	6,163,132	2,131,357	" 4,031,775
" 1909..	7,865,356	3,420,183	" 4,445,173
Silver:			
Jan. 1910..	4,498,304	4,248,354	Exp. 249,950
" 1909..	4,542,094	3,664,752	" 877,342
Year 1910..	4,498,304	4,248,354	" 249,950
" 1909..	4,542,094	3,664,752	" 877,342

Exports from the port of New York, week ended Feb. 26: Gold. $1,075,000 chiefly to Argentina; silver, $674,673, chiefly to London. Imports: Gold, $161,250; silver, $78,879, from Central and South America.

Gold—Prices on the open market in London were 77s. 9d. per oz. for bars, and 76s. 5d. for American coin, the premium of ⅛d. on bars reported last week having dropped. Gold arriving was divided between the Bank of England and Continental banks. In New York some more gold was taken for Argentina.

Platinum—The market remains quiet, but steady. Dealers continue to quote $28.50@29 per oz. for refined platinum, and $34.50 per oz. for hard metal.

Silver—The market, closing firm at 24d. on Feb. 24, opened weak the next day at 23 7/16 on the unexpected announcement of an extra 11 per cent. duty on silver imports by the Indian Government. The market has sold down to 23 3/16 and closes firm at 23 5/16 on China buying, with tendency uncertain.

SILVER AND STERLING EXCHANGE

Feb.-Mar.	24	25	26	28	1	2
New York....	52	50¾	50⅝	50½	50¼	50½
London	24	23 7/16	23⅜	23 5/16	23 3/16	23 5/16
Sterling Ex..	4.8675	4.8680	4.8700	4.8700	4.8715	4.8720

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver 0.925 fine.

Copper—In the week beginning Feb. 24, there has been more activity in the copper market than for a long time, the sales effected, particularly in the first half of the week, having been probably in the neighborhood of 40,000,000 lb., covering deliveries as far ahead as June. Transactions were made, especially with domestic manufacturers, many of the more important having come into the market, but some sales were also made for foreign delivery. The business followed the reduction by the United Metals Selling Company of its asking price to [illegible] delivered, 30 days, which is equivalent to about 13.35c. cash, New York, which price was promptly shaded by competitors, considerable business having been done as low as 13.20c, net, New York, with average at about 13.25c. The highest prices were realized on contracts for the more distant deliveries. Some considerable sales of Lake copper were made, fancy brands realizing 13¾c. and others 13½c. It is coming to be more generally recognized that fundamental conditions are now improving. Consumption, both here and abroad, is very good and stocks are decreasing. At the end of the week an improvement in the London standard market was quickly followed by a larger inquiry from abroad and a consequent stiffening of prices. The market closes at 13½@13¾ for Lake, and 13¼@13⅜ for electrolytic in cakes, ingots and wire bars. Casting copper is quoted nominally at 13@13¼ for the week.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Feb.-Mar.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
24	13½ @13¾	13⅛ @13⅜	59⅜	33⅛	4.62½ @4.60	4.37½ @4.40	5.30 @5.35
25	13½ @13¾	13⅛ @13⅜	59⅝	33¼	4.55 @4.60	4.40 @4.42½	5.35 @5.40
26	13½ @13¾	13⅛ @13⅜	....	33¼	4.55 @4.60	4.40 @4.42½	5.40 @5.45
28	13½ @13¾	13⅛ @13⅜	59½	32⅝	4.55 @4.60	4.40 @4.42½	5.45 @5.50
1	13½ @13¾	13⅛ @13⅜	59 11/16	32⅝	4.55 @4.60	4.40 @4.42½	5.50 @5.55
2	13½ @13¾	13¼ @13⅜	60	32¾	4.55 @4.60	4.40 @4.42½	5.55 @5.60

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper sheets have been advanced 1c., and are now 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill.

There has been more business done in the London market, which opened on Feb. 24 at £59⅜, advanced 5 shillings on that day and closes firm at £60 for spot and £61 for three months.

Refined and manufactured sorts we quote: English tough, £63½; best selected, £63½@64; strong sheets, £73½@74½.

Copper exports from New York and Philadelphia for the week were 2007 long tons. Our special correspondent gives the exports from Baltimore at 130 tons copper.

Tin—The London market remained steady until the beginning of this week, when it suddenly declined about £2 notwithstanding that the deliveries int American consumption during Februar were the largest on record for that month The market closed at £149⅜ for spot, and £151 for three months.

In the domestic market, the owners o spot material, who have held for premiums, became freer sellers when the market declined in London at the beginnin of this week. Business done was mainl among dealers, and at the close tin car be purchased at 32¾c.

Lead—The market continues dull an unchanged at last prices, viz.: 4.40@4.42½ St. Louis, and 4.55@4.60 New York.

Spanish lead at London is quoted at £13 3s. 9d, and English lead at £13 6s. 3d.

Spelter—There was a better demand for this metal, which the smelters did not meet freely, and in consequence the market has advanced and closes at 5.55@5.60c. St. Louis, and 5.70@5.75c. New York.

New York quotations for spelter Feb. 24, were 5.45@5.50c.; Feb. 25, 5.50@5.55c.; Feb. 26, 5.55@5.60c.; Feb. 28, 5.60@5.65 cents.

The London market is slightly lower and closes at £23 for good ordinaries, and £23.5 for specials.

Base price of sheet zinc is $7.50 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

A judgment of $2,464,660 has been entered against the Lanyon Zinc Company, at Iola, and an order of foreclosure granted to the Trust Company of America, the trustee for the bondholders.

Other Metals

Aluminum—The market is active and improving. Quotations are strong, at 22½@23½c. for No. 1 ingots. Abroad prices are strong and the upward tendency has not been lost.

Antimony—The market is rather dull and business light. Prices are easier than than they have been, Cookson's selling at 8¼@8½c., and U. S. at 7⅞@8c.; while 7¼@7⅜c. is asked for outside brands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland.

Quicksilver—Business is fair and the market is steady and unchanged. New York quotations are $50 per flask of 75 lb. for large lots. Jobbers ask 70c. per lb. for small quantities. San Francisco, 19@50 for domestic and $2 less for exort orders. The London price is £9 10s., ith second hands selling at £9 7s. 6d. r flask.

British Metal Imports and Exports

Imports and exports of metals in Great ritain, month of January, figures in ng tons, except quicksilver, which is pounds:

Metals:	Imports.	Exports.	Excess.	
pper, long tons	14,927	5,515	Imp.	9,413
Copper, 1909....	12,842	6,089	Imp.	6,752
n, long tons....	4,177	3,794	Imp.	383
Tin, 1909........	3,564	3,060	Imp.	504
a l, long tons..	19,012	3,912	Imp.	15,100
Lead, 1909......	18,613	2,765	Imp.	15,848
elter, l'g tons..	11,055	813	Imp.	10,242
Spelter, 1909....	9,359	490	Imp.	8,869
icksilver, lb...	455,662	54,743	Imp.	400,919
Quicksilver, '09	9,992	60,746	Exp.	50,754
Ores:				
n ore and con.	1,817	....	Imp.	1,817
Tin ore, 1909...	1,305	....	Imp.	1,305
rites	63,617	....	Imp.	63,617
Pyrites, 1909...	64,636	....	Imp.	64,636

Copper totals include metallic contents ore and matte. Exports include reports of foreign material. Of the imrts in 1909 the United States furnished all 4582 tons fine copper and 1942 ns lead. This lead was chiefly Mexin, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Feb. 26—The base ice paid this week for 60 per cent. zinc e was $40@41 per ton; only two cars high-grade ore were sold in the open arket; producers are holding off for gher prices. The week's shipment is e lightest reported for a year. For 80 r cent. lead ore $53 per ton was paid.

SHIPMENTS, WEEK ENDED FEB. 26.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
neral Point.........	405,300	....	....
nton................	163,900	....	....
ba City.............	86,250	....	....
tteville............	80,000	66,220	63,000
ullsburg............	70,000	....	....
Total...............	805,450	66,220	63,000
ar to Feb. 26........	11,916,040	972,389	1,995,050

In addition to the above there was ipped to the separating plants, 1,922,-5 lb. during the week.

Joplin, Mo., Feb. 26—The highest price fering for zinc-sulphide ore was $43. e base offerings were $40@42.50 per n of 60 per cent. zinc. The base price id for zinc silicate ore was $19@23 per n of 40 per cent. zinc. The higher ades of zinc ore sold early in the week a base of $40@41, and later in the ek an increasing demand for medium ades and ores carrying an iron penalty rced the base of these ores as high as 2.50 for settlements and refusals of 3 base for delivery the coming week. en with the large increase in the deand the shipment was only 866 tons rger than last week. Average price, all ades, $38.88. Lead ore was dull, selles holding ore on bids of $53. Buyers ere in the market for all purchasable ore, but the enforced curtailment occasioned by the severity of the weather reduced the output. Average price, all grades, $52.72 per ton.

The week's production and shipment indicated a reduction in stock of 540 tons.

SHIPMENTS, WEEK ENDED FEB. 26.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Cartorville	4,096,270	598,230	$ 97,777
Joplin....................	1,770,210	120,310	38,476
Duenweg..................	620,620	......	12,006
Alba-Neck................	456,000	9,250	9,816
Carthage.................	426,330	......	8,952
Oronogo..................	434,190	......	8,652
Galena...................	323,610	39,560	7,520
Badger...................	319,940	......	6,718
Spurgeon.................	196,310	105,320	5,757
Aurora...................	223,680	55,160	5,067
Jackson..................	207,840	......	4,156
Sarcoxie.................	191,250	......	3,323
Quapaw...................	126,140	19,260	3,022
Granby	274,180	3,420	2,975
Miami....................	154,760	48,960	2,974
Carl Junction............	65,830	......	1,382
Totals	9,887,160	999,470	$218,573
2 months............	89,002,950	15,277,430	$2,331,275

Zinc value, the week, $192,217; 2 mos., $1,903,798
Lead value, the week, 26,356; 2 mos., 427,477

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January.....	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February....	36.94	40.69	34.37	39.47	50.50	53.64
March.......	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May.........	40.06	......	37.42	......	56.59	......
June.........	44.15	......	40.35	......	57.52	......
July.........	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September ..	47.70	......	44.87	......	56.11	......
October......	49.50	......	45.75	......	55.02	......
November...	51.31	......	48.29	......	53.94	......
December...	49.45	......	47.57	......	55.26	......
Year.......	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, March 2—The general market is steady and firm, with improvement in some lines.

Copper Sulphate—The market is steady, with a fair business doing. Prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—A much larger business is reported in this article than for some time past. Prices are unchanged at 2.10c. per lb. for spot nitrate and 2.07½c. per lb. for futures.

Arsenic—There are no buyers for the moment, and offers of lower prices do not tempt them into the market. Quotations are nominal, and easier, $2.25@2.50 per 100 lb. being asked for white arsenic.

Sulphur—Messrs. Parson & Petit, New York, report the arrival of 700 tons Sicilian sulphur by steamer from Girgenti; 150 tons consigned to New York and 550 tons to Baltimore.

MINING·STOCKS $

New York, March 2—While the active liquidation of the previous week in the general stock market was over, there was a degree of weakness and irregularity not encouraging to operators. Slight rallies were not enough to check the general depressed condition of the market, which remains in rather an unpromising condition.

Horn Silver made its appearance during the week—the first for a long time—with a sale of 175 shares at 75c. per share. One sale of Homestake, of South Dakota, was reported at $82.50 per share.

On the Curb copper stocks were rather irregular, prices fluctuating within small limits. At the close a little more strength was manifest, and there were fractional gains in some of the more prominent stocks. Other mining stocks were rather neglected.

One thousand shares of Big Vein Copper Company were sold at auction, Feb. 23, at $25 for the lot. This is the stock that was recently ruled off the Curb market, previous to which it had been run up to $11 per share.

Boston, March 1—With the exceptions of Lake Copper and one or two others of the new flotations, prices are above those of a week ago. The market has been dull and uninteresting but shows a gradually hardening tendency.

The reduction of the North Butte company's quarterly dividend from $1 to 50c. did not have any unfavorable effect on the stock as this action had been thoroughly discounted. The turn seems to have come in the company's stock and a $3.75 advance occurred during the week to $39, although it was not all retained.

Lake Copper variations are wide and swift at times. It broke from $84.50 to $75 in one day's session of the Stock Exchange last week, but when it looked as if the bottom had dropped out of the stock it recovered to $80. After that it followed another downward course to $70.50, from which it again recovered to above $75.

On the Curb prices in the main have followed the course of the big market.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.............	Mar. 12	Apr. 7	$0.05
Bader, Cal..................	Feb. 24	Mar. 14	0.10
Belcher, Nev................	Mar. 9	Mar. 29	0.10
Caledonia, Nev..............	Feb. 16	Mar. 9	0.10
Central Eureka, Nev.........	Mar. 13	Apr. 23	0.02½
Challonge Con., Nev.........	Feb. 17	Mar. 10	0.10
Chollar, Nev................	Mar. 8	Mar. 31	0.10
Crown Point, Nev............	Mar. 8	Mar. 28	0.10
Gould & Curry, Nev..........	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev........	Mar. 9	Mar. 31	0.10
Julia Con., Nev.............	Feb. 17	Mar. 10	0 03
King Philip Copper, Mich..	Mar. 10	....	1.00
Mexican, Nev	Feb. 21	Mar. 17	0.15
New Arcadian, Mich.........	Mar. 10	....	1.00
Ojibway, Mich...............	Mr.Oct.	....	2.00
Oneco, Mich...	Feb. 15	....	1.00
Rexall S. & C., Utah........	Feb. 13	Mar. 15	0.01
Savage, Nev.................	Feb. 10	Mar. 8	0.10
Seg. Belcher, Nev...........	Mar. 8	Mar. 28	0.10
Union, Nev..................	Mar. 7	Mar. 31	0.10
Wabash, Utah................	Feb. 21	Mar. 15	0.05
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Chino had a sharp $1.75 advance to $15.25; Bohemia has lost its activity and buoyancy; First National and Davis-Daly are heavy. Active features have been Boston-Ely, Cactus and Humboldt Smelters, the latter more than doubling in price.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II, 1909	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,495	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1909	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	....	....	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	......	23.227	......
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52. 38	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	......
March	12.387	......	12.826	......	56.231	......
April	12.56	......	12.93	......	57.363	......
May	12.893	......	13.238	......	59.338	......
June	13.214	......	13.518	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	......	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	......
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	......
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	......	16.09	......	15.90	......
March	16.40	......	15.84	......	15.62	......
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Mar. 1

Name of Comp.	Bid.
Listed:	
Acacia	‡.05⅞
Cripple Cr'k Con.	‡.02⅞
C. K. & N.	‡.10
Doctor Jack Pot.	.07½
Elkton Con.	.68½
El Paso	.66½
Fannie Rawlins	‡.06
Findlay	.10½
Gold Dollar	.09⅞
Gold Sovereign	‡.03½
Isabella	.16½
Mary McKinney	.46
Pharmacist	‡.03
Portland	1.05
Vindicator	.79½
Work	‡.06
Unlisted:	
Golden Cycle	‡1.50
United Gold Mines	‡.08½

SALT LAKE Mar. 1

Name of Comp.	Clg.
Carisa	.56
Colorado Mining	.83
Columbus Con.	.72
Daly Judge	4.00
Grand Central	1.80
Iron Blossom	.90
Little Bell	1.65
Little Chief	.45
Lower Mammoth	.50
Mason Valley	1.87½
Maj. Mines	2.32½
May Day	.19½
Nevada Hills	.52
New York	.11
Prince Con	.75
Red Warrior	6.00
Silver King Coal'n	2.50
Sioux Con.	.38½
Uncle Sam	.39
Victoria	1.10

SAN FRANCISCO. Mar. 1.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.16	Belmont	1.57
Belcher	1.25	Daisy	.07
Best & Belcher	‡.75	Jim Butler	.11
Caledonia	.87	MacNamara	.26
Challenge Con.	.48	Midway	.25
Chollar	.31	North Star	.03
Confidence	1.40	West End Con.	.36
Con. Cal. & Va.	2.05	Atlanta	.16
Crown Point	1.37	Booth	.16
Exchequer	.27	C.O.D. Con.	.10
Gould & Curry	.37	Columbia Mt.	.06
Hale & Norcross	.62	Comb. Frac.	.31
Mexican	2.07	Great Bend	.03
Ophir	2.35	Jumbo Extension	.37
Overman	1.47	Oro	.06
Potosi	.73	Red Hill	.04
Savage	.64	Sandstorm	.03
Sierra Nevada	.85	Silver Pick	.09
Union	.95	St. Ives	.20
Yellow Jacket	1.30	Tramps Con.	.05

N. Y. EXCH. Mar. 1

Name of Comp.	Clg.
Amalgamated	77⅞
Am. Agri. Chem.	‡46½
Am.Sm.&Ref.,com	83¾
Am. Sm. & Ref., pf.	107¼
Anaconda	50¼
Bethlehem Steel	31
Col. & Hock. C. & I.	‡20⅛
Colo. Fuel & Iron.	39⅞
Du Pont P'd'r, pf.	‡85
Federal M. & S.	‡81
Great Nor., ore ctf.	70¼
Nat'nal Lead, com.	82½
National Lead, pf.	‡108
Pittsburg Coal	22¼
Republic I&S, com.	39¼
Republic I & S, pf.	101¾
Sloss Sheffi'd, com.	‡76
Sloss Sheffield, pf.	117½
Tennessee Copper	‡32⅝
Utah Copper	50
U. S. Steel, com.	83
U. S. Steel, pf.	120½
Va. Car. Chem.	55½

N. Y. CURB Mar. 1

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19⅛
Braden Copper	4⅝
B. C. Copper	7
Buffalo Mines	3½
Butte Coalition	24¾
Chino Copper	14⅞
Cobalt Central	.17½
Combination Fra.	.31
Con. Ariz. Sm.	2 13/16
Cumberland Ely.	‡9
Davis-Daly	3⅛
Dominion Cop.	7
Ely Con.	⅞
El Rayo	2 9/16
Florence	3⅛
Gila Copper	8⅛
Giroux	9¾
Gold Hill	1¾
Goldfield Con.	7 13/16
Greene Cananea	10½
Guanajuato	1¾
Guggen. Exp.	225
Kerr Lake	.09⅛
La Rose	4 9/16
McKinley-Dar-Sa.	.85
Miami Copper	21⅞
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	¾
Mont.-Tonopah	.70
Nev. Utah M. & S.	1⅜
Newhouse M. & S.	3½
Nipissing Mines	10¼
Ohio Copper	4
Pacific Sm. & M.	⅞
Silver Queen	.24
Standard Oil	618
Stewart	⅝
Tonopah	6⅞
Tonopah Ex.	.72
Tri-Bullion	15/16
Utah Apex	5⅛
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4⅜

LONDON Mar. 2

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 0
Esperanza	2 18 0
Tomboy	0 17 6
El Oro	1 8 6
Oroville	0 10 0

BOSTON EXCH. Mar. 1

Name of Comp.	Clg.
Adventure	7½
Allouez	56
Am. Zinc	30
Arcadian	7
Arizona Com.	40
Atlantic	9½
Boston Con.	19⅛
Calumet & Ariz.	73
Calumet & Hecla	632
Centennial	26
Con. Mercur	.10
Copper Range	77
Daly-West	8½
East Butte	10
Franklin	19¼
Greene-Can.	10⅝
Hancock	27
Isle Royal	23½
Keweenaw	4⅞
La Salle	17¼
Mass	6½
Michigan	6½
Mohawk	64
Nevada	22¾
North Butte	37¼
Ojibway	10
Old Dominion	44¾
Osceola	149
Parrot	20
Quincy	87
Shannon	14⅞
Superior	57
Superior & Bost.	12¾
Superior & Pitts.	13¼
Tamarack	73
Trinity	8¾
U. S. Smg. & Ref.	45½
U.S.Sm. & Re., pd.	50¼
Utah Con.	32
Victoria	4¼
Winona	10
Wolverine	142
Wyandotte	2⅝

BOSTON CURB Mar. 1

Name of Comp.	Clg.
Ahmeek	215
Bingham Mines	2½
Boston Ely	3¾
Calaveras	5 1/16
Champion	.06½
Chemung	11½
Chief Cons.	2 1/16
Chino	14¾
Corbin	.09⅞
Cactus	5⅛
Crown Reserve	2 1/16
First Nat. Cop.	4½
Gila Copper	8¼
Indiana	34½
Inspiration	8 9/16
Majestic	.89
Ray Central	3⅛
Ray Con.	21½
Rawhide Coal	.23
Rhode Island Coal	9⅞
San Antonio	9⅜
South Lake	11¼
Trethewey	1¾
Vulture	9½
Yuma	‡1 7/16

ST. LOUIS Feb. 26

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.07	.06
Center Cr'k	1.75	1.50
Cent. C. & C.	82.00	81.00
C. C. & C. pf.	84.00	83.00
Cent. Oil	110.00	100.00
Con. Coal	20.00	19.00
Doe Run	110.00	100.00
Gra. Bimet.	.32	28
St. Joe	14.00	12.50

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Denatured ... "	.42
Refined wood, 95@97% ... "	.52@.57
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Ground ... "	1.85
Chrome Alum ... "	.04⅜@.04½
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" 26 deg. lb ... "	.04¾@.05¾
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Bromide ... lb.	.28
Carbonate ... "	.08@.08⅜
Muriate grain ... "	.05⅝@.06¼
Lump ... "	.09¼@.09½
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CALCIUM—Acetate, gray, 100 lb.	1.90@2.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. ... sh. ton.	65.00
Chloride, f.o.b. N. Y. ... "	11.00@14.10
CEMENT—Slag cement ... bbl	.75@1.25
Portland, Am. 500 lb ... "	1.50@1.60
Foreign ... "	2.25@2.90
"Rosendale," 300 lb ... "	.85
On sack ... "	.65
CHROME ORE—	
New Caledonia 50% ex. ship N. Y. ... per lg. ton	14.00@16.00
Bricks, f.o.b. Pittsburg, per M.	175.00
CLAY, CHINA—Am. common ex-dock N. Y. ... ton.	7.00@10.00
Foreign ... "	10.00@20.00
COBALT—Oxide ... lb.	.80@.85

COPPERAS—Bulk ... 100 lb.	$0.55
In bbls ... "	.65@.80
In bags ... "	.60@.75
CRYOLITE (carload) ... lb.	.06¼@.07
FELDSPAR—Ground . . sh. ton.	6.00@14.00
FIRE BRICK—	
American ... per M.	30.00@40.00
Imported ... "	30.00@45.00
St. Louis ... "	16.00
Extra ... "	20.00@23.00
Special extra ... "	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.	
St. Louis, extra quality . per ton.	5.00
" ordinary ... "	2.50
FLUORSPAR—	
Domestic f.o.b. Pittsburg:	
Lump ... ton.	8.00@10.00
Ground ... "	12.00@14.00
Foreign crude ex. dock. "	8.50
FULLER'S EARTH—Lump, 100 lb.	.80@.85
Powdered ... "	.80@.85
GRAPHITE—Ceylon.	
Flying dust, finest to best ... lb.	.02@.04
Dust ... "	.02¼@.05
Chip ... "	.04@.08
Lump ... "	.05½@.12
Large lump ... "	.08¼@.10½
GYPSUM—	
Fertilizer ... sh. ton.	5.00
Ground ... "	4.00@7.00
INFUSORIAL EARTH—	
Ground Am. Best ... lb.	.01¾@.02¼
German ... "	.02¼@.02⅝
LEAD—Acetate (sugar of) brown, ... lb.	.07¾@.08
Nitrate, com'l ... "	.08@.08½
MAGNESITE—Greece.	
Crude (95%) ... lg. ton.	7.50@8.50
Calcined, powdered ... sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg ... M.	160@200
MAGNESIUM—	
Chloride, com'l ... 100 lb.	.90@1.25
Sulphate (Epsom salt) . . 100 lb.	.90@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide ... lb.	.01@.01¼
75@85% binoxide ... "	.01¼@.01½
85@90% binoxide ... "	.01½@.04
90@95% binoxide ... "	.06½
Ore, 80%-85% ... sh. ton.	16.00@32.50
MARBLE—Flour ... sh. ton.	7.00@9.00
MINERAL WOOL—	
Slag, ordinary ... sh. ton.	19.00
Selected ... "	25.00
Rock, ordinary ... "	32.00
MONAZITE SAND—	
Guar. 97%, with 5% Thorium oxide, normal ... lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained ...	.47
Sulphate, single ... lb.	.10¼@.11
Sulphate, double ... "	.05⅞@.08
NITRATE OF SODA—	
100 lb. 95% ...	2.07½@2.10
95% for 1910 ...	2.07½@2.10
96% is 2½@7½c. higher per 100 lb.	
OZOKERITE—best ... lb.	.14@.17
PAINTS AND COLORS—	
Litharge, Am. powdered ... lb.	.06¼@.06¾
English glassmakers' ... "	.08¼@.09¼
Lithopone ... "	.03½@.07
Metallic, brown ... sh. ton	16.50@22.00
Red ... "	14.00@18.00
Ocher, Am. common ... "	8.50@9.00
Best ... "	12.00@15.00
Dutch, washed ... lb.	.02¾@.03
French, washed ... "	.01¼@.02
Paris green, pure, bulk ... "	.17½@.20½
Red lead, American ... "	.06¾@.07
Foreign ... "	.08¼@.09¼
Turpentine, spirits bbl., per gal.	.62@.63½
White lead, Am., dry ... lb.	.05¾@.06
American, in oil ... "	.07@.07¼
Foreign, in oil ... "	.09@.09¾
Zinc white, Am. extra dry "	.05¼@.05⅜
French, proc's, red seal, dry "	.06¾@.07½
French, process, green seal, dry ... "	.07¼@.07½
PHOSPHATES—Acid ...	55@60c. per unit
*Fla., hard rock 77% ...	7.00@7.50
land pebble 68% ...	3.75@4.00
†Tenn., 78@80% ...	5.00@5.50
75% ...	4.75@5.00
68@72% ...	4.25@4.50
‡So. Car. land rock 60% ...	3.50@4.00

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—	
Bicarbonate crystal ... lb.	$.07½
Powdered or granulated . . "	.08
Bichromate, Am. ... "	.07⅞@.08
Scotch ... "	.10¾
Bromide ... "	.20
Carbonate (80@85%) ... "	.03⅝@.03⅞
Caustic, ordinary ... "	.05¼
Elect. (90% KOH) ... "	.06@.06¼
Chloride (muriate), 100 lb . .	1.90
Chlorate, powdered ... "	.09@.09⅜
Crystals ... "	.08¾@.09⅛
Cyanide (98@99%)	
Carloads (30,000 lb.) ... "	18c.
5-ton lots ...	18½c.
Less than 5 tons ...	.19
Kainite, long ton, bulk, 8.50; bags,	8.50
Permanganate ... lb.	.09¼@.10½
Prussiate, yellow ... "	.13@.13¾
Red ... "	.29@.32
Sulphate (basis 90%) ... 100 lb.	2.18@2.21
PYRITE—	
Domestic, non-arsenical, furnace size, f.o.b. R. R. ... per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines ...	10¾@11c.
Imported, non-arsenical, furnace size, ex-ship, per unit ...	.12½
Imported, arsenical, furnace size, ex-ship, per unit ...	.11½@.12
Imported fines, arsenical, ex-ship, per unit ...	.09
Imported fines, non-arsenical, ex-ship, per unit ...	10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl.	.72@1.13
N. Y. agricultural ... sh. ton.	3.80@4.50
SALTPETER—Crude ... 100 lb.	4.00@4.50
Refined, crystals ... "	5.00@5.75
SILICA—	
Ground quartz, ord'ry . . lg. ton.	7.00@15.00
Silex, ground ... "	7.00@15.00
Silex, floated ... "	35.00@40.00
Lump quartz ... "	5.00@5.50
Glass sand ... "	2.75
SILVER—Nitrate, crystals ... oz.	.33¼@.36¾
SODIUM—Acetate ... lb	.04½@.05
"Alkali," per 100 lb., 58/48 ...	.90@.95
Bicarb. soda, per 100 lb ...	1.00@1.30
Soda, caustic, per 100 lb., 78/60	1.72½@1.85
Soda, caustic, powdered ...	.02½@.03
Salt cake, per 100 lb., bulk ...	.50@.60
Salt cake, bbl ...	.75@.85
Soda, monohydrate, per lb. ...	1.30@1.75
Bichromate ... lb.	.05⅝@.06¼
Bromide ... "	.20
Chlorate, com'l ... "	.08¼@.09½
Cyanide, 120-130% KCN, per 100%	
Carloads (30,000 lb.) ... lb.	18c.
5-ton lots ... "	18½c.
Less than 5 tons ... "	.20
Hyposulphite, Am. ... "	1.30@1.50
Phosphate ... 100 lb.	2.10@2.40
Prussiate ... "	.08½@.09
Sal soda, f.o.b. N. Y. ... "	.60@.75
Foreign, f.o.b. N. Y. . . "	.80@1.00
Silicate, com'l ... "	.65@1.00
Sulphate, com'l (Glauber's salt) ... 100 lb.	.60@.80
Sulphate, com'l, calcined ...	.65@.85
STRONTIUM—Nitrate ... lb.	.07½@.08
SULPHUR—Louisiana (prime) to New York ... lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore ... "	22.50 up
Roll ... 100 lb.	1.85@2.15
Flour ... "	2.00@2.40
Flowers, sublimed ... "	2.20@2.60
Powdered commercial, bags	1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York ... lg. ton.	$22.00
TERRA ALBA—Fr. & Eng. 100 lb.	.70@1.00
TALC—Domestic ... sh. ton.	12.00@20.00
French ... "	15.00@25.00
Italian, best ... "	30.00@40.00
TIN—Bi-chloride, 50° ... lb.	.10
Crystals ... "	.22½@.24
Oxide, lb ... "	.37@.40
URANIUM—Oxide ... "	2.20@4.25
ZINC—Chloride sol., com. 20° "	.02¼
Chloride, granular ... "	.04¼
Dust ... "	.06¾
Sulphate ... "	.02@.02¼

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as a matter of private contract.

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**Illustrated.*

The Copper Statistics

In going to press on Wednesday, as usual, we are unable this week to report the American copper statistics for February, which are not published until the 10th. Inasmuch as the figures will be known to our readers before this issue is in their hands, it is not worth while to forecast the February figures. It is, however, useful to correct some misunderstanding that exists respecting these statistics.

Some suspicion has been expressed as to the accuracy of the figures reported by the Copper Producers' Association. We state in the most unqualified way that in our opinion the statistics are complete and correct. If at some times they show totals that look peculiar, as for January last, the explanation is usually quite simple. Deliveries do not mean consumption. The amount of actual consumption is impossible for any of us to know, month by month, because such statistics are not collected. In any single month deliveries and consumption may be widely different, but over a long period, say a year, the totals are likely to be substantially the same.

The American statistics, taken alone, are not a good criterion of the situation in the copper market, but taken in conjunction with the European statistics, they are a good guide. Insofar as the accumulation is concerned, it is the grand total upon which attention should be fixed. That total may not comprise everything, because stocks existing at some of the Continental ports are not included, but this figure is the best available and the industry ought to be thankful for having it.

Regrinding Machines

What promised to be a valuable comparison of the relative merits of two radically different methods for the crushing of the Bingham porphyry ore has thus far failed to materialize, at least in any conclusive way. For the liberation of the mineral of this ore a decidedly fine grinding—from the standpoint of the ore-dresser—is necessary. The Utah company, conforming to the accepted tenets of good practice, adopted the principle of stage-crushing by rolls, with intermediate screening and the treatment of comparatively coarse products to extract mineral already liberated. So far so good, but then came the problem of regrinding the tailings from the preliminary separators, which constituted the real work of the mill, and for this chile mills were installed.

The Boston company came to the conclusion that inasmuch as the ore required fine grinding it might as well be effected in one operation and be done with it. Consequently, it boldly adopted the Nissen stamp, basing its conclusions upon experimental work conducted upon a comparatively small scale. This work was evidently well done, however, and in fact all of Mr. Bettles' plans were carefully considered and reflect great credit upon him, although when it was announced that the Boston company was going to adopt stamps we expressed the opinion that the choice was not the wisest and still hold that opinion.

Now, as to the results up to date there is no question about those of the Boston company having been superior in the matter of mineral extraction, the difference between the two mills being large. The Boston mill has given all that was expected, or more, while the Utah mill has fallen short. Unfortunately the conditions attending the operation of the Utah mill have been such that its shortcomings cannot be ascribed wholly to features of its design and the relative merits of the two systems of crushing have not been determined as it was expected they would be.

Mill-men are nearly a unit nowadays in condemning the stamp as a crushing machine for ore-dressing purposes, except the steam stamp which has survived under the peculiar conditions of Lake Superior, and possibly the Nissen stamp. The recognition of the latter as a possibility is based upon its large and cylindrical screening surface which gives the particles of ore increased chances to escape from the mortar and thereby reduces the danger of sliming. On the other hand the chile mill is a notorious slimer. It is indeed a great problem among mill men to decide upon a type of regrinding machine that is not a bad slimer, the Huntington mill also being open to serious objection on that ground. It may be that the advantages of tube mills and ball mills have not been sufficently considered in those cases where comparatively fine grinding is required. However, for those who desire to adhere closely to the lines of conventional practice there is a standard and meritorious machine that can well be substituted for the chile and Huntington mills. This is the rigid roll, which already finds successful employment in the mills of Lake Superior and elsewhere. We understand that the new Miami mill is also to employ them and it seems to us that its engineers are taking a step in the right direction.

The Silver-Lead Mines of the Coeur d'Alene

The mines of the Cœur d'Alene, one of the great lead-producing districts of America, are concentrated in a few hands. The most important are the Federal Mining and Smelting Company, controlled by the American Smelting and Refining Company, which owns a number of mines, and the Bunker Hill & Sullivan Mining and Concentrating Company, which owns only one mine, but that one the richest and most cheaply operated of the whole district. Outside of these companies the Hecla Mining Company and the Hercules (owned by a partnership) are important producers and there a few others of minor consequence. It will be gathered from this that the Cœur d'Alene is still, as indeed it has always been, a field of operation for companies with considerable capital rather than for the small miner. This is chiefly because the ore shoots are of low grade as a rule, requiring the erection of dressing works before they can be made productive, but there are exceptions as witness the Hercules, one of the more recent discoveries, which had large bodies of shipping ore.

It is the hope of every prospector to find another Hercules. There is a good deal of prospecting going on in the district all the time. Viewing the densely wooded character of the hill-sides, which may hide the outcrops of many veins, and recognizing moreover that most of the veins of this district were poor at the surface, anyone will be free to admit that the chances have by no means been exhausted and that new veins of concentrating ore, perhaps another Hercules, perhaps even an Atlas, may yet be discovered.

Eastern Iron Ore Supplies

Reports of sales of merchant ores from the Lake Superior region for the coming season, all agree that the eastern furnaces have been lighter buyers than usual Most eastern blast furnaces use some quantity of Lake ore for a mixture with local ores, though complaints have been made of their high cost, which is due to the railroad freights from Lake Erie ports. It does not appear that the light buying is due to any anticipation of poor business, but rather to a disposition to look elsewhere for ore supplies. In 1909 there was a marked increase in activity in eastern iron mines. This was manifested chiefly in the Lake Champlain, the Adirondack and the Hudson river districts in New York, in New Jersey and in eastern Pennsylvania.

Another source of supply is found in increased imports. The recent large developments in Cuba have an important bearing upon this movement; but some furnaces are looking further. The imports of iron ore in 1907, an active year, were 1,229,168 tons; in 1908 there was a heavy drop, as might have been expected, the total being 776,898 tons; in 1909 there was an increase to 1,696,411 tons, or one-third more than the total of 1907. For a number of years past the quantity of iron ore imported has averaged about 3 per cent. of the Lake production, but last year it was about 5 per cent. A careful study by B. S. Stephenson, in the Cleveland *Iron Trade Review* puts the probable imports for 1910 at over 3,000,000 tons. On the basis of contracts known to have been already closed 1,500,000 tons of ore will come from Cuba; 700,000 tons from Spain; 300,000 from Sweden; 100,000 from Algeria; 50,000 from Greece; and 350,000 tons from Newfoundland. Cuba and Newfoundland are familiar sources of supply; Spain also to a smaller extent. Sweden and Algeria, however are comparatively new fields, so far as our ironmakers are concerned. A large part of the Cuban ore will be taken by the Bethlehem and the Pennsylvania Steel companies, which control the deposits in the island; but there is a surplus for sale to eastern merchant furnaces, of a quality which will take the place of the more expensive Lake ores.

Two causes contribute to this increased importation, besides the higher cost of Lake ores. One is the reduction of the duty on iron ores from 40c. to 15c. —or to 12c. in the case of Cuban ores. Another is that ocean freights are low, and promise to continue so for some time. Moreover, the ocean transportation of ore has been in recent years reduced to a system and improved by the use of steamers especially built for the trade, on plans approaching as nearly as ocean conditions will permit our large Lake ore carriers. The Cuban mines and the larger Swedish and Spanish mines now control their own fleets, and can contract for deliveries without reckoning with possible variations in freight rates.

The existence of large contracts for ore indicates that eastern furnaces look for an active year, and that they intend to hold their own against competition from the Central West. Railroad freight rates form a barrier which prevents any ore from the seaboard from going west of the Alleghenies. The activity in eastern mines and in foreign ores depends entirely on the demand from Eastern furnaces.

DETAILS OF PRACTICAL MINING

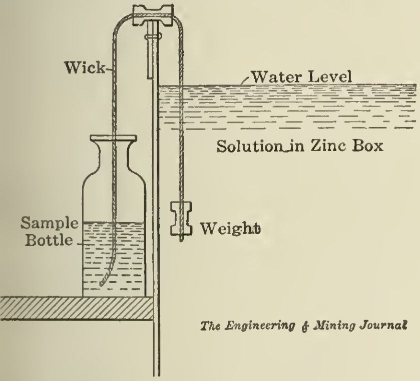
NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES — THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the Journal are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that s intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Device for Sampling Zinc-box Solutions

By Fred. W. Monahan*

An ingenious and useful method of sampling the solution in the last zinc box in cyanide mills is shown in the accompanying sketch. It consists of a otton wick with one end in the zinc-ox solution and the other in the bottle receive the sample. The wick passes rough a porcelain insulator on the dge of the box, and has another inulator attached to the end to act as a eight. The bottle is set below the level the water in the zinc box and the ick continuously siphons a small nount of the solution over into the bot, thus taking a uniform and accurate mple.



The Engineering & Mining Journal

Sampling Cyanide Solution in Zinc Box

The samples are collected each day d tested for any trace of gold which ay have passed the zinc shavings. This a much more accurate method than to ve the boy who bucks the samples go ound and take out a dipperful now and en. It is also a means of checking and ten preventing large losses due to reless treatment of the zinc shavings.

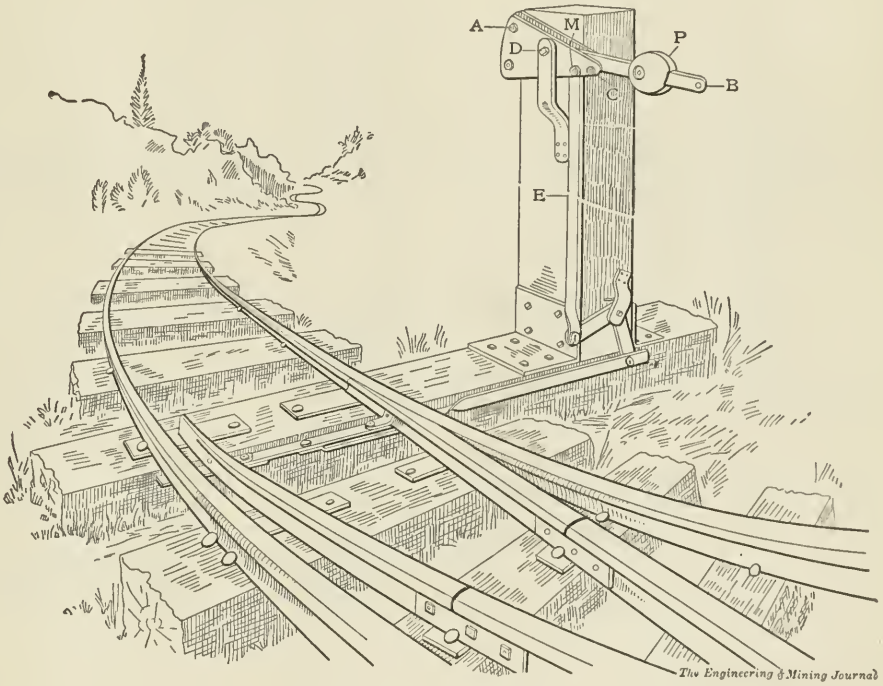
A Convenient Switch-throwing Device

The switch-throwing device shown in the accompanying drawing is in use at the Homestake mine, and is made at Newport News, Va., by Peter H. Petersen, a former employee of that company. The function of the apparatus is to permit the switch being set in either position: when trailing a closed switch no adjustment is necessary, the action being automatic; and when facing it, the required adjustment can be made by the engineer from the train.

The device consists of a triangular lever box composed of two plates spaced by roller-shaped fillers on the bolts, and pivoted at *D*. The switch rails are connected to this lever box through a bell crank and bar *E*, which is pivoted at the bolt *M*. The gravity lever *B* with weight *P* is pivoted between the plates at *D*. When *B* is in the position shown, it rests on bolt *C* and holds the switch points against the right-hand rail, thus keeping the left-hand track open. When *B* is thrown over center, it rests on bolt *A*, raising *E* and holding the points in the opposite position.

When trailing a closed switch, no matter for which track it is closed, the switch points will open to let the cars pass through and adjust themselves again to their former position after the last car has passed over them. The engineer or motorman can throw the lever to set the switch for either track he desires while his locomotive is passing over the switch points.

When facing a switch, should it be placed wrong, the engineer drives to the throw, adjusts it to suit, and then moves off the switch points, whereupon the weight sets the switch to its new position. Or a rope may be attached to *B*, run through a pulley directly over the pivot *D* and extended to any point along the track, permitting the engineer to set his switch as he approaches it. Thus no switchman or extra trainman is necessary.



The Engineering & Mining Journal

The Petersen Switch

It is announced by a British consul that a radium factory is being started at Lidingö, one of the suburbs of Stockholm, Sweden. The company hopes to have a factory which will employ about 120 men ready in a few months, and expects to produce 4½ grams of radium per year.

---

*Atlas block, Salt Lake City, Utah.

Using the Ore Bucket

By S. A. Worcester*

While the mining bucket as a device for tramming and hoisting rock is no doubt crude, it has the important merits of simplicity, cheapness and minimum dead weight and is probably the best appliance available for handling, say, up to 30 or 40 tons per shift while prospecting and developing or doing other temporary work. In some cases a much larger tonnage may be handled with good economy, provided that proper conveniences are used for handling, filling and dumping the bucket. It can be used in crooked shafts, either vertical or inclined, or partly both. Where the law permits, it may be used without guides or crosshead and is therefore a cheap arrangement.

The bucket is filled either from chutes when stoping, or with the shovel when sinking or drifting. Its relatively small diameter causes a good deal of spilling when it is filled from chutes. Filling with the shovel is easier with the bucket lying on its side, as shown in Fig. 1, than when upright. The sidewise position has the advantage that when hoisting away the bucket tends to upset the truck.

The arrangement shown in Fig. 2 is perhaps the most economical method of bucket filling now in use. The bucket is not detached from the cable and is automatically guided to the loading place and requires no attention from the trammer when hoisting away. The length of the car being much greater than the width of the loading chute prevents spilling, and a short spout with converging sides prevents spilling when loading the bucket.

For dumping buckets at the surface the hand-operated hook, engaging a ring on the bottom of the bucket, as shown in Fig. 1, is still used in many places. Perhaps the simplest form of bucket dumper which can be operated by the engineer without leaving the hoist is that shown in Fig. 3 and is useful only for dumping water. The bucket is lowered on the closed door, which upests it, pouring the water into the trough. The bucket is then raised to clear and the door opened with a cord or rope.

Three different styles of ore dumpers, operated by the engineer (two of them patented), are in use in the Cripple Creek district. Fig. 4 shows the apron dumper. The swinging apron shown hangs normally in the dotted position, its swing being limited by two chains at the upper corners. After the rising loaded bucket passes, the apron swings beneath the bucket. The bucket is then lowered and upsets on the apron. As it slides down to the full-line position, the ball or button at the end of the chain is caught in a Y-shaped notch in the upper edge of the apron. When the bucket is emptied and again raised, the apron is swung clear, using the cord and pulley shown, and allowing the bucket to be lowered.

This dumper has the merit of turning the bucket away from the shaft so that there is seldom any rock spilled in the shaft. It is the most expensive of the auto-dumpers and has the disadvantages of requiring special framing and concealing the bucket so that the engineer cannot see whether it is dumped clean or not. As it does not invert the bucket completely, rock hangs oftener with it than with other dumpers.

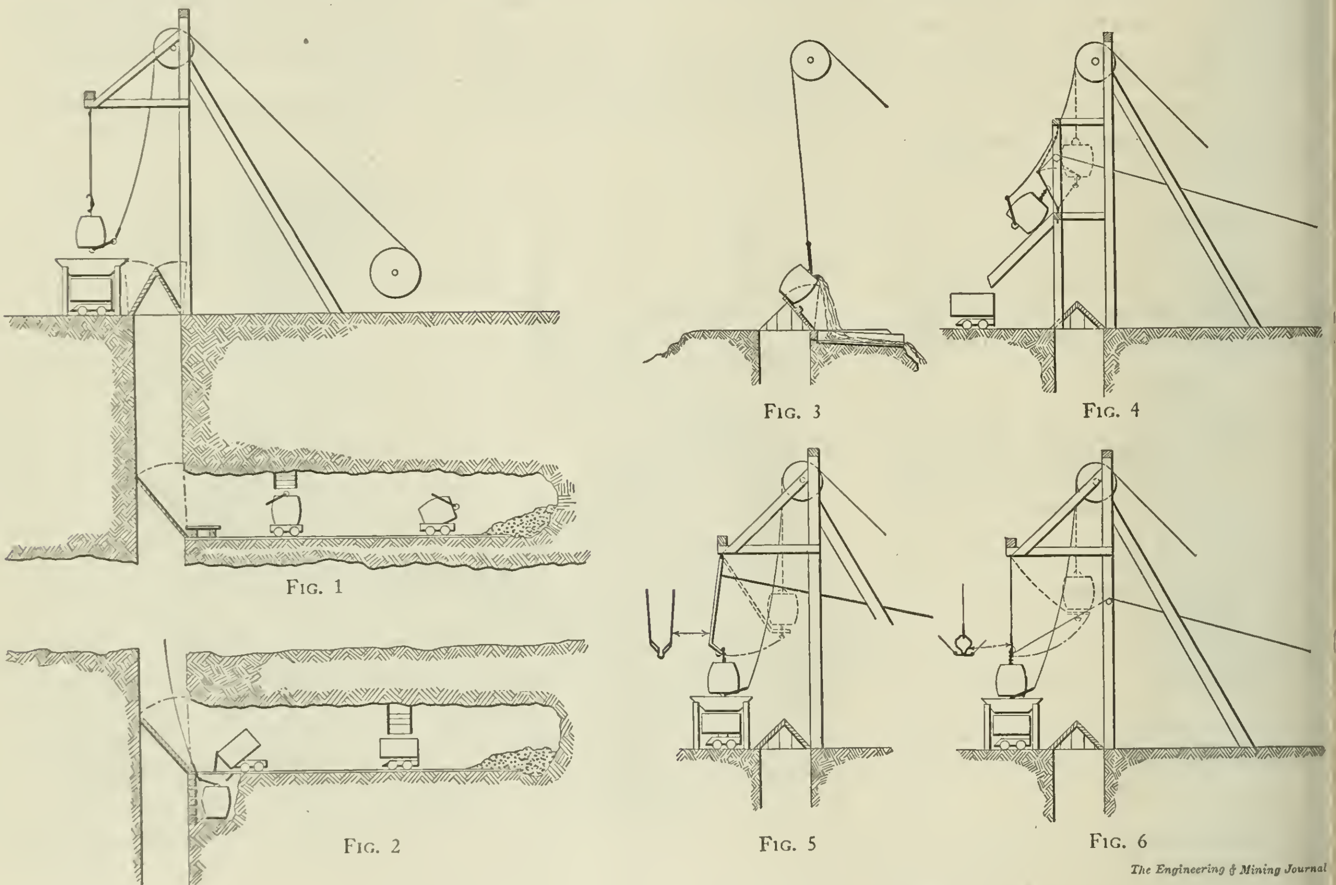


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

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Various Methods of Filling and Dumping Buckets

The looped-rod dumper shown in Fig. 5 is a cheap and simple device which inverts the bucket completely, turning it toward the shaft. The looped rod is swung up beneath the bucket, as shown by the dotted lines, using the pull rod shown. As the bucket lowers, the button catches in the loop and suspends the bucket, bottom up.

The cord and pulley dumper, Fig. 6, is about the cheapest device possible. Its operation is similar to that of the looped rod, but the loop in this case is the short forging shown in the detailed side view, and is suspended from the ordinary dumping rope or chain, engaging the button and performing the same function that the ordinary dumping hook shown in Fig. 1 does. The two cords shown in the detail run from the loop to the two sts of the gallows frame, where they ss through pulleys and are joined in e cord passing to the hoist. This cord used to pull the loop over the button, d the dumping operation is like that of g. 5. The shaft doors for all of these mpers are opened and closed by cord d pulley arrangements, or by rod deces of some simple description.

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*Mechanical engineer, Victor, Colo.

Rapid Method of Determining Copper in Slags

By A. W. Diack and Thorn Smith*

The article by F. D. Aller in the urnal of Dec. 25 is interesting and luable to the chemist desiring to sere the best results. It is well known to reful chemists that, working on the ual one-gram sample of low slag, good sults are not the rule. The time reired to prepare the copper for its final timation when using the ordinary meths is too long. If it is desired to use e or more grams of the sample, the ica present is so excessive and difficult wash free from copper that one is inned to give it up as a bad job.

The usual method is to precipitate the pper on aluminum after removing the ica. To get the copper into solution it necessary to treat the original sample th nitric acid. This oxidizes the iron, d before the copper will completely ecipitate on the aluminum it is necesry to reduce the ferric iron. We have own reputable chemists to boil such a lution for two and even three hours.

Mr. Aller's method shortens the time to fraction of that ordinarily required, but open to two criticisms: (1) Does he cceed in precipitating all of the copper aluminum? (2) Will not the slight nount of gelatinous silica, which we ave found almost invariably present, inrfere with the filtration, assuming as e do that most chemists will prefer to ecant through a filter paper?

It is the experience of many chemists at some copper remains in solution and is customary to add hydrogen sulphide efore filtering.

Our method, which is in use in many neltery laboratories, was devised a year r two after Mr. Aller's, we then beeving it to be original. The main idea the same but we depart slightly after issolving the slag.

Any Size Sample May Be Used

Briefly, we take 5, 10, or 20 grams as esired, place in a 600-c.c. beaker, add 00 c.c. water, preferably boiling hot, nd bring to a boil. With constant stiring add 15 c.c. hydrochloric acid, a few c.c. at a time to prevent boiling over from violent action. Continue to boil until apparent action has ceased, which does not require over three minutes. The beaker is then removed from the source of heat and a rapid stream of hydrogen sulphide run into it to precipitate the copper that has gone into solution. As but a fraction of the copper is dissolved and the iron is mostly in the ferrous condition, it is not necessary to use the hydrogen sulphide more than five minutes, in fact two minutes is generally sufficient.

A porcelain Gooch crucible, in one piece, is fitted with a double disk of filter paper, attached to the pump in any suitable manner and the solution rapidly filtered and washed two or three times with hydrogen-sulphide water. The tendency of the gelatinous silica to clog the paper is overcome by the addition of a few drops of hydrofluoric acid directly to the solution in the Gooch, every time the solution ceases to flow rapidly. If too much acid is added the filtering practically ceases, hence it is advisable to use a 1:4 solution and add gradually. No effort is made to remove the main precipitate from the original beaker; in fact it is preferable to retain as much as possible therein.

Remove the Gooch from the pump and poke out the paper disks with a glass rod or platinum wire into a 250-c.c. beaker. Add 5 or 10 c.c. nitric acid to the large beaker, cover and boil until the sulphides are in solution. Then pour through the Gooch into the smaller beaker. Rinse the large beaker with bromine water, pouring through the Gooch into the small beaker. Two washings with bromine water are sufficient. Cover the small beaker and boil free from bromine, filter and determine the copper by any method, electrolytic preferred.

As in Mr. Aller's method, there will be an insoluble residue of matter, magnetic oxide, silica, etc., but no copper will escape solution in the final treatment with nitric acid and bromine. The time required is no longer than with Mr. Aller's scheme, and is much shorter than any other method where ordinary accuracy is required.

We believe our method has two distinct advantages over Mr. Aller's; we are sure the copper is all precipitated, and by filtering through a Gooch we are positive that no copper escapes mechanically. We have for years used the Gooch as above for filtering the copper in mattes, precipitated on aluminum in the usual manner, particularly when using the cyanide method for furnace control.

It is not our intent to critisize Mr. Aller's method unfavorably but merely to add our experience that the thinking chemist can adopt a method suited to his material.

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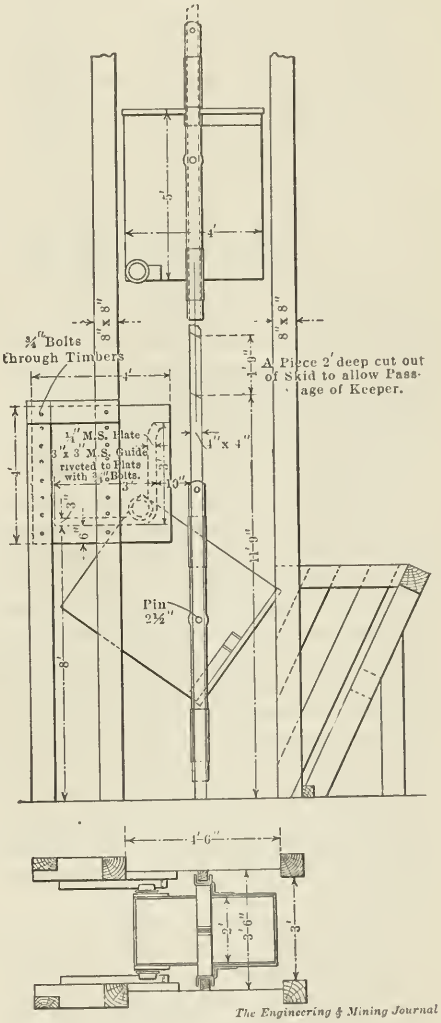
*Chemical engineers, 33 Mullett street, Deroit, Mich.

Arrangement of Self-dumping Underground Skip

An arrangement for discharging a self-dumping skip at the bottom of a winze or shaft is illustrated in the accompanying drawing. The tipping arrangement permits the complete operation of discharging within limited head-room. The guide wheels on the skip engage with 3-in. square mild-steel guides. When lowering a full skip and discharging, the operation is positive and complete. The whole weight of the skip when discharged is carried by the steel guides, and the engineer at the surface knows by the release of the weight from the rope, that the skip has reached its maximum discharge position.



4'
8" x 8"
8" x 8"
¾" Bolts through Timbers
4'
A Piece 2' deep cut out of Skid to allow Passage of Keeper.
1'-0"
¼" M.S. Plate
3" x 3" M.S. Guide riveted to Plate with ¾" Bolts.
4" x 4"
3'
10"
3"
6"
Pin 2½"
11'-9"
8'
4'-6"

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Arrangement of Self-dumping Skip

This scheme is used at the South Kalgurli gold mine, as reported by the *Monthly Journ.* of the Chamber of Mines of Western Australia, Sept. 30, 1909. It might be successfully adopted wherever it is desirable to drop all the material mined from a series of workings into a pocket or ore bin, whence it is to be trammed or hoisted through another opening.

Working Costs of West African Mines

Special Correspondence

The three leading producing companies on the Gold Coast, West Africa, the Ashanti goldfields, the Taquah and the Abosso, have now issued their reports for the financial year ended June 30, 1909. It is of interest to compare the latest costs with those of the preceding year with a view to seeing what reductions are being made.

The best showing is that of the Ashanti Goldfields, costs having been reduced about 5s. ($1.22) per ton of 2000 lb.

COMPARATIVE COSTS ON THE GOLD COAST.

	Period Year Ended.	Tons (2000 lb.) Milled.	Yield per Ton, Shillings.	Total Costs, Shillings.
Ashanti Goldfields........	June, 1908	66,254	52.2	36.4
Ashanti Goldfields........	June, 1909	78,786	44.0	31.3
Abosso	June, 1908	44,021	50.4	39.0
Abosso	June, 1909	60,702	45.6	37.6
Taquah	June, 1908	46,234	60.0	48.3
Taquah	June, 1909	56,793	55.6	55.7

Abosso shows a reduction of 2s. per ton, but it must be noted that the tonnage crushed was considerably in excess of that previously crushed, as was also the case at the Ashanti Goldfields. At the Taquah, on the other hand, the costs, which were already high for the year ended June, 1908, show a considerable increase during that ended June 30, 1909; a result attributed to floods and engineering difficulties. The costs given in the accompanying table embrace not only operating costs at the mine, but general expenditure in London and the amount written off for depreciation of plant and machinery.

The costs of the Ashanti Goldfields for the year ended June 30, 1908, are made up of 22.3s. ($5.43) per short ton (2000 lb.) for mining, milling and general charges, and of 14.1s. ($3.43) per ton for freight on bullion, government royalty, general expenses in London, mine development and depreciation of plant and machinery. The corresponding figures for 1908-9 were 21.4s. ($5.20) and 10s. ($2.43). It should also be noted that of the tonnage milled, about one-sixth was derived from a quarry where the mining costs were comparatively low.

The Abosso costs for 1907-8 included a development charge of 5.25s. ($1.28) per ton and a depreciation charge of 4.4s. ($1.07) per ton. In 1908-9 these items were 4.5s. ($1.09) and 3.6s. ($0.88) per ton respectively. The Taquah costs for 1907-8 include 6.5s. ($1.58) for development and 6.2s. ($1.50) for depreciation. For 1908-9 the development charge was the same, but depreciation amounted to 8s. ($1.95) per ton milled.

Nevada Consolidated-Utah Copper Company

The time for the deposit of Nevada shares in exchange for Utah expired March 5. There has not yet been any official announcement. In the newspapers the Utah management has been claiming that 950,000 Nevada shares have been turned in for exchange, while James Phillips, Jr., says that the number is not over 900,000 and that some of the stock deposited will be withdrawn. Reading between the lines it appears that the Utah Copper Company lacks an actual majority, but nevertheless it will probably control Nevada by its ownership of so large a block inasmuch as the opposition will find it difficult to concentrate their scattered holdings, and it is said that C. M. MacNeill and D. C. Jackling will be put on the Nevada board, replacing two of the Guggenheim directors.

We are inclined to believe that the Utah Copper Company holds about the number of Nevada shares that it claims.

California Oil

Special Correspondence

Recent oil strikes in the Midway-Sunset districts of Kern county lead some of the oil men of the State to predict that the section in that vicinity will soon eclipse all others as an oil-producing region. Lands bought a few months since from the Government for $1.25 per acre are now held at over $1500 per acre. Such are the crowds of people going there that the hotels and restaurants of Bakersfield and Maricopa are overcrowded and shacks and tents are being put up to house newcomers. The K. T. & O. gusher No. 28, adjoining the town of Maricopa, at 970 ft. depth began producing at the rate of 3000 bbl. daily and then began spouting at the rate of 6000 to 7000 bbl. If reports be true, it is now yielding from 10,000 to 12,000 bbl. daily. It has kept the owners on the rush to provide storage for the accumulated oil.

The San Francisco Chamber of Commerce is aiding the oil men by petitioning the Tokio Chamber of Commerce to urge upon the Japanese lawmakers who are now discussing the tariff, to move for a reduction on the rate of duty on California oil. Owing to increased duty the Japanese have quit buying California oil, although they were formerly extensive and regular purchasers.

An invitation has been extended to the managers of all oil refineries in California to meet at Bakersfield on March 1 the date upon which the oil producers are to discuss the question of the "closed door" policy for the independent oil agencies.

The question to come up is the combining of all the oil refineries of the State on the same lines as have proved so beneficial to the oil producers. A present, in order to compete with each other, California asphalt makers at the refineries are turning out an article in many instances low in grade, thus bringing a bad reputation on the State's paving material. The idea of the refiners is to increase the prevailing price for asphalt so that a better grade can be profitably made.

Litigation Over the Zinc Schedule

The American Smelting and Refining Company through its subsidiary, the Consolidated Kansas City Smelting and Refining Company, has brought an action before the Board of U. S. General Appraisers for the determination of the legality of paragraphs 181 and 193 of the Payne-Aldrich tariff, under which the Treasury Department is collecting duty upon the zinc contents of lead ores. In a statement given out March 1 the attorneys for the plaintiff say:

"We claim broadly that the Treasury Department has no right to assess duty on the same merchandise under two entirely different paragraphs of the act o 1909. The Government must elect which one of the two provisions duty is to be taken under. If the act provided for the assessment of duty on lead on the one hand, and again for the assessment o duty on zinc, this issue would not arise But the law has specifically provided fo the imposition of separate duties on these two commodities. We claim that the ore cannot be lead-bearing ore and a zinc bearing ore at the same time. It mus be one classification or the other."

Agreement of Power Companies in Mexico

The Chapala Hydro-Electric and Irrigation Company, of Guadalajara, and the Guanajuato Power and Electric Company, of Guanajuato, have agreed on a division of territory. The former will transmit power to Aguascalientes and Zacatecas and mining districts in those states and the latter will transmit to San Luis Potosi and adjacent mining camps. Transmission line to Aguascalientes and Zacatecas will be started with a few months and cost will be 1,500,000 pesos. Line to Aguascalientes will be 180 km., and from that point to Zacatecas 125 kilometers.

American Institute of Mining Engineers

Ninety-eighth Meeting Held at Pittsburg. Members and Guests Present 350; Many Valuable Papers Read and Discussed. Steel Plants Visited

BY JOSEPH STRUTHERS*

The ninety-eighth meeting of the American Institute of Mining Engineers was held at Pittsburg, Penn., from March 1 to 4, 1910. The institute headquarters was at the Hotel Schenley, where a bureau of information was maintained during the meeting for the benefit of the visiting members and guests. R. C. Crawford was chairman and H. W. Craver, secretary of the local committee. Mr. Craver was indefatigable in looking after the comfort and convenience of the party.

The ladies committee, of which Mrs. Taylor Alderdice was chairman, intertained most hospitably the ladies of the institute party.

Many pleasing and instructive excursions were made, notably to the art galleries and museum of Carnegie Institute; luncheon at the Allegheny County Club; the Margaret Morrison Carnegie School, which is the woman's department of the Carnegie Technical School; the famous pickle plant of H. J. Heinz Company; and other places of interest in the city and environs.

The Opening Session

The opening session on Tuesday evening, March 1, was held in the large lecture hall of the Carnegie Institute, Pres. David W. Brunton presiding. Harrison W. Craver, secretary of the local committee, introduced Dr. John A. Brashear, who delivered the welcoming address, to which President Brunton responded.

Dr. R. W. Raymond presented in oral abstract the biographical notice of the late Dr. Charles B. Dudley, which will be published in full in the *Bulletin* of the institution. Col. H. P. Bope gave an earnest eulogy of the late William Metcalf, whose name has been so prominently identified with the progress and development of the iron and steel industries of Pittsburg.

Prof. Robert H. Richards, past president of the institute, presented an interesting paper on the "Development of Hindered Settling Apparatus," clearly illustrated by lantern slides.

The session concluded with a brief description by L. T. Beyl of the mining districts of the Argentine Republic, illustrated by many lantern photographic views.

On Wednesday morning, March 2, the second session, at the same place, was called to order by President Brunton. The following papers were presented in oral abstract by the authors:

"Systematic Exploitation in the Pittsburg Coal Seam," by F. Z. Schillenberg and Edward McGrew, Pittsburg, Penn. Discussed by Frank W. De Wolf, geologist of the Illinois State Geological Survey.

"A Commercial Fuel-Briquetting Plant," by William H. Blauvelt, Syracuse, N. Y. Discussed by C. W. Malcolmson, Chicago, Ill.; E. W. Parker, U. S. Geological Survey and J. Birkinbine, of Philadelphia, Penn.

"Dust Explosions in Coal Mines," by George Samuel Rice, Pittsburg, Penn.

"The Gaseous Decomposition Products of Black Powder," by C. M. Young, Lawrence, Kan.

"Work of the Technologic Branch of the U. S. Geological Survey at Pittsburg, Penn., by Dr. Joseph A. Holmes, Washington, D. C.

Wednesday afternoon was devoted to a visit to the testing station of the U. S. Geological Survey at Arsenal park. Through the courtesy of the engineers of the Technologic Branch of the survey a party of about 100 members and guests visited the station and viewed the tests that were made to illustrate the work that is now being done.

Wednesday evening's session was held in the lecture hall, and the following papers presented by the authors in oral abstract:

"Accumulation of Petroleum in the Earth," by David T. Day, Washington, D. C.

"The School of Mines at the Pittsburg University," by M. E. Wadsworth, Pittsburg, Penn.

"The Technical Schools of the Carnegie Institution," by Fred Crabtree, Pittsburg, Penn.

New Cyanide Method

"A New Method of Cyaniding Gold and Silver Ores," by E. Gybbon Spilsbury, New York. Mr. Spilsbury described the use of a silica sponge in the form of a diaphragm which is placed as a false bottom in the ordinary filter tank used for the cyanidation of gold and silver ores. The sponge is specially prepared in the form of slabs 12x12 in., and 12x20 in., supported on bricks, and calked with oakum and liquid cement. The pores of the slab are so minute that while air will readily pass through, no solids whatever can penetrate the slab.

In practice, the tank is filled with ore and solution in the usual way and air at a pressure of from 2 to 6 lb. per sq.ft. is introduced in the channels below the diaphragm, the resultant agitation by the minute air globules is so thorough that the time of treatment is reduced to about 6 hours, and the consumption of cyanide is much less than that of the Pachuca tank or of processes having mechanical agitators. Mr. Spilsbury quoted the results of many tests among which, as an example is the following:

A gold-silver ore assaying $14.53 per ton gave, after one hour of treatment an extraction of 97.9 per cent. of the gold and 51.7 per cent. of the silver; after 2 hours, 99 per cent. and 69 per cent.; and after 12 hours, 99 per cent. and 84.8 per cent. respectively.

"The Dwight and Lloyd Sintering Process," by Arthur S. Dwight, New York. Mr. Dwight described the process in the present state of its development as applied to the sintering of fine lead ores, and gave many lantern views of furnaces now in operation, and plans of various installations. This process was described in the JOURNAL, March 28, 1908, and in "The Mineral Industry," Vol. XVI, but considerable advance has been made since these articles were published, which Mr. Dwight dwelt especially upon in his remarks.

Steel Works Visited

On Thursday morning, through the courtesy of the Carnegie Steel Company, a party of about 100 visited the steel works at Homestead. A brief trip was made through the Carrie furnace plant and the party then proceeded by train back to Newhall where a welcome and delightful luncheon was given in the Firemen's hall, presided over by Col. A. R. Hunt, of the Carnegie Steel Company. The remainder of the afternoon was devoted to special trips to the electric steel furnace of the Carnegie Steel Company and the plant of the Mesta Machine Company.

While the institute party was visiting the steel plant, the ladies, in charge of the ladies' local committee, visited the famous pickle plant of the H. J. Heinz Company, where they were entertained at luncheon. On Thursday evening a reception, dance and collation were given in the ball-room of the Hotel Schenley.

On Friday morning, the fourth and concluding session was held. The following papers were presented:

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*Assistant secretary, American Institute of Mining Engineers, New York.

"The Huronian as a Gold-bearing Terrane," by Robert Bell, Ottawa, Can.

"The Action of Explosives in Rocks of Different Degrees of Hardness," by W. O. Snelling, Pittsburg, Penn.

"History of the Introduction of Basic Steel in the United States," by George W. Maynard, New York.

"Electric Mine Hoists," by Karl A. Panly, Schenectady, N. Y.

"Field Investigations of Structural Materials for Use in Federal Buildings," by E. F. Burchard, Washington, D. C.

"Coal and Iron Ore in Western Oaxaca, Mexico," by J. L. W. Birkinbine, Mexico, D. F.

"The Chemical Control of Slimes," by Harrison E. Ashley, Pittsburg, Penn.

Papers Read by Title

The following papers were presented, to be read by title for subsequent publication in the *Bulletin* of the Institute:

"Combustion in Cement Burning," by Byron E. Eldrid, Tuckahoe, N. Y.

"A Method of Calculating Sinking Funds, and a Table of Values for Ordinary Periods and Rates of Interest," by John B. Dilworth, Philadelphia, Penn.

"Cyanide Plant and Practice at the Minas del Tajo, Rosario, Sinaloa, Mexico," by George A. Tweedy and Roger L. Beals, Rosario, Sinaloa, Mexico.

"The Copper Provinces of the United States," by William H. Emmons, Chicago, Ill.

"The Behavior of Copper Slags in the Electric Furnace," by Lewis T. Wright, San Francisco, Cal.

"Chemical Laboratories in Iron and Steel Works," by George W. Maynard, New York.

"Notes on Fields Methods of Assaying, i.e., an Assay Shop in an Ordinary Valise," by S. K. Bradford, National, Nev.

"The Girod Electric Furnace, and the French Works Using the Paul Girod Steel Process," by Wilhelm Borchers, Aachen, Germany.

"Electricity in Mines," by William Kelly, Vulcan, Mich.

"A New Separator for the Removal of Slate from Coal," by W. S. Ayres, Hazelton, Penn.

"Improvements in Blast Roasting," by Herbert Haas, San Francisco, Cal.

"Ultimate Source of Ores," by Charles R. Keyes, Des Moines, Iowa.

"The Genesis of the Leadville Ore Deposits," by Max Boehmer, Denver, Colo.

"Heats of Formation of Some Ferrocalcic Singulo-silicates, by H. O. Hofman and C. Y. Wen, Boston, Mass.

"Professional Ethics," by R. W. Raymond, New York.

"Application of Descriptive Geometry to Mining Problems," by Joseph W. Roe, New Haven, Conn.

"The Behavior of Copper Mattes and Copper-nickel Mattes in the Bessemer Converter," by D. H. Browne, Copper Cliff, Ontario, Can.

"Mining Conditions in the Belgian Congo," by Sydney H. Ball, New York, and Millard K. Shaler, Lawrence, Kan.

"An Investigation of the Sampling of Anode Copper, with Special Reference to Silver Content, at the Washoe Smelter, Anaconda, Mont.," by William Wraith, Anaconda, Mont.

"The Giroux Shaft," by Everard Arnold, Kimberly, Nev.

"The Gaseous Decomposition Products of Black Powder," by C. M. Young, Lawrence, Kan.

"Deacidifying Furnace Gases," by F. T. Havard, Madison, Wis.

"The Combustion Temperature of Carbon and its Relation to Blast-Furnace Phenomena," by Clarence P. Lineville, State College, Penn.

"The Fushun Colliery, South Manchuria," by Warden A. Moller, Tientsin, China.

"Federal Coal Mines in the Philippines," by Oscar H. Reinholt, Pasadena, Cal.

"Professional Ethics," by Victor G. Hills, Denver, Col.

During the sessions an exceedingly good portrait in oil by Farley, of Philadelphia, of the late Thomas M. Drown, the first secretary of the institute, was on exhibition in the lecture hall. About 350 members and guests attended the sessions, and the various excursions.

Sonoma Magnesite Company

The Sonoma Magnesite Company, of Philadelphia, Penn., capitalized at $1,000,000, divided into 100,000 shares of $10 each, is offering a portion of its treasury stock at $10 per share. The company claims to own a very large deposit of high-grade magnesite and is now raising money to construct about 12 miles of narrow-gage railroad to connect with the Northwestern Pacific Railroad at Watson, Cal., to build kilns, calcining and grinding plants and for additional working capital. The estimated cost of the railroad is $100,000; plant of 100 tons daily capacity, $50,000; working capital, $100,000. It is claimed that upon completion of the railroad magnesite can be quarried, calcined and ground, and delivered at $4 per ton at San Francisco, or $10 per ton by ship at New York. Upon a business of 30,000 tons per annum (it is stated that the market will take double or more than this tonnage) on a basis of $20 per ton ("as against the trade quotations of $27.50 to $30 per ton" says the prospectus) a profit of $300,000 per year is estimated.

As to the extent and character of the deposits owned by this company, we do not know, but with respect to its statements as to market conditions, we quote in the interest of prospective investors from "The Mineral Industry," Vol. XVII, slightly condensing, as follows:

The only important deposits of magnesite in the United States are in California, mainly in the Coast Range. But few of them are worked. The consumption on the Pacific coast is small, and the high cost of transportation to the Atlantic seaboard prevents competition with the mineral imported there from Austria and Greece. Even to supply the small consumption of the Pacific coast only those deposits that are close to railways can be profitably worked. The annual production of California is 7000 to 9000 tons, worth from $3 to $3.50 at the mines. The bulk of the production is made by the Willamette Paper and Pulp Company at Porterville, Tulare county.

According to F. L. Hess, of the U. S. Geological Survey, none of the California veins compares well in size with the reported width of the Hungarian veins. In quality, however, the comparison with the foreign material is favorable; in fact, the California article is ordinarily better.

Magnesite from Sonoma and Napa counties can probably be calcined and delivered in San Francisco at $15 per 2000 lb. Imported calcined magnesite was quoted in New York in April, 1908, at $16.75 to $25 per 2000 lb., and when comparatively free from lime, ground, sells in small lots at the latter price. Mr. Hess expressed the opinion that with this difference in price for calcined magnesite of $5 to $6 between San Francisco and New York, it seems possible that this product could sometimes be shipped at a profit to the Eastern coast of the United States on vessels that would otherwise sail without a full cargo, and would for this reason be willing to carry the material at low rates.

According to a communication from the Willamette Paper and Pulp Company, its production from December, 1904, to May 9, 1908, was 14,241 tons of raw magnesite, which yielded 5888 tons of calcined. The raw material cost $4.93 per ton f.o.b. cars at Porterville, while the calcined cost $18.99 per ton delivered at San Francisco.

According to "The Mineral Industry," Vol. XVII, the production of magnesite in California in 1908 was 8967 tons while the imports of foreign magnesite into the United States were 84,494 tons, the total consumption being 93,461 tons. The largest consumption on record was in 1907 when the amount was 105,413 tons.

The discrepancy between these statistics and those presented by the Sonoma Magnesite Company will be quite obvious. The California producers have been of the opinion that they cannot compete with the foreign mineral unless they are protected by a tariff, which last year they sought to obtain, but failed. The prospect for a California producer to capture nearly one-third of the domestic consumption and realize a profit of $10 per ton does not appear to be good.

The Canadian Mining Institute Meeting

Proceedings of the Twelfth Annual Meeting, at Toronto. A Large and Successful Meeting, with Many Valuable Papers and Interesting Discussions

EDITORIAL CORRESPONDENCE

The twelfth annual meeting began at oronto, Ont., March 2, with a large atendance, 152 members being registered n the course of the meeting. After a rief address of welcome from the city, ith appropriate response, President Iiller delivered his annual address. In his, after referring to the progress of ining during the year, he dwelt at coniderable length on the mining laws of he Dominion and the several Provinces, rging revision and unification where ossible. He referred to the excellence f the new mining law of Quebec in many espects. Other subjects referred to were he extension of railroads, the use of waer powers, and accidents in mining.

The report of the Council showed that he total membership of the Institute was 35, including active, associate and stuent members. The total receipts during he year were $10,497, and the cash balnce at the close was $1452. The report lso referred at considerable length to the ction taken by the council in appointing committee to confer with the Committee n Mines and Mining of the Dominion arliament. A number of conferences ere held, and most of the suggestions nade were embodied in the reports of the ommittee to Parliament on proposed egislation.

MINERAL PRODUCTION

J. McLeish then read a summary of is report on the Mineral Production of Canada in 1909. We hope to publish this aluable report in full. He was followed y Thomas W. Gibson, deputy minister of ines of Ontario, who stated that the alue of the total mineral production of he Province during 1909 was $32,652,72. Of the total, $22,765,463 was the alue of metallic production, and $9,86,609 that of non-metallic production. he former included 2042 oz. gold, 25,37,037 oz. silver 1533 tons cobalt, 13,07 tons nickel, 7933 tons of copper, 63,777 tons of iron ore, 407,013 tons of ig iron, and 895 tons of zinc ore. The ilver output was the largest in the hisory of the Province.

Theodore C. Denis, superintendent of ines of Quebec, reported that the total alue of the mineral production of that rovince in 1909 was $5,424,808; asbesos being the largest item.

BUSINESS MEETING

The president appointed as scrutineers o count the votes cast for officers of the nstitute, Frederick Hobart, of New York, and Prof. M. B. Baker, of Kingston, Ontario.

The report on the competition for the prizes offered for papers by student members stated that the Council had awarded the President's gold medal to N. L. Bowen, of the School of Mining, Kingston. In addition Mr. Bowen received a cash prize of $25; while cash prizes of $25 and $20, respectively, were awarded to E. P. Cowles, of McGill University, and G. J. Burland, of McGill University. The papers submitted by Messrs. King. Rider, Rutherford and White received honorable mention.

A rather sharp debate was caused by a resolution introduced by R. W. Brigstocke, of Cobalt, regarding certain statements made by Hon. Clifford Sifton, chairman of the Conservation Commission, in a recent speech, in which he referred to a supposed high percentage of accidents in Canadian mines. It was shown that these statements were based largely on a misunderstanding of the figures, and a resolution was finally passed expressing regret that the statements had been made, and looking to their correction.

THE AFTERNOON SESSION

The afternoon session was devoted to the reading and discussion of papers. R. W. Brock, of Ottawa, Ontario, spoke on "The Necessity of Distinguishing Between Prospecting, Developing and Mining." His paper was really a plea for the elimination of the unscrupulous promoter from the mining industry. Other papers were: "Mining Engineers and Mining Institutes," by P. D. Kendall, of London, England; "The Helen Mine, Michipicoten, Ontario," by R. E. Seelye of Sault Ste. Marie, Ont.; "Iron Ores in Vancouver Island," by E. Linderman, of the Mines Department, Ottawa. All these papers were discussed, Dr. Brock's especially calling out considerable debate.

ELECTRO-METALLURGY

The evening session was devoted to electro-metallurgy, two papers being read: "Recent Developments in Electro-Siderurgy," by P. McN. Bennie, Niagara Falls, and "Steel from the Electric Furnace," by Dr. A. Stansfield, Montreal. Both papers were illustrated by lantern slides; both were exceedingly interesting and called out long discussions. Mr. Bennie's paper was a careful record of the actual present position of the electric furnace as a producer of iron and steel. He referred especially to the furnace now in operation at Heroult, Cal., and to the furnaces erected at Joliet, Ill., and Worcester, Mass., by the United States Steel Corporation.

ASBESTOS

The morning session on Thursday, March 3, was devoted largely to asbestos. Three papers were read on "The Origin of Asbestos," by Dr. A. E. Barlow, of Montreal; on "The Distributions of Chromite and Asbestos Deposits in the Eastern Townships of Quebec," by John A. Dresser, and on "Recent Developments in the Thetford Asbestos Region," by W. J. Woolsey, Thetford Mines, Quebec. All these papers were interesting and suggestive, and they called out extended debate on the geology and probable origin of asbestos and on the distribution of the serpentine and asbestos deposits which have been so important in the mining district of Quebec. A short paper on "Mining Literature," by Allen Greenwall, of London, England, was read and called out a discussion in which Doctor Wilmot, Professor Walker and Mr. Hobart took part.

AMENDMENTS TO THE BY-LAWS

The afternoon session on Thursday opened by the presentation of a report by the committee appointed at the Montreal meeting in 1909 to consider amendments to the by-laws. Several of these, which were merely verbal improvements in the old by-laws, were passed. A strong debate arose on the most important of the amendments, which provided for an entirely new classification of the members, and for a restriction of full membership hereafter to persons possessing certain technical qualifications. This called out a sharp debate in which a number of members joined, the leading part being taken by Professor Haultain, Messrs. Cole, Brigstocke and Barlow. The amendment was voted down by a large majority, the feeling of the meeting being strongly and unmistakably in favor of continuing the institute on its present basis.

The remaining amendments were also of some importance, providing for certain geographical restrictions in the membership of council and for the appointment yearly of a nominating committee to which all nominations for membership should be referred and which should present yearly candidates for officers. This group of amendments was again rather sharply debated, Professor Porter and Messrs. Brown, Haultain, Barlow and Hobart taking the lead in the debate.

They were finally voted down, leaving the membership of council without restriction and the nomination of officers open, as for some years past.

Megantic Copper Mines

After the business had been completed, Dr. James Douglas, of New York, gave some interesting reminiscences of copper mining in Megantic county, coupled with some consideration of the possibilities of utilizing the low-grade ores of that region. He also gave an interesting account of the opening and history of the Eustis mines, the only mines at present operating in that region. Doctor Douglas thought that with modern methods and the utilization of the by-products several of the old mines now closed might be reopened with fair prospects of success. He was followed by J. W. Wilson, of Ottawa, who gave a description of the recent examinations made of a number of the old mines of the Megantic region.

The Evening Session

On Thursday evening, Dr. J. B. Irving, of New Haven, Conn., read a paper on the formation of ore deposits by replacing, which was illustrated by a number of lantern slides. At the conclusion of this paper the meeting resolved itself into a smoking concert, which was highly enjoyed by the members present and which was presided over by G. G. S. Lindsey, who enjoys the triple distinction of being eminent in coal mining, in the law and as an entertainer. In the course of the evening, a presentation of a very handsome testimonial was made to Major Leckie, who is the senior member of the institute both in period of membership and in age, and who has long enjoyed the honorary title of "Dean of the Institute."

The Friday Sessions

At the morning session on Friday, March 4, B. B. Lawrence, of New York, gave "Some reminiscenses of Two Well Known Mines." A paper on "Criteria of Downward Sulphide Enrichment" was read by F. L. Ransome, of Washington, D. C., and an exceedingly important and interesting paper on "Some Directions in Which Improvements in Concentration May be Looked For" was read by Prof. Robert H. Richards, of Boston. The time devoted to these papers prevented any extended discussion although many members made brief remarks on Professor Richards' paper.

On Friday afternoon, Dr. Heinrich Ries, of Ithaca, N. Y., read a long paper illustrated by a number of lantern slides, on the "Clays of Nova Scotia." This paper embodied the results of examinations made by him in the field during the past year for the geological survey in Nova Scotia and a portion on New Brunswick. The paper was followed with much interest and there was a debate of length.

Officers Elected

Following Doctor Ries' papers, the scrutineers reported that they had counted the ballots and that the following officers were elected for the ensuing year: President, Frank A. Adams, Montreal; vice-presidents A. B. W. Hodges, of Grand Forks, B. C., and R. W. Leonard, of St. Catherines, Ontario. Councilors, Arthur A. Cole, of Cobalt, Ont; Charles Fergie, of Montreal; J. B. Tyrrell, of Toronto; John A. Dresser, of Ottawa; G. G. S. Lindsey, of Toronto; O. E. S. Whiteside, of Coleman, Alberta; Selwyn G. Blaylock, of Moyle, B. C.; Robert A. Bryce, of Cobalt, Ont; R. A. Hopper, of Montreal, and John J. Penhale, of Sherbrooke, Quebec.

The Sifton Resolutions

Following this announcement, Doctor Porter somewhat unexpectedly brought up, as a question of privilege, a motion to rescind the resolution passed earlier in the meeting in relation to certain statements about mine accidents made in a speech by the chairman of the Conservation Commission. Although President Miller read a letter from Mr. Sifton, stating that he regretted that there had been any misunderstanding, a sharp debate arose, which was closed by a motion to lay the whole matter on the table. The meeting then adjourned.

The Annual Dinner

The meeting was closed by the annual dinner on Friday evenuing which was marked by some excellent speaking. Among the toasts were the Dominion and Provincial Governments, proposed by Mr. Lindsey and responded to by Hon. Frank Cochrane, Minister of Lands, Forests and Mines of Ontario; Hon. Ralph Smith, of British Columbia, and Hon. F. T. Congdon, of Yukon Territory. "The Mining Industry" was proposed by Dr. A. B. Willmott, of Sault Ste. Marie, and responded to by B. B. Lawrence, of New York, and Eugene Coste, of Toronto. "Our Guests," proposed by Col. A. M. Hay, of Toronto, was responded to by Dr. R. H. Richards, of Boston, and Dr. J. D. Irving, of New Haven. In answer to "Sister Societies," proposed by Dr. F. D. Adams, Dr. Ledoux, of New York, spoke for the American Institute of Mining Engineers, and Dean Galbraith, of Toronto, for the Canadian Society of Civil Engineers. "The Mining Press," proposed by Colonel Hay, brought responses from Frederick Hobart, of New York, and J. C. Murray, of Toronto.

The formal proceedings were closed by a brief valedictory speech by W. G. Miller, the retiring president, to which appropriate response was made by Dr. F D. Adams, the new president.

Papers Received

The papers prepared for presentation at this meeting—other than those mentioned above—which were read by title or in brief abstract, were as follows:

"The Work and Functions of State Geological Surveys," by H. Foster Bain San Francisco.

"The Origin of Archean Graphite," by H. P. H. Brumell, Buckingham, Quebec

"An Automatic Pulp Divider," by Thomas Kiddie, Northport, Wash.

"Geology, Mining and Milling in the Thetford Asbestos District," by G. G Gibbins, Montreal.

"Copper Mining on the British Columbia Coast," by W. M. Brewer, Victoria B. C.

"Recent Developments at the Granby Smelter," by Frank E. Lathe, Grand Forks, B. C.

"Platinum Mining in the Tulameen District," by Charles Camsell, Ottawa.

"Some Antimony Ore Deposits in the Southern Yukon," by D. D. Cairnes, Ottawa.

"Sizing for Plate Amalgamation," by N. P. Nissen, Toronto.

"A Wet Sample Cutter," by H. E. T. Haultain, Toronto.

"The Geology of Petroleum," by Eugene Coste, Toronto.

"Coal Developments in Alberta," by James McEvoy, Toronto.

"The Spontaneous Combustion of Coal," by Edgar Stansfield, Montreal.

"The Alteration of Vegetable Matter into Coal," by D. B. Dowling, Ottawa.

"The Recording and Use of Colliery Data," by F. W. Gray, Glace Bay, N. S.

"The Hosmer Mines," by H. H. Yuill, Montreal.

"The Development of Ore Reduction in Cobalt," by Nicholas C. Groch, Cobalt.

"Setting Out Inclined Shaft Timbers," by D. J. Browne, Rossland, B. C.

"Fungus on Mine Timbers," by James Macoun, Ottawa.

"The Tenure of Mining Property," by Frederick Hobart, New York.

"The Unification of Mining Laws in Canada," by H. Mortimer-Lamb, Montreal.

"Some Notes on Recent Amendments to the Quebec Mining Act," by J. Obalski, Montreal.

"The United States Geological Survey," by R. H. Chapman, Ottawa.

"Methods of Making a Large Scale Contour Surface Plan of Mining Claims," by W. H. Boyd, Ottawa.

"The Portland Canal Region," by R. W. Thomson, Toronto.

"The Silver Fields of Nipissing," by Reginald E. Hore, Houghton, Mich.

"Nitro-Starch Dynamite, Its Manufacture and Use," by A. Mosco Vici, Montreal.

British Columbia Copper Company, Ltd.

The report of the British Columbia Copper Company, Ltd., for the year ended Nov. 30, 1909, states that production was interrupted for a period of three months from May to August on account of a strike of the coal miners of the Crows Nest Pass district from which the fuel supply is obtained. During the nine months' operation the mines at Greenwood, B. C., produced 367,024 tons of ore. This together with a small tonnage of custom ore amounted to 373,336 tons smelted. Blister copper to the amount of 6,366,318 lb. was recovered, containing fine copper 6,325,000 lb.; gold 18,244 oz., and silver 64,234 oz. The yield of copper per ton of ore was 17.7 lb. Gold and silver amounted to $1.03 per ton. The cost of producing, refining and marketing per pound of fine copper, after crediting expenditure with gold and silver contents, was 9.829c. The cost per ton of ore handled, including all charges from ore in place to sale of the contained metals, was $2.683.

In general the standard of operation was higher than in the previous year, as the expense and loss, due to the three months' cessation on account of coke shortage, were all borne by that portion of the year when operations were in progress. The loss entailed on account of the shutdown was approximately $30,000, besides an indirect loss for this period during which no profits were realized.

During the year the company acquired 132,556 shares of the common stock of the New Dominion Copper Company, Ltd., owning claims contiguous to the property of the British Columbia Copper Company. These shares represent over 53 per cent. of the capital stock of the New Dominion company. This will result in establishing relations between the two companies which should prove highly beneficial to both. This purchase was made also for the purpose of insuring a sufficient ore reserve to enable the company to operate under increased capacity, and to this end steps have already been taken to enlarge the capacity of the smeltery.

Esperanza, Ltd.

Esperanza, Ltd., owning the Mexican mine of that name, has issued a circular giving the principal figures of the annual report which will shortly follow. The estimated profit in the ore reserves of the mine is somewhat less than at the corresponding date of the previous year, but the profit from the tailings dump is about double what was calculated last year. It is further stated that the balance sheet will show cash and assets readily realizable, after providing for current liabilities and the final dividends for 1909 of over $800,000. Altogether the profit in the mine ore reserves and tailings dump and the cash total £723,293. The total costs of the company during the last quarter were $8.22 per ton of dry ore. The profit per ton ($8.81) in the ore reserves is about the same figure as last year, when it was $8.89 per ton.

Arizona Copper Company

The Arizona Copper Company, in the year ended Sept. 30, 1909, produced 741,068 tons of ore, which yielded 31,573,950 lb. of copper, or 42.49 lb. per ton of ore. In addition to the above ores there were mined and shipped 129,031 tons of limestone flux, making a grand total of ores and fluxes of 870,099 tons, as compared with 856,669 tons for the previous year. Of the total ores, 441,358 tons (59.57 per cent.) were derived from the Longfellow group, and the balance from the Metcalf and Coronado group, all in Graham county, Arizona.

The profit and loss account gives the operating costs at £616,541, and general charges £22,042. After paying preferential dividends to the amount of £24,531, and an ordinary dividend of 2s. 6d. per share, and transferring £80,000 to reserve account, a balance of £39,994 was carried forward.

The grade of ore treated was slightly lower than during the previous year. Fuel oil was substituted for coal at Clifton and Longfellow, the saving from which is estimated at $25,000 to $30,000 per year.

Quincy Mining Company

The 1909 output of the Quincy Mining Company, Hancock, Mich., was 22,511,984 lb. of copper, an increase of more than 9 per cent. over that of any other year. The cost per pound of copper was about ¾c. less than during 1908. A statement of operating costs follows, but no figures are given as to tonnage or grade of rock mined:

OPERATIONS IN 1909.

Sale of 22,511,984 lb. copper		$3,034,810
Mining expense	$1,765,965	
Opening mine expense	216,130	
Michigan taxes	58,749	
Smelting, transportation, etc	206,462	2,247,306
Mining profit		$787,504
Interest receipts	$9,631	
Real estate receipts	3,125	$12,756
		$800,260
Construction at mine	$68,137	
Construction at smeltery	8,434	
No. 9 shaft work	34,839	$111,410
Business profits		$688,850

Dividends amounting to $440,000 were paid and $120,000 was paid on the purchase of Franklin property, the company beginning the new year with a balance of $1,120,215 of liquid assets.

All the shafts except No. 6 have been sinking during the year and the reserves increased. The grade of the ore reserves is reported unchanged. Caving rock damaged No. 2 shaft to the 49th level, but it has been recovered to the 46th level. No. 4 shaft was permanently closed, and its output will be handled through No. 2. The sinking of No. 9 shaft was hampered by water, but this trouble was remedied and sinking is now proceeding rapidly. Considerable copper has been encountered in No. 9 and shipment may begin by spring.

Quincy officials are watching developments on the Hancock, and believe the lode recently reported from that property will traverse Quincy ground for more than 3½ miles and carry the underlay to great depth.

McKinley-Darragh

The annual statement of the McKinley-Darragh, at Cobalt, shows gross receipts in 1909 of $639,442, including balance of $46,419 from the previous year. From this were paid operating expenses and improvements, $294,262, and dividends aggregating $224,493, leaving a balance on hand of $120,759. Mine Manager Robbins' report shows that 1,297,530 oz. silver were produced in 1909, this being equal to the total production of the three preceding years. The ore reserves at the McKinley-Darragh are estimated at 4,975,000 oz., and at the Savage 755,000 ounces.

New Steel Works in Alabama

The sale of the properties of the Southern Steel Company, bankrupt, on April 12, 1909, to the Southern Iron and Steel Company, through a reorganization committee, was upheld in a decision handed down a few days since by the United States Circuit Court of Appeals in New Orleans. The court denied the petitions of George H. Schuler and Samuel I. Knight, to have the decree of the district court at Birmingham revised and dismissed their appeals. The reorganized company has charge of the properties, and has not only made needed repairs, but has built new mills near Gadsden, Ala., and will shortly put that industry in operation.

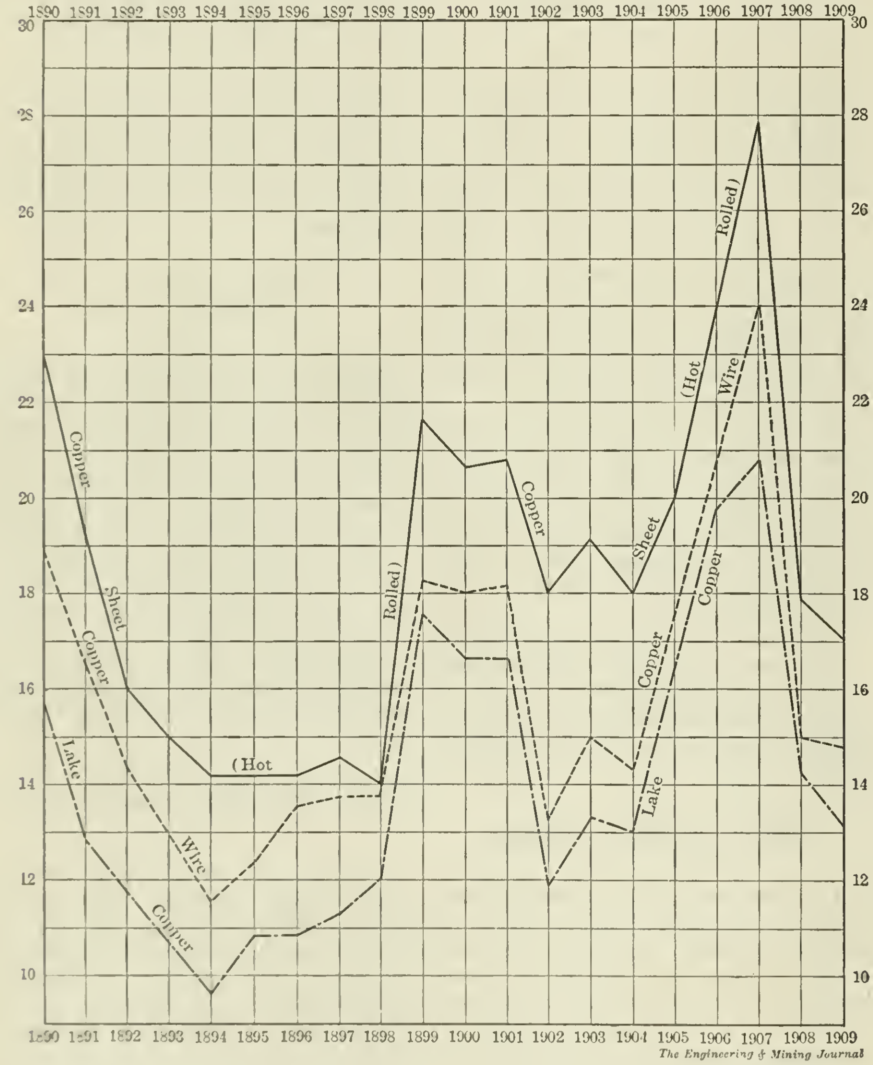
Ground has been broken for the extensive improvements of the Tennessee Coal, Iron and Railroad Company and the American Steel and Wire Company near Ensley, in the Birmingham district. A lake to provide more water, a power plant, by-product coke-oven plant and steel-wire and rod mills will be erected.

Diagram of Copper Prices

The accompanying diagram is interesting because of its graphic presentation of the relative price of bar copper and the chief primary manufactures, namely sheet and wire. In an editorial in the JOURNAL of Feb. 26, 1910, we discussed the conditions under which the price for these manufactures is established.

The lines in the accompanying diagram are plotted from the annual averages, the figures for Lake copper being as reported by the JOURNAL, while the figures for sheet and wire are as reported by the Department of Commerce and Labor up to 1908; for 1908 and 1909, as reported by the JOURNAL.

It would be preferable to make comparison with the price for electrolytic copper, but unfortunately data for that class of metal do not go further back than 1899, and consequently we have taken the figures for Lake copper in order to preserve uniformity in the diagram, covering the period of 20 years. However, the line for electrolytic copper since 1898 would be substantially parallel to the line for Lake copper.



GRAPHIC COMPARISON OF THE PRICE OF COPPER AND ITS CHIEF MANUFACTURES

Errors in Testing Cyanide Solutions*

By BEDE COLLINGRIDGE

The results of experiments have convinced me that potassium iodide influences the testing for "protective alkalinity" in cyanide solutions. Cyanide decomposes much faster in solutions which are deficient in protective alkalinity than it does when protected by an alkali; therefore, the method I give of testing without potassium iodide will mean a considerable saving of cyanide at large plants, as the method generally used is to test the cyanide and protective alkalinity in one measured portion.

Into 10 c.c. of the test solution, using potassium iodide as indicator, run standardized silver nitrate until a deep brown coloration of iodide of silver shows clearly, and note number of cubic centimeters of silver nitrate taken. Now, using another 10 c.c. of the test solution, without adding potassium iodide, run in twice the quantity of silver nitrate that was necessary in the above test, to make sure of getting rid of the alkalinity due to cyanide. Add phenol phthalein and titrate with standardized acid. The result will be protective alkalinity.

A second method gives clearer results than the foregoing, and also does away with the first part of the previous test. Into the measured portion of test solution, to which has been added the indicator, phenol phthalein, run in silver nitrate until the indicator color remains constant, then titrate with standardized acid in the ordinary way. With a little practice this gives good results.

The accompanying table shows the results of testing solutions by the first of these methods. The test solution was made slightly acid as regards protective alkalinity by adding 3.5 c.c. standard hydrochloric acid; 10 c.c. of the acidulated test solution were taken for each experiment and tested for protective alkalinity by the method given:

	Protective Alkalinity, Per Cent.	
I. Without adding KI...	nil	Clear end reaction.
II. With ½ cc. KI........	0.002	Indistinct reaction.
III. With 1 cc. KI........	0.0037	Indistinct reaction.
IV. With 5 cc. KI........	0.0068	Indistinct reaction.

The results shown prove that solutions which contain no protective alkalinity give tests for protective alkalinity after the addition of potassium iodide, and that potassium iodide must be absent when testing cyanide solutions for protective alkalinity.

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*Abstract of a paper presented before the Institution of Mining and Metallurgy, Jan. 20, 1910.

Rio Plata Mining Company

The second annual report of the Rio Plata Mining Company, Chihuahua, Mex., for the year ended Nov. 30, 1909, states that during the year, 14,580 tons of ore were mined averaging 63.8 oz. of silver per ton. The cost of mining is given at $1.89 per ton, this covering labor, timber, explosives, hoisting and tramming. A total of 1684 ft. of development work was done at a cost of $9.22 per foot.

Milling operations for April were hampered for lack of power and in May and June from lack of water for batteries and concentrators. The report states that the cost per ounce of silver recovered was 27.5c.; the total cost per ton of ore handled, $8.181. The recovery in the cyanide plant was 87.6 per cent. The revenue for the year from sale of ore and concentrates was, $192,030; rents, $2253; ore and concentrates on hand and in transit, Nov. 30, 1909, $20,622; total, $214,905. The total expenses were $117,139; profits, $97,766, carried to surplus account.

Dredging and the Sampling of Placer Ground

Preliminary Sampling Done by Test Pits, Followed by Systematic Drilling; Important New Fields in Siberia, Alaska and South America

BY A. P. ROGERS[*]

Dredge mining under the proper conitions presents one of the safest and ost attractive forms of investment that xist today, but so many placer claims rove to be valueless after an examinaon has been made that a brief descripon of the methods pursued by engineers testing them should benefit the general ublic. A properly conducted examinaon will determine the possible return pon the investment as closely as anying can be figured, and it is to the inerest of the land owner to be more or ess sure of his ground before he beomes too enthusiastic about it.

Important Dredging Fields

The most extensive operations in redge mining today are those in Caliornia, where an immense amount of apital is invested in huge dredges, some f which handle over 250,000 cu.yd. f gravel per month at a cost of 2 r 3c. per yard. The Natomas Comany, in California, not only saves e gold but crushes much of the gravel r road material, and is now replanting e areas over which it has dredged, with ruit trees. This is, perhaps, the highest evelopment of the industry so far atempted, but it has long been known st how that land would dredge and the esults possible were much simpler to etermine than in a new, untried region, lthough they had to be worked out in e beginning with the crude New Zeaand dredge.

Another large field is in the Klondike egion of Alaska, where the Yukon Gold ompany has been at work for several ears in solving the problem of successully dredging frozen gravel. The gold ontents are higher than in California, ut the latitude of the country and the hort season during which work can be rosecuted, combine to make the costs of peration also higher. Conditions, altoether different from those in California, ave been met and overcome, although has required the best engineering skill nd much money to succeed.

Another field, which presents still a ifferent class of obstacles, is just openg up at present in the tropics of South merica and in the Philippines. In these ountries it is possible to work all rough the year unless torrential rains ause a temporary shutdown. The effect f malarial fevers and uncertain political onditions in these countries is still to be considered. There is much clay in some of the deposits, and an impenetrable jungle which must be cleared away covers most of them.

Perhaps the latest important field under observation is one in the Southern States, which is being tested to determine whether the gold can be extracted from a deposit containing a large percentage of sticky clay. The ordinary dredge will not produce results in this region, and it remains to be seen whether something can be devised to handle the material on a large scale. Dredging is still being carried on in several of our Western States; in New Zealand; and in sections of Siberia where the results, so far obtained, have been most encouraging; in fact, some remarkably rich deposits have been found in the latter country.

From this brief mention of the important fields, it will be realized how scattered are the deposits. Americans would prefer to operate in their own country, but the requisite natural conditions are difficult to find, and practically all of the larger deposits have been taken up. Those remaining are either small in area, low in grade, or present some other obstacle which must be overcome to prove successful.

Preliminary Sampling of Placer Ground

No dredge will do good work if left to itself. It is a complicated mass of machinery which must be carefully handled by experts in this particular line of work to obtain the results estimated by the engineer. It must be adapted to the particular conditions existing at each locality. It is the business of the engineer to determine exactly what these conditions are, and decide whether they are suitable for a dredge, as well as the amount of gold the gravel contains per yard. To obtain this information he lays out a course of action which will insure a minimum of expenses until he is satisfied the showing justifies a further outlay. In other words, he looks carefully in advance before each step is taken, and is in a position to stop at any time he finds an insurmountable obstacle before any large sum of money has been expended. If more people would recognize this form of insurance there would be fewer idle dredges lying about as expensive monuments to some disastrous failure.

To illustrate this advice by a concrete example, I will mention the methods pursued by the engineers in examining a piece of dredging land in South America a year or so ago. Gold has been known to exist in that region for centuries, and many attempts have been made by foreign companies to work the deposits with small dredges. Every one of these attempts proved a failure for one reason or another, and at the time of this examination practically all the dredges were out of commission. The engineer, however, noted upon his preliminary survey that the gravel contained much gold; in fact, the old Spanish workings were proof of this. The property was well situated upon a navigable river, and the physical conditions were ideal. He thereupon determined to obtain some samples by sinking pits to water level at stated intervals.

This is a rough method of sampling a property, but if it is well done by an experienced man, it is surprising to note how accurate the results may be. The pits must be sunk at points which will afford a fair average of the ground and have their sides as perpendicular as possible. Then, by scraping down one side of the pit with a pick for 18 in. from the surface, enough dirt or gravel is taken to fill three pans. These are carefully washed out and the gold so recovered is put away in a small bottle to be weighed later. The next 18 in. in depth is sampled in a similar way; and so on, down to water level. By assuming that 135 pans of gravel equal 1 cu.yd. in place, the value per yard for each 18-in. section can be readily calculated, as well as the average value for the whole pit. Of course, nothing can be told about the ground below permanent water level, but for preliminary purposes this method of sampling requires a minimum of equipment and it affords the man who does the work an excellent chance to see the character of the gravel. Where the water level comes directly to the surface, it cannot be used, and a hand drill should be employed, but it is seldom that such conditions exist all over a property.

As each pit is sampled the results are noted upon a plan of the property, and finally a general average for the whole plot can be estimated for the depth sampled. A small hand compass and a steel tape are the only instruments needed to make a rough plan of the property and indicate the relative positions and elevation of the pits.

With these data in his pocket, and all the information he could obtain regarding the history and physical conditions of the property, the engineer returned and submitted it to his principals. They decided at once to undertake a detailed examination for the purchase and equipment of the property.

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[*] Mining engineer, 25 Broad street, New ork.

Details of Sampling

This time the engineer took with him a churn drill and crew to thoroughly sample the ground. He had the benefit of his preliminary work to guide him in his operations and was able to plan his mode of attack with the least possible loss of time. While the crew was putting the drill together, the engineer with one or two assistants, proceeded to "flag" the ground. By this I mean that the area to be drilled was marked off into squares of equal size, and sticks with small pieces of cloth nailed to them were set up at the alternate corners of each square to mark the places where the drill holes were to be sunk. The size of the squares depends upon the nature of the deposit, and the engineer uses his good judgment in deciding what they shall be. Usually they are 200 to 400 ft. on each side.

When this work had been far enough advanced, a surveying party was sent out to make an accurate map of the property, showing the elevation and position of each hole or test pit. At the same time, the drill was brought to the first flag and started to work. Usually the first few holes that are put down will give an idea of the real value of the deposit, and if they are not encouraging, the drill should be skipped around from flag to flag until a channel can be located. For an ideal dredging property, the gold should be pretty evenly distributed through the gravel from the surface down to bedrock, and be bright enough to amalgamate easily.

The conditions found upon this particular property were excellent: The gravel was all small, with no stones larger than a man's head; there was a little clay mixed through the gravel but it contained so much sand that it would cause no trouble; the overburden of soil was not heavy; and the bedrock was a clay containing no gold. In addition to this, no blank holes were sunk, showing that the distribution of the gold was quite regular.

The data on each hole drilled were kept in detail, and after the work was finished, the general average value and yardage for the dredgeable area was figured out. Having obtained this information accurately, the engineer had something tangible to figure on, and could then determine what the working costs should be. While this ground has not yet been equipped, it soon will be, and the examination was so carefully and thoroughly done, there is no question that it will dredge as estimated and show good results.

Another case, which has proven that correct estimates can be made, may be mentioned here as an illustration of some accurate work. This was at a placer property in one of the Western States, upon which a dredge was already working, but upon a poor part of the deposit. The ground had not been properly drilled in the beginning, and the anticipated profits were not obtained. It was decided to drill ahead to see if something better could be found. A hand drill was employed for this purpose, and after the work was finished, the dredge was moved over to this new ground. The results have checked up almost exactly with the sampling done, and have proved a great benefit in directing the future operations upon the property.

Placer Deposits Containing Clay

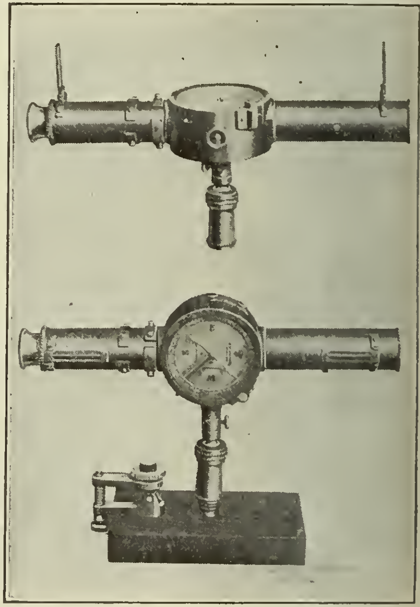
Perhaps one of the most interesting properties now being tested to determine its commercial value, is one in North Carolina, which I have already referred to. This region has been regarded generally as a doubtful gold country for several reasons, although the presence of gold has long been known and a large amount has been recovered by individual workers. All attempts to work these deposits successfully upon a large scale, however, have been failures because the promoters did not correctly understand the conditions, or because of the low-grade gravel. The nature of the deposit is most unusual; in fact, it is unique in that it is not a placer deposit in the generally accepted definition of the term. Here we find a micaceous schist, through which a system of small quartz stringers carrying free gold run in every direction, forming a veritable network of little veins, called a stockwork deposit. The peculiar characteristic of the field, however, is the fact that the schists have decayed and rotted away into a kind of clay, breaking up the veins and setting the gold free. This large amount of clay prevents the use of any ordinary methods for its recovery, and it is only within the last year that a machine has been devised and perfected to handle it successfully. This machine, called a separator, has been described by other writers and I need only say that it breaks up the lumps of clay, which washes away, while the gold remains behind, due to its greater specific gravity. To definitely determine this point has required a long series of experiments and a careful sampling of the ground, before making any outlay upon a dredge. The results obtainable have been so satisfactory that the property is to be equipped with a large dredge, using these separators in place of riffles. Some of this ground runs over 50c. per cubic yard.

These illustrations are mentioned as examples of dredging operations which have been brought to a successful issue, or give promise of so doing. Every piece of placer ground, however, is not necessarily suitable for dredging purposes. At each one the conditions vary in some particular, and it becomes a question of solving these conditions successfully and at a profit which will warrant the investment.

A Stadia Hand Transit

A stadia hand transit is being made by Keuffel & Esser Company which increases the adaptability of hand instruments in surveying. In measuring vertical angles, the sighted object and the two scale readings (slopes and degrees) appear together in the field of view. Compass bearings can be sighted by the telescope on level ground, or by the folding sights on sloping ground.

The instrument is threaded to be mounted with the compass box horizontal for using the compass, or vertical for using the clinometer. The leveling attachment is adjusted by slow-motion screw and considerably increases the accuracy, especially when sighting at long range.



Stadia Hand Transit

In combination with a flexible leveling rod, this transit is convenient for many kinds of surveying work and will give greater accuracy than is usually expected from a hand transit.

The flexible leveling rods are strips of prepared canvas, 3 in. wide, graduated like self-reading rods. For use they are fastened to a straight board with thumb tacks, and when rolled up are easily carried in the pocket.

The telescope is 10 in. long, and provided with a 1-in. object glass with cross hairs and stadia hairs adjusted to read 1:100. Vertical angles can be measured to single degrees.

Recent Patents for Basic-lined Copper Converters

A Review of the Peirce and Smith Converter Patents; These Basic-lined Converters Being Used at Garfield, Baltimore and Perth Amboy

BY RICHARD H. VAIL

The experiments which have been in ogress at the Garfield plant of the nerican Smelting and Refining Company r a number of months with basic-lined nverters, designed by William H. Peirce d Elias A. C. Smith, of Baltimore, will ake of interest a review of the va- us constructions which they have re- ntly patented. The converters as used practice are of unusual length, being out 20 ft. long by 10 ft. in diameter. ey are lined with magnesia brick, silica fluxing the iron being added in the rm of ore which is fed from "boats." e use of basic lining is not novel in pper converting and offers no metallur- cal difficulties. They are indeed in ne respects easier to operate than acid- ed converters.

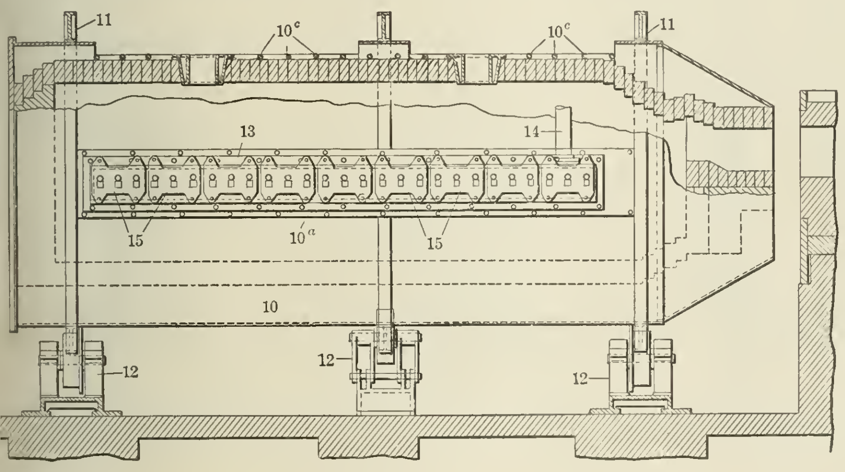


FIG. 1. SIDE SECTIONAL ELEVATION OF PEIRCE AND SMITH BASIC-LINED CONVERTER

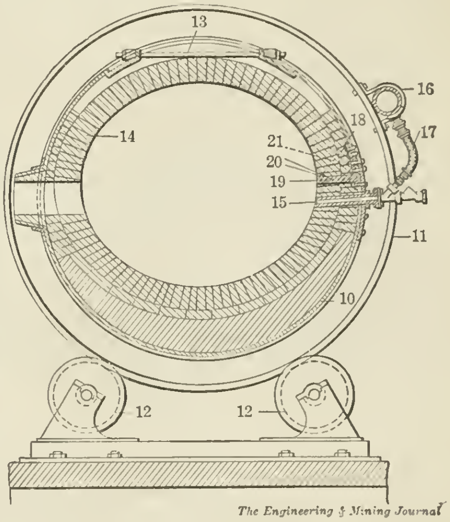


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FIG. 2. LATER ARRANGEMENT OF INDIVIDUAL TUYERE PIPES

PHYSICAL DIFFICULTIES

The difficulty in the operation of the sic-lined converter has from the first en in getting the lining to withstand the ysical strains, and the patents taken t by Messrs. Pierce and Smith have th one or two exceptions been en- ely along this line. Their efforts repre- nt a number of ingenious improvements d have demonstrated the possibility of commercial use of basic-lined copper nverters, a concomitant of which will obably be the treatment in many plants lower-grade mattes than can now be ofitably handled in acid-lined convert- s.

At Baltimore at the plant of the ltimore Copper Smelting and Rolling mpany, where the practical features these converters were worked out, the basic-lined converter has been operated for about two years. Three basic-lined converters have been built at Garfield, Utah, and one has been in operation for about nine months at the Perth Amboy plant of the American Smelting and Refining Company, where copper and lead-copper mattes have been successfully converted, connection being made with the baghouse when the lead-copper matte is treated.

THE FIRST PATENT

The first important patent by Messrs. Peirce and Smith was applied[1] for June 13, 1908. This application is liberally quoted from herewith as the inventors have given therein a general review of their aims.

Owing to the large percentage of iron always present in the matte, as a cheap source of fuel supply to insure requisite fluidity, the corrosion of acid converter lining goes on apace, and the whole of the free silica is quickly taken up so that the renewal of the lining becomes necessary, at much delay and expense, after only a few hours' run. To avoid such frequent renewals of the acid lining, it has been proposed to employ instead, a basic lining, this generally being composed of magnesia brick.

The silicious flux for union with the iron oxide to form the slag is no longer derived from the lining, but is introduced into the converter in the form of loose pulverulent ore supplied at suitable intervals.

Experience, however, soon showed that the converter with ordinary basic lining was nearly as short lived as the earlier form equipped with the corrodible acid lining. The tuyeres for the air blast were composed of perforated magnesia brick. As is well known, the entering blast chills the charge in proximity to the air vent, so that a "cold nose" quickly forms and becomes adherent to the tip of the tuyere. Constant vigilance on the part of the workmen becomes requisite to dislodge the nose by thrusting the punching tool through the air channel of the tuyere. This "cold nose" was especially adherent to tuyeres of magnesia brick, and pieces of the brick were frequently broken off in removing the chilled material. In a comparatively short time the bricks become so thin as to require renewal, or to impair the fidelity of the construction immediately above.

EXPANSIBLE LINING

The invention further designs to provide an inner non-corrodible lining free to shift under varying heat conditions. The plan was to equip the converter with a non-corrodible lining of tenacious coherent texture, left free to expand or shift under heat, without risk of buckling or rupture, said lining to be united with a set of tuyeres flexibly sustained so as to participate in the play of the lining up and down, the lining thus being maintained in floating fashion, as it were.

As shown in Figs. 1 and 2, the upper side of the converter shell is left open, while a series of tie rods, 10c., extends across the opening to keep the shell from spreading, which otherwise might easily occur, once the inner lining expands or swells far enough under the influence of extreme heat.

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[1] U. S. Pat. No. 942,346; Dec. 7, 1909.

CAST IRON TUYERES

It was planned to form the flexible tuyere of cast iron, entending entirely through the lining, but properly jointed at the back to the air conduit in tight fashion to prevent all vagrant leaks of the blast, such as in prior usage tended constantly to undermine the coherent lining. Formed of metal, the improved tuyere stoutly withstands the blow of the punching tool, while, as experience shows, the "cold nose" that forms constantly at the tuyere tip is much less adherent than in the case of the earlier magnesia tuyere; hence the nose is detached readily when attacked by the workmen.

In the original application, each tuyere was to consist of a hollow iron casting, made square in cross-section, to snugly adapt itself to the faces of the lining brick. Referring to Fig. 3, the tuyere 16 extended entirely through the lining for certain delivery of the air at the very tip.

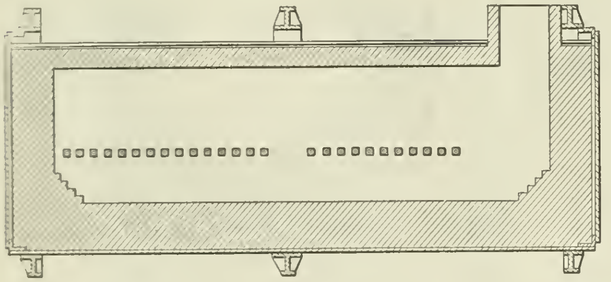

FIG. 4. SMITH PATENT WITH CONVERTER MOUTH AT END

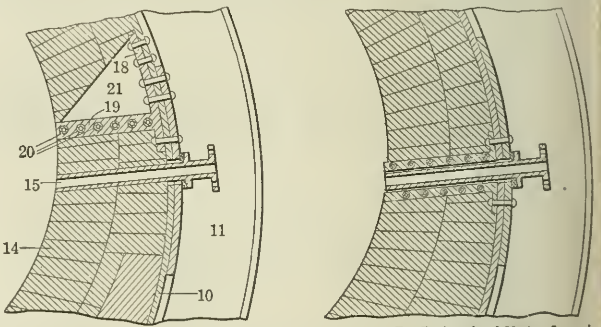

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FIG. 5. BRACKETS TO KEEP LINING STATIONARY

In position the tuyere was set at a slight incline and furnished with an enlarged head 17 that rests snugly within a square hole of the retainer plate 18, arranged to receive three adjacent tuyeres. About the neck and head of each tuyere is placed packing 17 *a*, originally of asbestos wicking (metallic lead is now used as packing), sufficient in quantity to stop the leakage of air next the shell and serving besides to sustain the tuyeres by a flexible air-tight joint during the rise and fall of the tuyere at its free end, due to the "heave" of the lining, as the latter contracts or expands under the changes of temperature occurring within the converter. The old type of windbox has been replaced in actual practice by a bustle pipe from which the air is supplied to each individual tuyere by rubber hose. The tuyere valves are of the Dyblie ball type.

The original specifications suggest that the vessel's interior be lined with magnesia brick of the usual sort but instead of lining the layer of brick and tuyeres with the usual cement of ground magnesite with a slight addition of clay to cause the cement to adhere, it is suggested to employ for the purpose a cement composed of ground magnesite and linseed oil. Experience showed that the cement thus prepared bakes hard and clings to the brick and tuyeres, completely closing all cracks and passages (otherwise apt to develop) and remaining tenacious and adherent at all extremes of temperature within the vessel.

ARRANGEMENT OF TUYERES AND CONVERTER MOUTH

Another patent[2] taken out by Mr. Smith relates to the arrangement of the converter tuyeres, regardless of whether the operation is carried on in a converter having an acid or a non-corrodible lining. The characteristic feature of this invention consists in so arranging the tuyeres that the outlet port will be substantially out of range of the ejecting or "slopping" action of the tuyeres. This will be readily understood by reference to Fig. 4 in which the outlet port or mouth of the converter is shown substantially at the end thereof; the outlet port, however, may be at any other position. The converters in use at Garfield, Utah, and at Perth Amboy have the mouth in the position shown in the illustration.

ABUTMENT TO ANCHOR LINING

To prevent the distortion or breaking of tuyeres by the shifting of the lining, Mr. Peirce in October, 1909, filed application for a new patent[3] in which the lining is shiftable, relatively to the shell, as before, but that section of the lining in the immediate neighborhood of the tuyeres is anchored to the shell to form a zone in which there is no substantial shift. The lining is made stationary at the tuyere belt by means of the metal abutments, secured to the shell and extending into the lining adjacent to the tuyeres. The abutment comprises a series of cast-metal brackets preferably arranged above and spaced apart from the tuyeres as shown in Fig. 5; the brackets thus form a barrier against substantial transverse shift of the lining in the immediate neighborhood of the tuyeres so that the latter cannot be bent or broken by the movement of the lining. The lining is otherwise free to expand under the influence of the heat of the operation, and may shift in opposite direction from the tuyere belt and thus preserve its continuity.

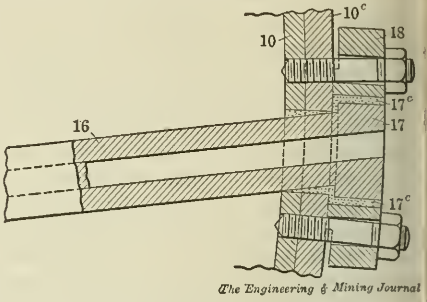

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FIG. 3. THE CAST-IRON TUYERE

The brackets are preferably water cooled, in which case the application states that it is preferable to place them far enough above the tuyeres to prevent the submersion of the brackets when the converter is in operation, thus avoiding the danger of explosion in case the water-cooled brackets should leak. In the form shown the inwardly projecting portion or shelf 19 of each bracket is provided with water pipes 20, extending longitudinally therethrough. Each bracket has strengthening ribs 21 that extend between the upper side of the shelf 19 and the base portion 18, the ribs being spaced in accordance with the size of the lining bricks employed. Another form of bracket is also suggested in which the water-cooled bracket surrounds the tuyeres, and is riveted at the base to the converter shell.

SHELL WITH TELESCOPIC HEAD

In his latest patent[4] Mr. Peirce provides for a cylindrical shell with flanged head which telescopically engages the end of the converter shell, and with adjustable connections between the head and shell. As shown in Figs. 6 and 7, the cramp bars extend across the outer face of the head and are connected to the shell by a tie-bolt. As the lining expands, the tie-bolts are slackened off so that the head may be forced outwardly to relieve the strain. The tie-bolts are preferably provided with yielding washers or equivalent devices. Fig. 6 is a view partly in side elevation and partly in longitudinal section of such a converter. Fig. 7 is an enlarged detailed section of the expansible head through the line 4-4.

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[2] U. S. Pat. No. 942,675, Dec. 7, 1909; reissue, No. 13,080, Jan. 25, 1910.

[3] U. S. Pat. No. 942,661, Dec. 7, 1909.

[4] U. S. Pat. No. 944,905, Dec. 28, 1909.

All of the patents here described are not embodied in the construction of the converters as used at Garfield. Their principal points, however, are shown in Figs. 2, 4, 6 and 7. There have been no especial metallurgical difficulties, but certain mechanical changes have been made as occasions manifested themselves in the actual operation. In the course of nine months' operations the converters have demonstrated that a much larger tonnage can be handled with a decided reduction for lining expense. Mattes of lower grade can also be profitably made with the incidental smelting of larger quantities of silicious ore.

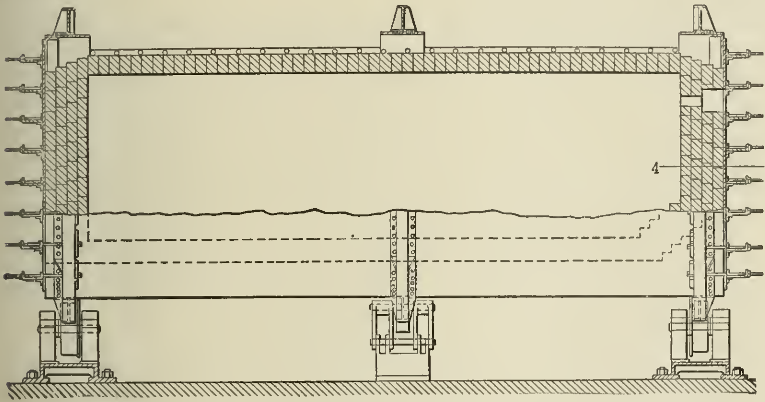

Fig. 6. Side Sectional Elevation of Converter with Telescopic Ends

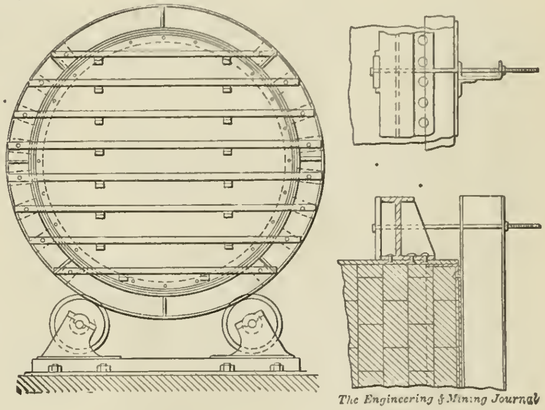

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Fig. 7. Section of Head and Details of Cramp Bars

The linings are laid with 9-in. magnesia bricks, several courses being used at the lower portion of the shell. Around the tuyeres, however, 18-in. brick is used. The principal wear is along and just above the tuyere zone. The tuyeres and brick adjacent require replacing after production of from 2,500,000 to 4,000,000 lb. of copper. The average lining is expected to give a production of 1000 tons of copper from 35 to 40 per cent. matte. The slags are kept somewhat lower in silica than when acid-lined converters are used. The charges are usually started with about 40 tons of matte, which is added to at intervals until about 100 tons have been put in, the charge then being blown to blister copper. It is expected that a detailed account of the operation of these converters will soon be available for publication.

The second gram of radium has just been produced at Joachimsthal, Bohemia, and word has been sent to the Austrian sales bureau that it is now available for shipment. By every gram of radium produced the Austrian exchequer benefits, as its value is fixed for valuation purposes at $2,375,000 an ounce, and the demand far exceeds the supply.

Dolcoath Mine, Ltd.

The report of the Dolcoath Mine, Ltd. of Cornwall, for the last six months of 1909 records a profit of £12,722 as against £14,827 for the previous six months. The grade of ore worked has fallen from a recovery of 48.85 to 43.68 lb. of black tin per ton of ore. The increased market price of tin has allowed lower grade of ore to be worked at a profit. The working costs were 25.7s. exclusive of the lord's royalty of 2.2s; the company's profits were in round figures 5.5s. per ton. The new vertical shaft, which will, it is hoped, produce more economical work, is not yet in commission. The present depth is 2832 ft. and further sinking will be continued to 3000 ft. The manager's report gives particulars of the grade of ore met with at those parts of the mine where development is in progress, but from the way the information is presented, it is not easy to say whether, on the whole, the condition of the mine is as satisfactory as it was at the date of the last report. The impression given is that the bottom developments are not so favorable as they were, owing to the occurrence of a "sparry" course which is unproductive in tin. A longitudinal section with the ore reserves plainly marked would make the situation more intelligible. What one would like to know is the tonnage developed and its value, and what the prospects are as regards a reduction in working costs when the new shaft is in working order.

Lackawanna Steel Company

This company owns blast furnaces and a steel plant near Buffalo, N. Y.; iron-ore mines in the Lake Superior region, and other subsidiary enterprises. The report for the year 1909 shows $34,750,000 stock; $23,517,000 bonds, and $15,000,000 notes outstanding. The cost of property and plants is given at $63,105,916; while the sum of $6,191,379 is given as the value of investments in iron-mining and other subsidiary companies.

The income account for the year is as follows:

Gross sales and earnings	$25,296,661
Interest on investment	451,430
Total receipts	$25,748,091
Operating expenses	$20,586,839
General expenses and taxes	692,877
Total expenses	$21,279,716
Net earnings	$ 4,468,375
Interest, rentals, etc	3,690,266
Surplus for the year	$ 778,109

Gross sales and earnings increased $10,208,779 over 1908, but were $7,714,749 less than in 1907.

Oil Developments in West Virginia

Among new companies drilling for oil in the West Virginia field are the Regal company at Parkersburg, the White Rock Oil Company at Lewisburg and the Porter Oil and Gas Company in Brooke county. In Marion county, the Burt Oil Company's second well, on the J. R. Baker farm in the Mannington district, began to spout 40 bbl. per hour; it is 1200 ft. south of the Wells well which started with 75 bbl. per hour last year and is now yielding 450 bbl. per day.

In Harrison county, Miller & Co.'s new gusher on the Nimshi-Mizum farm is now producing 450 bbl.; the South Penn wells Nos. 1 and 2 on the Whiteman farms are giving 1050 and 1260 bbl. respectively; while No. 1 well of the Philadelphia company, on the Swiger land, is flowing 750 bbl. per day.

In Roane county, Lovering & Wooster have just brought in a 25-bbl. producer from the Big Injun sand on the Hascue farm in Walton district. In Lincoln county, the Interstate Gas Company has struck a gasser of 1,000,000 cu.ft. daily yield, on the Cook-Evans farm in Sheridan district. In the Duval region, the South Penn Company in its No. 11 on Horse Creek, and the Ohio Fuel and Oil Company, on the Morrison farm, have both drilled through the Berea grit for small oil wells below, while a gasser has been struck by the Hamlin Oil Company.

Cyanide Practice at Minas del Tajo, Sinaloa

Crushing in Solution; Separate Sand and Slime Treatment, Oliver Continuous Filters Being Used for the Latter; Treatment Costs $1.37 per Ton

BY G. A. TWEEDY AND R. L. BEALS*

The old pan-amalgamation process, in operation at the Minas del Tajo up to and including 1905, while paying a profit on high-grade ores, was no longer able to treat profitably the ores in sight at that time; hence an alteration in the process was imperative. Crushing with stamps and subsequent treatment by cyanidation was finally decided upon. The success of this alteration is eloquently expressed in the comparative cost data in Table 1.

TABLE 1. COMPARATIVE COST BY CYANIDATION AND PAN AMALGAMATION.

	Pan Amalgamation.	Cyanidation. 1907.	1908.
Tons treated	51,387	58,983	69,200
Value per ton	$10.78	$8.39	$8.28
Extraction, per cent.	65.00	88.56	87.45
Extraction, per ton.	$7.00	$7.43	$7.24
Total cost, per ton treated	6.50	4.36	4.01
Profit, per ton treated	0.50	3.07	3.23

CHARACTER OF ORE

Two classes of ore are mined and treated—namely, oxidized and unoxidized ore. Roughly speaking, all ore coming from below the 150-ft. level falls into the latter class.

Unoxidized Ore. Type 1, characterized by large proportion of galena, not rich in silver, and presenting no difficulty in treatment. Type 2, carrying a lesser proportion of galena, accompanied, however, with blende and chalcopyrite. Whenever this chalcopyrite is found the ratio of gold to silver increases. This type of ore is amenable to treatment, but causes a larger cyanide consumption. Type 3, clean ore, carrying little base sulphides, with a greater ratio of silver to gold, and easily cyanided. The gangue of this type contains a considerable amount of rhodochrosite and feldspar.

Oxidized Ore. The counterparts of these types in the oxidized ore are traced by their silver-gold content ratio, and by the presence of analogous minerals derived from the oxidation of the base sulphides, etc. For instance, Type 1 shows considerable lead carbonate; Type 2, a lesser amount of lead carbonate, accompanied by zinc carbonate and copper carbonates and oxides, while Type 3 contains manganese oxides, particularly psilomelane or wad.

All these types are amenable to cyanide treatment, Type 2 causing the greatest cyanide consumption, while Type 3 produces the most slime, due to the greater proportion of clay.

A typical analysis of Type 3, oxidized ore, is: Copper, 0.2 per cent.; iron, 4.2; zinc, 1.4; manganese, 1.6; lead, trace; lime (CaO), 1.2; sulphur, 1.5; insoluble (Al_2O_3 and SiO_2), 82.8; undetermined, 7.1; gold, 0.20 oz. per ton; silver, 8.60. The sulphur is partly combined as sulphide and partly as the sulphates, $FeSO_4$ and $Fe_2(SO_4)_3$, the acid sulphate accounting for the greater acidity of this class of ore. The undetermined comprises CO_2, oxygen of the sulphates, and oxygen combined with manganese, etc.

PRELIMINARY EXPERIMENTS

Before the erection of the stamp mill and cyanide plant, experiments were conducted to determine the best method of treatment. The ore experimented upon was the unoxidized class. Samples were taken from various parts of the mine and treated separately in 100-lb. lots.

The feasibility of collection of sand, leachability, and extraction on a working scale were determined by small mill runs, the ore being crushed in 5- and 10-ton lots in a five-stamp battery; the pulp was run to a pit, where the sand was collected, the slime overflowing through a gate and settling in a tank below the pit, the overflow being regulated by raising the gate. The net result of these leaching tests showed:

(1) That the extraction of gold was 97 per cent. and silver 89.6 per cent.

(2) That the dissolution of the gold was rapid, the silver going into solution more slowly.

(3) That the best results were obtained by allowing the charges to drain thoroughly before each addition of solution.

(4) That the leaching rate was 4 to 6 in. per hour, and that no serious fouling of working solution took place.

(5) That the cyanide consumption was 2.2 lb. per ton of sand.

The collected slime from the test runs was treated, in small tanks fitted with mechanical stirrers, by agitation and decantation in solution averaging 0.20 per cent. of KCN. The extraction was: gold, 94, and silver, 88 per cent. The consistency of the pulp giving the best results was 4 of solution and 1 of dry slime. The slime settled to 52 per cent. of moisture in 12 hours.

To determine the advisability of concentration of the ore, a sample of the sand in each charge was concentrated before and after treatment with cyanide. A slightly increased extraction could be made by separating and regrinding, but this increased extraction was not sufficient to justfy the erection of an extra plant.

OUTLINE OF OPERATIONS

The ore from the mine is crushed by a No. 5 Gates breaker, style K, to pass a 2-in. ring. The breaker is fed from two 200-ton bins, and the ore, after crushing, is elevated by inclined belt to the fine-ore bins. The mill and cyanide plant are situated on the Rosario river, half a mile from the mine, the ore being hauled to the mill by a light locomotive in gable-bottom cars, holding 15 tons. The bins at the mill have a capacity of 600 tons. The ore is fed from the mill bins by automatic feeders to 12 batteries of 5 stamps each, crushing in cyanide solution. Lime is added to the ore in the bin as needed. The alkalinity of the battery solution is maintained at 0.05 per cent. of CaO. From the batteries the pulp flows directly to four sand-collecting tanks, each holding 145 tons of dry sand. The pulp is distributed by radial-arm distributors, fitted with ball bearings, each tank being equipped with a distributor. The sand settles, and the slime overflows through four curtained gates to a launder leading to the slime plant.

The two slime-collecting tanks are 35 ft. in diameter by 9.5 ft. deep, set in series, so that the pulp enters one and overflows to the second. The overflow from the second tank runs to a concrete sump, and is then pumped back to the battery-supply tank above the mill.

The sand, after collection and thorough draining, is transferred by cars to the leaching tanks, 14 in number. After treatment the sand is sluiced to the river.

The thickened slime is withdrawn at regular intervals from the slime-collecting tanks. The treatment of this slime, by agitation and settlement, takes place in nine tanks, each 24 ft. in diameter by 9.5 ft. deep. From the treatment tanks the slime is transferred to a tank of the same size, supplying the filters.

The solutions from the sand and slime plant are collected in sumps, built of brick and faced with cement. Centrifugal pumps, driven by the engine running the slime plant, handle the solutions. The water for the mill and mine is supplied by steam pumps situated in a well connected by a tunnel with the river.

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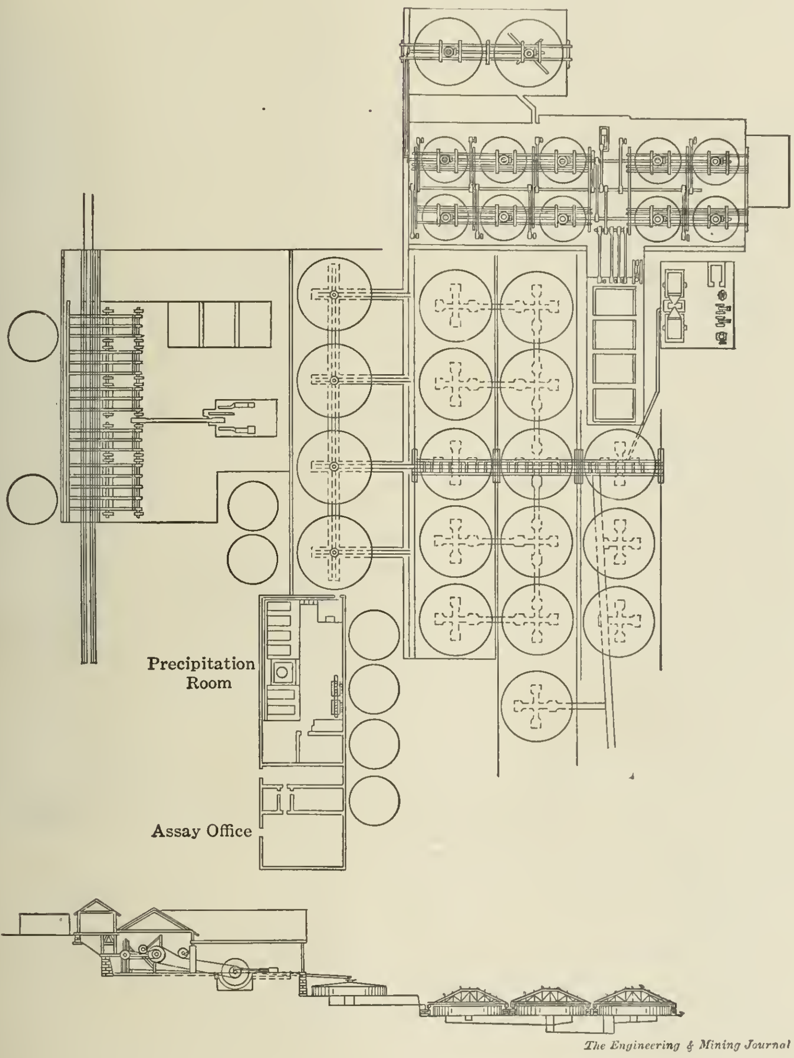
*Rosario, Sinaloa, Mex.

NOTE—Excerpt from a paper, "Cyanide Plant and Practice at the Minas del Tajo, Rosario, Sinaloa, Mexico." *Bull.* 38, A. I. M. E., Feb. 1910.

STAMP MILLING

The mill consists of 12 batteries of 5 imps set on concrete mortar blocks. ie battery frame is of the front-knee ttern, the sills anchored in concrete by 5-in. bolts. Each mortar weighs 5 tons. iough designed for double discharge, ey now have the backs blocked up with ieavy cast-iron plate and are fitted with iers. The mortars were planed on their ses, and the tops of the concrete blocks ere finished carefully with neat cement. tween mortar and block a 1/8-in. sheet rubber is placed; eight bolts, 1.5 in. in ameter, are used to hold the mortar gidly in place on the block.



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PLAN AND SECTIONAL ELEVATION OF MILL AND CYANIDE PLANT

The gross weight of the stamp with w shoe is: stem, 450; boss, 350; tap- t, 120; shoe, 180; total, 1100 lb. The erage running weight is 1010 lb. The ight of the die used, when new, is 140 The stamps drop 6.5 in. 104 nes per minute. Wooden guides are ed, which last from 8 to 10 months; e wood is native and is extremely hard d of fine grain.

A cross-compound, slide-valve engine drives a line shaft running the batteries, eight having separate drive, while four are driven in pairs, 10 stamps to a shaft; however, the separate drive for each battery is preferable. Idler pulleys are used as belt tighteners. For the 60 stamps, 125 h.p. is required.

When crushing with double discharge it was found that an excessive amount of solution was necessary in order to maintain a proper wash in the mortars, from 10 to 12 tons being required per ton of ore. With single discharge, the same amount was crushed with 6 tons of solution. Chuck blocks are used to maintain the discharge at from 2.5 to 3 in., which is the hight of greatest capacity. The endeavor was to obtain as great a capacity per stamp as possible, with the condition of keeping the amount of coarse sand under 6 per cent.

Using woven-wire screens, crushing in cyanide solution carrying from 0.04 to 0.08 per cent. of CaO, the lime built up on the screens and choked them, closing the holes as with a cement. Frequent brushing was necessary to keep the holes clear, and this broke the screens; 30-mesh iron-wire screens were tried and discarded. Heavy punched plate having holes 0.6 mm. in diameter gave a properly sized product, and no trouble from lime deposition; but the capacity was low, since the holes were spaced too far apart and the plate was too heavy. Diagonal-slot screens, the slots 0.6 mm. wide, gave capacity, but as they rapidly wore to 1 mm. and larger at the lower end of the slot, the product was too coarse.

It was finally found that thin, punched, tinned screens gave the best results; these last 15 or 20 days as compared with 30 or 40 days when using the heavy plate. Their cost is such, however, that though lasting but half the time, the screen cost per ton crushed is one-third of that resulting from the use of heavy plate.

The stamp duty varies with the class of ore, from 3.5 to 4 tons, and the total cost of stamp milling is slightly under 49c. per ton.

The quantity of slime in the pulp from the stamps increases from 35 per cent. in crushing unoxidized ore to 45 per cent. in crushing a mixture of oxidized and unoxidized, the screens, discharge, drop and solution used being the same in each case. The pulp from the batteries is delivered to a V-shaped launder running to the sand-collecting tanks. The launder is set on a grade of 2.75 per cent., which is sufficient to keep the launder clear, when using 6 tons of solution per ton of ore.

THE SAND PLANT

There are four redwood collecting tanks, each 35 ft. in diameter by 4.5 ft. deep, fitted with pine filter bottoms supporting cocoa matting and 6-oz. duck filter cloth. The filter cloth is protected by 1.5-in. strips spaced 2 in. apart. The filter and strips take up 6 in. of the depth of the tank.

Each tank has a radial-arm distributor, and four side outlets for the overflow of slimes. The outlets are 4-in. pipes, and have a lattice and curtain in front to control the overflow. There are also four bottom doors. The pulp from the batteries is delivered to the hopper of the distributor and spread over the tank. The sand settles, while the slime overflows the curtains and is delivered to a launder running to the slime plant. As the sand collects the curtains are raised, the endeavor being to overflow as much of the slime as possible. A charge amounting to 145 tons drains to 15 per cent. of moisture after 30 hours.

Charges are allowed to stand as long as possible before transfer, usually 60 hours. The sand is then shoveled through the bottom-discharge doors to cars, and charged into the treatment tanks. The cars containing the sand are trammed over the treatment tanks on movable bridges. Two cars are handled at a time; the sand is charged evenly over the surface of the tank and leveled off. The traveling bridges are a cheap and efficient means of filling the tanks, and no vibration is transmitted to the tank to cause settling and channeling of the sand. The work of charging, done by contract, costs 5c. per ton.

The leaching tanks, 14 in number, are the same size as the collecting tanks. The canvas filter is held in place by strips, ½x5 in., spaced 5 in. apart and radiating from the discharge doors, which protects the cloth while the sand is being discharged. The sand leaches rapidly and drains to 25 per cent. of moisture in 6 hr. After the first addition of solution and draining, the leaching cocks are left open for all succeeding leaches till the tank is ready to be discharged.

The solution from the slime plant, consisting of the decantations from the last treatments of the slime, is pumped to two supply tanks situated above the sand plant. This solution, which carries from 1 to 1.5 oz. of silver and from 0.03 to 0.06 oz. of gold, is brought up to a strength of 0.25 per cent. of KCN by addition of cyanide. This solution is used for the first or strong washes on the sand, being run on the tanks every 8 hr. with continuous draining. The tanks drain to from 22 to 25 per cent. of moisture between the additions of solution.

When the silver dissolves rapidly the addition of strong solution is stopped after three days, and solution from the slime plant is used without addition of cyanide. It takes from three to seven days to bring the undissolved value of the sand to less than 2 oz. of silver per ton. The charge is then allowed to aërate from two to three days.

The solutions from this first period of treatment are collected in a sump and pumped to the high-grade solution tank above the precipitation boxes. After precipitation, the solution is used for the barren leaches, being put on the sand after it has been thoroughly aërated. This precipitated solution, titrating from 0.15 to 0.25 per cent. of KCN, is used for from three to six days until the residue and undissolved values of the sand are approximately equal. When the leaches drop in value to 0.4 oz. of silver and 0.01 oz. of gold per ton, the tank is allowed to aërate a second time for two or three days. The leachings during this second period are collected in a separate sump. The sump solution, assaying from 1 to 2 oz. of silver per ton, is pumped to the second tank above the precipitation boxes.

After the second aëration, water washes, in lots of 10 tons each, are continued usually for two days, and the drainings drop to 0.1 oz. of silver per ton, a trace of gold, and a cyanide content of from 0.02 to 0.03 per cent. of KCN. After the final water washes, the tank is drained and sluiced to the river through the four bottom doors. It takes from 8 to 10 hours to discharge the sand, since the tanks are shallow. One man using a 2-in. hose, under a 40-ft. head, washes out the sand, the launders carrying the discharged sand having a 3 per cent. grade. The total time of treatment is approximately 18 days, which allows for from four to six days' aëration in the tanks. Without this aëration a much larger quantity of solution is necessary to accomplish the work.

A summary of the cost per ton of sand treated for a period of seven months, based on a total quantity of 23,925 tons, is given in Table 2.

TABLE 2. COST PER TON OF SAND TREATED.

Labor (native)	$0.1066
Employees (white)	0.0324
Cyanide	0.2367
Lime	0.1040
Filter cloths	0.0074
Shovels	0.0028
Pipe and sundries	0.0025
Miscellaneous	0.0130
Power	0.0934
Total	$0.5988

The Slime Plant

The slime plant consists of two collecting tanks, 35 ft. in diameter by 9 ft. 6 in. deep, and ten treatment tanks, 24 ft. in diameter by 9 ft. 6 in. deep, with filter presses, necessary pumps, etc. All the tanks are of redwood with 3-in. staves. There is a 4-in. centrifugal pump connected to each tank. These pumps are driven by friction-clutch pulleys from a line shaft between the tanks, running at 800 r.p.m. They handle the contents of a tank in 1 hr. 15 min. The pumps have solution lubrication, and the runners and shaft last for two years. The runners, of the inclosed type, have given no difficulty in pumping thick or sandy slime, and have a much greater efficiency than open runners of the star type. Each pump requires 1.5 and each agitator 1 horsepower.

The treatment tanks are arranged in two lines of five tanks each. Each tank is equipped with a mechanical agitator consisting of two cross arms, driven by crown wheel and spur gear from a line shaft over the top of the tanks. The arms revolve six times per minute.

The pulp overflowing from the sand-collecting tanks is delivered by a 6-in. pipe, set on a 1 per cent. grade, to a box at the side of one of the 35-ft. slime-collecting tanks. At the opposite side of the tank is a slotted decanting pipe, through which the overflow of solution passes to the second tank. From the second tank a similar pipe carries the solution to the battery sump, whence it is returned to the battery-supply tank by the centrifugal pumps.

Slime charges are drawn from the collecting tanks, at intervals depending on the time of treatment and the tanks available, by a 4-in. centrifugal pump running 1200 r.p.m. This pump transfers a charge of 35 tons in 30 min. The charge, after transference from the collecting tanks, is agitated with pump and stirrer, settled and decanted. This operation is repeated, using weak precipitated solution. The number of treatments given varies with the ore. Practically all the gold is dissolved in from 4 to 6 hours after the first agitation begins, while the silver dissolves slowly and quite uniformly whether the pulp is being agitated or not.

The addition of oxygen from the air, necessary for the dissolution of metals by cyanide, is much better made to the clean solution before it is mixed with the slime, for it is much more soluble in clean solution than in a thick pulp, and therefore frequent additions of fresh solution are preferable to continued agitation of a thick pulp.

There are 10 tanks available for the treatment of slime; one is used as a supply tank for the filters, and of the nine remaining, two are at present used for the treatment of slime accumulated during the last years of the pan-amalgamation plant. With the seven tanks remaining, 70 hours are available for treatment, charging a tank every 10 hours. Four agitations are given, the first of eight hours and the three following of four hours each, which allows time for four 12-hour decantations and two hours for the charging of the tank and the transference of the charge to the filter-supply tank. The transference is done by the same pump used in charging the treatment tanks.

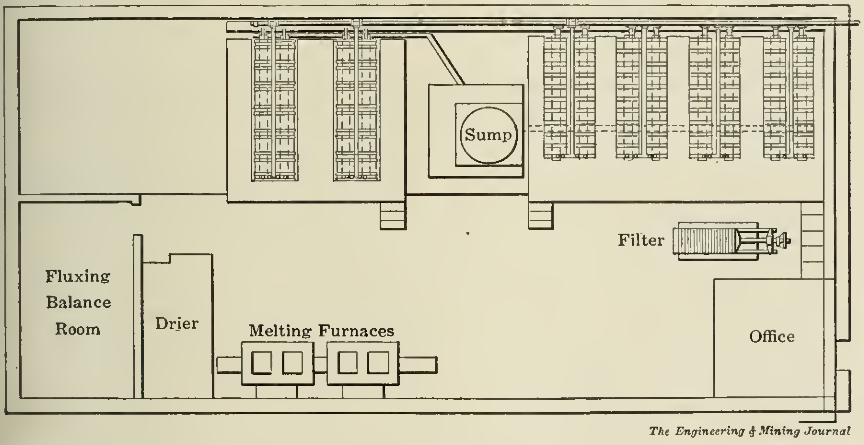
The filter plant has two Oliver continuous filters, each of 60 tons capacity, which were described recently in the JOURNAL. The cost before the installation of the filters was $1.21 per ton of slime. The filters reduced this to 91c. per ton.

Precipitation

The solutions from the sand and slime plants are collected in sumps situated at the foot of the plant. Centrifugal pumps deliver the solution for precipitation to two tanks placed above the precipitation room, which is 40x80 ft. in area. A plan of this room, showing the position of the zinc boxes, furnace, etc., is given in an accompanying illustration. Along one side of the room are zinc-precipitation boxes of two types: eight are of sheet steel, having 10 compartments, 12x22x27 in.; 6-mesh screens are placed 5 in. above the bottom. The bottoms are hopper-shaped and discharge through 2-in. iron cocks to the clean-up launder, which delivers the solution and precipitate to the sump situated in the middle of the room on the side containing the boxes.

Two pairs of wooden boxes are placed on the other side of the sump, each having five compartments, 24x24x22 in., and one compartment, 12x24x22 in., used for settling. The boxes have one side in common. The bottom slopes to the side, the precipitate being delivered to the sump by a launder along the side of the box. These boxes have 4-mesh screens placed 5 in. above the bottom. Both sets of boxes are set 3 ft. above the concrete floor, which is drained to a sump. The precipitated solutions flow to two tanks at the side of the building.

The precipitate is delivered on a screen over the clean-up tank, which is of redwood, 6 ft. in diameter by 4 ft. deep, and is fitted with a canvas filter. This tank drains into the sump, above which it is placed. The solution obtained from the clean-up is pumped by a 2-in. steam pump to a 24-in. Shriver filter press, holding 24 frames, the effluent solution from which goes to the head of the low-grade extractors. The precipitate is settled in the tank, drained over night, and put into the drier.



Plan of Precipitation Room, Showing the Position of Zinc Boxes, Furnaces, Etc.

The Drier

The drier consists of a steel box with cast-iron plates for a base, resting on a flue shaped like the letter U. The flames from a small firebox at one end thus pass twice the length of the drier before reaching the stack. A small fire serves to dry from four to eight trays of precipitate, weighing from 440 to 1000 lb., in five hours.

Two grades of solutions are precipitated. The high-grade solution, consisting of the first drainings from sand plant, runs from 3.5 to 4.5 oz. of silver and from 0.15 to 0.25 oz. of gold per ton. Six of the steel boxes are used to receive this solution. Nine of the 10 compartments are filled with zinc; the last compartment being used as a settler. Each set of boxes contains 30 cu.ft. of zinc shavings. The rate of flow of solution has varied from 1.1 to 2.7 tons of solution per 24 hours per cubic foot of zinc; the precipitation is good at a rate up to 3 tons per cubic foot of zinc; above this rate it falls off.

The low-grade solution comprises the intermediate washes from the sand and the first decantations and carries from 1 to 2 oz. of silver and from 0.03 to 0.06 oz. of gold per ton. The low-grade solutions are precipitated in two of the steel and two of the wooden boxes. The rate of flow for the wooden boxes has varied from 4 to 8 tons of solution per 24 hours per cubic foot of zinc. The precipitation takes place almost entirely in the first two compartments. An interesting feature of the work is the regeneraton of cyanide. The cyanide strength of the solution leaving the boxes is greater than that of the entering solution.

Clean-Up of Zinc Boxes

The boxes are cleaned up each week. Half the strong and half the weak boxes are cleaned one day, the remainder three days later. The boxes are all dressed with zinc on clean-up days. The fine zinc and precipitate is delivered by the launder to a No. 40 brass screen over the clean-up tank. The fine precipitate passing the screen settles on the filter cloth and the rate of filtration decreases. To avoid delay from this cause, the excess solution arising from the washing of the zinc is pumped from the top of the tank to a filter press. The fine zinc remaining on the screen is well washed with water and returned to the head compartments of the zinc boxes. In two years there has been no accumulation of short zinc.

The precipitate in the tank is drained over night and the following morning is placed in the drier. About 95 per cent. of the clean-up is obtained from the tank, the remainder passing to the filter press. The press is cleaned bi-monthly, the product amounting to about 250 kg. An hour is sufficient to clean the tank and place the product in the drier. To clean the press properly takes from 4 to 6 hours. A set of cloths for the press costs $26, while the filter in the tank costs $3. The durability is approximately the same, from 8 to 10 months. The amount of precipitate obtained each week is approximately 1000 pounds.

Melting

Four furnaces, 18 in. in diameter by 26 in. deep, are used for melting the precipitate, using No. 80 Dixon and No. 100 Battersea crucibles. The fuel is a mixture of 3 parts charcoal to 1 of coke. Natural draft is used, giving ample heat. The crucibles are handled with a lever hung from an overhead track serving the four furnaces. Two natives, working from 12 to 16 hours, flux and melt the week's clean-up into bars.

The dried precipitate is broken up and bedded on a zinc-lined table and the flux added. The flux consists of: ground borax glass, 20; assay slag, 6, and sand, from 2 to 4 parts. The fluxed precipitate is put in manila-paper bags for charging.

The melts are arranged to give from 15 to 20 kg. of bullion, two melts going to make a bar. The bullion from the cones has a thin skin of matte, soft and malleable. The cones of bullion are remelted with borax glass and iron, the amount of iron used depending on the quantity of matte on the bullion. The iron serves to make a matte which is easily removed from the bars, and at the same time reduces the value of the matte by replacing some of the silver. The melted bullion is skimmed till clean, thoroughly stirred, two dip samples taken and then poured into molds. The bars are cleaned with dilute sulphuric acid. The average fineness of gold and silver during 1908 was 932. The skimmings from the bars are remelted with addition of excess of iron and 10 per cent. of sodium bicarbonate.

The costs of precipitation and melting, Table 3, are given together, as the work is interdependent. Two men are employed in the work, cleaning the boxes and melting. The zinc is cut in the machine shop, and the cost of cutting is included in the labor and power items. These figures are the average for a period of seven months, during which time 224,390 fine ounces of gold and silver were precipitated and melted.

TABLE 3. COST OF PRECIPITATION AND MELTING.

	Per Ton of Ore.	Per Fine Ounce, Gold and Silver.
Labor	$0.0174	$0.0032
Supervision	0.0168	0.0030
Zinc	0.0600	0.0111
Coke	0.0055	0.0010
Charcoal	0.0053	0.0009
Borax glass	0.0158	0.0029
Crucibles and covers	0.0044	0.0006
Power	0.0017	0.0003
Miscellaneous supplies	0.0030	0.0050
Total	$0.1299	$0.0235

The total cost for the year 1908 was approximately $1.50 per ton. During 1909 the cost per ton is lower ($1.372), largely due to an increased saving in cyanide made by the filters and to better quality of wood and cyanide.

Ore Dressing in the Coeur d'Alene District—VII

Theoretical Considerations of Factors Affecting Subsidence of Particles; Rapid Settlement the Desideratum; Efficiencies of Tanks Compared

BY EDWARD S. WIARD*

Up to the present point in my treatment of the subject of the ore-dressing practice in the Cœur d'Alene I have gone very slightly into the basic theoretical considerations. A better conception of the factors affecting flow in settling tanks will, however, be useful. Many times I have seen millmen exhausting their ingenuity on devices designed to reduce the entering velocity of pulp under the mistaken idea that so doing would reduce the rate of flow in the body of the tank. The effect of such device is merely to prevent eddies and currents.

Buoyancy of Liquids

Archimedes' principle is often stated as follows, "A body loses weight in a liquid equal to that of the liquid displaced." I regard this as a very unphilosophical statement. If we place a piece of rock in a beaker full of water and weigh it we shall find, having previously weighed the rock, beaker and water separately, that there is no loss of weight in the fragment of rock. If, however, the beaker of water rests on a stool over a balance pan and not in contact with it, and the fragment of rock be suspended in the water by a fine thread from the beam of the balance the beam will descend sharply though in perfect balance before the fragment of rock was immersed in the water. To restore the balance, weights must be put on the opposite pan to an amount equal to the weight of water displaced by the fragment of rock.

Consider for simplicity a unit cube of rock submerged at any depth in a body of liquid of specific gravity S. Let one of the sides be considered parallel to the surface of the water and let S' be the specific gravity of the cubical mass. If w is the weight of a unit cube of water and d the depth to which the upper face is submerged below the surface of the liquid, then the pressure on this face is evidently the weight of the column of liquid upon it, or dwS; that on the lower face, $(d + 1)\ wS$. The difference in pressure between the upper and lower face is $(d + 1)\ wS - dwS = wS$, which is the weight of the liquid displaced. If the liquid be water S becomes unity and wS equal to the weight of a unit cube of water. The pressure on the sides of the cubes balance one another.

If the piece of rock be irregular in shape the same relation will hold, i.e., the total upward buoyant force will be equal to the difference of pressure between the sum of the upward and the downward pressures which equals the weight of liquid displaced. If the rock be heavier than the liquid then the unbalanced force tending to produce downward motion is the weight of the particle minus the upward buoyant force. If we equate this expression against mass times acceleration we have, $VwS' - VwS = \frac{VwS'}{g}a$, where V is the volume of the particle, g the acceleration due to gravity (in a vacuum) and a the acceleration of the fragment. This gives, $a = \frac{g\ (S' - S)}{S'}$ i.e., in a frictionless liquid particles accelerate and the amount of such acceleration depends entirely on the specific gravities of the solid and the liquid. It will be noted that the acceleration can never be greater than g. If a substance lighter than the liquid in which it is immersed be considered we have merely to reverse S' and S. Thus a piece of cork of 0.25 sp.gr. would rise in a frictionless liquid of the specific gravity of water, if such a thing could be conceived, with an acceleration of $\frac{3}{4}g$.

Subsidence of Solids

Barus states that the subsidence of finely divided tripoli of all sizes in ether was practically instantaneous and resembled the fall of matter *in vacuo*. In his experiments equal amounts of tripoli powder were introduced into glass tubes containing different liquids and the depth of the clear liquid noted from time to time. The powder was so fine that in water the surface of the slime was but 2 mm. below the surface of the water after 16 hours of settlement; and after 180 days it had only dropped 25 mm. The ether column was absolutely clear in three-quarters of an hour. If a mixture of finely ground minerals were introduced into a flowing stream of ether they should settle out in the order of their specific gravity. This may be a valuable suggestion for a laboratory apparatus.

I have found that a uniform current can be started perfectly in a rectangular tank of small size by placing a pipe pierced with a line of holes across the bottom. Above the pipe I placed an adjustable curved shield against which the jets of water impinged. By turning the pipe and changing the angle of the shield I finally succeeded in finding a position for the two which gave me an almost uniform current. This was shown by sawdust introduced with the water. All particles in a vertical plane at the beginning of flow remained in the same plane until they reached the overflow. In the work with this tank the ore was introduced in a thin dry stream. If the ore had been introduced with water the whole current would probably have been spoiled.

The resistance of a liquid like water to the passage through it of solid particles soon reduces the motion of subsidence to a uniform one. For small particles it is proportional to the area of wetted surface and the velocity. For large particles the resistance appears to increase as the square of the velocity. For small particles the final velocity of subsidence for spherical grains in liquids is $V = \frac{2}{9} g \left(\frac{S - S'}{K}\right) r^2$ where r = radius of particle, S = its density, S' = density of liquid and K = coefficient of friction of liquid; Kirchoff's formula. For large particles of spherical shape Rittinger's formula (in c. g. s. units), $V = c \sqrt{D\ (S - 1)}$ holds, D being the diameter of the particle, S its density and c a constant. Richards has shown that for galena the critical velocity and diameter come at 63 mm. per sec. and 0.13 mm. dia. For quartz 28 mm. per sec. velocity and 0.20 mm. diameter. For grains of larger diameters Rittinger's formula applies for smaller ones than Kirchoff's. This is the same as Stoke's formula used by Richards.

In all experimental work on the velocity of grains falling in water they have either been introduced separately into the test device or not in sufficient amount to affect the specific gravity of the liquid. If two beakers contain slime of 3 sp.gr., one to the extent of 10 per cent. of solids by weight and the other 25 per cent. then the respective specific gravities are 1.2 and 1.5. Such increases in the specific gravity of the liquid of course only prevail at the constant figure given so long as none of the slime settles. It will readily be seen from the formulas given that, considered merely as a statical problem, the velocity of subsidence must decrease as the percentage of solids increases. If particles are settling in a thick mixture there is a further retardation due to fast settling grains passing through the interstices of slower settling ones. Barus records the test the results of which are shown in the accompanying table, in which d is the length of column of clear liquid above slime.

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*Mining engineer, Denver, Colo.

SETTLEMENT TEST OF BARUS.

Hours.	d (Very Opaque).	d (Opaque).	d (Translucent).
234	12 mm.	35 mm.	50 mm.
331	20 mm.	50 mm.	77 mm.
385	29 mm.	60 mm.	90 mm.
408	33 mm.	65 mm.	96 mm.

The "very opaque" mixture contained the most slime and the translucent the least. This point has been discussed recently in the technical press. If slime containing a large percentage of solids be fed to a spitzkasten it will be found that it eddies and whirls slowly in the most extraordinary fashion. I attribute this action to some extent to changes in the specific gravity from point to point due to settlement.

Colloidal Slime Theory Not of Universal Application

The colloidal theory of slime will not apply to the majority of ores treated by wet concentration. I recognize that there are sometimes great differences in the settling rates of two slimes even when they show the same screen- and settling-test analyses, but the colloidal theory has not furnished an entirely satisfactory explanation for such instances of these differences as have come under my observation. There are substances not in the list of colloids so fine that they require days to settle in such a medium as water. It is a well known fact that there are particles in the air whose rate of subsidence is so infinitesimally small that they will be suspended for all time. The ore dresser requires settlement in seconds or minutes, so therefore his aim must be to make as little slime as possible so that what goes to waste from non settlement will be commercially negligible.

It is customary to estimate the velocity of flow in a tank in which there is a uniform current by the expression $\frac{Q}{A}$ where Q is the volume of pulp and A the cross-section of the tank. If A is the area of cross section of the water then the expression is correct. But in a rectangular tank the cross section of the water can only be gotten by adding to the depth of water to the edge of the overflow the head of water on the overflow and multiplying it by the width of the tank. The logical sequence of ideas in regard to the flow is, quantity of pulp entering the tank produces a head of water on the overflow and head of water on the overflow produces a certain rate of flow in the body of the tank. Discharge from an overflow or weir is only a special example of discharge from an orifice. For a thin slot in the bottom of a tank an approximate expression is $Q = \sqrt{2gh}.ba$, where b is the width of the slot, a the depth and Q the quantity of discharge. If the depth a has to be taken into consideration the theoretical expression becomes,

$$Q = \tfrac{2}{3}\, b \sqrt{2g}\,(h + h')^{\frac{3}{2}},$$

where h is the head on the lower edge of the slot and h' the head on the upper.

If the slot be considered as moved progressively up the side of the tank, h and h' become smaller and smaller, finally the upper edge of the slot emerges from the water and h' becomes zero; the expression then reduces to, $Q = \frac{2}{3}\, b \sqrt{2g}\, h^{\frac{3}{2}}$, which is the theoretical basic formula for discharge in weir calculation. It affords a means of obtaining the head of discharge from the volume of material entering a tank. This expression would only be theoretically true providing the cross-section of the tank were infinitely great. If not, then the velocity of approach, which is the figure with which the millman is concerned, will make a reduction in the theoretical head. In weir work the velocity of approach is usually of minor consideration. Where it must be considered, the head obtained from the theoretical expression is assumed to be increased by an additional amount given by the expression, $h' = \frac{V}{2g}$, where V is the velocity of approach calculated from the expression, $\frac{(d + h)\,w}{Q}$, in which d is the depth to the edge of the weir, w the width of the channel of approach and h the measured head of discharge, the channel of approach being of rectangular cross-section. The error in this approximation will be noticed at once.

The correction to be made for velocity of approach is so small that, for weirs, correction in the approximate way given is well within the errors of observation. For a full discussion of this point Trautwine or Merriman should be consulted. In the calculations which follow I assume that, $h = \sqrt{\frac{9Q^2}{8b^2g}}$, h being derived from the theoretical formula for Q.

Rectangular Tanks

The efficiency of two rectangular tanks of the same superficial spread and with equal depths of water in each is the same. If a grain will just settle to the bottom in a square tank at the overflow it will just settle to the bottom in a long narrow tank of the same depth and area. If the depth of the water to the edge of the discharge be the same in both cases the long tank will be slightly more efficient because the head of water will be greater. I assume in both cases that the length of overflow is the same as the width of the tank.

The above statements are true for perfectly uniform flow only. Practically, the square tank would be the better because the rate of flow would be less and there would be less stirring up of slime from eddies and currents. The converging current at the end of the long tank would be stronger and have influence for a greater distance back of the overflow than would be the case at the discharge of the square tank. The path of a particle settling in a rectangular tank would be, under perfect conditions, a straight line sloping downward toward the overflow. If the surface of the water be considered to be the axis of X and the axis of Y a vertical line at the end or point of entry of the tank, then the equation or path of a particle introduced at the origin is, $y = \frac{Vx}{m}$, where V is the rate of flow of the water and m the rate of subsidence of the particle, both in the same units.

Cylindrical Tanks

In a circular or cylindrical tank fed from the center and overflowing the whole perimeter the path of a settling particle is given by the expression, $y = \frac{mx^2}{2RV}$, which is the equation of a parabola. In this expression R is the radius of the tank and V the velocity of the cylindrical section at the overflow. The origin is considered in the surface of the water at the center of the tank, the axis of X in the surface of the water and the axis of Y a vertical line passing through the origin.

In a cylindrical tank the horizontal velocity along or parallel to the axis of X can be obtained from the following proportion, $V : v_x :: x : R$, or, $v_x = \frac{RV}{x}$, V being the velocity at the cylindrical shell at the overflow. It is evident from the ratio given above that the velocity must increase to infinity at the origin. If V be the velocity at distance R from the origin then the velocity v_x at any point x, must be inversely proportional to the distance from the origin. Now, $\frac{dx}{dt} = v_x = \frac{RV}{x}$, and, $x\,dx = RV\,dt$. Integrating, there is obtained the expression, $\frac{1}{2}x^2 = RVt$, $t = \frac{x^2}{2RV}$. In time t, however, the particle subsides the distance mt or y. Substituting $t = \frac{y}{m}$ in the expression $t = \frac{x^2}{2RV}$, there is obtained the equation of the path of a particle introduced into the surface of the water at the center of a circular tank, $y = \frac{mx^2}{2RV}$.[1]

If it be desired to determine the relative theoretical efficiency of circular and rectangular tanks, this may be obtained in the manner described below.

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[1] I am indebted to A. G. Plant, of the University of Montana, for aid in solving this equation. From my assumption that, $V : v_x :: x : R$, and that t along the axes was to be equated he deduced the expression for y.

THEORETICAL EFFICIENCY OF CIRCULAR AND RECTANGULAR TANKS

Let it be supposed that there is a circular tank of 20 ft. diameter and 4 ft. depth and it is desired to know how long a rectangular tank 10 ft. wide and 4 ft. deep must be to have the same settling power as the circular tank. Let it be assumed in either case that the flow of water entering the tanks is 2 cu.ft. per sec. From the expression, $Q = \frac{2}{3} b \sqrt{2g}\, h^{\frac{3}{2}}$, the head of water at the overflow of the circular tank can be determined. In this case b is the perimeter of the tank and h will be found to be about 0.03 ft. The depth of the water in the tank is then 4.03 ft. V is then determined as $\frac{2}{4.03 \times 2 \pi R}$, the numerator being the number of cubic feet of water entering the tank. From, $t = \frac{x^2}{2RV}$, can be determined the time in seconds required for a particle of ore or water to travel from the center to the periphery. In this case x equals R, and t is found to be about 633 sec. or about 10.6 min. In the case of the rectangular tank with b equal to 10 ft., h will be found to be about 0.11 ft. As the water is 4.03 ft. deep a particle of ore of a size to just reach bottom in 633 sec. must have a vertical settlement rate of 4.03 divided by 633 or .0.00637 ft. per sec. In the case of the rectangular tank with b equal to 10, h will be found to be about 0.11 ft. Then 2 divided by 4.11×10 equals 0.0486 ft. which is the velocity of horizontal flow. At a vertical subsidence of .00637 ft. per sec. it will take particles mentioned above 645 sec. to reach the bottom of the tank. In this time it has advanced a distance 645 × 0.0486 ft. or 31.35 ft. This would be the length of the rectangular tank equal in theoretical settling power to the circular one. The area of the tanks are respectively 313.5 and 314.2 squart feet.

So far I have not considered the size grain which will just settle in these tanks, but a little figuring readily gives it. It is a grain of galena about 0.04 mm. in diameter. Theoretically, the rectangular tank is shown by the comparison to be better but practically it is inferior. The difficulty of creating a perfectly uniform current in a rectangular tank is insuperable. Indeed it is seldom tried. In the best settling tanks the water is commonly introduced from a box stretched across the width of the tank and having holes pierced in the side facing the overflow. This must create a sort of surface current breaking up into eddies and currents. In the case of the circular tank the theory shows that the velocity of entrance of the water may be comparatively great without in the least affecting its settling efficiency. The water may be introduced into the tank from the bottom, the distributing pipe rising vertically from the bottom and by suitable openings and deflectors a current can be created setting the whole body of water in motion in in the most efficient way. It must not be overlooked also that, although the converging current in the rectangular tank which has been discussed, is small, that in the circular tank is infinitesimal.

OUTDOOR TANKS UNDESIRABLE

In the Cœur d'Alene the situation of the settling tanks out of doors, and often at a considerable distance from the mill, has two serious objections. In the first place, from infrequent visits the distributing boxes are apt to be allowed to fill up partially or almost wholly with muck and trash. At one of the tanks I noted that the whole body of the water in the tank was in a whirl. The tank was 24 ft. long by 24 ft. wide and all but a few of the circular openings were closed with trash and slime. The discharge opening was a narrow one at the corner farthest away from where the water was entering. At the maximum the velocity of the whirl was 1 in. in 3¾ sec. The other great objection to the outdoor situation is that the water in the tanks is often exposed to long periods of zero weather. Barus has shown the effect of temperature on subsidence qualitatively. He introduced equal amounts of tripoli in two tubes containing water. One was maintained at room temperature and the other at the temperature of boiling point. The tubes were 15 cm. long. At the end of 24 hours the tube kept at the higher temperature was clear but the other had only subsided so as to leave a clear portion of but 3 mm. All who have undertaken mill work in tropical or semi-tropical countries such as Mexico have been impressed at the ease with which slime will settle in the warm water of these latitudes. The importance of warm water in mill work in our northern latitudes has been overlooked entirely.

German Foreign Metal Trade

Imports and exports of metals other than iron, in the German Empire, for the year ended Dec. 31, were, in metric tons:

	Imports.	Exports.	Excess.	
Copper..........	171,582	68,343	Imp.	103,239
Copper, 1908...	175,419	69,613	Imp.	105,776
Tin..............	13,700	7,936	Imp.	5,764
Tin, 1908.......	14,243	6,121	Imp.	8,122
Lead.............	77,294	42,692	Imp.	34,602
Lead, 1908......	77,649	40,568	Imp.	37,081
Zinc.............	47,263	104,486	Exp.	57,223
Zinc, 1908......	35,003	97,009	Exp.	62,006
Nickel...........	3,822	1,969	Imp.	1,853
Nickel, 1908....	3,119	1,604	Imp.	1,515
Aluminum.......	8,769	1,742	Imp.	7,027
Aluminum, '08.	3,278	1,232	Imp.	2,046
Miscellaneous....	1,190	11,269	Exp.	10,079
Miscellan's, '08	1,043	10,046	Exp.	9,003

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the year were, in metric tons:

Ores:	Imports.	Exports.	Excess.	
Gold ore.......	177	....	Imp.	177
Gold ore, 1908	180	....	Imp.	180
Silver ore......	1,578	....	Imp.	1,578
Silver ore, '08	1,742	5	Imp.	1,737
Copper ore....	26,488	22,498	Imp.	3,990
Copp'r ore,'08	17,456	21,729	Exp.	4,273
Tin ore........	15,423	284	Imp.	15,139
Tin ore, 1908.	11,420	12	Imp.	11,408
Lead ore......	111,017	2,556	Imp.	108,461
Lead ore, '08	133,597	1,189	Imp.	132,408
Zinc ore.......	201,110	52,026	Imp.	149,084
Zinc ore, 1908	199,840	39,450	Imp.	160,390
Nickel ore	10,186	....	Imp.	10,186
Nickel ore,'08	17,102	....	Imp.	17,102
Chrome ore....	22,018	5,023	Imp.	16,995
Ch'me ore '08	16,974	110	Imp.	16,864
Pyrites	691,213	11,566	Imp.	679,646
Pyrites, 1908.	659,871	16,384	Imp.	643,487
Miscellaneous.	6,150	661	Imp.	5,489
Mis., 1908....	4,926	676	Imp.	4,250

Miscellaneous ores include tungsten, molybdenum and other ores of the minor metals. Imports of slags and slag products were 562,853 tons in 1908, and 492,771 in 1909; exports, 74,821 tons in 1908, and 61,674 last year.

Cyaniding Cobalt Ores

SPECIAL CORRESPONDENCE

The application of the cyanide process to the ores of the Colbalt district has been followed with close interest by all engineers, although the majority of them doubt its importance except a few cases. Cobalt ores are easily treated by concentration, and in the majority of cases 80 to 85 per cent. of the silver can be saved.

At the present time there are two cyanide plants in operation, one at the Buffalo and one at the O'Brien. The former treats only the slimes from the concentrator and, as far as can be learned, this method of treatment is giving excellent results as the ore contains a good deal of argentite which cannot be saved on the tables. The O'Brien mill is a combination concentrator and cyanide plant, part of the ore being treated by straight concentration and the rest cyanided direct, except that it is jigged before fine crushing. This process is rendered necessary on account of the character of some of the veins which contain large quantities of ruby silver and argentite. A test run was made on some of this ore before the mill was erected, and it was found that by straight concentration not more than 50 per cent. could be recovered.

The Nova Scotia mill, which is in course of construction, will also use the cyanide process, but the application will be different from either of the two plants mentioned. On account of the severity of the weather in the winter months, the cost of erection of cyanide plants is an important item, and for the great majority of the mills it is doubtful if the small additional saving that could be made would pay for their installation.

Tin Mining and Ore Dressing in South Africa—III

Waterberg Ores Occur in Pipes and Beds; Fine Crushing Customary; Elmore Process to be Tried on Arsenical-Sulphide Concentrates

BY E. M. WESTON*

The tin deposits of the Waterberg dis- ict of South Africa lie about 100 miles orth of Pretoria, . Transvaal, and are ached by the Northern line to Pieters- rg. The center of the most northerly posits is the town of Piet Poterigers ust; of the southern, Warmbaths; and ' the central, the station of Naboomsruit and the town of Nylstroom on the yl river.

OCCURRENCE OF TIN ORE

The accompanying sketch map, taken om the recently published report of the ransvaal Geological Survey, shows the iief geological features of the district. he youngest rock, the Bushveldt amyg- aloids and sandstones of the Karoo sys- m, are not directly connected with the n deposits.

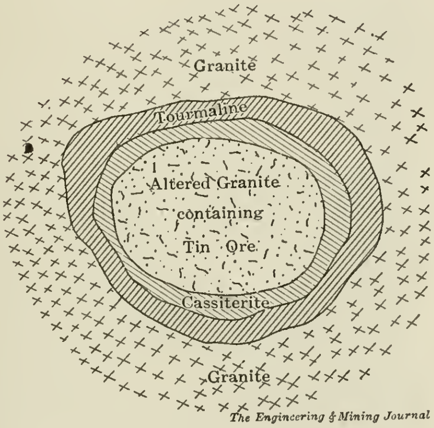
The tin ores occur in the Rooiberg indstone, and in the granite and in fel- tes and shales near their contact with ie sandstone. In this district it is the ewer granite which carries the ore, ither than the older as in Swaziland.

The great bulk of production to date as been from the northern area, where ie deposits occur in the new red granite. he ore-bearing zone is several miles in ngth, and has a width of about 1600 ft. ipe deposits occur at Zaaiplaats and roenfontein, while on the more northern id southern areas the deposits consist f more irregular bodies and impregna- ons along joint planes. On the latter reas, near the contact with felsite, the eposits are marked by the abundance of urmaline.

The pipes may be described as roughly ylindrical orebodies about 3 to 10 ft. in ameter, and consisting of more or less ltered granite carrying cassiterite. umerous pipes have been worked on aaiplaats, two having been worked to bout 500 ft. in depth along the dip. here is also a flat deposit of altered ranite impregnated with cassiterite at aaiplaats and Roodepoort. Tin ore orth from £90,000 to £100,000 has al- eady been extracted from Zaaiplaats, uch of it having been shipped without ny dressing other than by hand.

At Groenfontein a border of tourma- ne becomes more frequently associated ith the pipes, and pipes and "eyes" omposed entirely of tourmaline are et with. A section of a pipe taken om the Geological Survey report ac- ompanies this article. The principal pipe worked here, No. 9, is the largest so far discovered. It has been worked to a depth of over 500 ft., and has produced over 500 tons of ore worth about £40,000.

In the most northerly portion of the zone, and also in the southern district, the orebodies occur irregularly in altered granite and are more or less lenticular, following some horizon or line of weakness in the granite. Sometimes the ore impregnates the granite along each side of a fault plane as seen in the well known Cornish deposits. None of these are of large size, and none have justified mining on a large scale.



SECTION OF TIN-BEARING PIPE

ORIGIN OF DEPOSITS

Many of these deposits are similar to those which in other parts of the world are judged to be of pneumatolytic origin, *i. e.*, due to the action of vapors probably in the last stages of cooling of the mass. The formation of the pipes, however, is somewhat hard to explain, as it is hard to imagine lines of weakness in such form. Vapors under pressure in a semifluid mass might, indeed, boil up and force their way out, but this action would be rather cataclysmic; the granite in the pipes has evidently been subjected to metamorphism slowly by vapor and liquid. Several features, such as the occurrence of vugs, likewise make the theory of magmatic segregation untenable. Somewhat similar pipes occur in New South Wales and in Queensland.

At the Doornhoek the tin occurs in fissures in the shales, the lode proper consisting of brecciated fragments of country rock. The lode varies from a crack only up to 24 in. in width, but the surrounding shales are impregnated with tin ore in places for some distance along and near the bedding planes. In other places the tin occurs in the felsites themselves.

In the neighborhood of Zwartkloof tin ore occurs in irregular bodies of coarse granite, sometimes resembling irregular pipes, and at other times appearing to follow aplite veins. On this farm there is a large deposit containing 3,000,000 or 4,000,000 cu.yd. of materal which will be worked by hydraulicking, and which is estimated to have a recovery value of about 2s. per cu.yd. At Rooiberg the tin ore occurs largely in somewhat coarse crystals impregnating a quartzite along fissures.

ZAAIPLAATS MINE

The principal mines of this district have produced to date about £200,000, the chief producers having been the Zaaiplaats Tin Mining Company and Groenfontein Mines, Ltd. At the Zaaiplaats a 10-head battery has been running since early in 1909 and producing monthly about 90 tons of concentrate assaying about 70 per cent. tin. The deposits of this mine include a large number of pipes, of which 16 have been worked, a large body of rich ore of impregnated granite and a large area of alluvial oredeposits.

The ore from the mine is dumped over 1½-in. grizzlies and the oversize crushed to 2-in. cubes by a Blake-Marsden crusher. It is discharged into a 90-ton bin and fed by Challenge feeders to the stamps. A screen of about 22 mesh is employed. The pulp passes to four spitzlutten, the overflow going to four spitzkasten. The underflow from the first three spitzlutten is treated on Wilfley tables, and that from the fourth on No. 1 Frue vanner.

Two-thirds of the underflow from the first two spitzkasten is treated on No. 2, and one-third on No. 1 Buss slimer. No 2 also takes tailings from the Wilfleys and No. 1 takes tailings from the vanners. This arrangement, which may be convenient, seems to do away with any advantage gained by classification, as fine and coarse pulp is mixed again before treatment.

The middlings from the Buss tables are treated on a concave Cornish buddle. The concentrates from the Wilfleys and vanners are enriched in the tossing keive, as are also the middlings after treatment in buddles. The extraction is said to be from 85 to 90 per cent., and the cost about £3 per ton milled. This mill may be taken as typical of the district.

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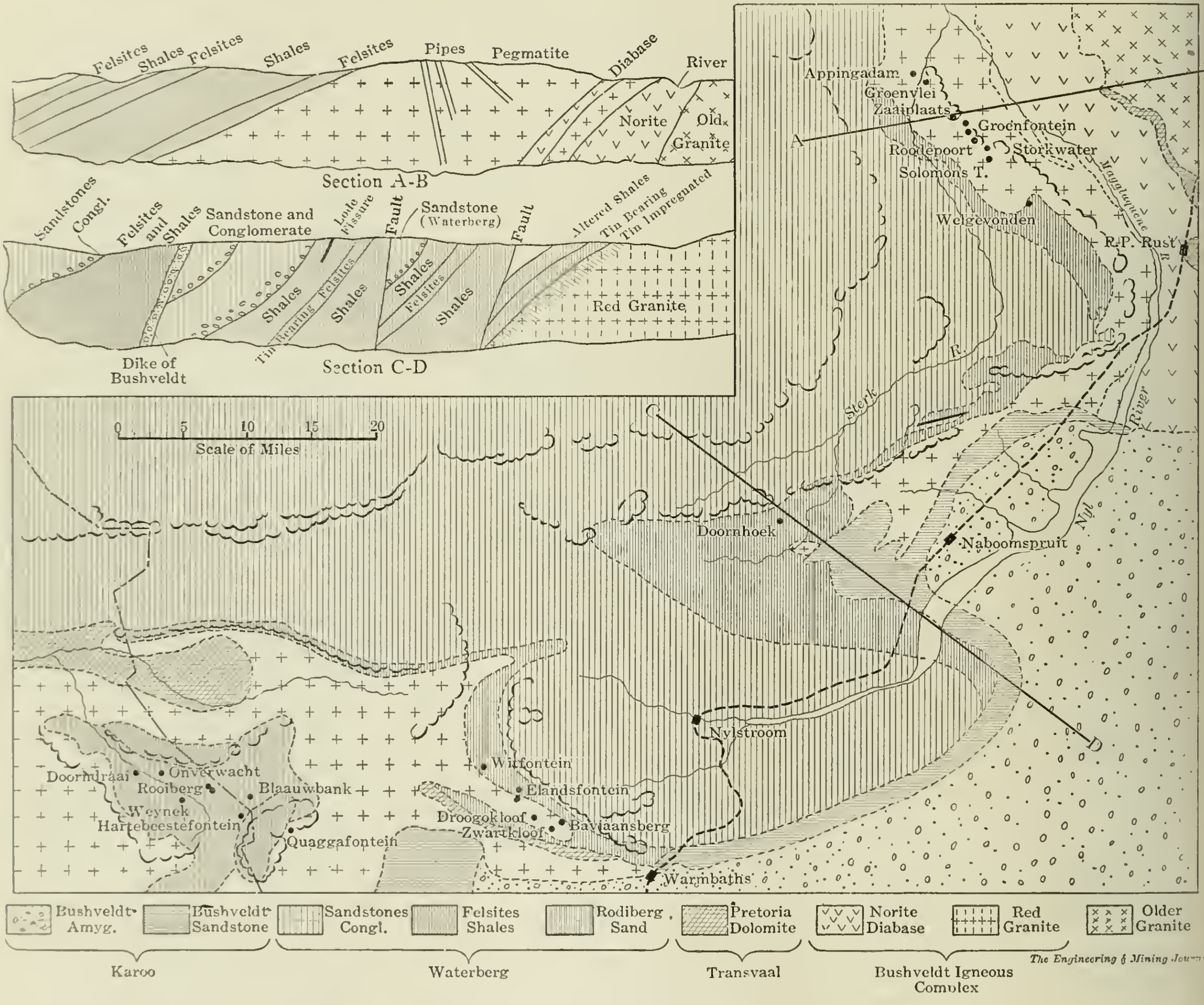
*Mining engineer, 20 St. Mary's buildings, ohannesburg, South Africa.

ROOIBERG MINE

The ore deposits of the Rooiberg mine consist of a network of ore-filled fissures or lodes which is not confined to the areas covered by ancient workings. Many of these veins do not indicate their presence on the surface, and it is thought that there is a great likelihood that the fissures of the various areas of old workings are connected with each other and form one large mining area. The longest distance over which any single lode has been proved so far is about 2000 feet.



Geologic Map of Waterberg Tin District, South Africa

These lodes are irregular in width and value, the average width being about 2 to 3 ft. The smallest oreshoot encountered so far is about 20 ft. along the strike, and the longest nearly 400 ft. In one instance the existence of payable ore has been proved for over 120 ft. on the dip with ore still underfoot. Most of the oreshoots at present opened begin at a depth of from 30 to 40 ft. below the surface. The general average of the ore is from 4 to 5 per cent.

Most of the ore is suitable for concentration and the concentrates produced are of high grade. In deeper levels the occurrence of sulphides of iron and copper have to be expected, but it is not thought that such admixtures will be likely to interfere seriously with the profitable working of the lode.

The concentrating mill on this property is rather unique in South Africa, as it involves hand sorting and coarse concentration. The usual custom in South Africa is to crush the ore to great fineness, although the particles of tin ore in the rock are quite coarse. This plant is regarded to be more or less of an experiment.

The ore is rough sorted and hand fed through a Baxter crusher and there reduced to 2-in. cubes. It is elevated 40 ft. by bucket elevators and tipped over a 1¼-in. grizzly on which water sprays. The coarse ore then travels over a rubber sorting belt to ten 1050-lb. stamps. A 10-mesh screen is used. The pulp is elevated by a bucket elevator to a Callow tank, 4 ft. in diameter. The overflow goes to a second tank. The underflow is treated on two 40-mesh Callow screens. The oversize goes to three 3-compartment Harz jigs. These jigs have 3/32-in. sieve holes; the first and second work on ¾-in. stroke and the third on ½-in. stroke. These strokes seem large for this size of ore. The tailboards are 4½ in. The ragging consist of ¼ in. of shot and 1 in. of coarse tin ore. The tails go to waste.

The first hutch gives 68 to 72 per cent. tin concentrates; the second, 55 to 65 per cent.; third, 20 to 30 per cent., which are reground. The tailings assay 0.4 to 1 per cent. The concentrates from the first two hutches are sacked. The undersize from the Callow screens goes to spitzlutten. The overflow goes to Callow tanks whose underflows are treated separately on two Wilfley tables, which give a 65 to 72 per cent. concentrate, the middlings carrying 8 to 20 per cent. tin. These middlings are reground in Holman grinding pans. The tailings assay 0.3 to 0.4 per cent. tin.

There are four Callow slime tanks which take slime from the grinding pans, overflows from the Callow tank before the jigs and from the spitzlutten. The bottom discharge of No. 1 goes to No. 1 vanner; that from Nos. 2 and 3 to No. 2 vanner; No. 3 vanner retreats the concentrates.

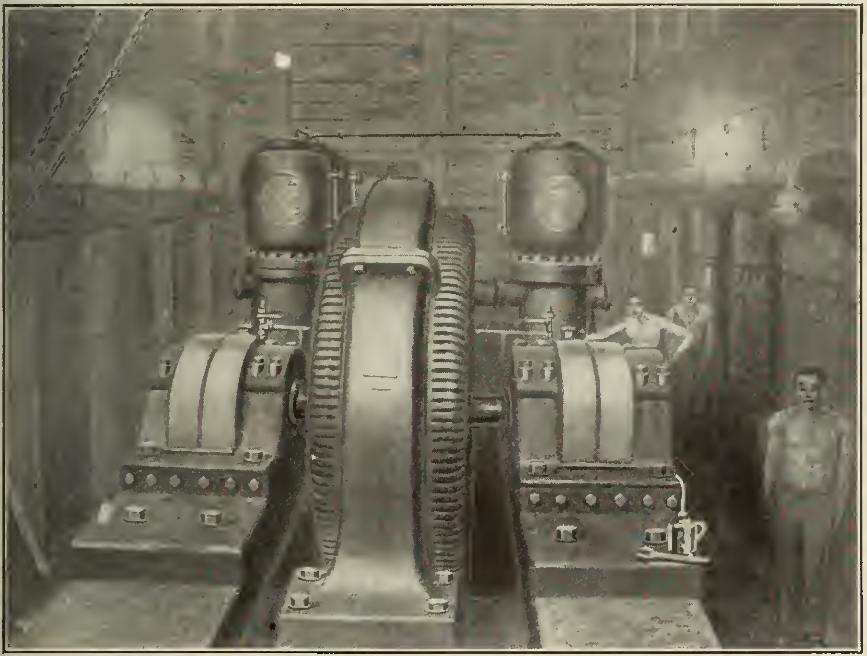
The stamp duty is 5 tons per day. The plant is being modified by the addition of Wilfley and Buss tables, and a Cornish buddle will be added to retreat the vanner concentrates. Suction gas engines furnish the power.

Elmore Process at Groenfontein

The mill on the Doornhoek consists of a rock breaker, 10 heads of 1350-lb. stamps, spitzkasten, two Wilfleys, four Frue vanners and a Wilfley and buddle with tossing gear. Difficulty is met here on account of iron pyrite, the concentrate above 60 per cent. being practically all slimes.

The ore-bearing fissure at Doornhoek has been opened up for several hundred feet in length and about 120 ft. in depth. The ore averages about 3 to 4 per cent. tin across a stoping width of 36 inches.

In all these mines arsenical and iron pyrites tend to increase in depth. To deal with this the Groenfontein mine intends to install an Elmore oil plant to treat the coarse concentrates containing arsenical sulphides without roasting. The process is a suitable one for this work, but is not applicable to slimes. None of the companies except, perhaps, Zaaiplaats, appear to have had the advantage of employing a slime concentration capable of making a separation between tin and pyrite, and the merits of the Luhrig vanner, which is largely used on the continent and in Australia for this work, appear not to be known.



Pumping Station on the 3100-foot Level, Ward Shaft, Virginia City, Nevada

Pumping Plant at the Ward Shaft, Virginia City, Nevada

In reopening the Ward shaft at Virginia City, Nev., a large flow of hot water was encountered, which for a time baffled the efforts of the workmen. The great depth of this shaft, 3480 ft., and the high temperature of the water, 175 deg. F., made the work of pumping unusually difficult. A temporary electric pump was finally successfully put into commission, and has since been supplanted by a permanent installation which easily handles the hot water.

Temporary Pumping Equipment

For emptying the mines, in the first place, a temporary motor-driven pump equipment was installed. Compressed-air sinking pumps at the bottom of the shaft lifted the water to a centrifugal pump on the 2330-ft. level. This in turn delivered to a vertical triplex pump on the 2100-ft. level. The sinking pumps were supplied with compressed air from two 100-h.p. Ingersoll-Sergeant compound air compressors driven by 100-h.p. Westinghouse motors situated on the surface. The three-stage Byron Jackson centrifugal pump on the intermediate level was belted to a 50-h.p. Westinghouse induction motor, while a 100-h.p. type "C" Westinghouse induction motor drove the 6¼x8-in. Knowles vertical triplex pump at the uppermost pumping level.

Permanent Pumping Plant

This apparatus has since been replaced by the installation of the permanent pumping plant placed in a pumping station 80 ft. long, 24 ft. wide and 20 ft. high, at the 3100-ft. level. The permanent pumping equipment consists of a special slow-speed, 800-h.p. Westinghouse type "HF" induction motor direct connected to a Knowles express type, duplex, double-acting pump, operated at 195 r.p.m. The valves are of the automatic poppet type arranged in nests of 13 each, presenting a valve area of 104 sq.in., which makes necessary very slight movement of the valves, and is conducive to a high speed and a minimum of wear. The valves and other visible parts are of bronze, and the pump has a capacity of delivering 1600 gal. per minute against a total head of 1550 feet.

The plant is equipped with a three-stage electrically driven air compressor for charging the air receivers, besides a vacuum pump and an automatic oiling system. For convenience of erection and repair, the pump station is fitted with a 15-ton traveling crane. The dimensions of each pump are 27 ft. 3¾ in. in length, 17 ft. in width, and 14 ft. 2 in. in hight. The motor is 13 ft. in diameter, and the steel crank shaft, forged from one piece, is 13¾ in. in diameter and 14 ft. 4½ in. long. The total cost of the installation was about $125,000. These pumps are supplied by either one of two centrifugal pumps at the bottom of the shaft, which are operated by special 75-h.p. Westinghouse motors on a vertical shaft.

The water is discharged through a 16-in. steel column with welded-steel flanges. The thickness of this pipe varies from ¼ in. at the tunnel level to 9/16 in. at the bottom. The column is supported by means of heavy iron clamps, six inches in length, which in turn rest upon the wall and end plates. To resist the pressure of 675 lb. to the square inch, male and female flanges are used and each fitted with a lead-filled copper gasket.

Electric Cables

The electric current is taken down the shaft at 2240 volts over a three-conductor, lead-covered, steel-armored cable of 400,000 circular mills capacity. The electrical equipment, from the automatic oil-circuit breakers on the surface to the motors themselves, is the best that money can buy, and in operation, with the splendid plants of the Truckee River Electric Company, results have been obtained never before approached for this class of work. The accompanying illustration of the present permanent pump house, 3100 ft. underground, was retouched from an actual flashlight photograph obtained during a recent visit to the mine.

Conditions Affecting the Coal-mining Industry

Forceful Arguments Showing That the State or Country That Exports Its Coal Is Sure to Fall behind in the Race for Commercial Supremacy

BY E. W. PARKER*

I was somewhat surprised to see in a recent number of *The Black Diamond*, an article, the argument of which was the possibility of securing a market for our "surplus" coal in Japan. The inspiration of this article seemed to come from the fact that the author had followed (he did not say accompanied) the Japanese royal commission from Chicago to South Bend, Ind., and interviewed one or two of the members on the subject of trade relations.

It seems to me that at this time, when one of the most important and interesting topics of discussion in the daily press, in the magazines, and in conventions, is the conservation of our natural resources, the writer or speaker who makes the exportation of such natural resources the burden of his song, is violently out of tune. We have been talking about the possibility of securing coal from China, when our own supplies approach exhaustion. Do we wish to hasten that undesirable contingency? My contention is that we have no surplus coal, and if I am guilty of riding a hobby, that hobby is opposition to the idea of building up an export trade in any of our raw materials, particularly coal. We have a big export trade in lumber, but already we are waking up to the fact that we not only need that lumber at home, but we are looking to Canada and other countries for some of our supplies. More trees will grow on the ground from which the timber has been taken, or the soil can be used for even more valuable agricultural products, but the coal once exhausted is gone forever. It is not replenished and the hole left in the ground will not yield any other product.

I am not an alarmist. In an official report which has recently been issued by the United States Geological Survey I have shown that so far as our knowledge goes the total exhaustion of our coal supplies, including half a ton lost for every ton marketed, down to the close of 1908, represents only 0.4 of one per cent. of the estimated original supply. That report also states that assuming the percentage of recovery in the future will be no more than at present, the quantity of coal now in the ground is 4913 times the exhaustion represented by the production in 1908.

TOTAL PRODUCTION MORE THAN 7,000,000,000 TONS

The grand total of production to December 31, 1908, has amounted to 7,281,000,000 short tons, which at the rate of half a ton lost to every ton mined, is equivalent to approximately 12,000,000,000 tons exhausted. The total production of coal in 1908 was 416,000,000 tons. If it were possible in the future to extract and use 100 per cent of the coal in the ground (say, 3,000,000,000,000 short tons), we would still be able to take out 250 times the approximately 12,000,000,000 tons exhausted to the close of 1908. If we continue to lose a half ton for every ton mined, we can still produce 167 times the exhaustion to the close of 1908, or, say about 2,000,000,000,000 tons.

But the most uncertain factor which we have to take into consideration is the possible rate of increase the production in the future will take. We, the so-called experts of the Geological survey, have done some figuring on this matter, basing our calculations for the future on the records of the past. It is not my intention to rehash what you have already heard, but as an astute publisher of one of the big technical journals once remarked to me, "The public not only has to be told; it has to be reminded." For this reason I remind you that while our coal supply would last, at the present rate of exhaustion, nearly 5,000 years, it would all be gone in less than 200 years if our rate of increase in the past should continue during this and the next century.

I admit that we have frequently an over-production, and if the great common enemies of the coal producer and the manufacturer, the railroads, were to supply all the cars asked for, there would be an over-production all the time until the resources of a sufficient number of weaker companies were exhausted and enough mines closed down to bring supply and demand into reasonable relation. Then the railroads would have the surplus in car supply.

If the increase in production should be at the rate of 90 per cent. in each ten years, this rate of production—that is, the 200,000,000,000 tons a year—would be reached in the decade from 1998 to 2008. If the average increase for each 10 years were 80 per cent., the point would be reached in the succeeding decade; if 70 per cent., 10 years later. If the average decennial increase should be 50 per cent., the production reached in 1998 would only be 8 per cent. of what it would be if the increased production doubled each 10 years. Still by 2068 the production for 10 years would be equal to the total supply which exists today. The fact is that all of the coal would be gone 30 years earlier. If our production increased at the average rate of 25 per cent. for every 10 years, all of the coal would be gone by about 2125, or, in a little over 200 years.

In the course of a conversation with a prominent coal operator, a few days ago, I asked him what he thought would be the figure of maximum annual production of coal in the United States. He thought that when the annual production reached about 1,000,000,000 tons, the maximum figure would be reached and the production would remain fairly constant with, of course, such fluctuations as conditions of trade would produce. That started me on a new line of figuring. The average annual increase in coal production for the last ten years has been between 6 and 7 per cent.. If the production should continue at about a 7 per cent. increase each year, the assumed maximum output of 1,000,000,000 tons would be reached in the decade between 1915 and 1922, while if it increased at the average rate of 6 per cent. annually, it would be reached in the decade 1917-26. At the former rate the total production from the earliest times to the date of maximum production will have amounted to 17,816,243,000 tons, equivalent to an exhaustion of 26,724,365,000 tons. At an average of 6 per cent. increase the total production from the earliest times to the period of maximum output or constancy will have amounted to 18,844,840,000 tons, equivalent to an exhaustion of 28,267,260,000 tons. In either case the quantity of coal still left in the ground will exceed, 3,000,000,000,000, and if the production and also the percentage of recovery remain fairly constant the supply would last something over 2,000 years. What chance is there of making any predictions as to the future when, according to these estimates of increase in production, the period of exhaustion can be anywhere between 1998—or say 90 years hence—and 3925, or over 2000 years hence.

In a paper presented before the American Institute of Mining Engineers, at Spokane, last October, I was bold enough to suggest that the time is not far distant when it will be necessary for the Federal government to exercise some restrictive control over the bituminous coal-mining industry, if the idea of conservation is to be carried out. Unless this is done it will be necessary, in order to protect the millions of dollars already invested, to control it by a community of interest such as now exists in the anthracite industry of Pennsylvania, or the creation of a monopoly such as the Standard Oil Company holds in the production, refining, and marketing of petroleum.

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*U. S. Geological Survey, Washington, D. C. Note—Abstract of paper read before the winter meeting of the West Virginia Coal Mining Institute.

I have spoken thus on the coal-mining industry as a whole, although my paper is supposed to be about conditions affecting coal mining in West Virginia. I shall endeavor to limit the remainder of the paper to the field considered in the title.

West Virginia is the third in importance among the coal-producing States, being outstripped in this regard by Pennsylvania and Illinois. For one short year (1906) West Virginia, thanks to a rather prolonged suspension of mining operations in Illinois, pending the biannual adjustment of the wage scale, ranked second among the coal producers. As a coke producer West Virginia stands second, her closest competitor in this regard being Alabama. Twenty years ago, n 1888, West Virginia's production of coal amounted to less than five and a half million short tons. In 1898 it was a little over 16,700,000 tons. In 1907 t was nearly three times that of 1898, exceeding 48,000,000 tons. In a period of 27 years there have been only two in which there was a decrease in output—he panic years of 1895 and 1908, and the average annual increase in the 27 years has been nearly 1,500,000 tons. At a mining meeting more than a year ago, I called attention to the fact that West Virginia was shipping out of the State by far, the larger part of her production o feed the fires of manufacturing establishments in other States, and this coal she is shipping out is the highest grade of bituminous or semibituminous coal n the United States, if not in the world.

West Virginia the Loser Through Exporting Its Coal

West Virginia has an export trade. She s getting rid of her surplus. What is he result in the economic development of the State? West Virginia is third in he production of coal. Few States, if any, have shown such a rate of growth n coal production as West Virginia. It s a great record. But let us look at some other statistics. The United States census for 1905 shows that West Virginia is thirty-first in the value of her manufacturers, and there are only 45 States. The census report shows hat the total gross value of the manufactured products of West Virginia was $99,000,000. Coke is included in this. In the census year 1905 Alabama's coal production was less than one-third that of West Virginia, and the gross value of Alabama's manufactured products was $10,000,000 more than that of West Virginia. Illinois's coal production in 1905 exceeded that of West Virginia by less than 700,000 short tons—less than 2 per cent., but the gross value of the manufactured products turned out by the factories of Illinois amounted to $1,400,000,000. Ohio's coal production in 1905 was only two-thirds that of West Virginia, but Ohio in that year had an outturn of manufactures worth $960,000,000, nearly ten times that of West Virginia. A large part of West Virginia's coal shipments go to New England. Massachusetts alone is credited with $1,100,000,000 worth of manufactured products. New York, which produces no coal but depends for her fuel upon Pennsylvania, Maryland, Virginia, and West Virginia, has a gross value of manufactures amounting to $2,400,000,000, in 1905, and Pennsylvania, the State that produces 50 per cent. of all the coal mined in the United States, had $1,955,000,000 worth of manufactured products in 1905.

The largest city of West Virginia, Wheeling, which in the census year 1900 had a population of 38,878, is exceeded in population by 97 cities in the United States, and yet West Virginia is the third State in coal production. Does it look like a paying proposition for a State to export its coal?

Look at it in another way. No one will claim that Illinois coal is comparable in quality with that of West Virginia, but in 1907 the average price for Illinois coal at the mines was $1.07 a ton; that for West Virginia coal was 99 cents. In 1908 the average price for Illinois coal was $1.05; for West Virginia, 95 cents. In 1907 the average price for West Virginia coal was the lowest for any State and in 1908 only one other State, Virginia (also a large exporter), had a lower average price than West Virginia. It may be argued that the strength of the miner's union in Illinois makes the coal cost more and renders a higher selling price necessary, but it is the home markets that make it possible to sell the coal at the higher price. Alabama coal is not better than West Virginia's product but it brought 30c. a ton more, and 31c. more, in 1908. West Virginia coke is certainly as good as that made in Alabama, but the average price at the ovens in West Virginia in 1908, was $2.00 per ton, while in Alabama the average price was $3.04. Alabama uses nearly all of her coke product in the furnaces of Birmingham, Ensley, Bessemer, etc., while most of West Virginia's goes outside the State. Could any more forceful arguments against the export of coal be presented than are shown by these figures? The State or the country that exports its raw materials is not keeping up with the procession.

The possibilties for West Virginia are enormous. Her coalfields are estimated to still contain over 140,000,000,000 tons of coal, over 30 per cent. more than the bituminous fields of Pennsylvania. Only 0.5 of one per cent. of the original supply of the entire State has been exhausted, and yet I have heard it stated that the New River field is expected to last only 100 years. The drain upon it is increasing rapidly and it is the best of the best that is going first. Is it not up to the public-spirited men of West Virginia to get together and take steps that will lead to the establishment of factories that will consume West Virginia coal at home, give employment to the class of labor that builds up desirable communities, and advance the happiness and prosperity of all citizens of the commonwealth?

More coal consumed at home will require a fewer number of cars. It will not be necessary for coal mines to shut down three days in the week for lack of cars, and the miners will be able to make a full week's wage. West Virginia should be one of the principal manufacturing States of the country. The coal operators of West Virginia are at a disadvantage as compared with those of other States for the lack of home markets for their product.

Illinois Coal Statistics

The total coal output of all mines in Illinois for the year ending June 30, 1909, was 49,163,710 short tons. This production shows a decrease of about 110,000 tons as compared with the output of the preceding year. Coal was produced in 55 counties; there were 384 shipping or commercial mines, as compared with 407 shipping mines in 1908. The average value of the coal per ton at the shipping mines was $1.012; the aggregate home value of the total product was $50,303,757. For haulage purposes underground there were 210 motors, 73 horses, and 5527 mules.

Mining machines were used in 107 mines, as compared with 105 mines in 1908. About 16,000,000 tons were undercut by machines, while 33,000,000 were mined by hand. There were 66,374 persons at work underground, while 6359 men were employed on the surface. The average price paid per gross ton for hand mining was 59c.; the average price paid per gross ton for machine mining was 46c. More than 1,280,000 kegs of powder were used for blasting coal. The number of men accidentally killed totaled 213, while of this number 14 were killed outside of the mine. The number of men killed to each million tons of coal produced was 4.3, as compared with 3.7 in 1908.

Mine Accidents Due to Disregard of Law

A resolution adopted by the recent convention of miners in Indianapolis declaring in favor of the office of mine inspector being entirely segregated from all political patronage, and that it should be filled by popular election, has occasioned James Epperson, mine inspector for Indiana to declare "that explosions and fires in mines, resulting in loss of life are due to wilful disregard of the mining laws." Mr. Epperson says that the Indiana department of mine inspection is continually crossing swords with men who disregard the law and when prosecutions are instituted without discrimination, the cry of politics is raised. "Indiana" Mr. Epperson declared, "has been fortunate in having few serious mine accidents, but since the mine-bit law was repealed at the special session of the legislature, the number of mine explosions have increased." Mr. Epperson says that "the principal danger contributary to explosion in mines is powder gas. We have had little trouble on account of firedamp because the Indiana mines are well ventilated, and it is our policy to see that they are kept well ventilated, as provided by law. Powder gas causes most of the trouble and powder gas can be controlled if the men will obey the law."

The Bit-law Repealed

Mr. Epperson deplores the repeal of the lesser bit law and says as a result thereof, a number of explosions occurred in 1909 killing and injuring a number of miners. He says, by reason of the heavy charge permitted by the larger bit and the violation of the law by the miners in tamping shots with fine drill dusts, the hazards of mining in Indiana has been greatly increased.

Mr. Epperson says that "one pound of coal dust exposed to the flames of a shot will generate 31½ cubic feet of carbon monoxide or white gas. Carbon monoxide has an explosive range extending from 1 volume of gas and 13 volumes of air to 1 volume of gas and 75 volumes of air. It has the widest explosive range of any gas except hydrogen. This is why the tamping of shots with coal dust is a dangerous thing. Carbon monoxide is the largest component of all the gases generated by the explosion of powder."

Mr. Epperson said that his department instituted 155 prosecutions for violations of the mining laws, and convictions were obtained in almost every case. "Prosecutions were instituted for the violation of every mining law on the statute books and the persons prosecuted included mine owners, mine superintendents, mine bosses, fire bosses and coal miners. We play no favorites or politics, nor will we do so."

Coal-leveling Machine for Beehive Ovens

Special Correspondence

What has proved to be one of the most remarkable inventions for assisting in the economical production of coke, since the birth of that important industry, is a new and unique machine for leveling coal in beehive ovens. This machine is now being placed on the market by the Covington Machine Company, of Covington, Va., the firm which a few years ago introduced the first coke-drawing machine.

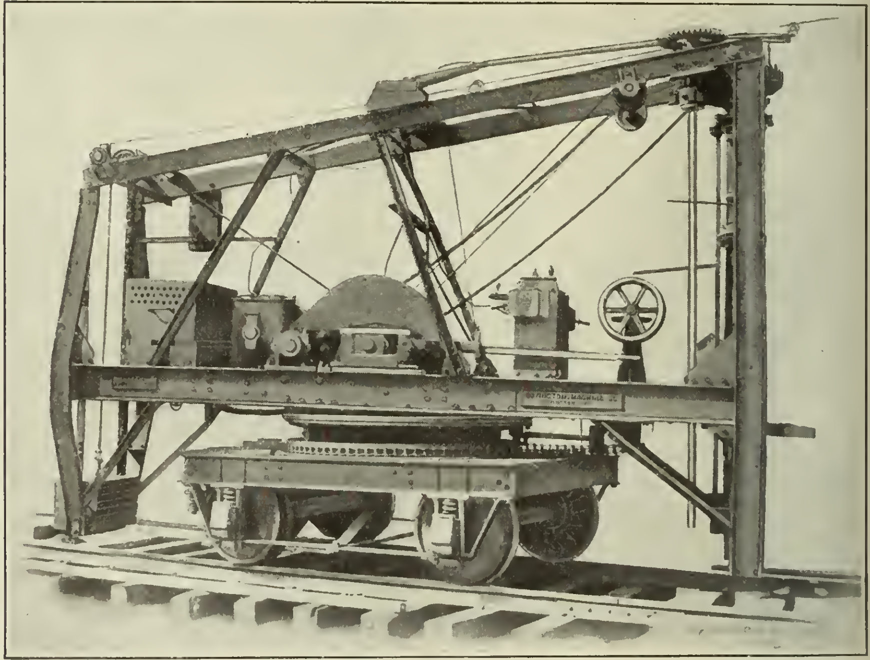

Fig. 1. Machine for Leveling Coal in Beehive Ovens

One of these mechanical levelers has been in operation at the Continental No. 1 plant of the H. C. Frick Coke Company, Uniontown, Penn., for the past six months and has attracted so much attention that it bids fair to equal, if not outrival, the popularity of the coke-drawing machine. A brief outline of what this machine is accomplishing, both as a labor saving and money-making machine, is given below and should interest everyone whose interest is at all along the line of the production of coke.

As an example, we give the record of the machine at the Continental No. 1 mine:

This machine levels 185 ovens per day, finishing its task within one minute after the last oven is charged. The machine is operated by one man and the labor-saving alone amounts to about $14.50 per day. In addition to the saving of labor, the perfect work of this machine makes it possible to not only burn off the usual charge put in an oven, but in addition allows the charging of approximately 7 per cent. more coal, thereby increasing the output of the plant, and makes into coke the coal which has heretofore been carted to the ash dump, due to the charge not burning off by reason of improper hand leveling. If the amount of coal carted to the ash dumps daily throughout the coke regions were known, it would startle those who are putting forth every effort to conserve our resources of this valuable commodity which is rapidly disappearing.

The proper leveling of the machine is not the only thing which makes it possible to burn more coal than is customary where hand-leveling is practiced. Where the machine is used, as soon as an oven is drawn the door is immediately bricked up and daubed before the oven is recharged, thus conserving so much heat that the new charge will ignite within one-third the time required where leveling is done by hand. This gives the coal longer to burn and has quite a little to do toward increasing the yield.

Description of the Leveler and Its Operation

The machine runs on the larry track, uses the larry trolley, and operates through the trunnel head, therefore, no expense is required for its installation.

The machine, as shown by Fig. 1, consists of a wheeled truck carrying a swinging frame, at one end of which is a vertical, sliding leveling shaft, which drops down through the trunnel head, and can be raised up clear of the track when desired. The truck is driven by a 20

.p., standard railway-type motor, geared o one of the axles. A similar motor is nounted on the swinging frame, which rives the leveling shaft and raises and owers same. Two controllers, a hand vheel and two levers bring everything nder easy and complete control of the perator.

The main vertical shaft is car-ied in a sliding crosshead, which is uided by vertical ways and is raised or owered by means of two wire cables vound on drums mounted on a shaft riven by friction bearing. This leveling haft is partially counterbalanced. By neans of a hand lever, the friction gear-ng can be thrown in, raising the leveling haft, or by dropping the lever a brake omes into action, holding the shaft at ny desired hight.

The leveling shaft, which drops through he trunnel head, is provided at its lower nd by a pair of pantographic arms, vhich shut up between the head when oing in or out of the oven, and are pened out to their full extent when eveling. The action of these arms is hown by the accompanying cuts; Fig. 3, howing the arms closed; Fig. 2, half pen, and Fig. 4, full open.

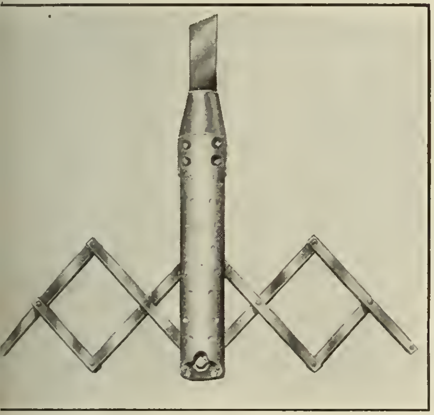

Fig. 2. Showing Pantographic Arms Half Open

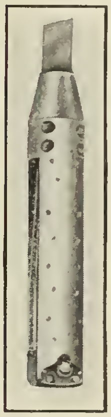

Fig. 3. Arms Closed

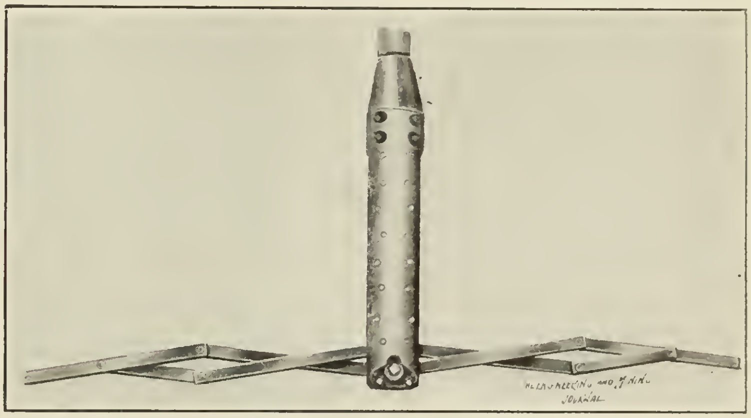

Fig. 4. Showing Arms Opened to Full Extent as Used in Leveling

In leveling, the operator moves his ma-hine near the center of the oven, adjusts : to the center of the trunnel head by the and wheel, throws over the hand lever, ausing the shaft to drop into the oven, nd by means of the controller starts it evolving.

A friction device operates an in-ernal nut, which, moving a plunger od within the vertical shaft, opens out he leveling arms. By the time the rms are moved out to their full extent he oven is perfectly leveled. Reversing he motor closes the arms; throwing in he friction raises the shaft to its upper osition, and the machine is ready for the ext oven.

The machine can be built to level any ize oven, and will operate equally as well n a double or single block of ovens. It s as active as a larry on the track, and s never in the way of the chargers.

Lehigh Coal and Navigation Company

This company owns a large estate in the anthracite region of Pennsylvania and operates a number of collieries. It owns and operates several short railroads giving outlet to its coal. It operates the Lehigh and the Delaware Division canals, connecting its property with the Delaware river. It owns the Lehigh & Susquehanna railroad, which is leased to the Central Railroad Company of New Jersey, forming the Pennsylvania division of that road. The company also owns a large interest in the Lehigh & Hudson River railroad, which gives it a line to the Hudson river and a connection with the Poughkeepsie Bridge line into New England.

The report for the year ended Dec. 31, 1909, shows that the capital stock is $21,002,750. This will be increased to $24,153,200 by the scrip dividend lately declared.

The coal tonnage for the year was, in long tons:

	1908.	1909.	Changes.	
Coal sold	3,116,545	3,187,979	I.	71,334
Used at mines	347,733	397,671	I.	49,938
Total	3,464,378	3,585,650	I.	121,272

The coal sold in 1909 included 2,828,788 tons mined by the company, 224,927 tons mined by tenants on its lands and 134,204 tons mined by tenants of the controlled Alliance Coal Company. The income account for the year, condensed, is as follows:

Net earnings, coal department	$1.227,656
Rent, Lehigh & Susquehanna RR.	2,199,293
Other railroads	78,762
Miscellaneous	167,736
Total	$3,673.447
Loss on canals	$18.904
General expenses, taxes and interest	1,314.321
Depreciation and sinking fund	452,685
Total charges	$1.785.910
Surplus for the year	$1.887,537

From this surplus dividends amounting to $1,813,977 were paid, leaving a balance of $73,560. Surplus from previous year was $4,294,162; accounts adjusted, $1397; making a total of $4,369,119. From this is deducted $470,505, cost of isolating the Summit Hill colliery fire,' and $3,150,412 for the 15 per cent. stock dividend; leaving $748,202 surplus at the end of the year.

The canals moved 328,990 tons of freight, 281,619 tons being coal. The lessee reports that the coal tonnage carried by the Lehigh & Susquehanna railroad was 8,274,752 tons, and its gross earnings were $8,682,352 for the year.

The net earnings reported for the Coal Department were 38.5c. per ton of coal sold. The coal used at mines and works in 1909 was 11.1 per cent. of the total mined, against 10 per cent. in the previous year.

The president's report says: "The general conditions surrounding the anthracite business during the year were not satisfactory. The congested condition of the coal market, due to the pressure to reduce large stocks of coal accumulated by some of the producers in 1907 and 1908, resulted not only in a low level of prices, but also in an irregular operation of the mines and a consequent high cost of production.

"The mining cost of your company was further increased by reason of the scarcity of water for colliery purposes, caused by the unusual drought which prevailed in eastern Pennsylvania during the late summer and fall; and, in fact, until the middle of December, making it necessary to operate at less than capacity such plants as were kept going.

"The necessity of maintaining mines Nos. 4 and 5 in idleness while the No. 5 breaker was being rebuilt also contributed to increase the cost of production, as did the fact that underground development work chargeable to mining was pushed at all operations throughout the year, in order to provide the increased mining capacity which will be needed as soon as the surface improvements under way are completed.

"It is proposed to increase the capacity of No. 10 breaker during 1910, if possible, so that the coal now handled at No. 11 breaker may be prepared at the former and at Coaldale breaker; and No. 11 breaker, which is out of date, will be abandoned or converted into a washery.

"The underground developments at No. 14 have been steadily prosecuted during the year, although the work has been materially delayed by unexpected difficulties encountered in removing an accumulation of water in certain of the old workings which will become tributary to this operation. It is proposed to complete No. 14 breaker plant during the next spring and summer, so that it may be ready for business in the autumn of the present year."

Mine Accidents in Pennsylvania

Inspector H. O. Prytherch, of the Fourth district, in his annual report for 1909 says that in the mines in his jurisdiction, the number of fatal accidents decreased and so did tonnage of coal produced, but he does not seem to think that the decrease in accidents bore any relation relatively to the decrease in tonnage. There were 25 fatal accidents last year as against 34 in 1908. The inspector also reports a decrease in the nonfatal accidents, and he attributes this to the greater care taken in reporting accidents. During the past year the coal companies have reported every accident to the mine inspector, and this enabled him to prevent similar accidents. The amount of coal mined in 1908 was 4,277,375 tons, as against 4,064,759 for 1909. The tonnage per fatal accident in 1908 was 129,167; for 1909, it was 162,159. In the 25 fatal accidents, rock-falls maintain their preëminence, there being 10 deaths owing to this cause. Six men were killed by gas explosions, two by exploding powder, three by premature blasts and three by electricity. The report from this district is satisfactory, for it indicates a substantial decrease not only in the number of fatal accidents, but what is of nearly as much importance, a decrease in the nonfatal accidents, many of which prove fatal in the end.

The reports of the mine inspectors from one cause or another are not prepared simultaneously, nor is it possible, the inspectors declare, to have them prepared at the same time, for the data upon which the mine inspectors build their reports are often delayed in coming to their hands. On the whole, however, this is rather an advantage than otherwise, for it enables the public to judge the reports of the inspectors separately and collate them one with the other. So far as the reports have been handed out to the press, the indications are that the more strict supervision exercised in the anthracite mines will eventually have the effect of considerably reducing the average number of accidents, particularly when taken in connection with the practical elimination of forged miners' certificates.

Mine Officials Blamed for Explosions

Officials of the Jefferson and Clearfield Coal and Iron Company, Indiana, Penn., are blamed by a coroner's jury for an explosion which caused the death of 11 miners at Ernest No. 2 mine, Feb. 5. After hearing testimony, the jury returned the following verdict:

"We find that the 11 men who met death in Ernest No. 2 mine, Feb. 5, were killed by afterdamp following an explosion of accumulated gas near the face of No. 5 room, off No. 11 entry; that the fire boss, William McLeavy, Mine Foreman John Harrington and Supt. William Reed had not complied with the laws governing the operation of bituminous mines in Pennsylvania; that Mine Inspector Roger Hampson, of Punxsutawney, has been lax in the inspection and negligent in the enforcement of mining laws in this mine. We approve the recommendations offered by the mine inspectors in their report and urge that the company adopt them."

Recommendations of mine inspectors who examined the mine after the explosion were that safety lamps be used instead of the open ones employed at the time of the explosion, and that a change be made in the supply of air to the workings.

The inspectors said today that no evidence had been found to show that a fireboss had examined the mine the morning of the explosion, and that gas was found after the explosion. An open light coming in contact with a pocket of gas, they said, caused the explosion.

A Company Formed to Mine Peat

Chicago capitalists have taken steps to establish a plant for the manufacture of peat fuel at a point near Fort Wayne, Ind. It is reported that the men interested have taken an option on 6000 acres of peat bog from which abundant material will be obtained. By mixing the peat with a small percentage of cheap coal chemically treated, a better and cheaper fuel than coal is said to be obtained. The plan is to put the new fuel on the market in a few months.

A consular report states that in some coal mines of the Nottingham district, England, the men want payment for their time going from the mine entrance to where they work, often a long distance. Instead of granting this, several mine owners are installing underground electric railways to transport the miners.

Continued Trouble Over Anthracite Mine Cave-ins

By Special Correspondence

On the evening of Feb. 14, 1910, a meeting composed of the members of the borough council, school board, the burgess and several citizens met in conference with the officials of the Clear Spring Coal Company, in West Pittston, Penn. The leading question was "what can be done to protect the public and private property in West Pittston from the settlements of the surface resulting from the collapse of the workings of the coal company." The answer on the part of the officials was that the company was doing everything possible to protect the mines and the surface. It was declared by the officials that the old workings are being supported with timber and gob piles with culm flushed in between.

This work has been costing the company from $275 to $300 a day. Joseph L. Cake, manager of the company declared that the latter has already spent $150,000 in trying to secure protection from squeezes; he further stated that as far as the money spent for protection was concerned, that would have to be spent in protecting the company properties owing to the inrush of water in the mines and the fact that the seam now being worked lies over the old Red Ash bed, which is causing the trouble.

Company's Interests Considered First

It was frankly admitted that in carrying on the protective policy the first consideration was the company's own properties and that the surface effects were a secondary consideration. Then the officials of the borough called attention to the damage which has already been done to the sewers, etc. To this question Mr. Cake declined a direct answer, pleading that it was a matter for the directors to take up and remarking that it would have a better chance for favorable consideration if the company was making money, which he declared was not the case at present, as the mines have been idle for some time on account of the frequent squeezes and caves.

The officials were then asked about the possibilities of future squeezes affecting the surface. To this answer was given that the people should not worry about it "because present ills are enough to find a remedy for." The surface owners did not seem to think that this was very soothing advice. Finally one of the borough officials suggested a trip into the mines to see just what sort of work the company was doing to prevent squeezes and caves. This was welcomed by the mine officials who declared that every courtesy would be shown to the investigating party.

PERSONAL

Mining and Metallurgical engineers are in-
ted to keep THE ENGINEERING AND MINING
URNAL informed of their movements and
ppointments.

Pope Yeatman has arrived in Chile.

B. B. Thayer has gone to Butte, ontana.

S. W. Mudd has returned to Los ngeles, California.

J. Parke Channing is expected in New ork in about three weeks.

C. F. Rand, president of the Spanish- nerican Iron Company, is in Cuba.

L. W. Francis, secretary of Witherbee, ierman & Co., Inc., New York, has gone Cuba.

Archibald Johnston, first vice-president the Bethlehem Steel Company, South ethlehem, Penn., has returned .from urope.

Dr. A. B. Willmott has removed his fice as consulting engineer from Sault e. Marie to No. 24 Adelaide street, west, ronto, Ontario.

S. R. Heakes, manager of the Kerr ake mine, at Cobalt, has been appointed anager of the Wetlaufer mine in South orraine, Ontario.

C. A. Heberlein has returned to the ty of Mexico from Achotla, Guerrero, ving finished and put in successful op- ation a 50-ton lead plant.

A. E. Drucker, recently appointed con- lting metallurgist for the Oriental onsolidated Mining Company, sailed om San Francisco March 15, on his ay to Korea.

C. O. Moss, formerly manager of the ansas City-Goldfield Mining Company's ase at Goldfield, Nev., is now superin- ndent of the Sierra Morena mine, near aso Robles, California.

Wallace H. Weston, recently manager the Copper Mining and Smelting Com- any in the Caballeros mountains near utter, N. M., is now manager of the atehood mine at Hillsboro, New Mex- o.

Hallett R. Robbins, of Seattle, Wash., s been appointed managing engineer r the Victory Mining Company, and is recting the operations of that company the Ironsides gold mine near Boise, aho.

Karl Landgrebe, of Cleveland, O., has en appointed superintendent of Ensley urnace division for the Tennessee Coal, on and Railroad Company, with head- arters at Ensley, Ala., effective Feb. 15, succeed W. A. Gibson, resigned.

Horace Brock and son, John Penn rock, vice-president of the American on and Steel Manufacturing Company, Lebanon, Penn., are spending some eeks inspecting steel plants in Germany. It is understood that the company is planning a steel plant at Lebanon.

H. F. Braddock is now chemist with the Jamison Coal and Coke Company, of Greensburg, Penn. He was formerly connected with the fuel engineering department of the Arthur D. Little Laboratory, Boston, and with the testing laboratory of the Consolidated Coal Company.

L. S. Austin, late professor of metallurgy and oredressing at the Michigan College of Mines announces that he will take charge of and supervise examinations and reports on mining properties in Alaska, the western United States and in Mexico. His office will be in the Dooly building, Salt Lake City, Utah.

W. B. Trainer has been promoted from assistant superintendent of rolling mills at the Duquesne works of the Carnegie Steel Company to superintendent of the rolling mills at that plant to succeed Carl F. Maeder, effective March 1. Mr. Maeder has resigned to become general manager of the Western Steel Corporation, at Irondale, Washington.

Edward Flynn, of Pratt City, Ala., has resigned his position as chief mine inspector of Alabama, effective April 1, to accept the position of inspector of coal mines for the Tennessee Coal, Iron and Railroad Company, with headquarters at Birmingham, Ala. James Hillhouse, Sr., assistant mine inspector has been appointed chief inspector to succeed Mr. Flynn.

John D. Rockefeller, Jr., has resigned as a director of the United States Steel Corporation, and is succeeded by Henry Walters, of Baltimore, chairman of the Louisville & Nashville, and the Atlantic Coast Line railroads. An authoritative statement issued gives as Mr. Rockefeller's reason for resigning that the holdings of stock in the corporation by the members of his family are not sufficiently large to justify his giving time or attention to its affairs.

The first iron-making establishment in Pennsylvania was a charcoal forge built by Thomas Rutter in Chester county, near Pottstown in 1708. This was followed in 1717 by a forge at Coventryville on French creek, also in Chester county, built by Samuel Nutt, an English Quaker. Nutt died in 1737, and his will made provisions for the erection of the Warwick furnace, which was built in 1738, by his widow, Anna Nutt, on the south branch of French creek.

OBITUARY

John C. Porter, Pittsburg, died Februay 17, aged 79 years. His connection with the iron trade began in 1862 as a member of the firm of McKnight, Duncan & Co., afterward McKnight, Porter & Co., manufacturing bar iron, bands and hoops. In 1880 he assisted in establishing the Spang Steel and Iron Company of which he was secretary and treasurer until 10 years ago, when he retired from active business life.

Charles N. Frost, president of the Frost Manufacturing Company, Kenosha, Wis., and prominently connected with the brass industry of the United States for 50 years, died Feb. 27, aged 66. He was a native of Waterbury, Conn. In 1866 he went to Kenosha and became superintendent of the plant of the Chicago Brass Company. In 1902 he retired and organized the Badger Brass Manufacturing Company, of which he was president for a number of years. Later, he organized the Frost Company.

George W. Sherling died at Birmingham, Ala., Feb. 26, aged 51 years. He was one of the pioneers of the Birmingham district, and had been prominently connected with mining there for 25 years. For several years he was connected with the Sloss-Sheffield Steel and Iron Company. Later he was for several years general superintendent of coal mines for the Southern district of the Republic Iron and Steel Company. For nearly three years past he had been president and general manager of the Eldorado Coal Company. He left a wife, three sons and two daughters. Mr. Sherling's funeral was the occasion of an unusual assembly of prominent mining men of the district. Among the pall bearers were J. W. McQueen, vice-president Sloss-Sheffield Steel and Iron Company; Walter Moore, president Red Star Coal Company; Maj. E. M. Tutweiler, one of the pioneers of the district, and for many years president of the Tutweiler Coal and Iron Company, now a part of the Birmingham Coal and Iron Company; Gen. E. W. Rucker, president of the Brilliant Coal Company; Henry B. Gray, lieutenant-governor of Alabama; Jones G. Moore, general superintendent of mines for the Sloss-Sheffield Steel and Iron Company; and W. A. Major, purchasing agent for the Tennessee Coal, Iron and Railroad Company.

SOCIETIES *and* TECHNICAL SCHOOLS

American Institute of Mining Engineers—A very fine portrait, painted by Richard B. Farley, Philadelphia, of Dr. Thomas M. Drown (one of the founders of the institute in 1871, a manager in 1872, secretary from 1873 to 1884, vice-president in 1892, president in 1897, and at the time of his death, in 1904, an honorary member of the institute, and president of Lehigh University) was exhibited at the Pittsburg meeting, and attracted much attention. This portrait has been presented to the institute by Dr. James Douglas and James Gayley, and may be seen hereafter in the Engineering Societies building, 29 West Thirty-ninth street, New York.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON
IMPORTANT EVENTS FROM MANY IMPORTANT
MINING CENTERS OF THE WORLD

San Francisco

March 4—Probably not more than 1300 men are at present at work in the Nevada county mines in the vicinity of Grass Valley and Nevada City. There is, however, some interest being manifested in the opening of a number of the older properties. As soon as the deep snow goes off the mountains it is also expected that there will be a number of people going into the Graniteville and Alleghany districts. At Grass Valley the North Star is working about 350 men and dropping all 40 stamps in both the Central and North Star mills, 20 of those in the latter being supplied from the Central workings. At the Empire the incline shaft is down nearly 3600 ft. and the 3400 North level is being opened from the shaft and from No. 2 winze from the 3000 level. Stoping is in progress below the 700 level to supply the 40-stamp mill. About 125 men are employed. Mark B. Kerr is opening up the Pittsburgh-Gold Flat mine situated between Grass Valley and Nevada City. Good showings of ore have recently been developed on the 900- and 1000-ft. levels north of the shaft and beyond the fault encountered on the 900 South. The shaft has been retimbered and enlarged, and sinking is in progress at a depth of 1070 ft. Development work is supplying ore for the 10-stamp mill. To the west of Nevada City, on Deer creek, the Mountaineer company is employing about 20 men on surface work and in sinking the new incline which has been sunk below the 400-ft. point. Concrete foundations have been placed for the head frame, shaft house, etc. At the Champion the company is working about 45 miners stoping and developing on the 800 and 1100 levels. Probably 25 tributers are at work in the upper Champion levels. All ore is being milled in the Champion 40-stamp mill. Pumping only is being done at the other mines of the group. Further west Frank Evans is operating the Oustomah under bond. The working force was recently reduced.

Butte

March 4—The walkout of the members of the International Engineers' Union No. 138 which began Feb. 16 and which resulted in the closing of the Butte mines because of lack of hoisting engineers, while still in effect, has been almost nullified so far as its effectiveness is concerned. The imported engineers have taken the places of the strikers so successfully that the camp has nearly resumed its normal output. President Matt Comerford, of the International Union of Steam Engineers, who was in Butte some time attempting to straighten out the situation, left a few days ago without having accomplished anything. A number of the striking engineers have deserted the cause and have applied for work, but it is understood that the new men who took their places will be retained as long as their services are satisfactory. Practically all of the mines in the camp are now operating although their output is less than normal. Several mines are using but two shifts of engineers, each man working 12 hours, instead of three shifts of eight hours each as formerly, but this will be changed when the supply of engineers is increased. It is practically assured there will be no further difficulty.

The United States Assay Office at Helena reports the receipt of $157,078 worth of precious metals during February. This is an increase of $15,335 over receipts for the same month in 1909. Chouteau county leads with $75,442. The citizens of Dillon have subscribed $12,000 for the purpose of assisting the Gilmore & Pittsburg railway to build into Dillon, and the railway has acepted the subscribed fund and agreed to begin construction work shortly.

Following the call of the special stockholders meeting of the Anaconda Copper Mining Company for March 23 for the purpose of increasing the capital stock of the company and amending the charter so that stock of other corporations may be bought and held by it, comes the notice of a meeting of stockholders of the Boston & Montana company in Butte March 26, when the plan of selling the entire property of the company to the Anaconda company will be put before the stockholders. It is probable that the other subsidiary companies of the Amalgamated will follow suit. C. F. Kelley, chief counsel for Amalgamated, has returned from New York and will be present at the meetings.

The local district court has appointed L. P. Donovan receiver of the Hypocka Mining Company, one of the old Heinze companies. The proceeding for the appointment of a receiver was brought by J. T. Haggerty who has an unsatisfied judgment against the company for $12,750. It is possible that the receiver will bring an action against the individual stockholders of the company to collect the judgment.

Denver

March 5—It is said that Thomas F. Walsh will work the Hidden Treasure and Pocahontas claims, in Imogene basin, San Juan county. These two properties on the same vein were acquired by Walsh, together with a large acreage of surrounding territory, after he had found the small streak of rich ore in the abandoned workings of the Gertrude (which was rechristened the Camp Bird), and which ultimately led to the bonanza which has made such a great mine. In 1882 the Pocahontas was being worked by the two owners, Bob Bell and "Kentuck," and showed in the upper level, which was the first one they drove, a shoot of ore about 100 ft. in length, varying in width from one foot to 18 in., and yielding from 95 to 250 oz. silver to the ton. In a lower drift on the vein, the ore was large cube galena, associated with resin blende, and running from 30 to as high as 160 oz. silver per ton. A mill run gave 101 oz. silver per ton and 42 per cent. lead. The character of the ore was galena and gray copper, associated with iron and copper pyrites, in a white quartz matrix. Whether deep workings on this vein will disclose gold ore remains to be seen, but the Camp Bird ore on the outcrop was low-grade galena. The elevation of the Hidden Treasure and Pocahontas is 11,200 to 11,500 ft., the latter being above timber-line. John W. Benson, formerly of the Camp Bird, is spoken of as manager.

In the Boulder oilfield, three wells were opened last week in a portion of the field hitherto thought to be barren, and about six miles north of the town. In the main field, a strike is reported on the property of the Inland Oil Company of 50 to 75 bbl. of oil per diem.

Salt Lake City

March 5—A portion of the so-called phosphate lands in Rich and Morgan counties, which were withdrawn from homestead entry pending an investigation of their mineral character, are once more open to entry according to word received Feb. 24 by the local land office. In December, 1908, the Secretary of the Interior withdrew from all kinds of entry lands in Utah, Idaho and Wyoming. The lands were not then known as phosphate-bearing, but they included all areas in which phosphate might exist. These lands were examined and mapped during the summer of 1909 by the U. S. Geological Survey, and this has led to the restoration of a part of the lands to entry and to the withdrawal of others. A report on the phosphate deposits is expected to be published by the survey during the present year. Persons who made valid entries prior to the withdrawal of these lands may proceed with their entries up to and including the submission of final proof, but no purchase money will be received or final certificates of entry issued by the land office until further notice. The land restored is in Phosphate Reserve No. 2, and includes portions of township 4 north, range 3 east; township 5 north, range 3 east, and township 5 north, range 2 east. The land withdrawn includes parts of township 6 north, range 2 east; township 7 north, range 3 east and township 7 north, range 4 east, all of which are in Phosphate Reserve No. 6; also township 9 north, range 7 east, in Phosphate Reserve No. 7. Much of this land is valuable for agricultural purposes.

The receipts of bullion at the local United States assay office for the month of February were gold, $57,409, silver, $49. All of the bullion came from Utah mines. These receipts are the smallest since the office has been established.

The hearing in the case of the Silver King Consolidated vs. the Silver King Coalition was continued in the United States court in Salt Lake City last week. A number of miners who worked in the Parson's stope testified for the defendant as to the poor quality and large amount of waste in the ore. David Keith, president and director of the old Silver King Mining Company, and holding the same offices in the present Coalition company, was the principal witness for the defendant. He said that he had been in the Parson's stope frequently during the time it was being developed and worked, probably once or twice a month on an average. Mr. Keith said that no separate record had been kept of the mill ore, or shipping ore, or of the quantity of ore in this stope. The shipping ore was put into a common bin with ore from other parts of the mine. He had no means of knowing the tonnage of this, or of any other stope—nothing closer than an estimate. Regarding the quality of the ore, Mr. Keith testified it occurred badly mixed with waste and second-class ore; there was little ore of shipping grade. The thickest first-class ore he had seen was about 3 ft. in thickness, and occurred as streaks and bunches which would usually be worked out over night. The shipping ore frequently pinched out into milling ore; in nearly all cases it was surrounded by milling ore or waste. Particular emphasis was laid upon the large amount of waste in the ore.

The cost of mining, according to Mr. Keith, was $6 per ton, which is higher than in other parts of the mine due to the long distance from the shaft, cost of getting timber in, etc. It was necessary to do a large amount of development and prospecting in this neighborhood looking for a continuation of the main oreshoot which had been cut off near the Copper stope. The Jewel orebody, a continuation of the oreshoot, was found early in 1908 before the action for an accounting by the Silver King Consolidated was begun. All the work from the shaft to the Vesuvius-Montezuma claim line, 200 ft. from the Jewel stope, was charged to the Parson's orebody. The work charged aggregates more than a mile of workings.

On cross examination, Mr. Keith testified that the Dynamite drift on the 1225 level was one of the drifts run to prospect for the Jewel orebody beyond the Parson's stope. This was charged in the account.

Mr. Keith remembered of hearing of the large cave in the Parson's stope in December, 1906. He was in the stope in November before the cave, when, he testified, the stope was pretty well worked out. He did not think he was there afterward until counsel for the plaintiff showed him the *Park City Record* dated Dec. 22, 1906, giving an interview with him regarding this cave. Mr. Keith thereupon stated that caves were not unusual, and that it was customary for them to work the stopes in sections and, as soon as worked out, to let the stopes cave, or cave them purposely. He said he had helped do this himself by shooting out the timbers in some of the old stopes on the 900 level, and that it was better to cave them if possible than to let them stand. The general method of procedure in the Silver King was to work a stope in sections, and when a section was worked out, to cave it as soon as they could. It was customary, however, to clean up the stope before caving, that is, as Mr. Keith explained, to clean up small bunches of ore along the foot- and hanging-walls before the stope was caved. Mr. Keith himself testified that this was being done on his last visit to the Parson's stope before the large cave occurred.

From the time the ore was discovered in the Parson's stope to the time stoping was begun was a period of about three years. Mr. Keith was asked if he had not been in favor of letting the ore stand because it was owned jointly with the Silver King Consolidated, and if he was not overruled by the rest of the management about taking it out. He denied this, and said he was ready to begin stoping at any time, and that he had never had any hesitation about it.

According to Mr. Keith's testimony, the 1300 level was run for the purpose of discovering a continuation of the oreshoot which had cut off on the 1200 level near the Copper stope, 500 or 600 ft. east of the Parson's stope. It was run west past the Parson's raise looking for the continuation of the ore to the boundaries of the Vesuvius claim and beyond into the Montezuma claim. After discovering the Jewel orebody, Mr. Keith stated he thinks they were entitled to charge all of the work on the 1300 from the shaft to the Montezuma claim line to the Parson's stope, because it was the only stope developed on the 1300 at this time.

Birmingham, Ala.

March 7—Announcement is made that the Louisville & Nashville company has bought the 25 miles of railroad in Cullman county, Ala., belonging to the Cullman Coal and Coke Company, and will complete and operate it. The mining developments in Cullman county are coming along on a large scale.

The Montevallo Red Ash Coal Company has been organized in Birmingham, to open and operate coal mines at Montevallo in Shelby county. The incorporators and officers of the concern are: Albert N. Butler, president; Joel I. Butler, vice-president; Walter E. Crittenden, secretary-treasurer.

Announcement is made that by the use of a number of pumps the flood in the ore mines of the Sloss-Sheffield Steel and Iron Company, caused by striking an underground steam, is being reduced rapidly and before long the usual output will be made. The trouble at this place has disturbed the production of ore for several weeks.

Eight fatal accidents were reported as having occurred in the coal mines of Alabama in February, making 22 in all for this year so far. Of these, 19 were caused by falling roof in the mines. By constant warnings sent from the office of the State mine inspector it is believed that at least a partial elimination of these accidents will be brought about later on. The use of dangerous explosives in the mining industry in Alabama has been minimized by the operations of the State mine inspector's office and during the last winter not a serious accident from explosives was recorded in the mines of the State.

Cobalt

March 5—During the last week there were incorporated seven new mining companies with an aggregate capital of $5,790,000. This is the largest amount for some time and is due principally to new flotations in Gowganda.

In connection with the arrest of the high-grading gang, which caused such excitement some time ago, the Crown Reserve and other companies are suing for the moneys now held by Doctor Wilkinson, of Toronto, being the balance for payment of ore said to have been sold to

Doctor Wilkinson by the high-graders. The majority of the men arrested still have money coming to them, and the suit is being brought to settle the question of ownership definitely. The trial of Doctor Wilkinson and the others implicated is to come off shortly, and every effort is being made by the mining companies, who are prosecuting the action, to obtain a conviction.

Tenders for the 571 lots that have been surveyed in the Porcupine district by the Government, will be received until March 15. The townsite was surveyed by the Government, and the post office and recorder's office for the district will be situated there.

One of the most important events of the week was the finding of high-grade ore in the bottom of the Temiskaming shaft at a depth of 425 ft. This is the second deepest working in the Cobalt camp and the finding of a new oreshoot at this depth will be encouraging to the management of the Temiskaming. The vein consists of quartz and calcite and shows considerable free silver.

The Crown Chartered Gold Mining Company has purchased a plant consisting of a boiler, hoist, compressor, drills, etc., to carry on operations on the property at Porcupine. A portable sawmill is also being taken in. It is also stated that within the next few days a plant will also be ordered for the Forneri and Wright properties. These claims are nine in number and some excellent showings are reported.

The annual report of the Otisse company at Elk Lake shows that since its inception $86,730 has been spent. It also states that as rich ore as was first discovered on the surface has been found underground, but it is pockety. The total amount of underground work accomplished to date is 1396 ft. The report states that there is not as yet a sufficient quantity of ore exposed underground to warrant stoping. The veins are, however, as well defined as on the surface and warrant the expenditure of additional money to carry on further development.

Toronto

March 5—Hon. W. Templeman, Canadian Minister of Mines, has asked for an appropriation of $50,000 for investigating a process for the production of zinc, for making experiments and for any other purpose deemed advisable for the promotion of zinc production. The department proposes to undertake experiments and gather information abroad with a view to improving present processes and preventing the waste now prevailing in the treatment of zinc ores, especially in British Columbia.

Reports have been for some time current as to the finding of coal in the clay belt of northern Ontario to the north of the route of the Grand Trunk Pacific. It is said to be a semi-anthracite similar to the coal of Saskatchewan. Robert Shillington, Haileybury, has sent out prospecting parties to this region with the object of locating the deposits.

Hon. Doctor Reaume, Minister of Public Works for Ontario, announced in the provincial legislature on March 1 that the government would build a branch of the Temiskaming & Northern Ontario railway into Whitney and Tisdale townships to open up the Porcupine mining area.

London

March 2—The Ashanti Goldfields Corporation announces the formation of a subsidiary company, to be called the Ashanti Goldfields Territories, Ltd., for the purpose of prospecting about 118 square miles of its concession. The working capital proposed is £300,000 in 5s. shares. The corporation will receive £105,000 as the purchase price, nearly all of which will be paid in shares.

The prospectus of a new mining company, called the Esmeralda Consolidated Mines (Mexico), has been issued. The property to be acquired is the Esmeralda and three other adjoining mineral properties, situated in the district of Iguana, in the State of Nuevo Leon, Mexico. The prospectus is issued on the faith of statements made by J. J. Nicholl, mining engineer, and a clause to this effect is inserted in the prospectus presumably as a safeguard to the directors.

The report is of such a remarkable character that it deserves the attention of the mining profession. Enormous wealth is promised to the shareholders of this company. From the Esmeralda property there is an annual net profit of $20,000 waiting only the erection of a 25-ton concentrator to be realized. For an expenditure of only £500, a "manto," or flat orebody can be developed which might contain anything from £50,000 to £500,000 worth of silver. The Cocina mine on the Esperanza property, with a 25-ton concentrating plant, is expected to give a profit of £24,000 per annum. A 100-ton plant is recommended for the Guadalupe mine, the "practically illimitable" silver-zinc ores of which should produce at this rate of working a net profit of £108,000 per annum. Then there is a trifle of profit in the old dumps, which are valued at £600,000 net. Indeed, so valuable are these properties, acording to Mr. Nicholl, and so small is the sum required (£10,000) to "secure an ample dividend on the capital of the company" that surprise will be felt that the property should be put on the London market and that the vendors are asking only a beggarly £100,000 for a property of such fabulous richness. The prospectus states that Mr. Nicholl's report has been submitted to R. B. Symington, a mining engineer, of San Francisco, who, by cable, has generally confirmed the report and expressed his belief that the property has a great future.

Whether Mr. Symington has ever been on the property is not stated and it would be interesting to know whether he has or not. Another point in the prospectus worthy of attention is that the vendors are a company called the Industrial Selections, Limited, who, in December, 1909, purchased certain of the properties now offered for sale for £31,800 payable £1800 in cash and £30,000 in shares. It would be interesting to know if the properties now being sold for £100,000 were bought for a cash outlay of £1800, and what the words "certain of the properties" really mean.

Johannesburg

Jan. 28—The current "Gazette" contains an invitation from the Transvaal Government for proposals for the erection of a local plant for the manufacture of iron from scrap. This is a departure from the original proposal. Under the new scheme the successful applicant will be entitled to purchase 15,000 tons of scrap now lying at the Pretoria works of the Central South African Railways at 20s. per ton, and not less than 500 tons produced annually during a period of five years at the same price. Furthermore the Government will consider favorably readjustment of railway rates facilitating the transport of scrap to the works, and the discouragement of its export, as in the past large quantities have gone to Italy and some to Germany. The former proposal was that the Government should undertake the erection of a furnace jointly with the railway administration. In his memorandum issued about the middle of July, 1909, the Government mining engineer said: "It appears that there is a profitable and immediate field for the products of electrical furnaces which can turn out high-class steel with a comparatively small output per unit. It is recommended that the Government share the cost with the Central South African Railways on the pound for pound basis of establishing such an electrical furnace at a cost not exceeding £30,000, or £15,000 each. It may be expected that the object lesson provided by such a plant running, as may be reasonably anticipated, with success, will induce the installation of further plants by private enterprise." It would now appear that the preliminary demonstration is to be abandoned. A large portion of the Government mining engineer's memorandum was devoted to a discussion of the bounty system similar to that adopted by Canada. But the Government has been advised that such a system cannot be established without the consent of other parties in the Customs Union, so this will have to wait consideration by the Parliament. The scheme referred to above also contemplates "experimental work in the smelting of iron ores to the satisfaction of the Government."

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY· INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

Alaska-Mexican—An explosion of the powder magazine on the 1100-ft. level killed 23 men and injured 8 more, 4 of whom are expected to die. The magazine was 30 ft. from the place where the shots had been fired 20 min. before, and contained 275 lb. of powder.

Iditarod—Late reports from reliable prospectors say that a new strike has been made on Flat creek, where pay dirt extending along the creek for five miles has been found. The width of the paystreak is undetermined. The dirt is running from $2 to $5 to the square foot.

Arizona

COCHISE COUNTY

Copper Queen—The winze in Lowell territory has reached the 1600-ft. level and drifting has been commenced both to the north and south. A station has also been cut at the 1500-ft. level in the winze and a drift has been started into the Hard Scrabble claim where ore is known to exist. Considerable ore has been stoped in Superior & Pittsburg ground along the Hard Scrabble-Del Norte line. Sinking below the 1600-ft. level has commenced at the Sacramento shaft in order to get clearance room below the ore pockets which are to be put in at this level. The drift on the 600-ft. level of the Spray has been run under the Holbrook shaft, and this shaft will be deepened by raising. The mule train on the 200-ft. level from the old South Nest stope will soon be replaced by a motor.

Bisbee Copper Mining Company—A tunnel is being driven to get under the old Gunsight vein.

Empire State—The 1000-ft. tunnel exposes about 150 ft. of low-grade copper ore, carrying a small amount of gold and silver. Prospecting from this tunnel is being continued.

Bisbee Extension—The shaft is now 660 ft. deep and in limestone. The company will sink to water level before drifting is commenced.

Calumet & Arizona—Recently four new drifts have been started to further prospect and develop the 1250 level of the Irish Mag shaft. The new drift on the 450 level is well out toward the oreshoot that extends above the cave on the 550 level.

Superior & Pittsburg—Sinking has been discontinued at the Briggs shaft until the 1200 station has been cut, after which sinking will again be commenced. The main new drift on the 1450 level at the Oliver shaft is in about 400 ft. It is expected that ore will be encountered with about 300 ft. more drifting. At the Cole shaft the new orebody on the 1000 level has been thoroughly prospected and has proved to be a large body of rich oxide ore.

Denn-Arizona—The drifts on the 1350 level have been advanced about 400 ft. each way along the Dividend fault. A raise has been started to come up under the ore on the level above. On the 1350 a drift is also being run to the northwest. A body of sulphide has been encountered.

Tombstone Consolidated—With the two new boilers being installed, the plant will consist of 10 large marine boilers. An attempt will first be made to unwater the mine to the 1000 level where there are two pumps submerged. With the aid of these two pumps the pumping capacity will be about 14,000,000 gal. per 24 hours and it is estimated that there will be little trouble encountered in handling the water.

GILA COUNTY

Miami—Shaft No. 4 has been sunk in conglomerate to a depth of 601 ft. During the last week of February, 911 ft. of drifting, crosscutting and raising were completed. The company spends $25,000 monthly in underground development. It is estimated that the Miami concentrates will average from 30 to 40 per cent. copper, and that the total percentage of extraction from the ore will be between 75 and 80 per cent.

Arizona-Commercial—The east drift on the seventh level, following the Black Hawk vein, has passed through 20 ft. of 7 per cent. ore and has since been in material averaging between 2½ and 3¼ per cent. copper, but containing considerable iron as well.

Live Oak—The company has issued its semi-annual report covering the period from its organization to Dec. 31, 1909. Of the 50,000 shares of stock, 11,000 shares have been issued, fully paid, and 39,000 shares part paid. The receipts have been $192,240. The disbursements amounted to $163,746. Cash on hand Jan. 1, 1910, was $28,494. To supply funds for future operations the management will make a call of $2 per share on all partially paid-up stock, payable April 1, 1910.

Colorado

LAKE COUNTY—LEADVILLE

Highland Mary and Bobby Burns—These claims, on Breece hill, are outputting about 50 tons per day of second-class ore. The ore carries a large amount of bismuth which must be sorted out.

Garbutt—This mine is producing about 50 tons of lead sulphide per day, which goes to the local smeltery.

TELLER COUNTY—CRIPPLE CREEK

It is reported that the February production of gold was $1,206,527, the average value of all ore treated being $22.81 per ton.

Jerry Johnson and Arapahoe—The February production is given at 1200 tons, of a gross value of $24,000.

Doctor-Jack Pot—The dividend of this company payable March 1 was ½c. per share, and amounted to $15,000. During the year ended Jan. 1 the production was 6048 tons, gross value $148,092. Treatment and freight charges amounted to $44,674, making the net returns $103,418.

El Paso—This mine shipped 2200 tons of ore of a gross value of about $44,000 in February. It is anticipated that when the lower workings are unwatered by the deep-drainage tunnel, the mine will be worked on company account.

United Gold Mines—The United Gold Mines Company is shipping 2000 tons of $20 ore per month.

Golden Cycle—That portion of the Golden Cycle mine under lease to Wilson & Co., produced 900 tons of ore in February, the value in gold being about $18 per ton. Two mining engineers are said to be examining this mine, with a view to purchase by English capital.

Bonanza-Midget—It is announced that the Bonanza-Midget company, organized three months ago, will pay a dividend of 2 per cent. on its capitalization of $500,000 on March 10. J. W. Doepke is manager.

Gold Dollar—In a quarterly report issued by H. L. Shepherd, manager, it is stated that the cash received from royalties and ore shipments on company account is $5411 for the quarter, with a cash reserve of $15,743 in the treasury.

Stratton's Independence—January production was 2170 tons of ore averaging 25 dwt. 15½ grains per ton; dump ore milled. 6100 tons; net working profit, $13,600; expenditure on new mine development account $1250.

Idaho

Coeur d'Alene District

Ferguson Group—A bond of $17,000 has been taken on these claims near Murray by H. P. McGuire, of Seattle.

Alice—The mill is producing 20 tons of concentrates per day and this output will be increased soon. Present shipments have paid all the expense of running 2½ miles of tunnel, and the property is on a solid paying basis.

Golden Queen—Ore rich in gold has been struck.

Nabob—Eastern stockholders have agreed to take up 425,000 of the 500,000 shares of increased capitalization and the proceeds will be used in further development. A 100-ton mill is contemplated.

North Fork Smelting Company—A small smeltery for treating lead ores has been erected at Enaville.

Indiana

Sullivan and Greene Counties

Alliance Coal Company—A recommendation for the improvement of this company's mines in Sullivan and Green counties, involving the expenditure of half a million dollars in the effort to produce more coal and get it to the direct market without shipping to jobbers at Chicago, will be the result of a tour of inspection just completed by Frank R. Fisher, general superintendent of the company. He has visited the 14 mines owned by the company and made a thorough inspection of the Gilmbrour mine, northeast of Sullivan. The Alliance Coal Company is composed of Chicago bankers who purchased the Walsh holdings at a sale conducted by the United States Court six months ago. The proposed improvement will bring an increase of work to the miners of Sullivan and Greene counties and will greatly increase the value of the property. Superintendent Fisher said: "We have been shipping to Chicago, and we now propose to ship to Indianapolis and St. Louis markets instead. We will establish offices in both cities."

Kansas

Production for February was 4,247,570 lb. of blende and 229,210 lb. of lead ore with a total value of $92,649. Little has been done in the Kansas district during the last month. All prospecting work has been at a standstill and the large companies have been waiting for the weather to settle. The Big Six mine has broken into the ore at a depth of 170 ft. and has a continuous face of ore extending to about 300 ft. as shown by the drill holes. The Boston Mining Company has taken the O'Neill land and the Boughton leases from the Playters and is going ahead now to open up the properties. A steam shovel has been secured for the Boughton lease. Franklin Playter is manager.

There seems to be great probability of a new Kansas camp starting up at Playter. The Old Dominion Mining Company is planning the opening of its Newton mine at Playter. This is one of the few open-pit mines in the district. The ore is found within 6 ft. of the surface and after the overburden is removed with teams the 30- to 40-ft. face of ore is to be taken to the mill by means of an incline tram. The mill is to be enlarged to 300 tons capacity.

Michigan

Copper

La Salle—Regular rock shipments have begun to the Allouez-Centennial mill, rock coming from the stock pile of No. 1 Tecumseh shaft. The copper content of the rock has not been officially announced, but it should show the average yield for the Kearsarge lode. It is estimated that this stock pile contains about 30,000 tons.

Mohawk—Sinking and drifting is going forward at No. 6 shaft. The drifts in both directions from the first level have been extended about 30 ft. each way. Though the rock is not as rich as first exposed in the face of the crosscut, it is a good grade of stamp rock and is being sent right to the mill, shipments of about 40 tons being made daily. The shaft is down about 300 ft. and will be at the second level within a few days, when crosscutting to the lode will be started. An arrangement has been entered into between the Mohawk and the Ahmeek, which will be taken up for ratification at the annual meetings, for the exchange of land in section 28. This exchange will straighten the boundary lines of the companies and allow the No. 3 shaft of the Mohawk to be sunk to a depth of nearly 4000 ft., its present limit being less than 2000 ft. and will let the Ahmeek work about 80 acres additional through its present shafts.

Isle Royale—"A" shaft, sunk to cut the Baltic lode, is down below the 3d level without exposing copper in commercial quantities. The shaft is evidently sinking in the lode, as copper is encountered from time to time. Drifting is under way at the 3d level. About 1800 tons daily are being shipped to the mill from the other shafts. The February returns show nearly 17 lb. refined copper per ton of rock stamped.

Oneco—No. 6 drill hole is down about 550 ft. and should intersect the recently discovered amygdaloid lode within the next 200 ft. No. 7 hole, going down at a point about 2000 ft. away to cut the same formation, is down about 200 feet.

Hancock—No. 2 shaft is down about 2200 ft. on its way to cut the No. 2 lode. This shaft should reach the lode within a few days. The winze from No. 1 shaft, sinking on the No. 3 lode from the 13th level, is down to the 18th level, and at that point it will be cut by the second crosscut from No. 2 shaft, through which the rock from the 13th level down will be handled.

Section 12—This exploration company has made arrangements for the second drilling outfit to go into commission on its tract east of the Isle Royale, in view of exposing the extension the Baltic lode. This hole, No. 3, will be about 800 ft. north of the present operating hole. A drill core taken from the first hole showed what the management believed to be the Baltic lode, but it was without copper in commercial quantities, and its further opening will be watched with interest.

Missouri

Joplin Zinc-Lead District

Production for the month was 30,761,815 lb. of blende, 2,171,710 lb. of calamine and 5,552,550 lb. of lead ore with a total value of $804,445.

The Mining Club has perfected a permanent organization with 150 members and an assured income of $20,000 per year. This is the best effort the district has yet made for an organization to better the conditions of the producers.

Old Dominion—This company is branching out and has added two more properties to its list. These are the Binghampton, east of Joplin, and a 640-acre tract of land near the town of Ritchie.

St. Paul—This company is thoroughly drilling its land at Redings mill, south of Joplin, and is reported to have struck deep ore there. This is in practically new territory as this section has never been prospected.

Pike County Land Company—Two drills are at work prospecting the 80-acre fee recently purchased at Porto Rico.

McGee—This mine at Duenweg has sunk a new shaft and struck the silicate orebody at 73 ft., thus demonstrating the extension of the ore quite a distance beyond the present workings. This is the greatest silicate mine in the district and the life of the mine seems to be assured for some time to come.

Montana

Broadwater County

Black Friday Gold Mining Company—This company has recently been incorporated with a capital of $1,500,000 and has acquired eight gold-quartz claims near Radersburg, among them the Black Friday which has made numerous shipments. A. B. Bennett is manager.

Butte District

Butte Central—The stockholders have recently elected the following directors: Sir Francis Borden, of Ottawa; Harry W. Davis, of Wilmington; William H. North, Freeman I. Davidson, Francis A. Cave, W. H. Thompson and W. G. Burns, all of Boston; Sir Henry M. Pellett, of Toronto; Rudolph Forget and Mark Workman, of Montreal; Charles A. Henderson, of New York; William R. Tillinghast, of Providence; George G. Cragin, of Athol, Mass.; and John A. Condy, of Lynn, Mass. Preparations are being made to have the stock listed on the Boston exchange.

Tuolumne—The management states that the January output was 72,800 lb. of copper and $5491 in silver.

Butte & Superior—It is thought that new machinery will be installed at the Basin concentrator so that the ores may be crushed more finely, since with the present machinery considerable zinc is lost. The crosscut from the Black Rock shaft to the Colonel Sellers shaft is now in about 300 feet.

Fergus County

New Mine Syndicate—A shipment of rough sapphires has recently been made from the mines near Utica to London, England, where they will be cut and polished and then reimported into the United States.

North Moccasin—The Bank of Fergus county has recently bought in the property of the company at sheriff's sale in satisfaction of a judgment for $121,634. It is thought that steps will be taken toward a reorganization of the company's affairs.

Jefferson County

Montana-Corbin—The management states that a 16-in. seam of chalcopyrite ore has been found on the hanging wall of the north ledge on the 400-ft. level, and 30 in. of 8 per cent. copper on the foot-wall side.

Corbin Metal Mining Company—The main shaft, sunk on the lead, is down 350 ft. The management states that a 2-ft. body of ore was discovered at a depth of 200 ft. and that it assays over 4 per cent. copper.

Robert Emmet—The management states that a concentrator will be built on the property in the spring. Development work has been done on the 200- and 300-ft. levels. The shaft is being sunk to the 500-ft. level where the veins will be explored.

Lincoln County

Last Turn—The tunnel has cut a silver-lead vein at a depth of 160 ft. and a crosscut has been driven through the vein a distance of 15 ft. without reaching the hanging-wall. The group is six miles from Libby.

Missoula County

Montana-Standard—A concentrator is to be erected soon and shipments resumed after three years of idleness.

Powell County

Maryland—This company expects to ship this summer, the ore to be taken out by way of Thompson Falls, Mont.

Elliston—A $100,000 bond has been taken by North Dakota people and the property is being operated under the management of E. R. McCartney.

Nevada

Nye County

Mayflower - Bullfrog Consolidated—Charles T. Dunbar, Henry Laub, E. S. Drury, F. H. Stickney, C. F. Ryan, L. P. Kimball and J. Lemle, the newly elected directors, who replace A. C. Eisen and his associates in the control of the affairs of the company, have entirely changed the plans of the old directorate. The property is to be worked by a newly organized leasing company, composed of original Mayflower stockholders.

Storey County

The project long under discussion of combining the various properties on the old Comstock Lode in Nevada for the purpose of clearing the lower levels of water and through coöperation attempting to resume operations on a large scale has taken definite form through the formation of a committee. The mines represented include the Consolidated Virginia, Ophir, Mexican, Potosi, Crown Point, Chollar, Utah, Yellow Jacket, Belcher, Savage, Sierra Nevada, Justice, Bullion, Union Consolidated, Imperial, Exchequer, Best & Belcher, Challenge, Kentuck, Gould & Curry, Confidence, Alpha, Hale & Norcross, Alta, Overman, Lady Washington and Julia. This committee represents the majority stockholders of the 27 companies on the lode and invites the deposit of shares with the Bankers' Trust Company, of New York, or the Crocker National Bank, of San Francisco, subject to approval of a plan of reorganization.

The call for the deposit of stock is signed by Franklin Leonard, Jr., president of the Comstock Tunnel Company, Adolph Lewisohn, Ernst Thalmann, A. L. Scheuer, W. C. Ralston, James McNab, J. Parke Channing, B. F. Shaw and Charles A. Ellis, who, the announcement says, have been appointed a commitee to formulate a plan for coöperation by consolidation of the mines, exchange of stock or otherwise, "to the end that the same may be placed upon a larger producing basis by means of ample capital and modern methods."

White Pine County

Giroux—Two compartments of the new shaft are now below the 1100-ft. level, and will be carried downward as rapidly as possible until the 1200-ft. level is reached, when a station will be cut and pumps installed. From the 1200-ft. level a crosscut will be run to join the 1200-ft. level of the Alpha shaft. The two are already connected by a drift at the 1000-ft. level and a big block of stoping ground will be thus established.

Oklahoma

Production for February was the smallest for many months, being only 1,888,760 lb. of blende and 618,965 lb. of lead ore with a total value of $40,402. The Quapaw Gas Company is laying its pipe through the Miami camp and Quapaw and these camps will soon have gas fuel instead of coal. The Omaha-Petersburg Mining Company is to build a new 500-ton mill north of the Mission mine at Quapaw. A local company has been organized at Baxter Springs to build an electric railway from Baxter Springs to the Miami mines.

South Dakota

Homestake—The plant is again operating at its full capacity of 1000 stamps.

Utah

Beaver County

Wild Bill—A strike was made on the 300-ft. level. This property is held under a bond and lease by G. S. Wilkins and F. T. Leonard.

South Utah Mines and Smelters—A copy of the articles of incorporation of this company, organized at Augusta, Me., was filed Feb. 28 with the secretary of state. The capital stock is $4,300,000 in shares of $5 each. The officers are L. N. Kramer, president; John Josten, secretar; C. H. Parsons, resident agent for Utah.

Leonora—A vein of carbonate ore about 18 in. wide was broken into in the lower tunnel of this property in the Star district. The company has been reorganized and is now under the management of Salt Lake people. C. N. Christensen is superintendent.

Majestic—Ore is exposed on the 500-ft. level of this company's Harrington-Hickory mine for a distance of 110 feet. The shaft is down about to the 550-ft. level and sinking is being continued. A carload of ore is now at the smeltery and it is stated that weekly shipments will be maintained regularly.

Juab County

Tintic ore shipments in carloads for the week ended Feb. 26 were as follows: Dragon Iron, 21; Iron Blossom, 19; Colorado, 17; Sioux Consolidated, 15; Opohengo, 2; Centennial-Eureka, 43; Gemini, 3; Grand Central, 8; Eagle & Blue Bell, 3; Uncle Sam, 2; Victoria, 2; Chief Consolidated, 4; Scranton, 6; Beck Tunnel, 2; Swansea, 1; North Cliff, 1; Eureka Hill, 1; Ridge & Valley, 3; Mammoth, 2; Yankee, 1; May Day, concentrates, 1; total, 157.

Lower Mammoth—A strike was made in a raise from the 1800-ft. level. This is thought to be the continuation of an orebody which was opened on the 1700-ft. level and from which a large tonnage was mined. On the 2000-ft. level a drift is being run to look for the continuation of the ore at this depth.

Salt Lake County

Bingham Mines Company—The annual report shows net earnings for the year to have been $55,774. The company retired $331,000 first-mortgage bonds of the old Bingham Consolidated, its predecessor, leaving $572,000 still outstanding. This has brought down the annual interest charge from $54,180 to $34,320. The company is making regular shipments from its Bingham and Tintic mines.

North Utah—The drift on the 227-ft. level of the Butler Liberal section has been driven several hundred feet through ore. This orebody has been opened on a lower level south of the shaft, and has largely added to the available tonnage.

Yosemite—A strike of silver-lead ore is reported 100 ft. below the level of the old Paradox tunnel. This is said to be the continuation of an orebody which was stoped above the tunnel level some years ago.

Washington

Ferry County

Tom Thumb—This mine is under lease to A. R. Sweet and O. B. Collins, of Republic. About six cars of ore are being shipped per week.

Copper Key—E. L. Tate, manager, reports that the orebody, for which such a long search has been made, has been found.

Stevens County

Imperial—Development work will be started on this property three miles north of Chewelah in the spring.

Wyoming

Albany County

Jupiter—The company is preparing to install machinery sufficient to sink a 500-ft. shaft the coming summer.

Rambler—Work is being pushed on the mill. Tests, it is claimed, show the concentrates to carry 1 to 6 oz. of platinum.

Canada

British Columbia

Consolidated Mining and Smelting—The Trail smeltery treated 36,840 tons of ore in the copper furnaces and 4673 tons in the lead furnaces during January. The production was 14,712 oz. gold worth $301,363; 205,232 oz. silver worth $109,036; 617,064 lb. copper worth $84,109 and 3,443,509 lb. lead worth $101,697. There were 43,344 tons of ore received, of which 34,507 tons came from the company's mines.

Ontario

Dominion Iron and Steel Company—At a meeting of the directors of the Dominion steel and coal companies, at Montreal, March 4, the balance of damages due to the steel company by the coal company was fixed at $800,000, and arrangements made for its settlement. This enabled the steel company to declare a dividend of 31½ per cent. on preferred stock, covering all arrears, as well as the dividend falling due April 1.

Ontario—Cobalt

The shipments from Cobalt for the week ended Feb. 25, were as follows: Kerr Lake, 350,000; La Rose, 212,565; Nipissing, 127,437; Crown Reserve, 61,153; City of Cobalt, 64,000; Silver Cliff, 66,010; total, 881,165.

Buffalo—In January 2770 tons of ore were treated in the mill and the silver recovery was 103,549 oz. at a milling cost of $6572

La Rose—A new vein has been cut in the stope from the No. 3 working. The vein is about 6 in. wide of high-grade ore.

Right-of-Way—A 2 per cent. dividend has been declared on the new capitalization. All the work is now being carried on at that end of the property adjoining the McKinley-Darragh.

Bailey—Ore has been exposed in the vein about 25 ft. below the tunnel level.

Rochester—A 5-in. vein reported to be rich has been encountered at the 75-ft. level.

Mexico

Chihuahua

San Francisco—John R. Roslyn and New York associates will drive a 1000-ft. development tunnel to open up this mine in the Naica camp. Machinery is to be installed.

Rio Plata—In January this company crushed 1706 tons of ore containing 93,872 oz. silver for a total production of 71,164 oz. worth $33,310. Tailings containing nearly 20,000 oz. were stored. The operating costs were $13,464 and operating profit was $20,047.

El Rayo—The mill crushed 4700 tons of ore in January for a production of $62,107. The ore averaged $12.55 per ton, and the extraction was 80 per cent. Operating expenses were $26,142. Monthly cards to stockholders are now to be discontinued, quarterly statements being substituted.

Rosario—It is reported that English people are to begin operations at this old mine in the Guadalupe y Calvo section in the extreme western part of the State.

Hidalgo

Santa Gertrudis—The final payment was made on this mine, Jan. 24, when Charles S. Thomas, representative of the Camp Bird, Ltd., deposited a check for 9,144,825 pesos. This amount, with the 200,000 pesos already paid, covers the purchase price of the mine and the cyanide plant at Guadalupe. It is the largest single check ever drawn in the Republic of Mexico.

Jalisco

Centralia—This Chicago concern is erecting a small concentrating plant for experimental purposes at its mines in the Hostotipaquillo district.

Hostotipaquillo Power—The Chapala Hydroëlectric and Irrigation Company will have its distributing station for the district in the town of Hostotipaquillo instead of at the El Favor mine. The town is much nearer the Cinco Minas, of the Marcus Daly estate, where it is planned to use up to 1000 horsepower.

Mexico

Dos Estrellas—The 1000-ton Butters filter plant is nearing completion and will soon be in operation. This is the largest vacuum-filter plant in Mexico.

Esperanza—The 1909 profits were approximately 1,517,582 pesos. A 50-ton Sweetland filter press is being installed for experimental purposes.

Sonora

Santa Rosalia—The main shaft is being lowered from the 350- to the 550-ft. level, from which point a crosscut will be run to tap the vein about 750 ft. below the surface. A small shipment of ore yielded $730.59 per ton, according to President R. K. Clancey.

Mexican Northern—A 100-ton cyanide plant is being installed at this company's property, in the southeastern part of the Magdalena district. A 15-stamp mill is being operated, but recovery has not gone above 55 per cent.

Carmen—Ore has been found on the lower level.

Ray—A. J. King and associates have purchased this mine, an adjoining property to the Cinco de Mayo, from the First National Bank, of Douglas, Ariz.

Lluvia de Oro—Plans for the erection of a stamp mill have been drawn and it is expected to be running by July 1.

Higinio—This mine has done 800 ft. of exploration work during the last year. The ores carry silver and copper.

Llanos de Oro Consolidated—Louis H. Mooser has been appointed receiver for this company, in the Altar district, and will continue operations.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, March 9—The Eastern bituminous-coal trade is gradually getting into better shape. There is less trouble over cars and transportation, though conditions are not yet ideal, by any means. The anthracite trade presents nothing new.

In the Western trade the wage scales and the storing of coal against a possible strike are the chief matters of interest. Everyone is waiting the results of the meeting now being held at Cincinnati. The Illinois mines and operators failed to reach an agreement at Peoria last week, and it is uncertain when another trial will be made. Meantime mines are busy shipping coal for storage and current business is active.

COAL TRAFFIC NOTES

Coastwise shipments of coal at Atlantic ports, year ended Dec. 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	14,418,292	10,549,974	24,968,266	61.2
Philadelphia	2,001,866	4,674,276	6,676,142	16 4
Baltimore....	235,233	3,344,225	3,579,458	8.8
Newp't News	....	3,495,596	3,495,596	8.6
Norfolk......	....	2,047,417	2,047,417	5.0
Total......	16,655,391	24,111,488	40,766,879	100.0
Total, 1908.	17,486,407	23,021,019	40,507,426	.....

The total increase in 1909 was 259,453 tons, or 0.6 per cent.

Coal delivered at Sewalls Point, Va., by the Virginian Railway in 1909 was 241,644 tons, of which 30,425 tons were exported and 48,122 tons bunkered or delivered for fuel to steamships in foreign trade.

New York

ANTHRACITE

March 9—There is nothing new in the anthracite trade. The first touches of spring weather are cutting down domestic sales a little; otherwise business is steady.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.85@2; barley, $1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

The trade shows some improvement. While car shortage and transportation are still vexing questions, there is some improvement in both. This is due largely to better weather. Orders are coming in rather more freely, New York harbor especially showing willingness to buy; but it is still the cheaper grades of coal that are in demand. Prices are about the same as for some weeks past.

The discussion of yearly contracts is becoming quite active as the end of March is drawing near. There is much difference of opinion as to prices, as usual.

The Western situation is attracting attention. The point here is to what extent West Virginia coal will be diverted to Western points in case of a general strike. If one does come, probably there will be less of that coal to spare for the seaboard trade.

In the coastwise vessel trade there are more boats to be had. There is no nominal change in rates, but a weaker tendency.

Birmingham

March 7—The coal production in Alabama is very heavy yet with no indications of curtailment. The railroads are doing a little better in handling the product of the mines.

Announcement is made that Chief State Mine Inspector Edward Flynn has resigned, to accept the position of chief inspector of the mines of the Tennessee company. James Hillhouse, heretofore associate, will succeed Mr. Flynn as chief inspector.

Chicago

March 7—Nearly all kinds of coal are in lessened demand and the trade appears to look forward to the usual spring slackness. Steam coals in general are in large demand, but the supply is large also. Screenings, however, hold up firmly to high prices. Domestic coals are weak. Transportation difficulties are no longer a cause of serious complaint, and the prospect seems to be for increased receipts, diminishing consumption of domestic coals and steady, large consumption of the lower-priced steam kinds.

Illinois and Indiana bring the following car prices: Lump and egg, $2.50@2.65; run-of-mine, $2.25@2.35 and screenings, $2.25@2.50. Eastern coals are all in good demand and fair to large supply, smokeless being somewhat weak. Prices on these coals are: Hocking, $3.15; smokeless, $3.65@3.85 for lump and $3.30@3.40 for run-of-mine; Youghiogheny ¾-in. gas, $3.30. The anthracite demand is for small lots, widely distributed, with nut in greatest requirement.

Indianapolis

March 7—Large shipments of coal from the mines of this State have continued for two weeks. Except for interference during the snowstorm the reports from the operators show heavy movements of coal during February. The railroad companies have stocked up liberally and are now furnishing ample cars and the output is very satisfactory.

The executive committee of the United Mine Workers held a meeting in this city during the week. President Lewis said the wage-scale matter was not considered at this meeting. "We had previously decided upon an advance and we will get it. If we don't, we are prepared to strike. Delegates will attend the Cincinnati conference Tuesday and will continue in session from day to day until an agreement is reached, if possible."

James Epperson, State mine inspector, has looked over the proposed site near Terre Haute for the establishment and equipment of a life-saving station. Mr. Epperson will ask the next legislature for an appropriation of $30,000 for the purpose.

Pittsburg

March 8—The convention of operators and miners assembled in Cincinnati this morning and will likely remain in session several days. The opinion is growing that on one ground or another there will be a suspension of mining. While there is no general movement to lay in stocks, there has already been considerable stocking by electric light and gas concerns, as well as by railroads. Coal for such prompt shipment generally commands 10@15c. premium above regular prices. The car supply is reported better this week than for five weeks. We quote regular prices unchanged, except that slack is 5c. higher; mine-run and nut, $1.15; ¾-in., $1.25; domestic 1¼-in., $1.40; slack, $1@1.05 per ton.

Connellsville Coke—The market has continued very quiet, sales being light, but there is increased inquiry, occasionally for early deliveries, but chiefly for second half. This latter inquiry is perhaps only tentative, furnaces looking for an improvement in pig iron and wishing to have coke negotiations under way in order to close should the pig-iron market really establish the trend expected. We quote prices on standard grades nominally at $2@2.25 for furnace and $2.75 @3 for foundry.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Feb. 26, at 461,774 tons, a decrease of 1300 tons from the preceding week; shipments at 4884 cars to Pittsburg, 8723 cars to points west of Pittsburg and 902 cars to points east of Connellsville, a total of 14,509 cars.

St. Louis

March 7—Summer weather prevails with the consequence that the demand from dealers has slowed down. However, the market has maintained itself surprisingly. There has not been the slightest falling off of price on any size of coal. The demand for lump is not as strong owing to weather conditions, yet this is more than offset by the very strong demand for mine-run which is being made in large quantity. Screenings for local shipment are today higher than at any time since 1906. They readily brought $1.10 per ton f.o.b. mine here today. The demand from industries and railroads is enormous and all of them are stocking coal as fast as they can get hold of it.

An enormous tonnage of coal is now moving as the traffic reports show that about 50,000 tons per day is being shipped into the St. Louis market. The car situation remains unchanged on the Illinois Central and Iron Mountain which roads were already so extremely short. High-grade coal is being readily absorbed by dealers and the prices on it remain unchanged. However, it seems to be coming forward more freely now.

Current quotations are as follows, the first being in each instance at the mines and the second f.o.b. St. Louis:

	F.O.B. Mines.	F.O.B. St. Louis.
Standard		
6-in. lump	$2.00	$2.52
2-in. lump	1.90	2.42
Mine run	1.50	2.02
Nut and pea	1.40	1.92
Screenings	1.10	1.62
Pea and slack	0.90	1.42
Springfield, Mt. Olive & Staunton		
6-in. lump	$2.10	$2.62
2-in. lump	2.00	2.52
Mine-run	1.60	2.12
Screenings	1.10	1.62
Franklin County		
6-in. lump	$2.20	$2.87
3-in. nut	2.00	2.67
1½-in. screenings	1.25	1.92
Carterville		
6-in. lump	$2.00	$2.67
3-in. nut	1.90	2.57
1½-in. screenings	1.00	1.67

The anthracite market is, of course, low, owing to the lateness of the season. Though stocks on hand are all low, an unusually brisk April trade is anticipated.

FOREIGN·COAL·TRADE

Bunker Coal at United States Ports—Coal furnished to steamships in foreign trade at United States ports, year ending Dec. 31, long tons:

	1908.	1909.	Changes.
Coast ports	5,797,567	5,890,848	I. 93,281
Great Lakes	226,162	233,400	I. 7,238
Total	6,023,729	6,124,248	I. 100,519

Adding the exports, previously reported, this makes a total of 18,660,805 tons in 1909 sold for consumption beyond the limits of the United States.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Feb. 26: Best Welsh steam, $3.96; seconds, $3.90; thirds, $3.78; dry coals, $3.84; best Monmouthshire, $3.60: seconds, $3.42; best small steam, $2.10; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, March 9—The iron and steel trades are beginning to revive a little from the quiet which has prevailed since December, but there is still rather a waiting than an active tendency.

In pig iron there are more inquiries, both in eastern and western territory; but many of these include an insistence on lower prices, which makers are not yet willing to concede. Some furnaces, however, are ready to meet buyers rather than let business go past them, and it looks as if their number would increase.

In finished material the chief new business has been in material for railroad equipment and rails. A number of small orders for structural steel are coming up, which make a fair total. Otherwise the market is quiet. Jobbers report an increase in demand for bars, nails and small material, which might be expected with the coming of spring.

Baltimore

March 8—Imports for the week included 6700 tons manganese ore from India; 21,075 tons iron ore from Cuba.

Birmingham

March 7—Optimism is expressed on all sides by the Southern pig-iron makers and while the market right now is a little quiet, there appears to be a feeling that the inquiries coming in will result in business. The quotations are yet a little weak, caused by the resale iron that is to be had. The furnace companies are holding to $14 per ton, No. 2 foundry, for their product, the resale iron to be had from 50 to 75c. cheaper. There is not much of the iron left. There has not been a very great accumulation of iron in the yards, and there is not much being stacked. The foundry iron make is under the average right now. Basic and charcoal irons continue to enjoy a fairly good demand, charcoal iron bringing over $22 per ton. The steel plant of the Southern Iron and Steel Company at Alabama City, near Gadsden, is making steel. The steel plant of the Tennessee company continues to operate steadily. The rail orders, mentioned before, are sufficient to warrant operation practically through the year.

Chicago

March 7—The iron market continues quiet, with Southern pig iron selling at uncertain prices, though the leading sales agents say it is in general held up to the $13 Birmingham mark, which means $17.35 Chicago. Northern iron is firm at $18, and is selling in small lots to the apparent satisfaction of furnace representatives. For both Northern and Southern, indeed, the demand is small and scattering still, with only a rare order for a good-sized tonnage, but some Southern interests undoubtedly are cutting the price in their eagerness to sell. Inquiries are more numerous and some are for large tonnage, based upon last-half requirements.

Notwithstanding large immediate and prospective consumption of pig iron, however, the melters appear to have the notion that overproduction may be near, with accompanying lower prices. On any other ground it is difficult to explain the holding off from contracts for large future needs. For iron and steel products the market is in general quiet, but with good sales of railroad supplies and with structural material showing a little more activity. Coke is in somewhat larger demand and brings $5.75 for the best Connellsville.

Philadelphia

March 9—The chief feature of this pig-iron market at present is the larger number of inquiries from outside sources, including New England, for foundry irons. The actual purchases during the week have fallen below expectations. Offers have been made within 24 hours which involve concessions from asking prices. Additional lots of Southern iron are coming this way. There is no evidence of a further weakening tendency. Basic pig continues strong and the market is in excellent shape at $18. No. 2 foundry has brought $18.25 for Northern and $17.75 for Southern.

Bars—Bar iron has recovered from any supposed weakness it had early in the month.

Sheets—The larger consumers are asking best prices on long deliveries. The mills are well supplied with orders.

Pipes and Tubes—The greatest activity prevails in all plants using tubes. The local strike has had no effect on such establishments.

Plates—Another batch of car-building orders has been scattered among the plate mills of the State. The reports of shaded prices on plates when large buying interests are concerned are not contradicted.

Structural Material—No reduction has been made, but in certain cases large orders have been taken at slightly lower prices.

Scrap—There is an accumulation of scrap now going on since favorable weather permitted easy shipment. Yards are better supplied and buyers are asking for figures on a wide range of scrap from railroad down to stove plate.

Pittsburg

March 8—Throughout the trade there is talk of there having been an improvement, but thus far the improvement appears to be in that intangible thing called sentiment. Perhaps the change is that there is a partial or complete elimination of the feeling, doubtless held in some quarters, that the market was going to go to pieces. There is no prospect that prices will score any important movement in either direction, while the prospect also is that production will be continued at approximately the gait attained in December. The blast furnaces got ahead of the steel works around the holidays and lately the steel works lost considerable production while the blast furnaces continued full production.

Pig Iron—Finding that there was quite a lot of bessemer pig iron to be had at the former purchasing price of $18, Valley, the United States Steel Corporation held off as to the purchase our last report mentioned it might make, and two independent steel companies stepped in and bought between 15,000 and 20,000 tons at $17.50, Valley, one of these being the Cambria Steel Company, which took 10,000 tons. The market on bessemer is thus quotable at $17.50, Valley, 50c. less than at last report. Several sales of basic pig have been put through, most of the iron being from speculators and at prices less than would be done by furnaces, one lot of 3500 tons being at $15.75, Valley. The market, however, is not quotable at under $16, Valley, as the speculative iron is understood to be pretty well cleaned out and the majority of furnaces are quoting at above $16. The Westinghouse Electric and Manufacturing Company is closing at this writing on the 15,000 tons it inquired for a week ago. It is understood that prices down to about $16, Valley, were quoted on this iron, which has surprised the majority of the trade, since it was thought that for the delivery—second half—the furnaces would want more money than for prompt iron, since second-half iron will be made out of this season's ore, which is 50c. higher. The market is quotable at $17.50 for bessemer, $16 for basic, $16.25 for No. 2 foundry and malleable and $15.25 for forge, all at Valley furnaces, freight to Pittsburg being 90 cents.

Steel—There is little steel pressing on the market, but there is plenty to make deliveries on contracts and there is little demand, so that the market is a trifle easier although there has not been enough business done to test the market absolutely. Some inquiry has appeared for sheet-bars for second quarter. We continue to quote billets at $27@27.50 for bessemer, $27.50@28 for open-hearth, sheet-bars at $28.50@29, with $33 for rods.

Ferromanganese—The market is quiet and not over strong. Nominally prices are unchanged at $43.50 for prompt, $44 for second quarter and $44@44.50 for second half, f.o.b. Baltimore, but it is possible that these prices could be shaded. Freight to Pittsburg is $2.30 per ton.

Sheets—Demand is fairly good, prices being well maintained except that the shading of $1 a ton on corrugated sheets continues. Blue annealed sheets are still stronger for early delivery. Subject to the shading in corrugated material the market is quotable at 2.40c. for black sheets, 3.50c. for galvanized, $1.70 per square for painted corrugated, $3 for galvanized corrugated and 1.90c. for blue annealed, 10 gage.

St. Louis

March 7—The pig-iron market remains quiet, though slight improvement has been noted this month. Producers are not at all worried over the situation though the present market is not quite up to expectations. Furnaces are all well covered for the first half and have a small sprinkling of orders for the third quarter. Some concessions have been heard of on small lots for immediate shipment, though the present price is $14.50 per ton f.o.b. Birmingham and $18.25 St. Louis for No. 2 foundry, both for immediate and future delivery.

Foreign Iron

British Iron Trade—Exports and imports for the year ended Dec. 31 are valued by the Board of Trade returns as follows:

	Exports.	Imports.	Excess.
Iron and steel	£38,267,690	£ 7,971,489	Ex. £30,296,201
Machinery...	28,088,956	4,438,292	Ex. 23,650,664
New ships....	5,914,684	....	Ex. 5,914,684
Total..... ..	£72,271,330	£12,409,781	Ex. £59,861,549
Total, 1908..	78,973,019	12,234,416	Ex. 66,738,608

Decrease in total exports, £6,701,689, or 8.5 per cent.; increase in imports, £175,365, or 1.4 per cent. The total quantities of iron and steel were, in long tons:

	1908.	1909.	Changes
Exports............	4,096,521	4,218,063	I. 121,542
Imports............	1,119,407	1,193,414	I. 74,007

Exports of scrap iron and steel, 137,393 tons in 1908, and 167,664 in 1909; increase, 30,271 tons.

Imports of iron ore into Great Britain for the year were 5,936,808 long tons in 1908, and 6,225,035 in 1909; increase, 288,227 tons. Of the imports in 1909 a total of 4,635,529 tons came from Spain. Imports of manganese ores were 120,702 tons in 1908, and 103,578 in 1909; decrease, 17,124 tons.

Scotch Iron Production—The statement of the Scotch furnaces for the year is as follows, in long tons:

	1908.	1909.	Changes.
Stocks, Jan. 1...	96,043	186,045	I. 90,002
Production.....	1,230,191	1,361,697	I. 131,506
Total........	1,326,234	1,547,742	I. 221,508
Domestic sales..	827,627	981,355	I. 153,728
Exports........	312,562	290,576	D. 21,986
Total sales....	1,140,187	1,271,931	I. 131,742
Stocks, Dec. 31	186,045	275,811	I. 89,766

Of the domestic sales in 1909 foundries took 189,889 and steel works 791,466 tons.

Belgian Iron Production—The make of pig iron in Belgium, year ended Dec. 31, was as follows, in metric tons:

	1908.	1909.	Changes.
Foundry iron.......	76,190	88,960	I. 12,770
Forge iron..........	127,630	156,590	I. 28,960
Bessemer and basic	1,002,620	1,386,800	I. 384,180
Total...............	1,206,440	1,632,350	I. 425,410

The total increase in 1909 was 35.3 per cent., the gain being chiefly in basic pig.

METAL · MARKETS

New York, March 9—The metal markets generally have been steady and fairly active, but with few notable changes.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1910..	$ 6,163,132	$ 2,131,357	Exp. $ 4,031,775
" 1909..	7,865,356	3,420,183	" 4,545,173
Year 1910..	6,163,132	2,131,357	" 4,031,775
" 1909..	7,865,356	3,420,183	" 4,445,173
Silver:			
Jan. 1910..	4,498,304	4,248,354	Exp. 249,950
" 1909..	4,542,094	3,664,752	" 877,342
Year 1910..	4,498,304	4,248,354	" 249,950
" 1909..	4,542,094	3,664,752	" 877,342

Exports from the port of New York, week ended March 5: Exports, $196,655, to Panama and the West Indies; silver, $1,095,161, chiefly to London. Imports: Gold, $196,960; silver, $3466, from the West Indies.

Foreign trade of the United States, month of January, as reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1909.	1910.
Exports..................	$ 156,712,842	$ 144,015,350
Imports..........	103,576,501	133,658,064
Excess, exports......	$ 53,136,341	$ 10,357,286
Add excess of exports, silver..........		249,950
Add excess of exports, gold...........		4,031,775
Total export balance................		$ 14,639,011

The gold and silver movement in detail will be found in the table at the head of this column.

Gold—Prices on the open market in London were unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. Supplies were divided between the Bank of England and the Continent. In New York further exports to South America are expected.

Platinum—The market remains steady. Dealers continue to quote $28.50@29 per oz. for refined platinum, and $34.50 per oz. for hard metal.

Silver—The market has continued quiet and steady between 23⅜ and 23 7/16d. in London. The China banks have been good buyers. The market closes at 23⅜d., and is steady at that figure.

SILVER AND STERLING EXCHANGE

Mar.	3	4	5	7	8	9
New York....	50¾	50¾	50¾	50⅞	50⅞	50¾
London . .	22 7/16	23⅜	23⅜	23 7/16	23 7/16	23⅜
Sterling Ex..	4.8720	4.8725	4.8725	4.8730	4.8725	4.8700

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Feb. 24, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£ 812,000	£1,173,900	I. £ 361,900
China........	230,000	257,000	I. 27,000
Straits.......	61,000	......	D. 61,000
Total......	£1,103,000	£1,430,900	I. £ 327,900

India Council bills in London sold at an average of 16.09d. per rupee.

Copper, Tin, Lead and Zinc

Mar.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
3	13½ @13¾	13¼ @13½	60½	32⅞	4.52½ @4.57½	4.40 @4.42½	5.57½ @5.62½
4	13½ @13¾	13¼ @13½	60¼	32¾	4.52½ @4.57½	4.40 @4.42½	5.57½ @5.62½
5	13½ @13¾	13¼ @13½	....	32¾	4.52½ @4.57½	4.40 @4.42½	5.57½ @5.62½
7	13⅝ @13¾	13⅜ @13½	59⅞	32½	4.52½ @4.55	4.37½ @4.40	5.57½ @5.62½
8	13⅝ @13¾	13⅜ @13½	60¼	32⅝	4.52½ @4.55	4.37½ @4.40	5 57½ @5.62½
9	13⅝ @13¾	13⅜ @13½	60¼	32⅝	4.52½ @4.55	4.37½ @4.40	5 57½ @5.62½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The inquiry from Europe that we mentioned last Wednesday, stimulated by the slight decrease in the statistics, which had a very good effect upon sentiment, materialized in important business on the following day, and on March 3-4 rather large business was done, both for domestic and foreign deliveries, the sales amounting probably in the neighborhood of 50,000,000 lb., electrolytic copper having been sold freely at 13½c., delivered, 30 days, corresponding to about 13.35c. net cash, New York. Since then the sellers have raised their prices further, but on the advance the market became rather dull, which is not surprising in view of the great activity compressed into a few days. Almost all of the agencies are now offering electrolytic copper at 13⅝c., delivered, 30 days, for any delivery up to the end of May and even into June, while some are shading this price materially for the early deliveries. The business in Lake Copper during the week of March 3-9 has been comparatively insignificant. This metal is freely obtainable at 13¾c. and under, but fancy brands have fetched as high as 13⅞c. on small sales and the price of the Calumet & Hecla is reported to be 14⅛c. The market closes firm at 13⅝@13¾c. for Lake, and 13⅜@13½c. for electrolytic in cakes, wirebars and ingots. Casting copper is quoted nominally at 13⅛@13¼c. as the average for the week.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been reduced, and is now 14¾c. base, carload lots at mill.

The London standard market fluctuated within narrow limits throughout the week and closes steady at £60 5s. for spot and £61 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £63 10s.@£64; strong sheets, £73 10s.@£74 10s. per ton.

Stocks of copper in Great Britain and France on March 1—including 5230 tons afloat from Chile and Australia—were 113,460 long tons; an increase, as compared with Feb. 1, of 2640 tons.

Copper exports from New York and Philadelphia for the week were 4571 long tons. Our special correspondent gives the exports from Baltimore at 3946 tons copper.

The Lake companies are beginning to make their reports for 1909. Our quotational average for the year was 13.335c. Osceola sold 24,659,729 lb. at 13.30. Allouez, 3,164,608 lb. at 13.26. Centennial, 2,583,793 lb. at 13.28. Tamarack, 13,118,785 lb. at 13.32c. Quincy, 22,511,984 lb. at 13.48. The Quincy figure includes the silver proceeds of that company. The quotational average for electrolytic was 12.982c. The Utah Copper Company reports 51,749,233 lb. sold at net price of 12.915 cents.

Tin—The market in London has been dull with a sagging tendency. While the favorable February statistics were the reason for a firm market the middle of last week, some liquidation which took place forced prices to their low level of £147 7s. 6d. for spot and £149 5s. for three months at the morning call of Tuesday last. The afternoon market, however, showed a reversal of form. The close is steady at £147 12s. 6d. for spot and £149 10s. for three months.

The domestic market, as far as quotations are concerned, moves in sympathy with London, but actual business is restricted to retail lots which can be bought at the close at 32⅝c. per pound.

Visible stocks of tin—including tin afloat—on March 1 were: London, 11,750; Holland, 2064; United States, excluding Pacific ports, 7474; total, 21,288 long tons. This is a decrease, as compared with Feb. 1, of 1736 tons.

Lead—Due to heavy offerings on the part of Missouri producers, prices have again given away, and the close is weaker at 4.52½@4.55c. New York, and 4.37½@4.40c. St. Louis.

The London market is unchanged, the close being cabled at £13 3s. 9d. for Spanish lead, and £13 6s. 3d. for English lead.

Spelter—A fair business is doing from day to day, and the market appears to have found its level, quotations being steady throughout the week at 5.72½@5.77½c. New York, and 5.57½@5.62½c. St. Louis.

New York quotations for spelter March 3-9, inclusive, were 5.72½@5.77½ cents.

The London market is quoted at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Base price of sheet zinc on March 7 was advanced ¼c. per lb., and is now $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Spelter Market—Paul Speier reports from Breslau, Germany, under date of Feb. 25, that the syndicate allotments for 1910 to Group A, including 18 works, are 264,232 tons; to Group B, 12 works, 175,919 tons. These are slightly above the 1909 allotments. Quotations current are 47.25 marks per 100 kg.—equal to 5.10c. per lb.—f.o.b. works in Silesia. Zinc dust is more active, and current prices are 44.25 marks per 100 kg.—4.78c. per lb.—in large lots, f.o.b. Stettin.

Other Metals

Aluminum—The market continues active, and a good business is reported. Quotations are steady, 22½@23½c. being asked for No. 1 ingots, with an advance expected. Abroad there is still a strong tendency.

Antimony—The market remains quiet and prices are unchanged, Cookson's is selling at 8¼@8½c., and U. S. at 7⅞@8c.; while 7¼@7⅜c. is asked for outside brands.

Quicksilver—The market is steady, with a fair business doing and prices unchanged. New York quotations are $50 per flask of 75 lb. for large lots; jobbers ask 70c. per lb. for small parcels. San Francisco, $49@50 for domestic orders; $2 less for export. London, £9 10s. per flask, with £9 7s. 6d. named from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio.

Spanish Metal Exports

Exports of metals and minerals from Spain, year ended Dec. 31; reports by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes
Pig and manuf. iron	33,638	59,904	I. 26,266
Copper	14,374	17,745	I. 3,371
Copper precipitate	20,089	16,842	D. 3,247
Lead	182,865	183,240	I. 375
Zinc	1,386	1,606	I. 220
Quicksilver	1,515	1,503	D. 12
Minerals.			
Iron ore	7,252,928	8,544,634	I. 1,291,706
Manganese ore	25,447	14,737	D. 10,710
Copper ore	1,104,696	1,087,060	D. 17,636
Lead ore	3,170	3,661	I. 491
Zinc ore	129,878	131,188	I. 1,310
Pyrites, iron	1,387,081	1,360,325	D. 26,756
Salt	553,949	545,075	D. 8,874

Imports of phosphates, 157,288 tons in 1908, and 172,177 in 1909; increase, 14,889 tons.

Zinc and Lead Ore Markets

Platteville, Wis., March 5—The base price of 60 per cent. zinc ore advanced from $41 to $44 per ton at the week end. No premium price was paid; high-grade producers are holding for further advance. For 80 per cent. lead ore $54@55 per ton was paid.

SHIPMENTS, WEEK ENDED MAR. 5.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	457,900	....	....
Platteville	313,200	....	256,500
Benton	172,650	....	....
Highland	120,400	....	....
Cuba City	....	85,110	....
Hazel Green	....	41,600	....
Total	1,0 4,150	126,710	256,500
Year to date	12,980,190	1,099,099	2,251,550

In addition to the above there was shipped during the week to the separating plants 2,126,750 lb. zinc concentrates.

Joplin, Mo., March 5—The highest price for zinc sulphide ore was $47.50, on a base price of $45 per ton of 60 per cent. zinc, the base ranging up from $43 offerings early in the week. Zinc silicate ore sold on a base of $20@26 per ton of 40 per cent. zinc. Lead sold as high as $55 per ton, an advance of $2 over the closing offers last week. The average price, all grades zinc, was $39.34. The average price, all grades of lead, was $53.88 per ton.

Nearly every mine in the Webb City portion of the district had a "walk-out" of miners during the week. So far as known the wage scale has been satisfactorily adjusted except at the mines of the American Zinc, Lead and Smelting Company, where several hundred miners are employed.

SHIPMENTS, WEEK ENDED MARCH 5.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,398,550	880,610	$111,747
Joplin	2,177,850	326,320	54,554
Alba-Neck	790,230	14,880	16,980
Galena	671,330	74,860	15,447
Duenweg	582,300	29,170	11,442
Aurora	674,020	......	10,081
Miami	479,590	144,070	9,092
Sarcoxie	616,280	......	7,309
Granby	376,830	8,690	6,093
Badger	209,190	......	4,392
Oronogo	199,440	......	3,469
Carthage	149,570	......	3,140
Quapaw	128,550	......	2,571
Cave Springs	127,800	......	2,556
Spurgeon	160,200	......	1,922
Carl Junction	65,860	......	1,383
Totals	11,807,590	1,478,600	$262,178
10 weeks	100,810,540	16,756,030	$2,593,453

Zinc value, the week, $222,342; 10 weeks, $2,126,140
Lead value, the week, 39,836; 10 weeks, 467,313

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore: the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, March 9—The general market continues steady, but with no special changes.

Copper Sulphate—The market is steady, with a fair business doing. Prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller parcels.

Arsenic—The market is dull, with no considerable sales. In the absence of business, quotations are nominal at $2.50@2.62½ per 100 lb. for white arsenic.

Nitrate of Soda—Business is on a large scale, and supplies are abundant. Futures are a little firmer, and 2.10c. per lb. is now asked for all positions.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on March 1 as follows, in long tons:

	1909.	1910.	Changes.
Stocks, Jan. 1	9,140	14,000	I. 4,860
Imports, 2 mos	47,100	81,800	I. 34,700
Total supplies	56,240	95,800	I. 39,560
Deliveries, 2 mos	50,310	66,500	I. 16,190
Stocks, Mar. 1	5,930	29,300	I. 23,370
Afloat for U. S. ports	82,500	100,000	I. 17,500

Quantities afloat include all cargoes due to arrive at United States ports before June 15 next.

MINING·STOCKS

New York, March 9—Depression in the early part of the week in the general market was replaced later by a stronger feeling and an advancing tendency. This was especially notable in the Steel Corporation shares and in Reading. There was no special news affecting the market, but a better sentiment. It is still a traders' market largely.

On the Curb the general course of business was the same, a stronger feeling replacing the weak and irregular feeling. Most of the coppers advanced, closing strong. Cobalt stocks looked up a little, and the same was the case with the Nevada shares. The proposed combination of a number of the Comstock companies aroused some interest.

Boston, March 8—Copper stocks continue to show improvement, although activity is confined to specialties. The Cole-Ryan stocks are getting back into their old position. Calumet & Arizona is $6 higher at $79, while strength is shown in Greene-Cananea and Giroux.

A sharp $3.25 drop in the price of Mass mining shares today to $4.50, was accompanied by reports that an assessment would be levied in the near future. There is still talk of consolidation of this property with the Adventure.

That there has been a steady absorption of North Butte mining stock is evidenced by the fact that the price is up $14 from the low of the early year. There has been buying of Franklin, and the price has risen over $3 to $22.37½.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev	Mar. 12	Apr. 7	$0.05
Bader, Cal	Feb. 24	Mar. 14	0.10
Belcher, Nev	Mar. 9	Mar. 29	0.10
Central Eureka, Nev	Mar. 13	Apr. 23	0.02½
Chollar, Nev	Mar. 8	Mar. 31	0.10
Confidence, Nev	Mar. 25	Apr. 15	0 20
Crown Point, Nev	Mar. 8	Mar. 28	0.10
Gould & Curry, Nev	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev	Mar. 9	Mar. 31	0.10
Julia Con., Nev	Feb. 17	Mar. 10	0 03
King Philip Copper, Mich	Mar. 10	....	1.00
Mexican, Nev	Feb. 21	Mar. 17	0.15
New Arcadian, Mich	Mar. 10	....	1 00
Ojibway, Mich	Mr.Oct.	....	2.00
Oneco, Mich	Feb. 15	....	1.00
Overman, Nev	Apr. 6	Apr. 27	0.10
Rexall S. & C., Utah	Feb. 13	Mar. 15	0.01
Seg. Belcher, Nev	Mar. 8	Mar. 28	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Union, Nev	Mar. 7	Mar. 31	0.10
Wabash, Utah	Feb. 21	Mar. 15	0.05
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Amalgamated has had a good week of it with a $5.50 advance to $83.25 per share.

Curb trading has been influenced by the course of prices in the big market. Bohemia and South Lake are both higher.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II. 1909	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1909	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	....	254,150,400	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	......	23.227	......
April	51 428	......	23.708	......
May	52.905	......	24.343	......
June	52..38	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.410	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52 226	......	24.030	......
Total	51 502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13 893	13 620	14 280	13 870	61.198	60.923
February	12 949	13 332	13 295	13 719	57.688	59 388
March	12 387	......	12 826	......	56 231	......
April	12 562	......	12 933	......	57 363	......
May	12 893	......	13 238	......	59 338	......
June	13 214	......	13 548	......	59 627	......
July	12 880	......	13 363	......	58 556	......
August	13 007	......	13 296	......	59 393	......
September	12 870	......	13 210	......	59 021	......
October	12 700	......	13 030	......	57 551	......
November	13 125	......	13 354	......	58 917	......
December	13 298	......	13 647	......	59 906	......
Year	12 982	......	13 335	......	58 732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	......	15.84	......	15.62	......
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Mar. 8

Name of Comp.	Bid.
Listed:	
Acacia	.05⅞
Cripple Cr'k Con.	.02⅞
C. K. & N.	.10
Doctor Jack Pot	.07½
Elkton Con.	.68½
El Paso	.67
Fannie Rawlins	.06
Findlay	.09⅞
Gold Dollar	.09
Gold Sovereign	.03¾
Isabella	.16¼
Mary McKinney	.46¾
Pharmacist	.03
Portland	1.04½
Vindicator	78½
Work	06
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.08½

SALT LAKE Mar. 8

Name of Comp.	Clg.
Carisa	.65
Colorado Mining	.85
Columbus Con.	.58
Daly Judge	4.00
Grand Central	1.60
Iron Blossom	.90
Little Bell	1.65
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	1.87½
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.50
New York	.13
Prince Con	.74
Red Warrior	‡6.00
Silver King Coal'n	2.97½
Sioux Con.	.45
Uncle Sam	.41
Victoria	1.05

SAN FRANCISCO. Mar. 8.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		**MISC. NEVADA**	
Atlanta	.15	Belmont	1.97
Belcher	1.32	Daisy	.06
Best & Belcher	.75	Jim Butler	.12
Caledonia	.88	MacNamara	.26
Challenge Con	.45	Midway	.26
Chollar	.38	North Star	.02
Confidence	1.30	West End Con	.45
Con. Cal. & Va.	1.77	Atlanta	.15
Crown Point	1.30	Booth	.18
Exchequer	.33	C.O.D. Con	.11
Gould & Curry	.38	Columbia Mt.	.05
Hale & Norcross	.65	Comb. Frac.	.33
Mexican	1.90	Great Bend	.03
Ophir	2.05	Jumbo Extension	.36
Overman	1.50	Oro	.08
Potosi	.71	Red Hill	.04
Savage	.58	Sandstorm	.04
Sierra Nevada	.74	Silver Pick	.10
Union	.97	St. Ives	.19
Yellow Jacket	1.27	Tramps Con	.05

N. Y. EXCH. Mar. 8

Name of Comp.	Clg.
Amalgamated	83⅛
Am. Agri. Chem.	48
Am.Sm.&Ref.,com	88⅞
Am. Sm. & Ref., pf.	110⅛
Anaconda	51⅞
Bethlehem Steel	30¾
Col. & Hock. C. & I.	18
Colo. Fuel & Iron.	43
Du Pont P'd'r, pf.	85
Federal M. & S.	80
Great Nor., ore ctf.	71½
Nat'nalLead,com.	85¼
National Lead, pf.	109½
Pittsburg Coal	23
RepublicI&S,com.	41¼
Republic I & S, pf.	104
SlossSheffi'd,com.	82
Sloss Sheffield, pf.	‡117½
Tennessee Copper	35¾
Utah Copper	52½
U. S. Steel, com.	89
U. S. Steel, pf.	122⅜
Va. Car. Chem.	57

N. Y. CURB Mar. 8

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	20¼
Braden Copper	4⅝
B. C. Copper	7
Buffalo Mines	3½
Butte Coalition	27⅜
Chino Copper	14⅞
Cobalt Central	.18½
Combination Fra.	.33
Con. Ariz. Sm.	2⅞
Cumberland Ely	9
Davis-Daly	3 3/16
Dominion Cop.	7
Ely Con	13/16
El Rayo	2 9/16
Florence	3⅛
Gila Copper	8⅝
Giroux	10⅛
Gold Hill	1½
Goldfield Con.	8½
Greene Cananea	10⅝
Guanajuato	1¾
Guggen. Exp.	225
Kerr Lake	.08¾
La Rose	4 9/16
McKinley-Dar-Sa.	.82
Miami Copper	24⅞
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1 5/16
Newhouse M. & S.	3½
Nipissing Mines	10¼
Ohio Copper	4⅜
Pacific Sm. & M.	⅞
Silver Queen	.21
Standard Oil	645
Stewart	9/16
Tonopah	7⅜
Tonopah Ex.	.73
Tri-Bullion	⅞
Utah Apex	‡5⅛
W. Va. Wyo. Cop.	2⅛
Yukon Gold	4⅝

LONDON Mar. 9

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	7	3
Esperanza	2	18	6
Tomboy	0	17	6
El Oro	1	8	9
Oroville	0	10	0

‡Last quotation.

BOSTON EXCH. Mar. 8

Name of Comp.	Clg.
Adventure	9¼
Allouez	56½
Am. Zinc	30
Arcadian	8
Arizona Com	39½
Atlantic	9¼
Boston Con	20
Calumet & Ariz.	79
Calumet & Hecla.	630
Centennial	23
Con. Mercur	.10
Copper Range	78½
Daly-West	9¼
East Butte	10½
Franklin	22¼
Greene—Can.	10⅝
Hancock	27
Isle Royal	22
Keweenaw	4¾
La Salle	17½
Mass	5⅞
Michigan	7½
Mohawk	65
Nevada	24½
North Butte	44
Ojibway	12
Old Dominion	45¾
Osceola	154
Parrot	20
Quincy	89
Shannon	15⅝
Superior	59
Superior & Bost.	13⅞
Superior & Pitts.	14¼
Tamarack	71
Trinity	8⅝
U. S. Smg. & Ref.	48½
U.S.Sm. & Re., pd.	51½
Utah Con	34
Victoria	4⅞
Winona	10½
Wolverine	145½
Wyandotte	2⅝

BOSTON CURB Mar. 8

Name of Comp.	Clg.
Ahmeek	210
Bingham Mines	6
Boston Ely	3 9/16
Calaveras	5⅜
Champion	.09
Chemung	12½
Chief Cons	2 7/16
Chino	14½
Corbin	.09¾
Cactus	5 1/16
Crown Reserve	3⅜
First Nat. Cop.	4⅝
Gila Copper	8½
Indiana	‡34½
Inspiration	8¾
Majestic	.94
Ray Central	3¾
Ray Con	‡21½
Rawhide Coal	.21
Rhode Island Coal	9½
San Antonio	8½
South Lake	13¼
Trethewey	1⅜
Vulture	9⅝
Yuma	1⅜

ST. LOUIS Feb. 26

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.07	.06
Center Cr'k	1.75	1.50
Cent.C.&C.	82.00	81.00
C.C. & C. pf.	84.00	83.00
Cent. Oil	110.00	100.00
Con. Coal	20.00	19.00
Doe Run	110.00	100.00
Gra. Bimet	.32	.28
St. Joe	14.00	12.50

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**Illustrated.*

The Copper Statistics for February

The increase in the accumulation in February was not unexpected among the well informed, nor under the conditions is the showing unfavorable. The January statistics looked much better than they were; the reverse is the case with respect to the February figures. During January, domestic manufacturers accepted delivery of a good deal more copper than they used, and at the very end of the month, a large quantity was despatched from the refineries for export, delivery being hastened for reasons that it is unnecessary to go into. If these shipments had been delayed a day or two, January would have showed a smaller decrease in the accumulation, and February would have shown a decrease instead of an increase.

The most surprising feature of the February statistics is the continued large production, which averaged 4,025,000 lb. per day, against 3,760,000 lb. in January. This shows that the decrease in January was due only to refinery troubles, as we pointed out at the time, which were corrected in February; and that the decreased production of blister copper had not materially affected the refiners up to the end of February. It may be expected to show in the figures for March.

The deliveries for export are likely to run small for several months to come. We have been for a long time transferring a large part of the accumulation to Europe, and of course we are bound to wait for its absorption from there. Consequently, it is the total visible stock that should receive attention, rather than that existing upon this side alone. The total visible supply at the end of February was 361,338,392 lb., which was an increase of about 15,000,000 lb. for the month, but a decrease of about 24,000,000 since Jan. 1, and about 28,000,000 since Dec. 1. The fact that the visible supply of Europe increased only 6,000,000 lb. in February in the face of the large arrivals from this side, is encouraging. Equally encouraging is the large amount of copper taken in February by domestic manufacturers. Deliveries are not the same thing as consumption, but the indications seem to be that the actual consumption in this country is now going on at the rate of nearly 2,400,000 lb. per day, with an increasing tendency.

The Utah-Nevada Contest

The end of the Utah-Nevada contest may be considered a drawn battle, in which the Utah Copper Company obtains the material advantage, while the opposition wins a moral victory. About 950,000 shares of Nevada Consolidated were deposited for exchange for Utah shares. This is 50,000 shares less than one-half of the Nevada capitalization, but the possession of so large a block by a single owner practically insures control. Indeed, a considerably smaller holding would undoubtedly accomplish that purpose. On the other hand, a great majority of the Nevada stockholders, who numbered about 6000, refused to deposit their stock. Nevada Consolidated will now bear substantially the same relation to Utah Copper Company as Anaconda has borne with respect to Amalgamated.

In their statement that exchange of 2¼ shares of Nevada for one share of Utah was an equitable basis, we know that the Guggenheim engineers were absolutely sincere. Independent engineers believed that a ratio of two to one was more nearly correct, and we have held that opinion. However, it is to be recognized that the variation in these estimates has been simply a straightforward difference in opinion.

The weakness in the Guggenheim argument was the failure to state frankly all the reasons inspiring the idea of this consolidation. If one of them were to consummate a union in preparation for an attempt at a larger one, the result has been failure, because more than 50 per cent. of the Nevada stock must be reckoned with just as before. If one of them were to obtain the advantage of the wide distribution of Nevada stock, the result has also been failure, because numerically the great majority of the 6000 did not deposit. If the idea were inspired by the fear that control of Nevada might some day turn up in the hands of a rival interest, that danger has probably been forever forestalled. The outside stockholders of Nevada are as well off now as they were before. As Utah Copper Company draws its dividends so will all of the others *pro rata*. The management of Nevada remains unchanged. The Utah Copper Company will benefit from its dividends on Nevada stock, which probably will be helpful during the period when some readjustments in its own operations are being made. The outcome is not of a nature to perpetuate hard feelings on either side.

Canadian Mineral Production

The mineral production of Canada, the details of which are given elsewhere, reached in 1909 a total estimated value of $90,415,763, or nearly nine times the total of 1886, when the present system of reports by the Mines Department of the Dominion was begun. From that year the total gradually, but slowly, increased, until it reached $28,485,023 in 1897. In the years 1898-1900 there was a rapid advance, resulting from the gold production in the Yukon. As the first rush of the placer gold mining there passed, there was a gradual decline until 1904, when the Cobalt mines began to contribute to what has since been a rapid gain.

The mineral industry of Canada is now on a substantial basis, and further gains may be expected from the opening of the north country, which has so far given some surprising and unexpected results. Apart from these possibilities, there is a steady increase in iron ore, nickel and other metallic products, and in asbestos, of which Canada now produces the greater part of the world's supply.

The Western Coal Situation

The Cincinnati conference of bituminous coal miners and operators reached no result beyond the appointment of a joint scale committee, to which the demands of both parties were referred. This committee, however, failed to reach any agreement, and the conference broke up without result. It is uncertain whether another meeting will be called, and the present outlook is that April 1 will see a general suspension of mining. The only result of the conference is that the Illinois question has been eliminated, the miners and operators of that State being left to work out their own scales by consent of both parties. The conference served also to define clearly the position of both parties.

The miners on their side, demand an advance of 10c. per ton on the present rates for pick mining; payment on the basis of run-of-mine instead of screened coal; and a half-day suspension on Saturdays. The operators insist that no advance can be made under present conditions; that no change can be made in the payment basis, which would amount to a further increase; and they insist that the union shrould make good its promise, given several years ago, to organize the States of West Virginia and Kentucky. Their position is that it is very difficult for them now to compete with the two non-union States, which generally pay less than the union rates; with an increase of practically 15 per cent. in the wage rate they would be compelled to give up the fight, and to see business from the large consuming centers go past them to the two non-union States. Already they have lost much trade, and cannot stand it, if they are compelled to work along with only the trade which their rivals cannot supply.

During the last two months most mines have been active and large stocks are being accumulated there and in consumers' yards. It is quite possible that many operators would not object to a stoppage for a few weeks, which would enable them to clear out their stocks at the advanced prices which would certainly follow a strike.

There is no form of mining that is more honorable than the development of a prospect. There is, moreover, no form of mining that is more attractive, because of the large percentage of returns that may be realized. The promoters of a prospecting venture are thoroughly justified in asking the public to supply money in consideration of an interest; but the money thus obtained should be applied to the development of the property. It is not honorable to represent as a mine what is merely a prospect; nor to exploit a prospect to pass on to the public vendors' shares at prices made by the vendors themselves. No experienced mining house would think for a minute of taking over a prospect under such conditions. To the investor, or rather speculator, we say: Do not shun a prospect; but do not mistake a prospect for a mine; and do not put any money into a prospect that you cannot afford to lose.

The fatality rate in both coal and metal mining in the United States is disgracefully high, and measures for the improvement of conditions are worthy of all the attention that they are now receiving; but the people of the United States can correct the evil whenever they want to. The essential measures are adequate inspection and severe enforcement of the laws. The people can have these whenever the majority make up their minds that they want them. Unless they do that, no amount of scientific investigation will be of much service. The prevention of mine accidents is distinctly a matter for the policeman rather than for the scientist.

It begins to be clear that there was not in January and February any real recession in business in this country, as was feared when the prices for stocks were tumbling down in Wall Street. Insofar as the metals are concerned, there was undoubtedly a check to *buying*, because of the large supply that manufacturers had previously secured, but we do not believe that there was any diminution in the rate of *using*.

CORRESPONDENCE AND DISCUSSION

VIEWS, SUGGESTIONS AND THE EXPERIENCES OF READERS

Respecting Press Agents

In reference to the press-agent business, nearly all the big firms and promotion companies maintain relations with some newspaper man, either paying him a salary or giving him a call on a large block of stock for his services. Sometimes this connection is open and above board, and again it is secret, at least as far as the general public is concerned.

Col. William Greene, of Cananea and Gold-Silver fame, employed an industrial agent whose business was to look out for the newspapers, and this agent openly paid to all of the correspondents sending news from the southwest territory a *pro rata* per column for all items relating to Colonel Greene or his properties, no matter whether they were merely descriptive or not. Presumably the items would be at least favorable or non-committal as to the Colonel's operations, but at any rate the correspondents, local reporters and others were enabled to cash in at a fair figure their "strings" on any "dope" relating to Colonel Greene or his enterprises.

The duties of the press agent in some cases are entirely legitimate, for the handling of technical mining news is quite beyond the skill of the ordinary lay reporter and the egregious errors which creep into the daily press from time to time are strongly in evidence showing the inability of the otherwise alert and able newspaper man to handle correctly the difficult technical news relating to the mines. The reporters who are sent to interview mining men and others connected with the mining field often show lamentable ignorance about matters of which they must surely have knowledge before they can intelligently undertake to write up the items covered in their assignments. Frequently they have no general data on which to judge the relative importance of the item given, and they have absolutely no knowledge, geographical, technical or otherwise, concerning the subject, and are entirely at the mercy of the fairness and skill of the interviewed. The omnipotent and omnipresent city editor is supposed to know about these things, but it is clearly evident from the items which are fed to the daily reading public that the city editor's omniscience does not extend to the mining field.

In most of the active mining camps in the West are chambers of commerce and news bureaus, which are skilfully handled and which send out some interesting and generally reliable news concerning the district. However, these so-called news organizations are frequently warped in favor of some particular property, either by reason of financial or personal interest, and the papers generally are unable to discriminate in regard to such news. As a result, more or less "tainted" news is sent out from the camps to the papers throughout the country which publish general mining news and matters of interest relating to mining.

CRITICAL.

New York, March 10, 1909.

Coiling Cables for Alternating Currents on Drums

The article on "Taking up Slack on an Alternating-current Cable," in the JOURNAL, Jan. 1, 1910, is of considerable importance, but to my mind the remedy for the troubles mentioned there is a very simple one. Induction troubles are always met where alternating currents are employed, if there is iron in the neighborhood of the cable. The methods of overcoming the difficulty are well understood, and easily applied. The troubles arise from the fact that alternating currents are rising and falling and reversing, about 3000 times per minute, and each change of strength and direction of the current gives rise to a change in the magnetic field surrounding the cable. If a cable carrying a single alternating current, for instance, is inclosed in an iron pipe, an enormous amount of energy is swallowed up by the pipe, partly as induced currents in the pipe, and partly in the form of changes of magnetization of the iron. It is reported that in the early days of street lighting, when single-phase alternating curents were employed, the single-phase cables in a certain city in the United Kingdom were separately inclosed in iron pipes, and something like half the pressure was lost in a comparatively short distance.

The same trouble would arise in mining work, with three-phase currents, if each cable is armored, or inclosed in a separate iron pipe. In practice, however, no trouble arises, because the three cables are usually laid up together, spirally, and any armor that may be required placed outside of the completed three-core cable, as it is called. This arrangement completely neutralizes the induction troubles with three-phase apparatus for this reason:

There is a peculiar feature about three-phase currents. The sum of the currents or pressures at any instant is zero. Consequently when the three cables are laid up in the manner described, the sum of their action upon the iron outside is also zero. Consequently it appears to me that if a three-core cable is employed for delivering current to a three-phase motor driving a sinking pump, there should be no difficulty whatever, whether it is coiled upon an iron drum or a wooden one. The connections to the ends of the cable can be made either by bringing out the ends of the triple core to slip rings on the axle or by having three-plug terminals, which can easily be disconnected when the cables are to be lengthened. It appears to me also, that the loss of pressure that is described in the article quoted above would disappear for the reasons given.

SYDNEY F. WALKER.

Bath, England, Jan. 29, 1910.

Stamp Drop Sequence

Mark R. Lamb, in the JOURNAL, Feb. 12, 1910, instead of offering any criticism on my remark on the subject of secondary stamp drop, attempts to ridicule it by saying, "Would it not be equally logical to evolve a tertiary drop by omitting two stamps, or a quaternary by omitting three?" We might go still further and evolve another by taking every fifth and getting a series of one stamp only, but it would not be equally logical for the plain reason that the oftener any given sequence occurs the greater is its effect on the feed distribution, which is the point under consideration.

The principal element is the effect of the primary drop, which is modified by the effect of the secondary drop, which in turn is modified, if Mr. Lamb likes, by the effect of the tertiary drop (though not necessarily to the extent of 66 per cent. as he assumes). The final force remaining operative is the effect of the primary drop plus the unneutralized effect of the secondary, and it is therefore quite unnecessary to follow the matter any further back.

Examination of the drop 1, 3, 5, 2, 4, by itself does not show any reason why it should exhibit any tendency to transfer the feed to one end of the mortar, for this arrangement is specially designed to distribute the drop of the stamps as uniformly as possible, but that it has such a tendency is beyond question. Suppose a battery were arranged with the sequence 1, 2, 3, 4, 5, what would be the effect? Everyone will admit that it would be to hurl everything in the mortar violently toward No. 5, and when we find that in the arrangement under consideration we have just such a sequence once in every ten drops, is not the inference obvious that this is the cause of the observed effect?

In case it should be said that any effect of this secondary sequence must be altogether broken up and destroyed by the more frequently recurring primary drop, I will again call attention to the fact that in it there is an uninterrupted sequence of 3, 2, 1, in which Nos. 4 and 5 are the intermediate drops of the primary sequence, and therefore do not interfere with its effect in transferring the feed toward No. 1.

Anyone who dissents from this proposition may reasonably be asked, whether he denies the facts, or cannot see that the inference is consequential, or if he has a better explanation. If the latter, let him produce it; if he cannot see that the inference is consequential, he must be dull indeed, and if he denies the facts he must be ignorant of them.

RALSTON BELL.

Edinburgh, Scotland, Feb. 21, 1910.

Rail Production in 1909

The editorial on rail production in 1909, in the JOURNAL, March 5, 1910, contains one or two statements not strictly accurate. It is true there has been a substitution of open-hearth furnaces for bessemer converters by the Carnegie Steel Company, but this did not affect its rail production. At Duquesne the Bessemer department was discontinued about September, 1907, additional open-hearth furnaces being built, but Duquesne does not make rails. Then at the Ohio works, Youngstown, open-hearth furnaces were added, but the Ohio works has not, I think, made any rails since the first half of 1907. Its rail department took care of overflow work for the Carnegie Company, when the Edgar Thomson plant was insufficient, and Edgar Thomson remains strictly a bessemer operation. I do not think the Carnegie Steel Company has made any open-hearth rails at all to date. Then as to the Maryland steel works, the first of the open-hearth furnaces has been started only within a week or ten days. Gary and Bethlehem, which you mention, I think are responsible for practically all the increase in open-hearth rails in 1909.

The Edgar Thomson plant, which can make over a million tons of rails (bessemer) a year, and can make nothing else, has not averaged one-third capacity in 2½ years, and is not doing better than that now. An enormous depreciation has been written by the decrease in demand for rails, and the preference for open-hearth. Wall Street will take much interest in this fact after the stock-market declines. The newspapers have it that early this week a delegation of Braddock business men called on President Dinkey, of the Carnegie Steel Company, to ask whether the Edgar Thomson plant was really on the down grade, and would never again operate at full capacity. The story, presumably authentic, is that Mr. Dinkey informed the business men that the company intended to erect a splice-bar mill as an adjunct to the Edgar Thomson plant, to cost $300,000 to $400,000. The proposition to make splice bars because the demand for rails is insufficient is not, you will observe, without its humorous aspect.

B. E. V. LUTY.

Pittsburg, Penn., March 5, 1910.

Electrical Precipitation from Cyanide Solutions

This proposal to use electrical precipitation in cyanide plants is concomitant with the increase in metallic contents of solutions used in cyaniding silver ore. The use of air agitation and vacuum filtration greatly reduces the quantity of solution requiring precipitation. This reduced volume of solution is proportionally stronger, or contains more of the cyanides of the precious metals, and this offers a better set of conditions for electrical precipitation than the solutions heretofore used.

The principal disadvantage of exclusively electrical precipitation, which has hitherto prevented its general introduction, is the large and expensive plant required, as compared with a zinc precipitation plant. The disadvantage in the use of zinc for similarly exhaustive precipitation lies in the excessive cost of zinc.

The usual practice, where simple electrical precipitation can be used to advantage, is to use lead or iron anodes and lead or iron cathodes. The current density required varies from a minimum of 0.02 to 0.5 ampere per square foot of cathode. It is necessary to provide from 700 to 1800 sq.ft. of cathode area per ton of solution precipitated per hour. (These large differences are due to the great variations in the weights of metals in the solutions, and to the percentage of precipitation desired.) The richest solutions so treated, of which I have knowledge, contain a maximum of 4 oz. of metal (silver) per ton.

Where zinc is used as a precipitant, the least amount required so far as I know, is one of zinc to one of silver, and from that up to 40:1 of gold, by weight. Even the lesser quantity in a plant treating silver ore alone is a substantial item. In the case of zinc precipitation the principal item of expense is the cost of the zinc consumed. The attendant labor is also a large item. But whereas electro-deposition from a poor solution is relatively expensive, the consumption of zinc varies practically with the amount of metal precipitated, and only varies slightly with the strength of solution.

In the modern closed-circuit plant in which the ore is milled in solution, and in which a minimum of solution is used, complete precipitation from the bulk of solution is not required as it is not necessary to waste any of the solution; also because a small quantity of metal in a solution is of assistance in dissolving further quantities. Complete precipitation is only necessary with the final solution preceding the water wash.

This leads to the suggestion of the following process. All the solution as it comes from ore is passed through electro-deposition boxes in which it is subjected to the disintegrating action of the current, until the solution is so far impoverished that further precipitation would not be economical or desirable. The operator will soon ascertain when this point is reached. Then so much of the solution as it is desired to entirely free from gold and silver is passed through zinc presses and deprived of its metals by reaction with zinc as in the ordinary practice. The zinc-treated part of the solution, after being used as a wash, as well as the other part not so treated, is then returned to the storage tanks, whence it passes through the crushed ore before again reaching the electrolytic vats. In this passage through the ore the zinc content of the solution, which rarely exceeds 0.35 per cent., is precipitated in the crushed ore, thus obviating any serious contamination of the subsequently precipitated precious metals.

In carrying out this process in practice, the anodes should be preferably of carbon, permitting a much greater current density than that at present in use. The cathode can be made of any common metal and of any desired shape, it being merely necessary to provide for the easy removal of the rapidly accumulating spongy deposit of metal. The usual method of handling such a deposit is to wipe it from the cathodes into the hopper bottom of the precipitating box, withdrawing the metal from time to time into a filter press.

Such an auxiliary electrolytic plant to do the majority of the precipitation could be added to an existing zinc room with little difficulty or expense, and could be operated by the same attendant. The power required is nominal; there are no replacements, and skilled attendance is not required.

E. F. G.

New York, March 5, 1910.

DETAILS OF PRACTICAL MINING

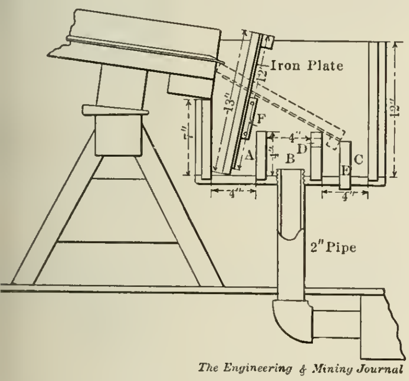
NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES — THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to ntribute to this department. Articles hould be brief, thoroughly practical, and eferably illustrated by drawings or etches. Our draftsmen will prepare operly any kind of a pencil sketch that intelligible. Something that is an old ory in one district may be quite unown in another. Articles accepted and blished are suitably paid for.

A Tail Box for Amalgamation Plates

By H. S. Reed, Jr.[*]

In order to shorten the time of essing plates and to clean down (inead of up), as the most satisfactory ethod of combating the green spots at appear on the lower ends of the ates, I designed the tail box shown in e accompanying sketch.



CONVENIENT AMALGAM TRAP

It consists of a box made entirely of in. lumber, dressed and well jointed, a fle longer inside than the outside width the plate table, and 12 in. deep. It is vided into three compartments, each 4 . deep by 4 in. wide, and contains a ffle of No. 20 black iron.

The baffle is made by nailing a strip of n, 12 in. wide, and of such length that baffle will slip freely into the box thout being too loose, to two end strips d one cross piece. These strips e of 1x1-in. wood, the end strips being in. long and the cross piece having e same length as the iron plate. The d strips are fastened to one side of the n and the cross strip to the other, the iron thus being between the strips where they join at the corners.

While the stamps are dropping, the baffle is in the position shown by the heavy lines, when the compartments *A* and *B*, together with the discharge pipe screwed into and above the bottom act as a trap.

The baffle rests upon the extended ends of the end strips, thus leaving a space at the bottom of the box through which the tailings may flow, and is supported by the cleats *F*, one at each end.

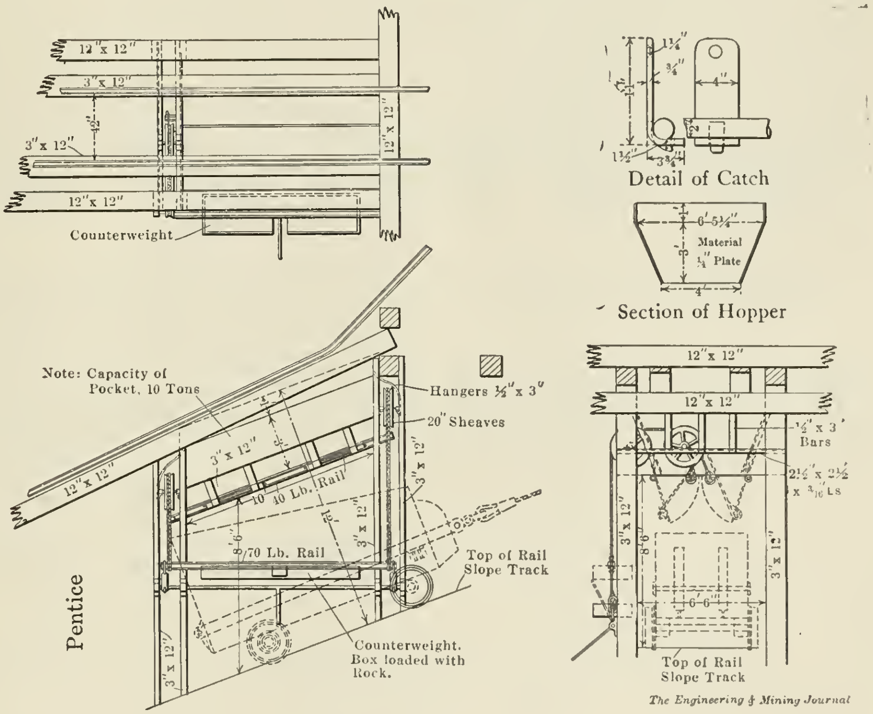
When ready to dress or clean the plates, the baffle is placed as shown by the dotted lines; thus, when the plates are flushed off, the loose particles of amalgam or rich concentrates are caught in compartment *C*, while the water escapes through the hole *D*. The end strips on the baffle coming outside the edges of the plate prevent amalgam or mercury from falling into *A* or *B*. When the plates are dressed an amalgam pail is placed under the box and the plug *E*, which should be long enough to support the baffle, is withdrawn, and the sludge swept from *C* into the pail.

This box is not fastened to the plate table but is supported by blocks, not shown in the illustration, at each end, and is easily removed by having a union in the discharge pipe or a loose board in the floor over the tail-sluice. The elbow should be used, as otherwise there will be constant trouble from splashing and renewing the bottom of the tail sluice.

An Underground Ore Pocket

At the iron-ore mines of the Tennessee Coal, Iron and Railroad Company, on Red mountain, Ala., hoisting is done in skips of 10-ton capacity. In sinking slopes without an ore pocket, the skip is lowered until it rests against a pentice of rock, and there receives ore hoisted, by an auxiliary engine from the face of the slope, in 2-ton end-discharge cars dumped by an ordinary curved-rail tipple. These 2-ton cars run over the rock pentice and, when no pocket is used, dump directly into the skip. This necessitates the use of an auxiliary steel car which can be attached to the rear of the skip and pulled out with it, or else the holding of the skip at this point until it can be filled from the small cars.

To eliminate this waste of time, an underground pocket is used in the slopes



UNDERGROUND ORE POCKET

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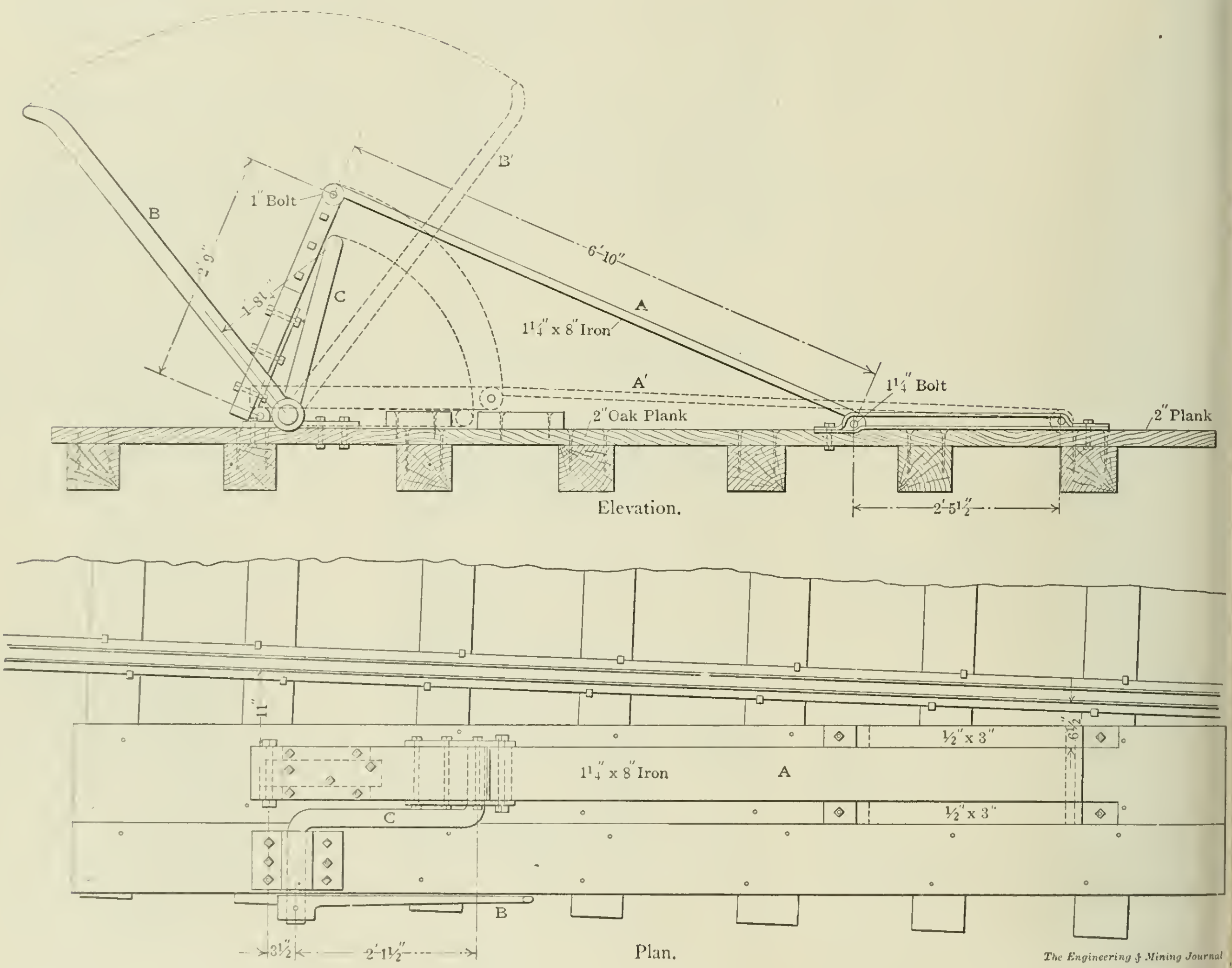
[*] Manager, Mina La Gloria, Batopilas, Chiahua, Mex.

of the Tennessee company, on the Ishkooda and Fossil divisions. The design and method of setting up this pocket are shown in the accompanying plan. It is of 10-ton capacity, and is set so that the skip can be run under the pocket and filled directly without any loss of time. The pocket is hopper shaped, and made of ¼-in. plate; it is fitted with hinged bottoms opening outward, as shown. These bottom doors are braced with 40-lb. rails at the ends, abutting at the center line of the bottom of the pocket. To the ends of these rails are fastened ropes which pass up and over two 20-in. sheave wheels and down on one side of the pocket framing where they are connected to a 70-lb. rail. A latch operated by a lever, details of which are shown, holds this rail, and consequently the gates in a closed position. By releasing the latch, the weight of the ore is allowed to open the pocket bottom, but sufficient counterbalance is attached to the 70-lb. rail to swing the gates closed after the pocket has discharged. The pocket is supported from two lateral, 12x12 timbers which are carried on 12x12 cross-timbers hitched into the walls of the slope.

Dump Car Righter

By F. A. Kennedy.*

The accompanying sketch shows a form of car righter for a 7-yd. dump car used in connection with the open-pit mining on the Mesabi range, by the Oliver Iron Mining Company. All 7-yd. stripping cars are dumped by hand, and either righted by hand or by means of this righter. When righted by hand it takes five men from 2 to 5 minutes, while with a car righter the whole train can be righted in that length of time. Two are used, one on each side of the main track leading into the pit, so that cars dumped from either side can be righted.



Elevation and Plan of Car Righter

When in position to right, plate *A* catches the lower edge of the dump car and throws it up into a horizontal position, the car is then locked mechanically or by hand. The righter is usually left in the position *A'*, so that it will not interfere with a passing train. As the train returns with its empty dump cars, a small lever on the engine catches the lever *B'*, and throws it into position *B*, which in turn raises the plate *A'* to the position *A*. The lever on the engine is thrown in position either by the foreman or switchman and takes but a minute.

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*Chief engineer, Shenango Furnace Company, Chisholm, Minn.

Bailing Water from Prospect Shafts

It frequently develops in connection with prospecting and exploration work that it is necessary to arrange for some temporary means of raising the water from shafts. The ordinary American method, of course, is to provide the mine with wooden tubs or iron bailers, which are hoisted to the surface by the usual means. This plan works all right, but on the other hand the time-honored Mexican custom of using the bull-hide bailers has advantages in that the apparatus can be easily homemade, providing there is a ranch within the jurisdiction of the mine, and will be found quite effective and efficient in all respects. The custom of the Mexican miners is to sew one or two bulls' hides together in the form of a bag with an annular opening, to which the rope is attached. This bag is filled in the sump in the usual way and hoisted.

The Sinking Pump and its Troubles

By M. T. Hoster *

In sinking wet shafts, both vertical and nclined, one of the most important roblems confronting the engineer is to eep the bottom of the shaft as free rom water as possible and so enable he miners to do their work efficiently. The sinking of many shafts, especially in emote districts where a few days are reuired to get supplies, is accompanied y far too many temporary shutdowns on ccount of not being able to keep the ater down low enough for the men to ork.

Sinking pumps and bailing skips, or uckets, are the most common means of eeping the water low. For prospecting new property, sinking a compartment haft, or where but little water is enountered, the bailing skip has the adantage over the sinking pump for the rst few hundred feet; but for singleompartment shafts or where considerble water is met with, the pump is by ar the better, especially as the shaft ets deeper.

For use in inclined shafts the pump ests on its lower side; therefore it will e found best to take off the hanger ons. If they are simply turned so that he bent arms stand up, trouble will be ncountered later in case the cylinder ead must be taken off. For vertical hafts the pump is hung from the ring r, in timbered shafts, from the hangers. f a hose is used for suction it should e tightly wound with ¼- or ½-in. rope prevent its being cut. The foot valve t the end of the suction hose should alays be protected by a good strainer; it akes but little time to wrap some mosuito wire around this, and such a trainer may save much trouble by preenting chips of wood or the like from etting into the water valve chest.

Most Trouble Due to Valves or Suction

Inside the valve chest are two sets of alves of two valves each; the upper are he exhaust valves, the lower the suction alves. These are soft-rubber valves set in rass valve seats and mounted centrally n brass valve rods. Each valve is forced gainst its valve seat by its own spring. The priming valves in the cover act as a ypass over the exhaust valve beneath hem. The trouble experienced with these inking pumps can generally be found in his valve chest or in the suction hose nd its foot valve.

In case of trouble, hold open one of he suction valves and pour water down he suction hose. If it fills up and remains full it is evident that all is in good condition below. If the water leaks out examine the entire pipe; the smallest leak will cause much trouble. Hold the foot valve above water and pour water in above to ascertain whether a new foot valve is required. Foot-valve leather should always be kept on hand.

If the suction valve and foot valve are in good condition the trouble is probably in the valve chest. Be sure that the gasket under the cover is good or else air will leak in. If the priming valves leak when closed, the pump will churn its water from the exhaust-valve chamber to the suction-valve chamber and will not throw water up the shaft.

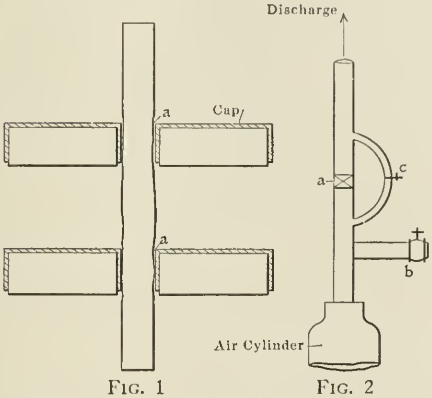


Fig. 1 Fig. 2

The Engineering & Mining Journal

Valve and Column Pipe of Sinking Pump

To detect this, close the priming valves and try to blow through them; if they leak, new gaskets (preferably leather) may remedy the leak or else new valves are required. I think it best if these valves are kept tightly closed at all times and the pump primed as will be described later.

A sinking pump always handles muddy, gritty water which is bound to cut the priming-valve seats if the valves are opened to let the water through. The soft-rubber valves often become worn or cut along the edges, letting the water pass back between the valves and their seats; hence very little water will go up the shaft. To remedy this, pull out the valve rod and take the valve and cap out. The valve can be turned over on its cap, but after both sides are worn a new valve is needed.

The dirt and grit in the water will in time wear the valve rods and caps also, the result being that the caps become too loose on the rods (Fig. 1) and water will rush back past the valves through the space *a*. In one case where the sinking pump would not work, nearly the whole pump was overhauled and still it would not throw water. Finally new rods and caps were put in and the pump has worked well ever since. Only under severe conditions will new valve seats or springs be needed. The packing boxes should be kept in good condition.

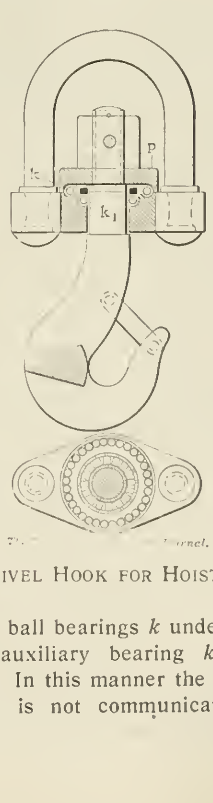
Extra Parts Should Be at Hand

The air (or steam) end of the pump will probably never give much trouble, but to take out the reverse valves at times and blow air (or steam) through will be of benefit. An inexperienced pumpman will often blame his troubles on the air end and thereby make a big mistake. The following repair parts should always be kept on hand and should be bought with the pump: foot-valve leather, two priming valves, four valve caps, two valve rods, good sheet-rubber packing (⅛-in.), packing for the boxes (air and water).

The column pipe should be fitted up as is shown in Fig. 2, with a check valve *a*, priming pipe and valve *b* and bypass *c* around the check valve. The check valve relieves the pump valves of the back water pressure, and the bypass is advantageous for starting the pump. To start pumping, open up both *b* and *c*, running the pump slowly. The water column being full of water, enough water will flow through *c* to prime the pump without the priming valves being open. After the pump starts throwing water out at *b*, close *c* and keep pumping into the sump, through *b*, until all air has been pumped out. Then close *b* while pumping and the pump will take its head slowly. Should the column pipe be empty, water can be poured in at *b*.

Swivel Hook for Hoisting

The hook shown in the accompanying illustration is described in *Bergbau*, Oct. 21, 1909. The twist of the cable is taken up by the ball bearings *k* under the plate *p*. The auxiliary bearing k_1 prevents buckling. In this manner the twisting of the cable is not communicated to the bucket.



Swivel Hook for Hoisting

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*Alvarado Gold Mining Company, Congress unction, Ariz.

Annual Report of the Yukon Gold Company

Dredges and Hydraulic Mines Produced $1,747,599 Gross from 3,087,424 cu. yd. of Gravel; World's Largest Mining Ditch Completed

EARNING ABOUT $700,000 PER YEAR

During the season of 1909 the dredging and hydraulic operations of the Yukon Gold Company yielded a gross return of $1,747,599 and a net profit of $691,682. A total of 3,087,427 cu.yd. of gravel were handled. The holdings of the company in the Yukon were increased by the acquisition of a number of creek claims and the establishment of working agreements covering ground adjoining the property of the company, but not owned by it. The most important purchase was that of the claims of the Canadian Bank of Commerce on Bonanza creek, while the principal working agreements entered into were with the North American Trading and Transportation Company and the Canadian Mining and Dredging Company.

YUKON GOLD STATEMENT

ASSETS.	
Property and investments....	$11,856,999.99
Equipment, cost of ditches, dredges, pipe lines, etc.....	6,073,045.26
Deferred charges, operating expenses, stripping and temporary equipment applicable to future work............	491,244.09
Supplies and material.......	434,578.72
Accounts collectible..........	300,931.33
Cash	9,863.32
	$19,166,662.71
LIABILITIES.	
Capital stock...............	$17,500,000.00
Guggenheim Exploration Co..	1,050,266.28
Accounts payable...........	120,849.36
Depreciation	142,731.00
Surplus	352,816.07
	$19,166,662.71

Of the work done in 1909, President S. R. Guggenheim says: “It is to be noted that the company finds itself practically one season behind in its hydraulic operations, which will necessitate some modifications of the estimate heretofore made of probable earnings for the year 1910. This, however, does not affect the estimates which are of paramount importance, such as the value per cubic yard of the property owned by the company, operating costs, etc., which have been verified by actual results. During the year the company was placed upon a dividend-paying basis at the rate of 8 per cent. per annum.” Exclusive of a quarterly dividend amounting to $35,000 declared in February and payable on March 31, 1910, the company to date has distributed a total of $700,000 in dividends to its stockholders. A statement of the assets and liabilities of the company on Dec. 31, 1909 is given in the accompanying table.

DREDGING

The Yukon country, in 1909, experienced a late spring with a correspondingly late opening of the navigation and mining operations. The seven dredges, the last of which was completed late in 1908, started as early as power was available. The last dredge began operation on June 9, 1909. The dredging season for six out of the seven dredges, was 132½ days as against a normal season of 140 days. The running time of one dredge, No. 5, was curtailed on account of local conditions. The dredges during the season handled 2,381,880 cu.yd., and produced $1,363,722 worth of gold. The value per cu.yd. was 57.24c. and the cost 31.94c. per cu.yd. This cost includes all thawing charges—amounting to 15.45c. per yd.—preliminary stripping operations and depreciation at the rate of $2000 per month per dredge. As an example of what may be expected in ground entirely thawed, the No. 1 dredge handled in the month of August, 100,217 yd. at a cost of 9.28c. per yard.

It is worthy of note that the actual value per yard of material handled, exceeded the estimated value based on examination results by 16.8 per cent. The cost per yard was 6 per cent. higher than the estimated cost for the season, but it is less than the estimated average cost for handling the creek deposit by 8.6 per cent. The dredges operated 83.5 per cent. of the possible running time.

COMPLETION OF THE MAIN DITCH SYSTEM

Regarding construction work and mining operations, the consulting engineer and general manager of the company, O. B. Perry, says: “The season of 1909 witnessed the completion of the main ditch system, including the Bonanza Extension to Gold Hill. After three seasons' work we now have completed over 70 miles of ditch system, 62 miles of which was in operation in 1909, and all of the remainder finished and tested before the close of the season. The ditch construction involved 6.25 miles of ditch, 4172 ft. of flume and 11,443 ft., or approximately 2.2 miles of pipe line. In order to place the water supply in the most advantageous position with regard to the deposit, it was necessary to cross Bonanza creek at Fox gulch, which was accomplished by an inverted siphon 6348 ft. in length. All the hydraulic or upper level gravels on Bonanza are now tributary to the main ditch system, making the company for the first time entirely independent of local water supply conditions.

“In addition to the extension of the main ditch system the power plant was also increased by the addition of one unit of 650 kw.. Elevator No. 3 was completed and put in commission in August. The main ditch system from Twelve Mile to Lovett, a distance of approximately 62 miles, was opened, tested and operated throughout the season of 1909. While a number of breaks, washouts and other delays were experienced, these were expected in a new ditch of this length, where a number of sections were constructed in frozen ground. The pipe lines gave excellent service and promised a delivery fully up to, if not exceeding, the estimated requirements. In connection with the maintenance of the ditch line, a large amount of construction work was done in the way of strengthening bad places and reinforcing weaknesses which developed in its operation. Permanent maintenance camps were established at numerous points along the line, all connected by telephone. Every portion of the ditch system is in direct communication with the Dawson office.

HYDRAULIC MINING

“During the season a total yardage of 705,544 cu.yd. was handled in the hydraulic mines. The total gross production was $383,877. The cost of this work, including the heavy charge for ditch maintenance was $294,811. The hydraulic mines, which were open at the beginning of the season actually operated an average of 23.46 days out of a season of 142 days in 1909, of 16½ per cent of the time. The yardage handled was small and the gross cost about the same as if a much larger yardage had been moved. The causes for the failure of the hydraulic operations to come up to expectations, may be briefly summarized as follows:

“(1) Delays and difficulties in the first year's operation of the main ditch due to breaks in bad ground and pipe line troubles. The result was a loss in operating time in the opened mines, and the work of opening the mines for full capacity was held back. These troubles were anticipated to a great extent, but more time was required for pipe-line repairs than estimated.

“(2) Complications with neighborlng owners, which resulted in the stoppage of work on Jackson and Bear creeks.

“(3) Unusually poor season for local water supply on which the elevator operations were dependent.

“(4) Delay in receipt of materials, particularly pipe line needed for completion of the Bonanza Extension of the main ditch. This delay made the Upper Bonanza operation dependent on local rainfall, which was the lowest ever known in the Yukon, resulting in decreased production and high cost.

Summary of Season's Work

"From the foregoing it appears that the dredging operations of the company are now in full swing and should be continued profitably for many years. The hydraulic operation has been delayed, both in completion of construction work and in getting the long water system into practical working condition. From a hydraulic-operating standpoint, we find ourselves at the beginning of the season of 1910 about where we had expected to be in 1909.

"In general the season's work has shown a distinct advance in the working out of the mining situation. The dredges have proven their practicability and usefulness. The dredge costs were lower than the season before, and the tendency is steadily downward. The elevating costs were practically cut in half as compared with the operation of the season before. The hydraulic operations have been entirely satisfactory as to recovery, and have, so far, been disappointing only in the volume of gravel handled. It is well to point out here that the hydraulic situation is improving yearly. The dredges and elevators in working out the creek claims are continually supplying new dump room and freer access to the hydraulic mines. The large amount of work expended on the main ditch last season has put it in condition for practically continuous operation. The ditch system will increase in capacity and improve generally in operating condition the longer it is run."

Explosion at the Alaska-Mexican Mine

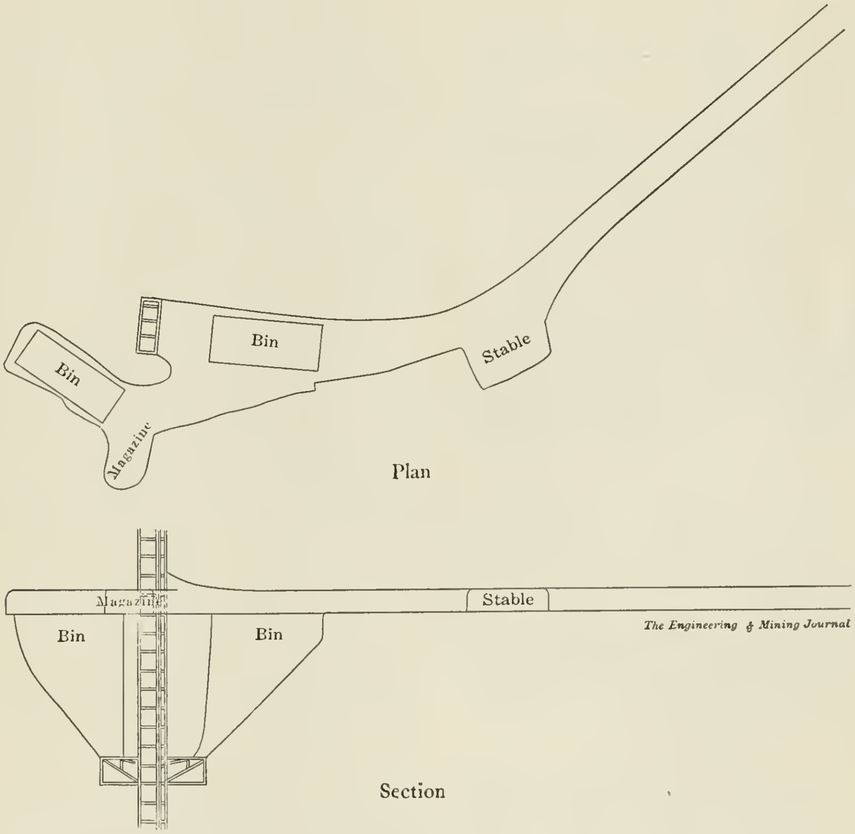
BY ROBERT A. KINZIE *

At 11:30 p. m., March 2, 1910, the powder magazine on the 1100-ft. level of the Mexican mine, Treadwell, Alaska, exploded, killing 37 men, and injuring nine. The accompanying sketch shows the position of the mine magazine. This, with a description of our method in handling powder, is all the information I can give in regard to the explosion.

Powder is delivered once in 24 hours to the mine magazines, one of which is situated on each level. Sufficient powder is delivered for the night and day shifts, which, in this magazine, amounted to between 20 and 30 boxes. This magazine furnishes powder for the 1100-ft. level only. The magazine in question consisted of a chamber cut out of the rock and boarded up in the front. A partition divided the magazine into two rooms, and each room had a door. The door had an open grating through which the interior of the magazine could be seen from the outside. The doors were always kept locked, except at powder time, when a stope boss was in the magazine to pass out powder to the miners, who call for it.

The magazine was lighted by an incandescent 16-c.p. lamp, which was a short distance inside of the door. No wiring crossed over the stored powder. No heat was brought into the magazine, as all powder is always thawed before being delivered to the separate mine magazines.

The situation of the magazine near and beyond the shaft excludes the possibility of any men being cut off from escape in case of accident. A rescuing party was at the scene of the explosion within 35 minutes after it occurred. No one was overcome by gas, which indicates good ventilation, and, to my mind, the advantage of placing the magazine near a shaft.



The 1100-foot Level of the Alaska-Mexican Mine Where the Explosion Occurred

The explosion occurred just at the time the shift was waiting to go to the surface for their midnight supper. Had it occurred at any other time, but few, if anyone, would have been killed. The men at the 990-ft. station, 110 ft. above, report two explosions. The first one put out their lights, but was of no great violence. They lighted their candles, and had just started for another shaft, when the second explosion of great violence occurred, knocking them over, seriously injuring one, and slightly injuring three more. One explosion consisting of a shock, followed by concussion, is probably the correct explanation. The skip-chute men, who were loading the skips from chutes 45 ft. below the station, were uninjured, and the men at the 1200 and 1300-ft. stations were uninjured.

The explosion knocked out the posts of the station set, which with lagging and other timbers, formed a mass of débris, closing the shaft. Among the débris, 22 bodies were recovered; five injured men were also taken up. As ore was being hoisted from the 1100-ft. level, the doors

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*General superintendent, Alaska Treadwell Gold Mining Company, Treadwell, Alaska.

were down, closing the hoisting compartment below the skip chutes. One body was found on these doors. The man-cage compartment was open and eight bodies were recovered from below in this compartment of the shaft. The stable, a light board shed, was entirely demolished. Here two bodies were recovered. The stable contained two horses; one was killed, the other uninjured. Two bodies were recovered along the drift between the station and the shaft, and the fragments of at least one body were found in a corner of the magazine.

Other than knocking out the posts of the station set and the guides opposite the level there was no damage to the shaft. By 10:30 a. m. the guides were put in for the man cage, which was then free to operate from the top to the bottom of the shaft. I have absolutely no clew to the cause of the explosion, and cannot account for it.

Goldfield Consolidated

The Goldfield Consolidated production for February is shown in an accompanying table. The estimated recovery was 93.74 per cent., or $684,291.

FEBRUARY PRODUCTION.

	Dry Tons.	Approximate Value	Per Ton.
Combination	6,034	$109,034	$18.07
Mohawk.........	7,370	131,010	17.78
Red Top.	5,988	194,322	32.45
Clermont........	4,474	295,554	66.06
Total.........	23,866	$729,920	$30.58

The mill made a particularly good showing. The costs showed no reduction, on account of the expense of repairing the fire loss of January, but the mill showed the best extraction in its history both on crude ore and concentrates. The extraction in the concentrate plant exceeded 95 per cent. for the latter two-thirds of the month.

Development Work

The advance at the various mines was as follows: Combination, 419 ft.; Mohawk, 795; Clermont, 1135; Red Top, 1050; total, 3399 ft. The amount advanced was much less than in January, but the results were more fortunate. The decline in amount done is due to some extent to the shortness of the month, but more particularly to a partial breakdown of the Mohawk hoist which prevented that machine from working in counterbalance and caused it to use more air. This made it necessary to curtail development a little.

Neglecting as usual the mere tracing out of known orebodies between levels and confining attention to exposure of new ore on main levels, the following facts may be noted: Red Top 330-ft. level, 325 tons at $15 and 110 tons at $13; Clermont 600-ft. level, 285 tons at $6, 750-ft. level, 1182 tons at $44, 1000-ft. level, 248 tons at $22.70; total, 2150 tons at $30.50 per ton.

FEBRUARY COSTS.

		Amount.	Per Ton.
General—			
Bullion tax and marketing bullion................		$14,000	
Administration, corporation, legal, taxes, etc....		13,000	
		$27,000	$1.13
Mining....................		95,569	4.00
Transportation.............		3,424	0.14
Milling—			
Milling and cyaniding.........	$55,800		
Marketing concentrate residues.........	17,000	$72,800	$3.05
Net cost.................		$198,793	$8.32
Loss in tailings...........		$45,629	1.92
Total costs and losses.....		$244,422	$10.24
Profit per ton............		$20.34	
Total value of ore........		$30.58	
Total profit for month.....		$485,498	
Percentage of profit.......		66.5	

Manager Finley says: "It seems fair to say that the development put in sight the following approximate amounts: Clermont, between 900 and 1000 levels, 17,000 tons at $20, above and below the 750 level, 14,000 tons at $44, above the 600 level, 18,700 tons at $10; Red Top, above the 330 level, 2000 tons at $14; total, 51,700 tons at $22 per ton. It is difficult to form an idea of just what this ore will average, but the best guess I can make is the above. This ore is at best only developed on two sides, some of it only on one side. It cannot, therefore, be called anything more than partially developed ore and any estimate may go astray. It seems fair to say, however, that the developments for January and February have been, by a considerable margin, in excess of extraction both in tonnage and in value."

Encouraging Returns from the Clermont

The 1000-ft. level of the Clermont is developing favorably. About Feb. 18, a small streak of good ore appeared. It assayed from $10 to $100 per ton for a few rounds but was too small to make the drift profitable. About the 25th, the streak began to show great improvement both in size and value and for the last two days of the month the car samples showed good ore, 41 tons averaging $33. There is some reason to hope that this oreshoot may prove better on the 1000- than on the 900-ft. level.

A development that cannot be other than important is the discovery, in the last two days of the month, of the continuation of the Mohawk oreshoot on the 750-ft. level of the Clermont. The vein is 8 ft. thick where cut in a crosscut southwest of the large Clermont orebody. The samples taken from the face indicate from $20 to $30 but the car samples taken thus far show an average of only $9 per ton. This latter ore must have been mixed with a good deal of waste.

Cleopatra Mining Company, Ltd.

The Cleopatra Mining Company, Ltd., is issuing flamboyant literature and doing sensational advertising in one or more of the popular magazines. The capital stock of the company is $2,000,000, divided into shares of $1 each, of which more or less have been sold at 50c. The financial arrangements of the company are not explained in the "literature" that has come to our attention.

The company states that it owns property in the Larder Lake district, in the Rainy River district, and in the Cobalt district. Upon the last is the chief emphasis placed and we shall confine our review to it.

This property is said to comprise 1056 acres, upon which nine veins have been uncovered. The most important of these are considered to be "the two upon which shafts are now being sunk." The following excerpts are from one of the pamphlets issued by the company:

"The silver veins on Cleopatra have been definitely located, and traced for hundreds of feet on the surface. Samples from these veins have been assayed and have been proved to be silver bearing."

"A few months ago Cleopatra was a prospect, but still a speculation. Two months ago we had reached the point where the speculative element had given place to a feeling of assurance. A month ago, with Professor Hassan's discovery on our property of the La Rose-University vein, Cleopatra's success became certain; and now Cleopatra becomes a sure, and wonderfully attractive investment."

In another document we find the following statements:

"On *all* our three great properties the shafts are being driven down to tap the rich bodies of ore at a depth of 100 to 200 ft. It is no longer a question of months, but a matter of weeks before Cleopatra joins the ranks of the big shipping mines."

"In contrast to our other two properties, which are low-grade ore, our Cobalt veins contain the richest and highest grade ore. Native silver has been found."

"The high-grade ore of our Cobalt properties should average a net profit of over $500 per ton. A vein 1 in. wide and 100 ft. long and deep can produce $1,000,000. We have *already* uncovered *nine* veins."

Respecting this company, a reliable mining engineer has reported to us under date of March 4, 1910, as follows:

"The Cleopatra claims are situated in the Gillies limit, and were purchased from the Government by Bannell Sawyer, of Montreal. Considerable trenching was done, but no discoveries of importance were made. At one point some calcite was found in some broken up and partially decomposed diabase, and one or two little flakes of silver were noticed. Some of the diabase gave low assays in silver. A shaft has been started and is now down about 30 ft. The property is only a prospect and not a mine in any sense of the word. It is promising only on account of its fairly favorable location. Up to date no ore of commercial value has been found."

An expert examination of the company's own literature shows that the Cobalt property of this company is distinctly a prospect only, just as our correspondent states, but this would not be apparent to the uninitiated and the bald statements that we have quoted are not only of a nature to mislead, but also have substantially nothing to support them except the hopes of the promoters.

Standardization Recommendations to the Institution of Mining and Metallurgy

The sectional committee of the Institution of Mining and Metallurgy on the standardization of bullion and assay values has submitted the following recommendations for adoption by the institution:

(1) Assay reports shall state the exact condition of the sample as to dryness when assayed.

(2) Assay values of gold and silver ores and products shall be represented in pennyweights and decimals or in ounces and decimals, and not in ounces, pennyweights and grains. They shall be expressed in terms of fine gold and fine silver respectively, not as "bullion."

(3) Assay values of alluvials shall be reported in grains and decimals of a grain of "fine" gold, or in pence (at 2d. per grain of "fine" gold), or cents per cubic yard. It is recommended that, in the absence of specific information, 1 cu.yd. of ordinary alluvial, excluding boulders, be taken as equivalent to 3000 lb. (1½ short tons).

(4) In reporting assay values of cyanide and other solutions, the results shall be given in parts by weight in a stated value of the solution. (In the case of cyanide solutions, the use of the "fluid ton of 32 cu. ft." is recommended. It closely approximates to 2000 lb. and is in common use.)

(5) When it is necessary to state or estimate the money value of an ore, etc. (other than of gold), it shall be accompanied by the assay value, and the basis on which the former has been calculated from the latter shall be stated.

(6) Laboratory sieving tests shall be made with the Institution of Mining and Metallurgy standard sieves, or, when other sieves are used, the widths of the apertures shall be stated.

The council of the institution will receive until June 30, 1910, any suggested alterations or additions before taking action on the recommendations of the committee.

Conservation Work of the Geological Survey

During the last twelve months the conservation work of the Geological Survey has included investigations relating to coal, oil, and phosphate deposits.

Coal-land withdrawals were made covering 7,675,000 acres not previously withdrawn and the form of withdrawal affecting an additional 9,000,000 acres was changed to cover all forms of entry instead of coal entry alone.

Under the old regulations the maximum price per acre for coal land was fixed at $75; under the new regulations the maximum price per acre thus far fixed for any particular area is $465.

PHOSPHATE LAND WITHDRAWALS

Phosphate-land withdrawals in force March 4, 1909, covered all vacant public lands in an area comprising 4,493,551 acres in Wyoming, Utah and Idaho. During the year areas covering 2,389,141 acres were restored to entry, for the field work showed that they contained no phosphate. Additional withdrawals including 399,693 acres have been made and the form of withdrawal has been changed so as to cover entered as well as vacant lands. All unpatented lands in an area of 2,504,103 acres are now affected by phosphate withdrawals.

WESTERN OIL LANDS

The California oil-land withdrawals made prior to March, 1909, aggregating 2,313,482 acres, prevented the acquisition of the withdrawn lands only under the agricultural-land laws. All lands covered by these withdrawals could be legally exploited for oil or other minerals. During the year these lands were excepted from acquisition as oil or as mineral lands as well as for agricultural use. New withdrawals were made in the States of California, Colorado, Oregon, Utah and Wyoming of a total area of 2,130,510 acres. In California there were restored to entry 956,916 acres that field examination had shown to be non-oil land. The area now covered by oil withdrawals is 3,487,076 acres.

February Oil Dividends

The accompanying table gives the amount of dividends paid by a number of California oil companies during February, 1910, together with their total dividends to date, as reported by the California Stock and Oil Exchange, San Francisco.

Name of Company.	February, 1910, Dividend.	Total Paid to Date.
American Petroleum	126,735	$929,960
Bay City	20,000	90,000
Caribou	20,175	680,355
Claremont	10,000	315,000
Columbia	9,992	264,804
Euclid	3,500	120,500
Four	3,000	213,000
Home	2,000	472,000
Homestake	1,000	77,250
Illinois Crude	2,000	86,000
Mascot	5,000	5,000
Mexican Petroleum	85,616	3,391,626
Palmer	18,020	232,340
Paraffin	3,000	12,000
Pinal	14,992	872,109
Record	7,500	47,500
Rice Ranch	3,000	96,000
Royalty	400	8,400
S. F. & McKittrick	15,000	325,000
Sauer Dough	4,987	512,316
Silver Tip	7,500	30,000
Superior	5,000	57,500
Traders	14,000	165,186
Union	124,813	6,243,442
United Petroleum	40,375	2,138,584
Wabash	3,000	117,000
Total for February	$550,605	

Allouez Mining Company

In the year ended Dec. 31, 1909, Allouez made an actual profit of $70,432, but this was reduced to $3065 by the expenditure of $67,367 on No. 2 shaft. The accompanying table shows the operation of this Lake Superior company for the year:

RESULTS AT ALLOUEZ IN 1909.

Tons of rock stamped	253,049
Cost of mining, transportation, stamping and taxes per ton of rock	$1.540
Cost of No. 2 shaft expense per ton of rock	$0.266
Pounds of mineral obtained	6,384,450
Pounds of refined copper produced	4,031,532
Per cent. of refined copper in mineral	63.14
Pounds of refined copper per ton of rock stamped	15.93
Cost per pound at mine, including construction and No. 2 shaft expense	9.67c.
Cost per pound at mine, No. 2 shaft expense	1.67c.
Cost per pound construction	0.21c.
Cost per pound of smelting, freight, commission, eastern office and all other charges	1.51c.
Cost per pound of interest paid	1.33c.
Total cost per pound refined copper	13.39c.

Out of 258,234 tons of rock broken, only 5185 tons (2.01 per cent.) was discarded. The company closed the year with a balance of $31,391 on hand.

Correction

In the Anaconda statement published in the JOURNAL of March 5, all the items in the 1909 column of the comparison table except the production of the metals represented the first six months of the year only.

The Bureau of Mines Bill

SPECIAL CORRESPONDENCE

Senator Dick, of Ohio, chairman of the Senate committee on mines and mining, is of the opinion that the Bureau of Mines bill will be brought to a vote in the Senate within a comparatively short time and will be passed. He thinks it is possible that the bill may be voted upon within two weeks although he anticipates that it will require a longer time than that to arrange matters for its adoption.

The Bureau of Mines bill is now on the calendar of the Senate, having been voted out of committee on March 7, the official report becoming available a few days later. This report was made by a unanimous ballot in the committee. It is understood that Senator Bailey in behalf of the Democrats is planning to make a speech against the measure whenever it is pressed for passage.

CHANGES IN THE BILL

Senator Dick believes that the bill in the form in which it is now before the Senate is satisfactory to President Brunton, of the American Institute of Mining Engineers, who lately appeared before the committee on mines and mining and advocated the measure subject to a few changes which have now been introduced into it. The most important changes that have been made in the bill in reporting it are the omission of the words "To foster, promote and develop the mining industries of the United States," which were used in describing the function of the bureau, and the omission of Section 5 which provided for terminating the work of the technologic branch of the geological survey, provision for such cessation being made in other language in Section 4. Section 5 is new and provides that "nothing in this act shall be construed as in any way granting to any officer or employee of the Bureau of Mines any right or authority in connection with the inspection or supervision of mines or metallurgical plants in any State or territory." The act is also made to take effect immediately upon its approval instead of upon July 1; 1910.

FUNCTIONS OF THE BUREAU

In the report which has been prepared to accompany the Bureau of Mines bill the function of the proposed bureau is set forth along the lines that will be pursued in the Senate discussion as follows:

"The function and duties proposed for the Bureau of Mines are limited to the making of inquiries and scientific investigations for the benefit of the mining industry and publishing the results of these inquiries and investigations in such manner as will render them most useful to the industry.

"It is a matter of no concern that the bureau will have no authority to enforce the adoption of its recommendations. Indeed, it is neither necessary nor desirable that it be clothed with this authority, for the exercise of the authority would consume the energies of the bureau and would jeopardize the chief purpose for which it was created—the making of thorough and impartial investigations.

"Even in other countries where the general government controls the inspection of mines experience has demonstrated the wisdom of having the investigation and the inspection under different officials. In this country the success and usefulness to the mining industry of the Bureau of Mines in conducting thorough and impartial investigations will be greater by virtue of the fact that it can have no part in the inspection or supervision of mines, and that function should continue to rest with the several States. . . . . .

"The essential purpose of the proposed Bureau of Mines is to provide scientific inquiries and investigations for the benefit of the mining industry, such investigations as will aid in making mining in the United States less wasteful of life and resources. These investigations will be useful to the States in the enactment of better and more uniform laws and regulations; useful to the State inspectors, operators and miners, by supplying them with reliable data concerning explosives, gas, dust, mine fires and other factors entering into the problem of mine safety; useful in solving the problems of the more efficient treatment and use of metallic mineral products; useful to the general public as supplying impartial data as the basis of intelligent public opinion.

"It will be the purpose of this bureau to make inquiry and investigations to discover the various causes of each type of mine accidents, and the best preventive measures; to aid in developing a uniform code of signals for use in mine operations, and a system of warning signals indicating when men should leave one or all parts of the mine, and the route to be taken so as to avoid the poisonous gases; to develop more efficient and cheaper methods of mine-rescue work; and to develop more effective methods of preventing or fighting mine fires."

The report refers to mining as a "giant, unorganized industry," calling for the leadership to be afforded by the proposed Bureau of Mines, and harks back to the question of what such a bureau could or should do, among which are the following proposals:

"Unification of the system of inspection and ratings of fuse, detonators and explosives, the variation in speed of fuses being claimed as the most fruitful source of mining accidents.

PROCESS INVESTIGATIONS

"Systematic investigations into both theory and practice of the different methods of concentration and their adaptability to various kinds of ores. Within the last few years there have been developed a number of new methods of ore dressing but the adaptability of the different methods to different types of ores is little understood. Even when individual tests by the various companies are successful it is a useless waste of capital to have these examinations duplicated all over the country, under such imperfect conditions that it is rare for two experimental plants operating on similar ores to obtain the same results.

"The best method of performing the separation of different minerals from each other so that each may be marketed to the greatest possible advantage. A correct process to adopt for any given ore is too often a matter of conjecture instead of scientific knowledge. Hence enormous amounts are lost each year not only to Western miners but to Eastern investors, who furnish the capital for the erection of now-idle mills and smelteries and who bemoan their losses and declare that mining is a wild gamble; whereas, if based on proper knowledge, it can be made as legitimate and safe as any other department of industry. A thoroughly organized and equipped national mining bureau, through its investigations of these fundamental methods in relation to different types of ores, in a few years would lift many departments of metallurgy from their present partially understood reactions and haphazard application to the domain of something like an exact science, and would render incalculable service to the industry.

"A great barrier to large metallurgic developments in many portions of the West is the lack of coking coal. Coals abound, but they will not coke; and the fundamental need which a bureau of mines should supply is a knowledge of these coals—still largely owned by the Government—as to why they will not coke, and what can be done by changes in treatment, mixing, etc., with a view to overcoming this difficulty."

Finally the report lays great stress on the possible services of the bureau in promoting "conservation." It maintains that the bill as proposed has the indorsement of the principal interests affected. It seems doubtful, however, that the majority of mining men will have greater faith in the efficiency of a governmental bureau in accomplishing many of these proposed investigations in a more effective manner than is now done by private industry as represented by our consulting mining and metallurgical engineers, experimental-testing plants and the manufacturers of metallurgical equipment.

Mineral Production of Canada in 1909

Total Value of Production $90,415,763. Gold, $9,790,000. Silver, 27,878,590 oz. Copper, 54,061,106 lb. Nickel, 26,282,991 Pounds.

BY JOHN MCLEISH[*]

The total mineral production of Canada in 1909 is valued, according to the preliminary returns, at $90,475,763, of which $45,188,387 is for metallic products; $30,587,591 for nonmetallic products; $14,339,785 for structural materials and clay products; $300,000 for estimated value of products not reported. These figures are subject to small corrections from later returns.

MINERAL PRODUCTION OF CANADA.

METALLIC.		1908.	1909.
Antimony ore (exports)	Tons	148	....
Copper	Lb.	62,702,873	54,061,106
Gold	Oz.	476,112	473,633
Pig iron from Canadian ore	Tons	99,720	149,444
Iron ore (exports)	Tons	....	21,956
Lead	Lb.	43,195,733	45,857,424
Nickel	Lb.	19,143,111	26,282,991
Cobalt	Value	$113,273	$90,950
Silver	Oz.	22,106,233	27,878,590
Zinc ore	Tons	452	....
Zinc	Value	....	$250,000
NONMETALLIC			
Arsenic	Value	$58,566	[$64,100
Asbestos	Tons	66,548	63,349
Asbestic and asbestic sand	Tons	24,225	23,951
Calcium carbide	Tons	6,864	....
Chromite	Tons	7,225	1,794
Coal	Tons	10,886,311	10,411,955
Corundum	Tons	1,089	1,491
Feldspar	Tons	7,877	10,286
Graphite	Tons	465	730
Grindstones	Tons	3,843	3,965
Gypsum	Tons	340,964	468,551
Limestone for flux	Tons	418,661	526,076
Magnesite	Tons	120	330
Mica	Value	$139,871	$154,106
Mineral waters	Value	$151,953	$177,304
Natural gas	Value	$1,012,660	$1,205,943
Petroleum	Bbl.	527,987	420,755
Phosphate	Tons	1,596	597
Pigments — ocher and barytes	Tons	9,058	4,119
Pyrites	Tons	47,336	57,038
Quartz	Tons	44,741	50,541
Salt	Tons	79,975	84,037
Talc	Tons	1,016	4,506
Tripolite	Tons	30	....
Estimate for minerals not reported	Value	$300,000	$300,000

In the accompanying table the production for 1908 and 1909 of metallic and nonmetallic substances is given, the production being stated in quantities, except for cobalt, arsenic, mica, mineral waters and natural gas, for which the values are given.

The values of structural material and clay products are made up as follows in 1909: Cement, $5,266,008; clay products, limes, etc., $6,805,639; stone, $2,268,138; being $14,339,785 in all.

General statistics of the production of smelting and refining works in Canada were collected for the first time in 1908. The accompanying table shows the results for two years, the works at Northport, Wash., being included, since they treat Canadian ore chiefly.

The total ore charged to the furnaces in 1909 was 2,377,780 tons, of which slightly over 40,000 tons were imported. The products exported for refining included, in 1908, copper matte, 7649 tons; blister copper, 15,418 tons; bessemer nickel-copper matte, 21,210 tons and silver-cobalt-nickel speiss, 1326 tons. In 1909 these smeltery products were base bullion, 2010 tons; copper matte, 11,597 tons; blister copper, 14,239 tons; bessemer nickel-copper matte, 25,845 tons; silver-cobalt-nickel speiss, 2660 tons.

PRODUCTION OF SMELTING AND REFINING WORKS.

Products.		1908.		1909.	
		Refined Products.	Metals Contained in Matte, Blister, Base Bullion, and Speiss Exported.	Refined Products.	Metals Contained in Matte, Blister, Base Bullion, and Speiss Exported.
Gold	Oz.	15,436	203,300	18,241	200,129
Silver	Oz.	11,168,689	3,271,899	14,242,545	4,845,920
Lead	Lb.	36,549,274	1,116,792	41,883,614	3,973,810
Copper	Lb.	....	51,965,289	....	53,328,583
Copper sulphate	Lb.	203,379	....	51,405	....
Nickel	Lb.	....	19,506,251	....	27,041,857
Cobalt	Lb.	....	692,170	....	1,721,083
White arsenic	Lb.	1,431,052	....	2,258,087	....
Arsenic	Lb.	....	436,787	....	1,074,516

METALLIC PRODUCTS—GOLD

A preliminary estimate shows a slight decrease in gold production in 1909. The total production in 1908 was $9,842,105, to which the Yukon district contributed $3,600,000; British Columbia, $5,929,880; Nova Scotia, $244,799. In 1909 the Yukon shows a further increase, the value of the gold being estimated at $3,960,000. The total gold exports on which royalty was paid were, according to the records of the Interior Department, during the calendar year, 239,766 oz. Complete statistics are not yet available as to the gold production in British Columbia, but the returns received appear to indicate a reduced output. The production in Nova Scotia will not differ much from that of the previous year.

SILVER

The rapid growth of Canada's silver production which has taken place during the past few years continued during 1909. Increased production is reported from both British Columbia and Ontario. In Ontario, where the production is practically all from the Cobalt district, a portion of the ores (8384 tons in 1909) is treated in Canadian metallurgical works producing silver bullion, white arsenic, and a speiss containing silver, cobalt, nickel, etc., the balance of the ore being exported for treatment abroad. The total production of recoverable silver in Canada is estimated at 27,878,590 oz., valued at $14,358,310. The production from the Cobalt district again shows a considerable increase over the previous year, but not so large an advance as was made in 1908 over 1907. According to returns received from 31 shipping mines, there were shipped during 1909 about 28,042 tons of ore and 2967 tons of concentrates. The silver contents of ore shipped are returned as 22,581,788 oz., or an average of 805.28 oz. per ton, and for the concentrates shipped 3,639,475 oz., or an average of 1,226.65 oz. per ton. Bullion shipped from the mines contained 143,440 fine oz. silver.

The total silver contents of ore, concentrates and bullion shipped from the mines was 26,364,703 oz. The mineowners receive payment for only 93 to 98 per cent. of the silver contents; and in valuing the production, a deduction of 5 per cent. is made from silver contained in ore and concentrates to cover losses in smelting and refining. On this basis, the silver recovery is estimated at 25,128,590 oz. Payments for cobalt contents were reported as $90,750; the total value of the year's output was a little over $13,000,000, without deductions for freight and treatment charges.

The number of men employed in shipping mines was reported as 2768, and wages paid $2,396,742. Incomplete returns of concentration showed 127,271 tons of ore treated, producing 3213 tons of concentrates. In 1908 the shipments were 25,682 tons of ore and concentrates containing 19,398,545 oz. of silver, or an average of 755 oz. per ton.

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[*] Chief of Division of Mineral Resources and Statistics, Department of Mines of Canada.

NOTE—Abstract of "Preliminary Report on the Mineral Production of Canada during the Calendar Year 1909," Canadian Department of Mines, Mines Branch. Government Printing Bureau, Ottawa, Canada.

Exports of silver from Canada in 1909 were 31,126,504 oz., as reported by the customs department.

Copper

Statistics are not available at the present time to show the total quantity of copper contained in ores shipped from the mines. The total production of copper, however, contained in blister and matte produced and estimated as recoverable from ores exported, was in 1909 approximately 54,061,106 lb. In 1908 the production of copper estimated on the same basis was 52,928,386 lb., an increased production of about 2 per cent. being, therefore, shown in 1909. Of the production in 1909, Ontario is credited with 15,746,699 lb. and British Columbia with 37,314,407 lb. The total exports of copper in ore, matte and blister were 54,447,750 lb., valued at $5,832,246, according to customs-department returns.

Lead

The total production in 1909 of pig and manufactured lead and lead contained in base bullion exported was 45,857,424 lb. It is possible that there was also some lead ore or lead concentrates exported, of which no record has yet been received. Customs-department statistics indicate such an export of upward of 2,000,000 lb. The production of refined lead, and lead contained in base bullion exported in 1908, was 37,666,066 lb. Customs-department statistics in this year also indicate an export of lead ore or concentrates, and the total production in 1908, of lead available for consumption was estimated at 40,891,448 lb.; an increased production in 1909 is, therefore, shown of from 5,000,000 to 7,000,000 lb. This production in both years was all from the province of British Columbia. The total amount of bounty paid during the twelve months ending Dec. 31, 1909, on account of lead production was $346,528. The exports of lead in ore, concentrates, base bullion, etc., during the year were 3116 tons and of pig lead 5650 tons, or a total of 8766 tons. From 14,000 tons to 15,000 tons of domestic production were, therefore, available for home consumption.

Nickel

The nickel industry was particularly active during 1909, the largest production on record being shown. Although important quantities of nickel are contained in the cobalt-silver ores of Coleman township, the Sudbury district continues to be the chief source of nickel production. The same companies are carrying on active operations: the Mond Nickel Company at Victoria Mines and the Canadian Copper Company at Copper Cliff. The ore is first roasted and then smelted to a bessemer matte containing from 77 to 82 per cent. of the combined metals, copper and nickel, the matte being shipped to the United States and Great Britain for refining. The total production of matte in 1909 was 25,845 tons, valued at the furnaces at $3,913,012. The metallic contents were: Copper, 15,746,699 lb.; nickel, 26,282,991 pounds.

The aggregate results of the operations on the Sudbury district nickel-copper ores during the past two years are as follows, in short tons:

	1908.	1909.
Ore mined	409,551	451,892
Ore smelted	360,180	462,336
Bessemer matte produced	21,197	25,845
Bessemer matte shipped	21,210	....
Copper contents of matte shipped	7,503	7,873
Nickel contents of matte shipped	9,572	13,141
Spot value of matte shipped	$2,930,989	$3,913,012
Wages paid	$1,286,265	$1,234,903
Men employed	1,690	1,735

Exports of nickel in ore, matte, etc., for the year 1909 were 25,616,398 lb., of which 21,772,635 lb. went to the United States, and 3,843,763 to Great Britain.

The mineowners received no payment for nickel contents of silver-cobalt ores, and complete statistics are not available as to the total quantity of nickel contained in these ores, of which about 31,609 tons were shipped during 1909. Of the total shipments, 8384 tons were treated in Canadian metallurgical works at Copper Cliff, Deloro and Thorold, producing silver bullion and white arsenic; the remaining speiss or residues amounted to 2660 tons and contained silver, cobalt, nickel and arsenic, the nickel contents being 758,966 lb. and the cobalt contents 1,721,083 lb. in all.

Iron Ore

The total shipments of iron ore from mines in Canada in 1909 were 268,043 short tons, valued at $659,120, as compared with 238,082 tons valued at $568,189 in 1908. The shipments in 1909 may be classified as magnetites, 73,420 tons; hematite, 190,473 tons; bog ore, 3330 tons; titaniferous magnetite (sand) for experimental purposes, 820 tons. In 1908 the ore shipped included magnetite, 49,946 tons; hematite, 173,164 tons; carbonate ore, 4869 tons; bog ore, 10,103 tons. Exports of ore from Canada during 1909, as recorded by the customs department, were 21,956 tons.

Iron and Steel

An increase of 20 per cent. is shown in the production of pig iron in Canada in 1909 as compared with 1908, despite the fact that the Londonderry furnace was out of commission during the whole year. The figures do not include the output from electric-furnace plants, making ferro products, which are situated at Welland and Sault Ste. Marie, Ontario, and Buckingham, Quebec.

Of the total output of pig iron during 1909, 17,003 tons were made with charcoal as fuel and 740,159 tons with coke. The classification of the production in 1909, according to the purpose for which it was intended, was as follows: Bessemer, 222,931 tons; basic, 400,921 tons; foundry, including miscellaneous, 116,307 tons.

The amount of Canadian ore used during 1909 was 231,994 tons; imported ore, 1,234,990 tons; mill cinder, etc., 25,508 tons. The amount of coke used during the year was 919,271 tons, comprising 412,016 tons from Canadian coal and 507,255 tons imported coke or coke made from imported coal. The consumption of charcoal was 1,782,258 bu. Limestone flux was used to the extent of 526,076 tons. In connection with blast-furnace operations there were employed 1486 men and $879,426 were paid in wages. The total daily capacity of 16 completed furnaces was, according to returns received, 2735 tons. The number of furnaces in blast on Dec. 31, 1909, was 11. The production of pig iron by provinces in 1908 and 1909 was as follows:

	1908.	1909.		Changes.
Nova Scotia	352,642	345,380	D.	7,262
Quebec	6,709	4,770	D.	1,939
Ontario	271,484	407,012	I.	135,528
Total tons	630,835	757,162	I.	126,327

Returns were received from eight steel plants, at which 2073 men were employed, showing a production of 754,719 tons in 1909, as against 588,763 tons in 1908. About two-thirds of the 1909 output was from the basic open-hearth process. A statement of the bounties paid on iron and steel during the year 1909 is furnished by the Trade and Commerce department. As no bounty is paid on iron made from mill cinder or ingredients other than ore, the figures do not show the total output of the furnaces, but only those quantities on which bounty was paid. The totals were: Pig iron from Canadian ore, $214,706; pig iron from imported ore, $425,402; steel ingots, $766,470; steel wire rods, $488,433; total $1,895,011, being a decrease of $103,273 from the preceding year.

Asbestos

While shipments of asbestos decreased 3473 tons in 1909, the stocks on hand, Dec. 31, were about 20,920 tons, as compared with stocks, Dec. 31, 1908, of 8669 tons. The total shipments in 1909 amounted to 63,349 tons of asbestos, valued at $2,284,587, and 23,951 tons of asbestic valued at $17,188.

The asbestos shipments were divided into five grades, crude Nos. 1 and 3, and mill stock Nos. 1, 2 and 3, varying in value from $270 down to $9.37 per ton. About 3000 tons of crude were shipped and 60,000 tons of mill stock, the best grade of which was valued at slightly over $50 per ton. Exports of asbestos, according to customs returns, were 56,971 tons in 1909, a decrease of 4239 ons.

ARSENIC

The total output of white arsenic as reported by three firms making this product, was 2,258,187 lb., valued at $64,100. n addition the residues or speiss from hese works exported contained 1,074,511 b. of arsenic. This is all obtained from hat portion of the Cobalt ores treated in Canada. No record is available of the otal arsenical contents of these ores. he exports of arsenic are reported as ,111,249 lb. in all, valued at $119,673.

CORUNDUM

The quantity of corundum ore treated during the year was 35,894 tons, from which was produced 1579 tons of grain orundum. The total shipments were 491, valued at $157,398, or an average of a little over 5c. per pound.

COAL AND COKE

The total coal production in Canada in 909, comprising sales and shipments, olliery consumption and coal used in making coke, is estimated at 10,411,955 hort tons, valued at $24,431,351. This s a smaller production than in either of the two preceding years. The western rovinces each show an increased production of coal in 1909, but not sufficient o counteract the reduced output in Nova cotia, which resulted from the coal miners' strike. The aggregate decrease or the whole of Canada was about 474,-56 tons, or 4.4 per cent., while Nova cotia alone showed a falling off of 968,-89 short tons, or 14.6 per cent., the aggregate increase in the western provinces eing 505,404 tons, or 12.1 per cent. Of the total production, Nova Scotia contributed 54.5, Saskatchewan and Alberta 0.5, and British Columbia 24.3 per cent.

The production by provinces was ap-roximately as follows, the figures for 907 and 1908 being also given:

Province.	1907.	1908.	1909.
ova Scotia...	6,354,133	6,652,539	5,683.750
ritish Columbia........	2,364,898	2,333,708	2,538,004
lberta......	1,591,579	1,685,661	1,978,843
askatchewan.	151,232	150,556	163.329
ew Brunswick.......	34,584	60,000	49,029
ukon Territory.......	15,000	3,847	....
Totals......	10,511,426	10,886,311	10,411,955

The total production of oven coke in 909 was 875,080 short tons, valued at 3,557,147, being a slight increase over the production in 1908. At the ovens of the Dominion Iron and Steel Company t Sydney, a quantity of imported coal was used, the supply of domestic coal eing insufficient on account of the strike. he Atikokan Iron Company at Port Arthur uses imported coal exclusively. At all other ovens Canadian coal is used. At the end of the year there were in Nova Scotia 670 ovens in operation, 64 idle and 120 building. In Alberta 226 were in operation and 40 idle, and in British Columbia 767 in operation and 753 idle. The ovens of the Dominion Iron and Steel Company are of the Otto Hoffman by-product type and there were recovered as by-products 4,016,824 gal. of tar and 3351 short tons of sulphate of ammonia.

FELDSPAR

Total shipments of feldspar are reported as 10,286 tons, valued at $35,694. This includes a quantity of high-grade "dental spar" shipped from the Villeneuve mine, Quebec, and valued at from $16 to $20 per ton at Buckingham.

PETROLEUM AND NATURAL GAS

The production of crude petroleum was, as usual, nearly all derived from the Ontario peninsula. Direct returns from the producers have not been obtained, but the production upon which bounty was paid, ascertained by the Trade and Commerce department, was 14,726,433 gal., of which 3328 gal. were produced in New Brunswick. This is equivalent to 420,755 bbl. and at an average price of $1.33 per barrel, was valued at $559,604. The total bounty paid in 1909 was $220,896. While the production of petroleum has been falling off, the receipts from natural gas sold have been increasing. The producing gas wells are located in the counties of Welland, Haldimand, Norfolk, Kent, Essex, and Bruce in Ontario, and at Medicine Hat and vicinity in Alberta. The total receipts from gas sold in 1909 were about $1,205,943, the figures representing, with one or two exceptions, the total values paid by the consumers. The quantity of gas sold or used during the year was over 6,000,000 M. ft. Of the total value about 95 per cent. is to be credited to Ontario.

SALT

Complete returns of salt production received show total sales of 84,037 tons, valued at $415,219 for the salt alone. Stock on hand at the end of the year was reported as 2671 tons; 185 men were employed, and $96,116 paid in wages.

PORTLAND CEMENT

Complete statistics have been received from all but two cement manufacturers in 1909. These, however, will not increase the totals by more than 2 or 3 per cent. Subject to this correction, the total quantity of cement made during the year was 4,089,191 bbl. as compared with 3,495,961 in 1908, an increase of 593,230 bbl., or 17 per cent. The total quantity of Canadian portland cement sold during the year was 4,010,180 bbl., as compared with 2,665,289 in 1908, an increase of 1,344,891 bbl., or 50 per cent. The total consumption of portland cement in 1909, including Canadian and imported cement, was 4,152,374 bbl., as compared with 3,134,338 in 1908, an increase of 1,018,036 bbl., or 32 per cent.

The average price per barrel at the works in 1909 was $1.31 as compared with $1.39 in 1908. The imports of portland cement into Canada during the 12 months ending Dec. 31, 1909, were 497,678 cwt., equivalent to 142,194 bbl. The duty is 12½c. per 100 lb. As there is very little cement exported from Canada, the consumption is practically represented by the Canadian sales together with the imports. An estimate of the Canadian consumption of portland cement for the past five years shows that it increased from 2,285,240 bbl. in 1905 to 4,152,374 in 1909. In the five years the Canadian production increased from 1,346,548 to 4,010,180 bbl., while there was a decrease from 918,701 to 142,194 bbl. in the imports.

Zinc Ore in Virginia

SPECIAL CORRESPONDENCE

During 1909 considerable work, mainly in the nature of prospecting, was done by the Virginia Mining and Milling Company on the Osborn property situated in Russell county, on Copper creek about 10 miles south of Castlewood, a station on the Norfolk & Western railroad.

The existence of zinc-lead ore at this point has been known for some years, and several parties worked there in a small way, on lease, before the present company took hold. The zinc ore is now mainly calamine, with a little carbonate and occasional traces of sulphide. The lead is galena, and occurs in contact with the zinc. The ore that has been found is fairly rich, but its occurrence is irregular, consisting of small stringers or veinlets through the creviced limestone, or as lumps in sandy pockets of small extent. No regular vein has been encountered, and no concentrated material similar to the well known formation at the Austinville mines.

The workings consist of a tunnel extending about 100 ft. into the hillside, from which three levels have been driven right and left, a distance of about 50 ft., and in these several shallow trial pits were sunk. Most of this work was done some years ago, the present operators having merely reopened and cleaned up, and in so doing obtained about 150 tons of ore. A carload of this ore was shipped recently to the spelter furnaces of the Bertha Mineral Company, at Pulaski, and is said to have averaged over 40 per cent. metal.

Operations of the Doe Run Lead Company

A 2000-ton Concentrating Plant Recently Completed. Producer Gas Engines and Electric Generators Replace Steam. Compressed Air Haulage

BY ALBERT H. FAY

The mining operations of the Doe Run Lead Company, Flat River, Mo., are carried on through shafts Nos. 1 and 4 at Flat River; Nos. 2 and 3 at Central, about ¼ mile west of Flat River; Nos. 9 and 11 at Esther, 2 miles east of Flat River; No. 6 at Elvins, 1 mile south; and No. 8 at Mitchell. The milling operations consist of the Columbia 600-ton mill at Esther; the Doe Run mill at Doe Run, 900 tons; and the Elvins mill of 2000 tons capacity. About 1400 men are employed at all the plants, divided as follows: 200 at Esther; 1000 at Central, and 200 at Doe Run. The proportion of mine to mill labor is about three to one. The company maintains offices at Doe Run, Central and Bonne Terre, Missouri.

Mining

The lead occurs disseminated in limestone strata which are approximately horizontal. The upper strata are quite strong and tough, giving an excellent roof so that no timbering is required. The orebody varies in thickness from 10 to 30 or 40 ft., and the work is carried on by running drifts about 30 ft. wide. Pillars 10 to 12 ft. in diameter are left with centers approximately 40 ft. apart. When running a drift, a heading is usually carried forward in the upper part of the ore. This is kept two or three rounds (15 to 20 ft.) in advance of the lower part of the face. The remainder of the face is then taken out in benches 8 to 10 ft. deep until the bottom is reached. In this way the face of the drift has a slope of about 45 deg. Piston air drills are used and 8- to 10-ft. holes are drilled. A large portion of the drill steel is sharpened underground, and it is only the actual repair work that is done at the surface shop.

The water is pumped by centrifugal pumps direct connected to electric motors. At shaft No. 4 is the largest pumping plant which consists of three five-stage centrifugal pumps each having a capacity of 750 gal. per minute. These are operated by 150-h.p. motors. Under normal conditions, only one pump is required to handle the water at this shaft. The other two are held in reserve to be used in case of an emergency. It frequently happens that a cave is encountered which sends in a large quantity of water on short notice, hence the necessity for keeping the pumps installed at the various shafts.

A large amount of the underground haulage is done in 1-ton cars with mule power. Little hand tramming is done. Two 25-h.p. H. K. Porter compressed-air locomotives were recently installed at shafts Nos. 4 and 1. These are operated under a pressure of 800 lb., although constructed to operate with 1000 lb. pressure. The track upon which these locomotives will run is laid with 20-lb. rails. Mules will still be used to gather the cars from the working faces and bring them to a point where they may be picked up in trains of eight or ten cars and taken to the shaft with the locomotives. This haul will be approximately ⅙ of a mile, although this is subject to a wide variation. The cars are hoisted on a balanced cage. Compressed-air haulage is also used at the St. Joseph mines at Bonne Terre.

Preliminary Crushing

As the ore comes from the mine it is dumped on a metal picking belt. Here a portion of the coarse waste material is taken out by hand. The ore from the belt goes to a 6-in. grizzly, where larger pieces are broken by hand hammers until they pass through. All the ore passes through a No. 5 McCully gyratory crusher and is broken to about two-inch size. It is then elevated to railroad cars and taken to the mill.

Elvins Mill, Doe Run Lead Company, Southeast Missouri

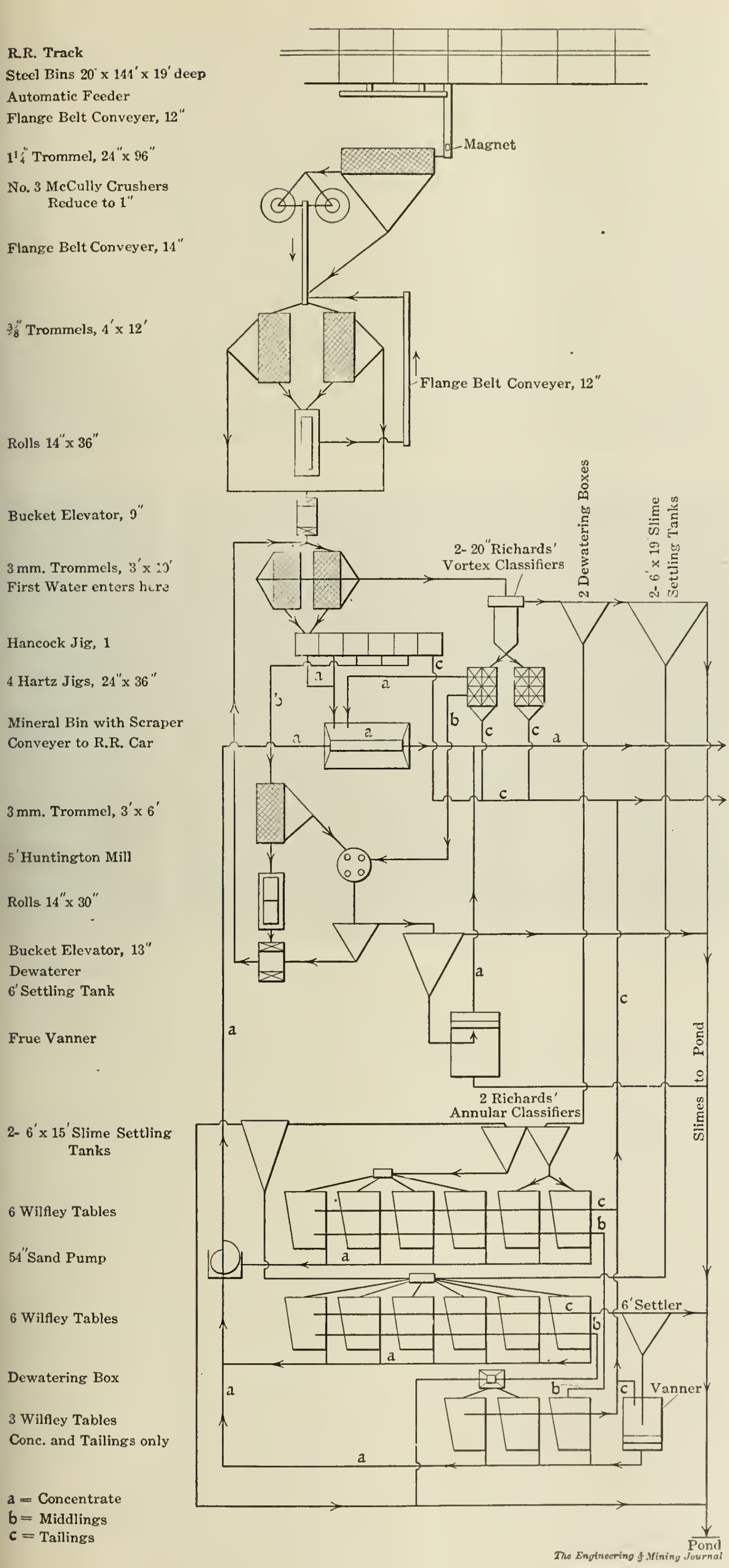
The Elvins 2000-ton Mill

The new Elvins plant of the Doe Run Lead Company has a capacity of 2000 tons per day and is built in four units of 500 tons each. The mill is shown in an accompanying illustration. Any one or all of the units may be operated as required. The building is constructed of steel throughout, with corrugated-iron siding. All the floors are reinforced concrete, supported by steel girders. The size of the building is as follows: Crusher floor, 88x144 ft.; jig floor, 45x144 ft.; table floor, 48x208 ft. The entire width of the building is 181 ft. and the total area is approximately one acre. The steel ore bin is 20x144 ft., and 19 ft. deep; with a standard-gage railroad track on top. The mill is heated by three Baltz hot-air heaters, one in the basement, two on the crushing floor.

All the water for the new mill is pumped from a reservoir in Flat river. Two 150-h.p. motors operate two 2-stage, 10-in., vertically mounted turbine pumps each having a capacity of 2000 gal. per minute under a head of 175 ft. The pipe line is 14 in. in diameter and about 1 mile long. Just above the mill is a large reservoir 150 ft. square, 12 ft. deep, built in the clay soil on a limestone bedrock, from which the water runs by gravity to the mill. A large percentage of the water from the mill, after passing through the dewatering screen goes to a settling pond from which it is pumped to the above reservoir by two single-stage centrifugal pumps, each operated with a 75-h.p. motor.

Milling

The accompanying flow sheet gives the system of milling in detail. One special feature of the mill is that the crushing is done dry. No water is added until after the ore passes the second set of rolls, where water and ore both enter


R.R. Track
Steel Bins 20' x 144' x 19' deep
Automatic Feeder
Flange Belt Conveyer, 12"
1¼" Trommel, 24" x 96"
Magnet
No. 3 McCully Crushers Reduce to 1"
Flange Belt Conveyer, 14"
⅜" Trommels, 4' x 12'
Flange Belt Conveyer, 12"
Rolls 14" x 36"
Bucket Elevator, 9"
3 mm. Trommels, 3' x 10' First Water enters here
2-20" Richards' Vortex Classifiers
2 Dewatering Boxes
2-6' x 19' Slime Settling Tanks
Hancock Jig, 1
4 Hartz Jigs, 24" x 36"
Mineral Bin with Scraper Conveyer to R.R. Car
3 mm. Trommel, 3' x 6'
5' Huntington Mill
Rolls 14" x 30"
Bucket Elevator, 13"
Dewaterer
6' Settling Tank
Frue Vanner
2 Richards' Annular Classifiers
Slimes to Pond
2- 6' x 15' Slime Settling Tanks
6 Wilfley Tables
54" Sand Pump
6 Wilfley Tables
6' Settler
Dewatering Box
Vanner
3 Wilfley Tables Conc. and Tailings only
a = Concentrate
b = Middlings
c = Tailings
a
b
c
Pond
The Engineering & Mining Journal

Flow Sheet of One Section of the Elvins Mill, Doe Run Lead Company

the third set of trommels. These trommels are 3x10 ft. with 3-mm. screens. The fine material from this trommel passes through a Richards classifier from which slimes go to the Wifley tables independent of the Hancock jig. The removal of all the slimes at this point is another feature of this mill. The 3-mm. sand is sent to Harz jig while the coarse material from 3 to 9 mm. is treated on a Hancock jig. The Hancock jig produces heads from two cells, middlings from three and tailings from one. The Harz jig produces heads from the first two cells, middlings from the second and tailings from the overflow.

The middlings from the Hancock jig pass through a 3-mm. trommel from which the oversize goes to a pair of 14x30-in. rolls and by bucket elevator to the trommel in front of the jigs. All the 3-mm. size goes through a Huntington mill to a dewaterer. The spigot producer is drawn off to the elevator and goes back to the trommel in front of the Hancock jig. The overflow passes to a 6-ft. V-shaped settling box from which the overflow goes to the slime pond, and the spigot product to a Frue vanner. In this way all the middlings are crushed to pass a 3-mm. screen and then enter the Harz jig and slime-treatment system.

Treatment of Slime

Just in front of the Harz jig are two 20-in. Richards vortex classifiers, the overflow from which passes to two dewatering boxes; the spigot product passes to the Harz jigs. The spigot product from the dewatering boxes goes to two Richards annular classifiers which produce three products distributed on Wilfley tables as shown in the flow sheet. The overflow from the dewatering boxes passes to two 6x10-ft. V-shaped settling tanks, the spigot product from which goes to Wilfley tables as shown, and the overflow to the slimes pond. The overflow from the annular classifiers also passes through two settling boxes before it reaches the slime pond. Twelve of the tables produce, heads, middlings and tailings. The tailings from the first six tables pass off as waste. Those from the second six to a 6-ft. settling box, yielding a spigot product for the Frue vanner. The middlings from the first six tables go to a single Wilfley table which yields heads and tailings, and the middlings from the second six pass through a classifier and thence to two Wilfley tables yielding heads and tailings.

All the lead concentrates are collected in a V-shaped bin, with a scraper conveyer in the bottom which elevates the concentrates to a hopper above the water level of the bin, from where the concentrates are taken by a similar conveyer to the car for shipment. The tailings are conducted to a dewatering screen then to a 20-in. belt conveyer which runs lengthwise of the mill, on the lower side, with a speed of 280 ft. per min. The waste material is transferred from this belt to a second 20-in. belt which runs at a speed of 350 ft. per min. and delivers the tailings on top of the tailings pile. This belt with its housing is shown in the foreground of the photograph showing the mill. From here the tailings are distributed by water, in launders, although some other system will be installed later, possibly an aërial tram.

The labor in the mill is reduced to a minimum. All the ore is handled mechanically. About 20 men per shift are required when the mill is running at full capacity. The mill is neat, well constructed and is the result of long experience in the milling of lead ores of southeast Missouri. It was built under the direction of O. M. Bilharz, consulting engineer to the Doe Run Company and to whom I am indebted for much of the above information.

Feed Floor for Gyratory Crushers, Elvins Mill

Wilfley Table Floor, with Classifiers Above

Smeltery at Herculaneum

All the concentrate from the Doe Run mills, as well as from the St. Joseph mills at Bonne Terre and Leadwood, are sent to Herculaneum to be smelted. The lead smeltery has been practically rebuilt during the last two years. The plant now has three blast furnaces, 48x160 in., each having a capacity of 250 tons per 24 hours. There are also two of the old furnaces, 48x100 in., in which retort dross and some matte are smelted. The Savelsberg process is being used for roasting lead ore and 29 pots are in use. These have replaced a large number of calcining furnaces. Only five of the reverberatory calcining furnaces are now in use and these will be abandoned as soon as 10 more roasting pots or other roasting facilities are installed.

Each pot has a capacity of 10,000 to 12,000 lb. per charge; two charges are run per 24 hours. Each cast-iron pot is 8 ft. in diameter, in the form of a hemisphere. The air for blowing is admitted at the bottom. The top of the pot is covered by a hood, which carries off the sulphur fumes. The pot is mounted on trunnions, so that when the charge is finished it can be revolved and the contents dumped on the floor, where it is broken by hand hammers and shoveled to a metal link-belt conveyer. In charging the pot a small coal fire is made in the bottom and then lead concentrates are shoveled in by hand, just enough to cover the fire. As soon as this is heated to redness another thin layer is added, so that at all times the surface of the charge is black, while less than an inch beneath it is at red heat. The feeding continues gradually in this way until the pot is full and the entire mass roasted. After it is all roasted, 20-oz. air pressure is turned on for a short time to convert the roasted ore into a high-grade matte.

Arrangements have been made recently to install two units of the Dwight-Lloyd sintering machines. Each unit is 42x264 in., and has a capacity of 95 tons per day. This installation is intended to do the same work that is now done by the Savelsberg pots.

Gas Generating Plant

The Loomis-Pettibone system of gas generation is used and consists of four units of 1000 horsepower each. Each unit has two generators of 500 horsepower each. The generators are constructed of iron and steel, and are lined with firebrick. The feed floor is above the generators. All the gases from the generators pass through a multi-tubular boiler thus producing steam which in turn is directed into the fires for decomposition. This method of using the heat of the gases increases the efficiency of the plant materially.

The gas after passing through the boiler goes to a wet scrubber which is built of steel cylinders in which are trays covered with coke. The gas enters at the bottom of the cylinder through water, passes up through the layers of coke upon which water is sprayed. Enough steam is generated in this scrubber to run the engine which operates a positive type of exhaust. The exhaust produces sufficient vacuum on the fires to give a down draft and pressure enough to deliver the gas to the holders.

From the wet scruber the gas passes through a dry scrubber which is made of shavings or excelsior inclosed in a sheet-iron cylinder. Two of these dry scrubbers are used intermittently. The storage tank has a capacity of 30,000 cu.ft. The fuel used is soft coal from Ilinois, and the plant produces one horsepower from 0.7 to 0.8 lb. of coal.

The Central Station

A central station has been completed recently, in which electricity is to supplant steam as a motive power. The engine room occupies a floor space of 157x70 ft. The building is structural steel covered with corrugated sheet iron. The floors throughout are made of concrete. In this engine room are four 4-cylinder, 24x36-in., cross-compound, 800-h.p. Snow gas engines direct connected with Westinghouse generators. The speed of the engine is 107 r.p.m. The four generators are alternating-current machines of the following type: 550 kw., 6600 volts, three phase, 60 cycle. There are two 100-h.p. engines direct connected to a 75-kw. dynamo operating at 85 to 125 volts used as exciters for the large generators. Only one of these is used at a time. Both are shown in the accompanying photograph.

The St. Joseph Lead Company, of Bonne Terre, Mo., has recently completed the installation of a producer-gas power plant which is a duplicate of the one described above.

The Gas Engine

The power cylinders of the large engines are provided with combustion chambers on the side, carrying inlet valves and gears on top, with exhaust valves and gear below. This construction is one of the distinct features and makes it possible to keep the center line of the engine down and have all valve gears above the floor which allows access to all moving parts of the cylinders. This also makes it possible to construct the foundation as one solid block under the entire length of the two power cylinders, which are placed in tandem, instead of having the foundation blocks broken up into a number of small piers, as is the case when the exhaust valve and gear are at the lowest point of the cylinder. Piping for air and gas can be partly carried in the continuous bed plate under the power end and, therefore, be made less unsightly and complicated.

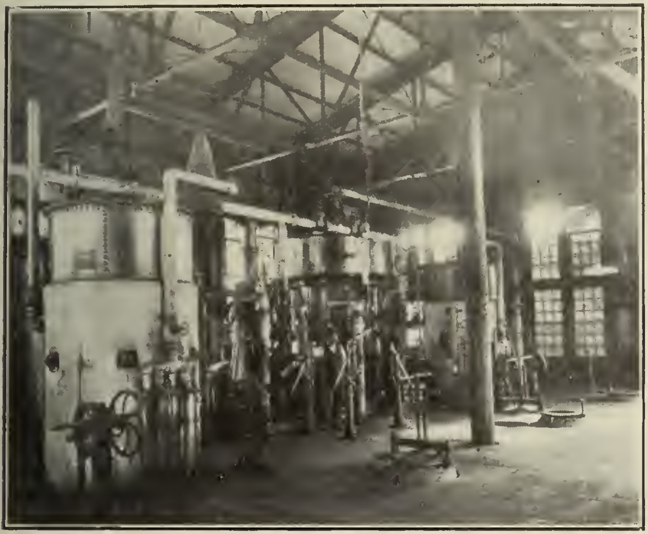
The valve gear consists of a single lever operated by a cam. Another distinct feature of this engine is the cutoff gear admitting gas and air to the main inlet valve. The governor on this engine is driven direct from the cam shaft. The cutoff shaft is driven positively from the cam shaft by the intermission of a hunting gear, the position of which is regulated by the governor lever. This gear transmits the motion from the cam shaft to the cutoff shaft which serves all cutoff valves.

The main inlet valve is operated by a lever from the cam shaft and from the top of its stem operates the air and gas cutoff valve, situated in a chamber cast on the side of the main inlet-valve casing. This is done by means of a simple floating lever and latch lifting the cutoff valve stem until the latch is disengaged from the cutoff valve stem. This movement is subject to the influence of the governor. The gas and air valves are closed by the action of the spring on the stem. A dashpot serves to seat them gently.

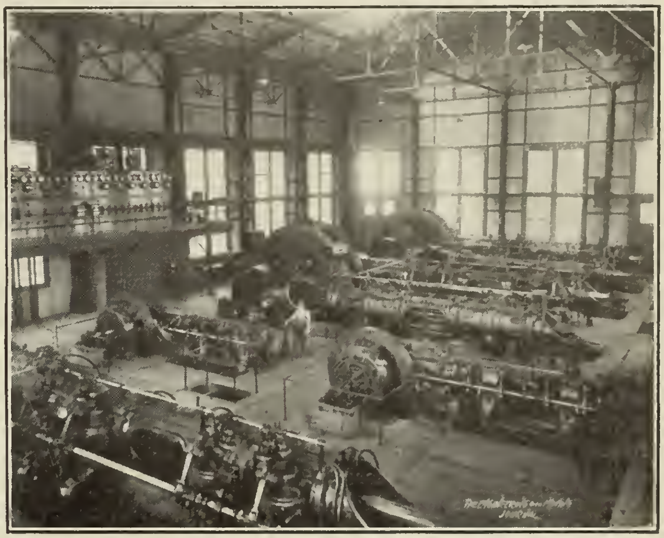
The igniters on these engines are of the mechanical make-and-break type and operate by tappet rods and cams on the cam shaft which cause the moving electrode to come into contact with the stationary ones during a short part of the stroke. Current is furnished from a battery of cells and stepped up to low voltage by means of a spark coil for each igniter. Telltales on these igniter-spark coils serve to detect any defects in the operation of the spark, being under easy observation by the operator and situated so that he can instantly go to the igniter, which is not operating satisfactorily. This igniter system is subject to less wear and repairs than magnetos of high or low voltage type. Three of these engines have also been installed by the St. Joseph Lead Company, at Bonne Terre.

Transmission System

The switchboard contains 13 panels, two for the exciters, four for the generators, two for the feeders, and five which distribute the current to the various working centers. The three-wire system is used. At the end of each line is a brick transformer vault in which the current is reduced to 440 volts, at which voltage it is delivered to the various motors. The longest transmission line is 3½ miles and the total mileage is 9½ miles. All of the electrical equipment, with the exception of five small motors for pumping, aggregating 85 h.p., is of Westinghouse make.



Loomis-Pettibone Producer-gas Plant. Charging Doors in Floor in Foreground



Power Plant Showing Three 800-horsepower Snow Gas Engines

Newfoundland Iron Ore in the United States

The Wabana ore workings, located on a small island in Conception bay, on the northeast coast of Newfoundland, have been shippers to furnaces in this country for a considerable period, though in some years only to the extent of one or two cargoes; during 1906, 1907 and 1908 the average was about 85,000 tons per year, practically all by the Nova Scotia Steel and Coal Company, represented in this country by Pilling & Crane, of Philadelphia. During the last year, according to the *Iron Trade Review*, the partial completion of important development work made it possible to increase the output materially, with the result that sales of approximately 200,000 tons were concluded, partly on a basis of 7c. per unit, duty paid, at seaboard, and later during the year at a slightly higher figure. For 1910 delivery, about 300,000 tons have been sold, the general price being 7½c. per unit at seaboard, duty paid.

The most interesting feature of these workings is the fact that they are largely submarine, drifts following the principal ore vein several thousand feet beyond the shore line. Recent tests show that the deposits increase in thickness and maintain their grade from the shore outward.

The ore, which averages well over 50 per cent. iron, is trammed two miles across the island to the loading piers, which are operated by gravity and admit of remarkable speed. The presence or danger of ice prevents shipments during about four months of the year. The ore is handled chiefly in vessels operating under time charters and the average freight to Philadelphia during the last season was 70 to 80c. per ton.

Commercial Sodium and Potassium Cyanide

Relative Merits Shown by Chemical Analyses. Errors Due to Incorrect Standards. Advantage for Sodium Cyanide with Increased Base Price

BY W. J. SHARWOOD*

Referring to the article on "Spurious Commercial Cyanide," by F. A. Ross, in the JOURNAL Oct. 23, 1909, calls to my attention the relative merits of cyanide containing as a base either potassium, sodium, or a mixture of the two, and to the confusion of ideas resulting from the common method of stating the analyses of the commercial salt. Dr. Russell W. Moore in 1902 published a long series of analyses[1] showing the wide range of variation in commercial potassium cyanide previously imported. Several others have communicated similar results, so that the existence of such variations is well known. The experiences which have been reported from time to time on the practical use of different classes of cyanide have been contradictory and lead to no definite conclusions. In the present instance two shipments of cyanide, apparently of almost identical composition, differed materially in efficiency, which would seem to indicate a new phase of the question.

The manufacture of cyanide is an industry in which an increased demand has encouraged the exploitation of new methods and new sources of supply, resulting in an enormously increased production and ultimate lowering of price, as well as improvement in the product. At present the commercial material contains three to four times the former percentage of cyanogen, and is obtainable at less than half the former price. In other words, one can now buy in the United States about eight times as much cyanogen, for a given sum, as could be bought before the introduction of the cyanide process for gold extraction.

Several years ago much of the cyanide sold contained as low at 12 per cent. CN, the alkali metal combined with it being almost exclusively potassium. With this were large proportions of carbonate and more or less cyanate, etc. Such a mixture would be reported as about 30 per cent. KCN, which no doubt was correct, an ideal "C. P." material being 100 per cent. KCN. Gradually the percentage of cyanogen was raised by the elimination of impurities, and a further increase was secured by the replacement of part of the potassium by sodium, the latter having a much lower atomic weight, but, so far as known, having no prejudicial effect. The relative cheapness of sodium compounds, and the constantly increasing demand for potassium in agriculture stimulated this substitution. The practice of valuing the commercial cyanide in terms of KCN has still been adhered to, in spite of occasional protests that the percentage of actual cyanogen afforded a more rational standard.

Absolutely pure KCN contains 39.95 per cent. CN, while pure NaCN contains 53.05 per cent.; 26.04 parts of cyanogen being combined in the one case with 39.15 parts of potassium, and in the other with 23.05 parts of sodium. For most purposes these percentages may be taken as 40 and 53 respectively. On this difference in percentage depend most of the complications which occasionally lead to misunderstanding. For by the above system of valuation a sample of pure sodium cyanide, containing no trace of potassium, would be rated as

$$\frac{53.05 \times 100}{39.95} = 132.8$$

per cent. KCN; while a mixture of exactly 3 parts sodium cyanide with one part of sodium chloride or sodium carbonate would be reported as 99.6 per cent. KCN. In this way the replacement of potassium by the lighter atom of sodium may cover up the presence of fully 25 per cent. of impurities in the commercial salt, the latter being still reported in the ordinary analysis as nearly 100 per cent. This is, of course, generally known, but there is a possibility of still further complication when a separate determination of sodium and potassium cyanides is called for.

REPORTING CHEMICAL ANALYSES

The analyses quoted by Mr. Ross deserve a little attention as an instance of such a complication. Being so nearly identical we may take the mean, which gives: KCN, 15.75 per cent.; NaCN, 82.30, and SO_3, 0.15, or a total of 98.20 per cent. Now if this is to be taken precisely at its face value the impurities cannot exceed 2 per cent., and we have:

	Per Cent.
CN in KCN = 0.3995 × 15.75 per cent. =	6.3
CN in NaCN = 0.5305 × 82.3 per cent. =	43.66
Total CN =	49.66

A material which contains practically 50 per cent. of actual CN would no doubt be sold as "125 per cent. KCN," while the samples appear to have been of the "98 to 100 per cent." class. It is probable, therefore, that the analyst reporting these results has adhered to the usual method of reporting the sodium cyanide in terms of its equivalent of KCN. Interpreting it on this assumption with NaCN equivalent to 82.3 per cent. KCN, we have:

	Per Cent.
CN in KCN = 0.3995 × 15.75 =	6.3
CN in NaCN = 0.3995 × 82.3 =	32.9
Total per cent. CN =	39.2

A sample containing 39.2 per cent. of actual CN would ordinarily be reported as

$$\frac{39.2}{0.3995} = 98.1$$

per cent., potassium cyanide, and presumably this mixed cyanide was sold on this basis. If we recast the analysis on this supposition, and consider the SO_3 as combined with sodium, the items become:

	Per Cent.
Actual KCN............	15.75
Actual NaCN = $\frac{32.9}{0.5305}$ =	62.0
Na_2SO_4..............	0.27
Total accounted for.....	78.02
Not accounted for........	21.98
Total..................	100.00

That there is no inherent objection to a mixture of this nature is obvious from the fact that one of the two shipments of this composition was found entirely satisfactory. The explanation of the difference in the behavior of the two lots is probably to be sought in the character of the supposedly inert ingredients which make up the deficiency in the analysis.

The analyst is not altogether to blame for reporting results in this way. If he were to state the results in such a way that the total alkaline cyanide summed up to less than 78 per cent., some of his clients would no doubt protest that they were not getting the 98 or 100 per. cent. cyanide they were paying for. The cyanide man using the salt would have to recalculate the analysis to the KCN basis, in order to know how much to use in making up his solutions. It would seem desirable for the analyst to state exactly what he means, when such an ambiguity exists as in the present instance. Thus the original analysis might be stated:

	Per Cent.
Actual KCN......................	15.75
NaCN in terms of KCN............	82.3
Total cyanide in terms of KCN...	98.05

The principal objection to the last system of stating the results is that, like the first, it conceals the undetermined deficit in the percentage composition; which, in this instance, appears to be about 22 per cent.

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*Homestake Mining Company, Lead, South Dakota.

[1] "Composition of Commercial Cyanide of Potassium," Journ. Soc. Chem. Ind., Mar. 31, 1902, Vol. 21, p. 321

Incorrect Standard

But the fundamental absurdity consists in reporting the valuable constituent of a substance in terms of an arbitrary and incorrectly used unit. The system is so thoroughly established, and so convenient for some practical purposes, that most people will no doubt continue to use it.

The conventional method of reporting the results of a cyanide analysis, in which the alkali metals have been determined, is first to consider the potassium and cyanogen, and combine them so far as possible. Any residual cyanogen is then calculated as combined with sodium. The remaining sodium, if any, is either ignored or is calculated as combined with any other acid radicals (SO_4 CO_3, etc.) which have been determined.

A report showing the percentages of actually determined potassium, sodium and cyanogen, without attempting to combine them, is in many ways preferable. This strictly logical and scientific method of stating analyses does not appear to find favor for most technical purposes, such as water analyses, where engineers prefer to have the bases and acids combined at NaCl, $CaSO_4$, etc. Similar absurdities are perpetrated and perpetuated in many industries, largely on account of the inconvenience of changing an established standard.

The actual estimation of sodium and potassium in cyanide presents little difficulty, if the percentages of the two are not too unequal. The cyanides are converted into chlorides and weighed, after which the chlorine is titrated by silver nitrate; if the ratio Na : K is beyond certain limits, say 1 : 4 and 4 : 1, errors in manipulation are multiplied disproportionately in the calculations.

Comparison of NaCN and KCN

Mr. Ross raises the question as to the relative advantage of the cyanide represented by the analysis just discussed, as compared with a brand containing actually 100 per cent. NaCN, when the latter costs about 4.53c. more per pound. An accurate comparison requires a knowledge of the actual price as well as the difference in price, but for the present purpose we may consider the cheaper material at two distinct valuations, say 18c. and 25c. per pound. The commercially pure sodium cyanide may be taken as containing 50 per cent. CN, equivalent to about 125 per cent. KCN, against 39.2 per cent. CN found for the mixed salt under consideration. Compared on the basis of the cyanogen contents we have the cost in cents per pound of cyanogen:

			Cents per Lb.
(1) Mixed cyanide, at 18c.	÷0.392	=	45.92
Sodium cyanide, at 22.53c.	÷0.50	=	45.06
(2) Mixed cyanide, at 25c.	÷0.392	=	63.77
Sodium cyanide, at 29.53c.	÷0.50	=	59.06

For a fixed difference in price per pound the advantage of the sodium cyanide therefore increases with an increase in the base price, and similarly with an increase in freight and other constant charges, provided its contained cyanogen can be safely assumed to be as efficient as that in the mixed or potassium salt. As to this point a remarkable diversity of opinion exists.

On a working scale the experience of Mr. Oxnam and many others in Mexico and elsewhere, points to the conclusion that the cyanogen in sodium cyanide is at least as efficient as that of potassium cyanide or the more common mixed salt. On the other hand Mr. Holbrook at three different plants, and Mr. Magenau, indicate a serious falling off in efficiency when the mixed "98 per cent." cyanide was replaced by the commercial sodium salt. Two other experienced metallurgists have to my knowledge arrived at the latter conclusion after extensive tests on a large scale. Some years ago S. J. McCormick[2] stated that a very impure potassium cyanide, obtained in Brazil and probably containing carbonates, gave much better extractions than a nearly pure consignment. No good explanation of these discrepancies seems to have been found.

In some instances it seems possible that fluctuations in the character of the ores treated may have prejudiced an otherwise fair comparison. As an instance where admixed impurities may affect a comparison we may suppose a plant to have been consuming, say, 1000 lb. of mixed cyanide per day containing about 40 per cent. CN and about 20 per cent. of some foreign salt, for example sodium carbonate. In place of this a change is made to approximately pure sodium cyanide (50 per cent. CN) of which 800 lb. is used per day. The operator, who has been incidentally and perhaps unconsciously dumping daily 200 lb. of sodium carbonate into his solutions, suddenly ceases to make this addition, and it is not surprising that some change in the alkalinity may follow, which, with an ore requiring careful neutralization, may have a perceptible or even pronounced effect upon extraction. The influence of an increase of 1/10 per cent. of sulphide may be equally marked if no precautions are taken to counteract it. Instead of an inert diluent, such as sodium chloride or sulphate, we have on the one hand a mixture of these with a small percentage of a detrimental constituent such as the sulphide, or on the other hand a carbonate supplying a certain amount of protective alkalinity. These are suggested as offering a plausible explanation of some of the reported discrepancies. Fuller details of the conditions of comparative tests of sodium and mixed cyanide are desirable, especially regarding the character of the ore and the impurities in the cyanide used.

In the solutions used in electroplating, which are fairly concentrated, sodium is stated to exert an injurious influence owing to the relative insolubility of sodium aurous cyanide, which may coat the anode and retard its dissolution. But it is difficult to conceive of this condition affecting results in the weak solutions used in treating ores, as generally speaking the reactions of sodium and potassium salts are identical in dilute solutions. Laboratory experiments also appear to indicate no superiority for potassium salts over those of sodium for the present purpose.

Messrs. Johnson and Matthey, quoted by Lawrie, state that in laboratory tests "with solutions of exactly similar strengths" (presumably in cyanogen) the extractions of gold were about six per cent. to eight per cent. better with sodium cyanide than with the mixed salt, and that "the tailings were much more readily washed." My own experience in tests on a laboratory scale agrees with those communicated by several other experimenters, in obtaining nearly identical results with the two classes of cyanide. The following results were obtained in one series of tests.

A sample of so-called "New Cyanide," which is simply commercial sodium cyanide, showed by analysis fully 50 per cent. of cyanogen, equivalent to 125 per cent. potassium cyanide. Samples taken from various boxes in recent shipments of the mixed cyanide previously used, had ranged from 38.4 to 41 per cent. cyanogen, or 96 to 102 per cent. potassium cyanide, the average being equivalent to 99 per cent. Therefore four pounds of the "New Cyanide" contained a trifle more cyanogen than five pounds of the old material. The "New" sample also showed little more than traces of alkaline sulphides, somewhat less than recent shipments of the old.

Parallel tests were made on the two classes of cyanide as follows: Two solutions were made up, one containing four pounds of "New Cyanide" to the ton, the other five pounds of the ordinary cyanide to the ton. Each then contained about 1/10 of one per cent. of cyanogen.

(1) Two parallel samples of slime, carrying $2.25 gold, and 2.0 ounces silver per ton, were treated with double their weight of these solutions for 18 hours. The decomposition of cyanogen was exactly the same in each instance, and the amounts dissolved were:

	"New Cyanide." NaCN.	Mixed Cyanide. KCN + NaCN.
Gold	89.0 per cent.	89.0 per cent.
Silver	76.5 per cent.	75.0 per cent.

(2) Pieces of pure gold foil, exposing equal surfaces of metal, were left in the two solutions for 18 hours, under identical conditions. The weights of gold dissolved were:

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[2] *Trans.* Inst. Min. and Met., Vol. 5, p. 125.

	"New Cyanide."	Mixed. Cyanide.
A. From 10 sq.cm	5 32 mg.	5.27 mg.
B. From 20 sq.cm.	11.42 mg.	11 14 mg.

The slight differences in favor of the "New Cyanide" are probably due to the fact that the former contains slightly less alkaline sulphides than the former, though the amount in each case is small. Under the conditions of these tests both are therefore of practically the same dissolving efficiency per unit of cyanogen, and if this held good on a working scale there would be a considerable advantage in favor of the new or sodium cyanide, unless its price were disproportionately high, as only four-fifths of the weight would require to be handled and freighted. This applies both to the net weight and to that of the cases.

In several other similar comparative tests the two varieties of cyanide showed efficiencies differing somewhat more than the above, but in no case did the extractions obtained with these two samples show differences greater than might be attributed to experimental error.

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Gold Mining in Nova Scotia

According to the Halifax *Industrial Advocate,* the production of gold in Nova Scotia in 1909 was 12,500 oz., a slight increase over 1908. The principal producers were the New England Mining Company (formerly the Boston Richardson) at Goldboro, the Oldham Sterling Gold Company at Oldham, the Great Bras D'Or Gold Mining Company at Middle River, Cape Breton, the Ponhook Mining Company at Malaga, and the Sydney Gold Mining Company at Country Harbor. Altogether about 25 mines were in operation, employing a total of 550 men.

During the year the Dominion Mining Company at Tangier changed the plant from steam to hydroelectric, generating the power at the Tangier river, about one mile from the mine. This new plant was completed in October and has since been in operation.

At Middle River, Cape Breton, the Great Bras D'Or Gold Mining Company commenced sinking a shaft on the Lizard lead. At Caribou, a disastrous fire destroyed the mill, power buildings and shaft house at the Lake property. New buildings, however, have been completed and work underground is to be pushed. At Malaga Barrens, the Ponhook Mining Company reopened the old workings on the Main Rabbit vein and installed new equipment.

Power Plants at Alabama Iron Mines

The Tennessee Coal, Iron and Railroad Company has erected modern power plants to serve the slopes of its mines on Red mountain, Alabama. These power plants serve one or two slopes as the nature of the situation determines. In the photograph which shows one of the power plants and tipples on the Muscoda division, the power plant serves two tipples, the second one being shown in the background to the right of the stack. The line of idlers, carrying the hoisting cable from the power plant to the tipple in the foreground, may be seen in the photograph. A similar line carries the cable to the other tipple on the other side of the power plant.

POWER PLANT AND TIPPLES ON RED MOUNTAIN, BIRMINGHAM DISTRICT, ALA.

The plant recently installed at the No. 13 slope on the Ishkooda division of the mines on Red mountain is the most modern of those in the district. The general construction of the building is similar to that shown in the accompanying photograph. This plant, however, is equipped with Murphy automatic smokeless stokers, in this particular being ahead of any of the other installations. The hoist is a Nordberg-Corliss, 30x60, first-motion machine with an 8-ft. drum; the compressor is an Allis-Chalmers, 60x48x42. There are eight boilers of 140 h.p. each, four of which are continually in use. As the boilers are equipped with automatic stokers and also with an automatic ash conveyer, shoveling is completely eliminated.

Metal Losses with Ore of Low Copper Contents

By C. A. Heberlein*

The subject of metal losses in smelting ore containing a small per cent. of copper has been discussed often, but the literature on the subject is far from being complete. Last September, I was called to Balsas, Guerrero, Mex., to blow in the furnace of the Maine & Nebraska Mining Company, to smelt an ore not exceeding 0.3 per cent. copper. I took the utmost pains to get at the actual slag loss for the copper, silver and gold while making what may be termed an iron matte.

Mine and Smeltery

Before entering into the subject, it may be of interest to give a description of the mine and smeltery, which are situated near the town of Balsas, Guerrero, the end station of the Cuernavaca division of the Mexican Central Railroad. Balsas lies almost due south from Mexico City, and the distance by railroad is 293 km. The altitude above sea level is about 1500 ft. The smeltery of the Maine & Nebraska company is connected with the main line by a broad-gage spur, 1½ miles in length.

The mine is reported to be well developed. The orebodies are opened by crosscut tunnels and the ore is delivered to the smeltery from the lowest tunnel. The smeltery equipment is of the usual type. The dimensions of the furnace are 36x120 in. at the tuyeres; the hight of the shaft above the tuyeres to the feed floor is 7 ft. An overflow trap spout was provided; also a circular brick-lined settler 6 ft. inside diameter. With a mud-lined swing spout the matte is tapped into sand beds, in which it is readily broken up and shipped to a custom smeltery. As the ore is hard and coarse, the hight of the furnace did not prove sufficient to allow hard driving, which the ore demanded in order to make a high concentration. In regular running the blast pressure did not exceed 18 ounces.

In testing the ore with the magnet I found it strongly magnetic. The mine-run of ore, as intended to be smelted, is a mixture of phyrrhotite, small quantities of chalcopyrite mixed with a calcite and shale gangue. A carefully taken grab sample gave the following analysis: SiO_2, 31.4 per cent.; Fe, 20.1; Al_2O_3, 5.6; S, 11.7; CaO, 14.6; and Cu, 0.28 per cent.

Furnace Experiments

The furnace was blown in on this ore without the further addition of fluxes, using 10 per cent. Agujita coke, which contained 16 per cent. ash and 81 per cent. fixed carbon. Until the furnace settled down to regular work, the slag was highly silicious and rather cold; with increased blast it became hot within a short time and the concentration of ore into matte was 10:1. After 24 hours I was able to reduce the coke gradually from 10 per cent. to 7 per cent. The blower delivered 6300 cu.ft. of free air per minute and the consumption per ton of ore was 56,000 cu.ft., with an average capacity of 160 tons per 24 hours, or 5.3 tons per sq.ft. of hearth area.

The above ore, I was told, did not represent exactly what the mine could produce and undoubtedly with a little sorting a better grade could have been made; but at the time of blowing in, room had to be made and it was decided to smelt the ore, in preference to sorting.

Determining Metal Losses

To determine the metal losses I took extreme care to protect the granulated slag sample against any salting. The composition of the slag turned out as calculated. The following is an analysis: SiO_2, 45.4 per cent.; FeO, 22.2; CaO, 22; Al_2O_3, 8.6; Cu, 0.086; Ag, 0.0035 kg. per ton, and Au, 0.2 gram. The matte from a concentration of 8:1 at that time, gave; Cu, 2.20 per cent.; Fe, 64.10; S, 27.50; Zn, 0.60; As, Sb, and Bi, *nil;* Ag, 0.391 kg. per ton, and Au, 30 grams. The losses in the slag with above concentration were: Cu, 21.5 per cent.; Ag, 7; Au, 6; total loss, 0.68 peso per ton of ore.

The second sampling, when the furnace ran at its best and concentrating at a rate of 10:1 with a coke consumption of 7 per cent., gave slightly different results. The slag ran: SiO_2, 45.60 per cent.; FeO, 23.88; CaO, 21.48; Cu, 0.095; Ag, 0.065 kg. per ton, and Au, trace.

I attempted several times to determine the gold with crucible charges as high as 100 grams, adding leaf silver for collector, but was unable to obtain more than a trace. Undoubtedly, at the time of this sampling, the furnace was running on some poor ore as the resulting matte showed the concentration of the copper but not of the silver and gold: Cu, 3.08 per cent.; Ag, 0.335 kg. per ton, and Au, 30 grams. The slag losses from the corresponding dump sample were: Cu, 23.7 per cent.; Ag, 13; Au, 3.3; total loss 0.739 peso per ton of ore.

Unfortunately I did not have an opportunity to run the same class of ore with higher gold and silver contents to collect a wider range of data. Enough can be learned from these data to show that only a small amount of copper is sufficient to produce a fair extraction of the silver, and a still better of the gold. If the furnace had been higher, the concentration would have gone up with the pressure of the blast; in this case the charge was entirely too open, and a burden of at least 10 to 12 ft. would have been necessary to obtain the right pressure, as at no time was the furnace lacking the necessary quantity of air.

The jackets were constructed without any bosh or inclination and the consumption of jacket water was tremendous; after running 5 days, I am informed, the consumption remained high, while usually after 12 hours it commences to decrease. I was informed that the furnace was specially designed to produce high concentration with great fuel economy. With higher sulphur and iron contents most likely the coke could be reduced materially, but with such a shallow shaft and narrow tuyere space as in this case, a concentrated smelting focus could not be expected.

Much trouble was experienced from the corroding action of the matte; the water-jacketed cast-iron spouts did not last at all, and I noticed that a heavy copper ring in the breast plate burned away within a few hours. A sectional, water-cooled cast-iron spout, lined inside with chrome brick, I believe would withstand the action of this matte.

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*Mining engineer, Mexico, D. F.

Manufacture of Alumina

An improvement in the manufacture of alumina, that is applicable to any process in which the alumina is precipitated from a solution of aluminate by carbon dioxide was patented (U. S. Pat. 941,799, Nov. 30, 1909) by Gilbert McCulloch, of East St. Louis, Ill., and assigned to the Aluminum Company of America, Niagara Falls, N. Y.

Mr. McCulloch's process is as follows: A liquor of approximately the proportions Al_2O_3, 75 to 80 grams per liter; Na_2CO_3, 40 to 50 grams; Na_2O combined with Al_2O_3, reckoned as NaOH, 105 to 115 grams; SiO_2, 0.15 to 0.25 gram, is placed in an agitator which is preferably a long, cylindrical steel tank. The liquor is then stirred by paddles, and carbon dioxide passed over it, which reacts with the sodium aluminate, forming Na_2CO_3 and aluminum hydrate, until the alumina present in solution has been reduced to 5 to 10 grams per liter. The composition of the liquor is now about Al_2O_3, 5 to 15 grams per liter; Na_2O combined with Al_2O_3 and reckoned as NaOH, 10 to 20 grams; SiO_2, 0.10 to 0.20 gram; Na_2CO_3, 185 to 195 grams.

Silica, as well as alumina, is precipitated by the carbon dioxide, but not in the same ratio. From the silica content of the liquor, it can be determined just when to stop the precipitation to obtain any desired degree of purity from the silica. The separation of the alumina and silica is the important feature of the process.

The Arteaga Mining District, Chihuahua, Mex.

SPECIAL CORRESPONDENCE

Probably one of the least known and at the same time oldest districts, in the point of producing mines, in northern Mexico is that portion of the Arteaga district lying adjacent to the town of Chinipas, in the southwestern part of the state of Chihuahua. Inaccessibility and higher transportation cost have been the causes of this district being neglected by the prospector, but since the completion of the Southern Pacific branch line to Alamos there has been a steadily increasing interest displayed in the mines and prospects of the entire district. One may now come from San Francisco to Alamos by rail in about 40 hours, from Alamos to San Bernardo by stage in 7 hours, and thence to Chinipas by mule back in about 12 hours.

The district is still dependent upon the faithful pack mule and burro. The capacity of these means of transportation is illustrated by the fact that a 12-mile narrow-gage railroad, 20-ton locomotives, has been operated for about 20 years between the mine and mill of the Palmarejo and Mexican Goldfield, Ltd., near Chinipas, to say nothing of the other mills throughout the district, all of which were packed in on mule back.

The Palmarejo Mine

Probably the most important mine of the district, and one of the great mines of Mexico, is the Palmarejo with a record of steady production of about 110 years. This mine has been controlled by an English company for about 20 years and it is this company that built the mentioned railroad, also a 14-mile masonry ditch supplying the 50-stamp mill with power. It is understood that this company is now about to install a new mill of 300 tons daily capacity, the process to include fine grinding in tube mills, agitation with cyanide and filtering.

The ores of the Palmarejo, and in fact of all the mines of the district, consist of a highly silicious matrix carrying from $\frac{1}{2}$ to 2 per cent. concentrates (iron sulphides). Argentite and free gold occur in proportions varying from 0.05 oz. gold with 10 oz. silver, to 1 oz. gold with 40 oz. silver.

The ore occurrence in the Palmarejo is in shoots and lenses of pay ore within an immense vein of low-grade stuff. The vein proper is 50 to 150 ft. between well defined walls, and within this vein occur the oreshoots. The mine is worked through a series of tunnels on the vein, the lowest being 700 ft. below the croppings. It may be said of all the vein systems of the district that wherever opened up they have proved to be strong and continuous; in one instance the vein system may be traced on the surface for considerably over two miles. The veins for the most part are perpendicular or nearly so.

Among the other producing mines of the district are the properties of the White Chief Mining and Milling Company, the Rio Plata Mining Company, and the Durazno-Tetamoa Mines Company. On a number of promising prospects development work is being pushed and more producers should soon be added to the ranks.

White Chief Mine and Mill

The properties of the White Chief Mining and Milling Company cover a system of five parallel veins occurring along the fracture planes of an immense diabase intrusion through a granite country. This diabase dike has a width of about 200 ft., with a strike north and south, and within it and more or less parallel are the five veins. The most important, inasmuch as it has been more developed, is the Guadalupe vein, on which is a working shaft 350 ft. deep, equipped with an 8x12 duplex direct-connected steam hoist, and with levels at each 100 ft. In this vein the ore occurrence is characteristic of the district, the pay ore occurring in shoots and lenses within the vein. The vein has been supplying the 15-stamp mill for 10 years with ore ranging from $8 to $20 per ton. Baby and hammer drills are used throughout the mine. In all the veins of the district are frequent occurrences of small shoots of high-grade or bonanza ore which is shipped direct to the smelteries. This ore runs from $200 to $3000 per ton.

At the mill of the White Chief the ore is delivered from the mine by a $1\frac{1}{8}$-mile, 24-in. narrow-gage tramway to an upper ore bin, thence through a 7x9 Blake crusher to 1-in. ring, then to the stamps, through 30-mesh, No. 28 wire cloth, over 8-ft. copper plates where from 40 to 60 per cent. of the gold and silver are amalgamated, making a bullion of about 534 gold and 420 silver. The pulp then passes through a Pierce amalgamator to cone sizer, thence to Wilfley tables, the tails from which are sized into sands and slimes, the sands going to 20-ton leaching tanks where they are given from 3 to 4 days' leaching with a 5-lb. solution of NaCN. At present a gross extraction of 80 per cent. is being made, but with the addition of a slime plant this should be increased to about 93 per cent. The concentrates and precipitates are shipped to San Francisco, but it is the intention to cyanide the concentrates. Mining, milling and overhead charges at present average about 8 pesos per ton.

Chinipas and Surrounding Country

Rio Plata and Other Companies

The Rio Plata company has been operating a 100-ton plant at its mines near Guazapares for the last three years on a high-grade silver ore. It has just completed the installation of a new hydroelectric power plant and a cyanide plant, including Pachuca tanks, for the retreatment of the tailings. It is claimed that the mill has been running on 100-oz. silver ore from its start, and the accumulated tailings are said to carry about 80 ounces.

The Durazno mines, about 12 miles from Chinipas, have been taken over by the Durazno-Tetamoa Mines Company, which has installed a 50-ton mill. These mines are among the producers, although they have been handicapped for lack of water due to the general drought which prevailed last year. These are old mines with a record of large production. The occurrence and character of the ore are typical of the district.

Of the old mines probably the Millonaria is the most picturesque. This mine was owned by the king of Spain and is credited with many millions of production. It is at present about to be opened by American capital. There are also many antiguas now being taken hold of and reopened, while others still offer opportunities to the prospector and investor.

MASONRY DITCH IN ARTEAGA DISTRICT

Price of Radium

A recent consular report states that the work of determining the radium content of the Joachimsthal ores has been begun at the Vienna institute, and that the radium will be sold in vials, each to contain 60 mg. of 5 per cent. radium or 30 mg. of 10 per cent. radium. The price of such a vial will be 1080 crowns (about $216), or on the basis of a price of 300,000 crowns ($60,000) per gram for pure radium. At present the demand from institutes and medical clinics is in excess of the supply.

Reverberatory vs. Blast Furnace[*]

By Henry F. Collins[†]

Besides being a valuable record of practice in a particular locality, Mr. Ricketts' paper on reverberatory practice at Cananea, brings up the general question of the blast furnace against the reverberatory, and it might be worth while to refer briefly to some of the principal factors which might affect a decision as between the reverberatory and the blast furnace.

There are two principal factors which affect the problem, and several subordinate ones. The two principal factors are the size of the particles of ore, and the relative cost of coal as compared with coke. Subordinate factors are water supply, the cost of refractory material, and the regularity of the ore supplies.

It is well known that a blast furnace lends itself much better than the reverberatory to intermittent and more or less variable ore supplies. In order to do cheap work on a large scale the reverberatory requires regular supplies of material of uniform quality, whereas a blast furnace can be started up today, shut down tomorrow and restarted next week without any difficulty, and with very slight additional expense.

With regard to water supply there are parts of South America and of Australia where water is so scarce that the use of water jackets is practically out of the question, and blast-furnace work without water jackets is, of course, for large-scale work impracticable. In such cases, provided fuel can be obtained, the reverberatory is most suitable.

Size of the Ore

Coming to the two principal factors which influence a decision on the problem—the size of the particles and the comparative price of coal and coke—of course with lump ore every one would prefer the blast furnace. If one had jig concentrates or natural smalls, the bulk of which was from ⅛ in. upward, with a certain proportion of grains between ⅜ and ½ in., I think the practice of blast-roasting followed by blast-furnace smelting has much to recommend it.

Blast roasting, where the material is suitable, has several well-marked advantages over ordinary roasting: it is cheaper; it produces less flue dust; it turns out a product which is in a better physical condition for the blast furnace. It is not only in better physical or mechanical condition, but in a better chemical condition, since fluxing has already begun. The sintered mass has already made a partial combination of the base with the silica and it requires fewer units of heat to remelt a slag once formed than to form it from its chemical constituents. Therefore, when the bulk of the material to be roasted is over ⅛ in., with some ¼ in., so that it is porous enough to become evenly roasted and sintered throughout, there is no doubt that blast roasting followed by the blast furnace is the cheapest method.

Where blast roasting fails is in treating table concentrates. In America, and elsewhere, attempts have been made to treat table concentrates by blast roasting, but the product is irregular and great difficulties were found through the formation of craters or blowholes. Such fine material appears to be only adapted to plain roasting in the ordinary automatic furnaces.

Fine, roasted material which is not agglomerated will not serve for the blast furnace; therefore it has to be briquetted first. Preparation for the blast furnace then comprised two processes: Plain roasting followed by briquetting, which combination would necessarily be more expensive than the preparation for the reverberatory. When one has a fine material, like table concentrates, such as nearly all the great plants in southwestern United States have to deal with, one must seriously consider the reverberatory as offering, over the blast furnace, other things being equal, a probability of cheaper smelting.

Coal and Coke Costs

The other great factor, which affects the comparative cost of smelting by the rival methods, is the relative cost of coal and coke. In blast-furnace smelting, leaving out of account any heat one might obtain from the sulphur, it requires from 10 to 12 per cent. of fuel; in reverberatory smelting from 22 to about 33 per cent. It is perfectly plain that when coal is more than half the price of coke the reverberatory is practically outclassed on the ground of economy.

If, as in a case in Spain, coke costs about £2 per ton, and good reverberatory coal costs from 25s. to 30s., it is obvious that the reverberatory, which uses more than double the dead weight of fuel required by the blast furnace, cannot compete.

But with the cost of coal not more than one-half that of coke, it is quite probable that the reverberatory could compete with the blast furnace; and, as Mr. Ricketts observed, there are many places in the southwestern United States and northern Mexico where it is probable that, the use of the reverberatory for treating fine material would continue to extend, leaving for blast-furnace treatment a relative smaller tonnage, but of coarser material, for which it is better adapted.

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[*] Discussion of L. D. Ricketts' paper, "Reverberatory Practice at Cananea," read before the Institution of Mining and Metallurgy.

[†] Consulting metallurgist, Crinnis, Par Station, Cornwall, England.

Gold in The Adirondacks

Last year witnessed a revival of interest in the alleged gold-bearing sands of the Adirondacks. The State geologist, John M. Clarke, has been called upon frequently for information on the subject, as well as for an expression of opinion regarding certain enterprises which have been inaugurated for the purpose of working such deposits on a commercial basis. The exact methods for the recovery of the gold have usually been kept secret and out of the reach of scientific inquiry. The metallurgical process rather than the mines themselves seems to be the principal consideration in the organization of these ventures. There have been many attempts to "promote" a gold-mining industry in this region.

In a recent report, Mr. Clarke states that "the thoroughness with which the prospector has covered the ground is to be seen in the abandoned pits and diggings that are scattered over the section. In 1898 alone nearly 4000 claims were filed for gold and silver discoveries in the State, mainly in the Adirondack region. The basis of all this activity is the alluvial and glacial sands, which occur in almost every stream valley. The sands consist entirely of the minerals of the country formation, which are chiefly granite, syenites, gabbros, and gneissoid rocks of ancient origin. These contain a small proportion of heavy minerals like garnet, hornblende and magnetite, which have sometimes been separated by water action into distinct layers and which are found as black sands along the shores of the Adirondack lakes.

"It is in these heavier concentrated portions of the sand that gold should be found if present anywhere in the region. Assays by reputable firms have occasionally shown a small quantity of gold, ranging from a mere trace to perhaps $1 per ton. The examination of innumerable samples under the microscope has failed to reveal any of the precious metals, though of course such evidence is not conclusive as to their absence or presence. On the other hand the claim has often been put forth that the common quartz sands in certain places carry from $2 to $20 per ton, which, if true, would under ordinary circumstances bring them into the zone of practical exploitation.

"The statement is commonly made by interested parties that the fire assay is unsuited to the determination of gold in the sands, and special analytical methods must be employed."

Is the Fire Assay Reliable?

The following is a letter sent to the JOURNAL for publication, in which the writer sets forth his views concerning the gold-bearing sands, and the method of assaying them:

"Your attention has doubtless been called to a recent *Bulletin* issued by the State geologist of New York, treating of certain alleged gold deposits situated in this, Lewis, and adjoining counties. Having spent all of last summer examining these deposits and watching the test work being done in the hope of developing a commercial process for saving the gold, it may be that some of my observations and conclusions may be of interest to some of your readers.

"The State geologist gives the origin of the gold-bearing sands as the breaking down of the 'granites, syenites, gabbros and gneissoid rocks of very ancient origin.' This conclusion is undoubtedly correct. There is no evidence to be seen that the sands are of glacial origin.

"The State geologist states that many assayers have found gold in small amounts but discredits the statement that the gold amounts to more than 25c. to $1 per ton because, as he expresses it, 'interested parties' claim that the fire assay is not a reliable guide to the accurate determination of values. I have no doubt but what many of your readers will agree with this statement and it is at this point that these deposits present a most interesting problem in metallurgy. I have made upward of 200 fire assays of sand from Lewis county during the last few months. About half of these assays gave from $1 to $4 per ton. Some large deposits averaged about $3.

Volatilization of Gold?

"I use a combination gasolene furnace, for easy control of heat, and run at the lowest possible temperature and only long enough to get a quiet fusion. In the course of my work I broke the cover to the top of my furnace and replaced it with a 3-in. scorifier, inverted. After a few weeks' use I chanced to pick this scorifier up and found it literally plastered with ruby glass, grains of gold and in places a wash of gold.

"I had been running assays against an amalgamation assay expert and had been totally unable to check; failed to even approximate his results. But if I had recovered the gold in my assays that I found condensed from volatilization, I would have at least approximated his figures. I have demonstrated to my own satisfaction that this gold does volatilize in the fire assay. I will be glad to take this point up with any of your readers who may be interested from a technical point of view.

"I have only repeated the experience which has been gained by every investigator since Professor Chase, professor of chemistry at Cornell 20 years ago, who examined these deposits and reported the fire assay to be unreliable, and the gold of $2 and more per ton not extractable by any known process.

"The certain knowledge of the presence of gold has kept the holders of mineral rights at work until a quarter of a million dollars would no more than cover the cost of the experimental work which has been done in the last 10 or 15 years.

New Plants Installed

"During last year two test plants have been equipped in this vicinity, capable of handling the sand in lots of five or more tons. The results attained by these plants have been so encouraging that it is proposed to erect one or more 100-ton mills the coming spring. A net saving of about $2 per ton is indicated by the preliminary work and tests.

"Chemists and engineers of high standing have been in charge of the recent test work and the present situation is of much interest, when it is considered that the effort is directed toward opening a new goldfield within a few hours of New York City. The most successful work so far done has been along the line of electro-amalgamation and it is to the perfecting of the adaptation of this process to the special conditions here found that the hope of success is based.

"Personally, I suspect that we are dealing with gold in the form of a silicate which is decomposed in the furnace and immediately volatilized. I would like to have the matter presented in such a way as to interest others in working out the question of just what the conditions are. I also find values in the country rock."

B. J. HATMAKER.

Lowville, N. Y., Jan. 19, 1910.

Analysis of Samples

In response to his request for an investigation of these sands and the character of the gold contained therein, we invited Mr. Hatmaker to forward sealed samples to the JOURNAL with the understanding that they were to be analyzed and assayed by reputable analysts in New York. The following is the letter accompanying the samples:

"I am glad, indeed, to act on your suggestion, and forward samples of sand which carries gold not recoverable by the ordinary fire assay.

"The samples marked 'A' are from an immense deposit along the Black river and represent three samples taken 300 ft. apart. These samples gave me, by fire, from $3.59 to $3.80 per ton. The samples marked 'B' are from a deposit back in the hills which should run around $3. This particular sample was taken by Professor Locke, of the Boston Institute of Technology, and myself. It represents the sand of which Dr. N. S. Kieth, of Philadelphia, has milled several ons and has reported $2.50 to $3 recovery, by amalgamation. My fire assays on this have run $1.50 and $2.75. Professor Locke was unable to get more than a race.

"We are here dealing with gold disseminated throughout the mass of sand derived from the breaking down of ancient rocks. Is it not possible that we may be dealing with gold in some primary condition or combination, not hitherto recognized? A possible silicate, for example?

"I am sending enough sand for both fire and amalgamation assays and shall greatly appreciate your kindness in leting me know the results of the tests. The question of the existence of gold in paying amounts in these sands is one of great importance and has attracted the atention of a good many engineers during he last 20 years. I hope these samples may lead to such an investigation under he auspices of the JOURNAL as may setle the matter."

B. J. HATMAKER.

Lowville, N. Y., January 28, 1910.

We have had the samples which Mr. Hatmaker sent us assayed in New York and the following are copies of the certificates, together with comments upon the gold contained in the sand:

REPORT BY RICKETTS & BANKS

"The samples of sand marked 'A' and B,' received sealed under signature of B. J. Hatmaker, submitted for assay, contain:

	"'A'	'B'
"Fire Assay	0.005 oz.	0.005 oz.
"Wet Assay	0.005 oz.	0.005 oz.

gold per ton of 2000 pounds."

"RICKETTS & BANKS.

"New York, March 3, 1910."

REPORT BY A. R. LEDOUX & CO.

The other two samples, also designated by "A" and "B," were submitted to A. R. Ledoux & Co., of New York, and the following is their report:

"The two samples of sand submitted to us on Feb. 1, 1910, marked respectively 'A' and 'B,' and sealed with paper bands, bearing the signature B. J. Hatmaker, have been assayed by the usual fire-assay method, yielding:

"'A'—Gold = 0.0025 oz. per ton = $0.05 per ton.

"'B'—Gold = 0.005 oz. per ton = $0.10 per ton.

"This work was very carefully done, using large assay charges. In view of the statement that these sands are said to contain gold combined with some element or elements, causing the gold to volatilize during the fire-assay process, and that this method is not capable of detecting gold in these sands, we have repeated the assays by a wet method which involves digestion of the finely ground sands with *aqua regia* at a low temperature for a long time, filtering off the acid liquid, evaporating it to small bulk and examining the concentrated solution for gold By this method we obtained:

"In sample 'A'—Gold, trace.

"In sample 'B'—Gold, 0.003 oz. per ton = $0.06 per ton.

"Supplementing these tests, a portion of each sample was concentrated by panning and the concentrates were examined both with a hand glass and also microscopically. Neither sample showed the presence of any visible gold or of any usual mineral or substance which might possibly carry gold. The concentrates are principally magnetic iron particles mixed with some complex silicates of the garnet family.

"Portions of each sample contained in closed tubes of hard glass were heated in a blast-lamp flame to the melting point of the glass. A quantity of combined water condensed on the cool parts of each tube but neither sample yielded any sublimate of volatile matter whatever.

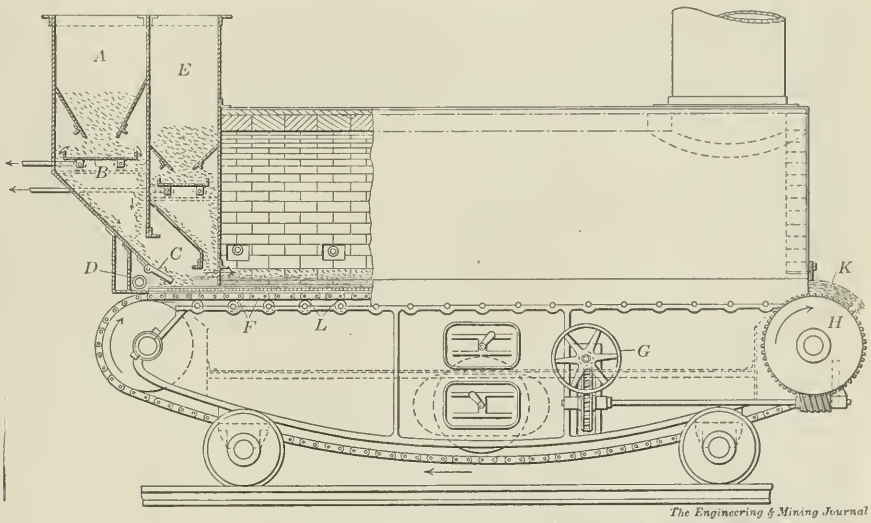
"From the above tests we conclude that these samples are ordinary silicious sands and that they contain only traces of gold as are usually found in such sands. Traces of gold are frequently present in many rocks and sands, and it is not unusual to find gold values equivalent to a few cents per ton in ordinary rocks, such for instance, as granite paving blocks. These samples do not contain any extraordinary or unusual element or any substance which could cause the gold to volatilize in the ordinary process of assaying, nor in fact do they contain any volatile substance except combined water.

"LEDOUX & CO.

"New York, Feb. 21, 1910."

Furnace for Sintering Ore

In United States Pat. 942,052, Dec. 7, 1909, Herman C. Bellinger describes a furnace for continuously sintering or agglomerating fine ores, preparatory to their being smelted. The ore to be sintered is automatically fed over a grizzly to permit the finer particles to drop through the spaces in the grizzly to a traveling carrier or grate, where the finer particles are ignited to form a combustion or priming bed, on which the larger and coarser particles of ore from the grizzly are deposited. On top of the bed, lime, coarse ore or other suitable material is continuously fed to serve as a blanket, this blanket serving to minimize the amount of flue dust created by the forced draft. The traveling grate extends through the blast chamber, and in the course of the travel of the ore sufficient combustion is attained to sinter it, making it ready for the smelting furnace.



SINTERING FURNACE WITH TRAVELING GRATE BARS

Referring to the illustration, which is a side elevation partly in section of the improved furnace, the ore to be treated is delivered into the hopper *A*, having a reciprocating distributing pan *B*, and at the lower end of the inclined chute a grizzly *C*, while beneath it is a burner *D*. Hopper *E* (also fitted with a reciprocating distributing pan) is for the limestone or coarse ore used for the blanket bed, the limestone being delivered at a point somewhat in advance of the end of the ore grizzly. The traveling grate or carrier *F* in the present instance is operated by the pulley *G* and worm gear driving the drum *H*. The sintered product is discharged from the grate at *K*, ready for the blast furnace.

The Advantages of Machine Mining

With a Fair Sized Differential Favoring Machine Mining, the Saving to a Company Will Pay for Machine Plant in One Year's Time

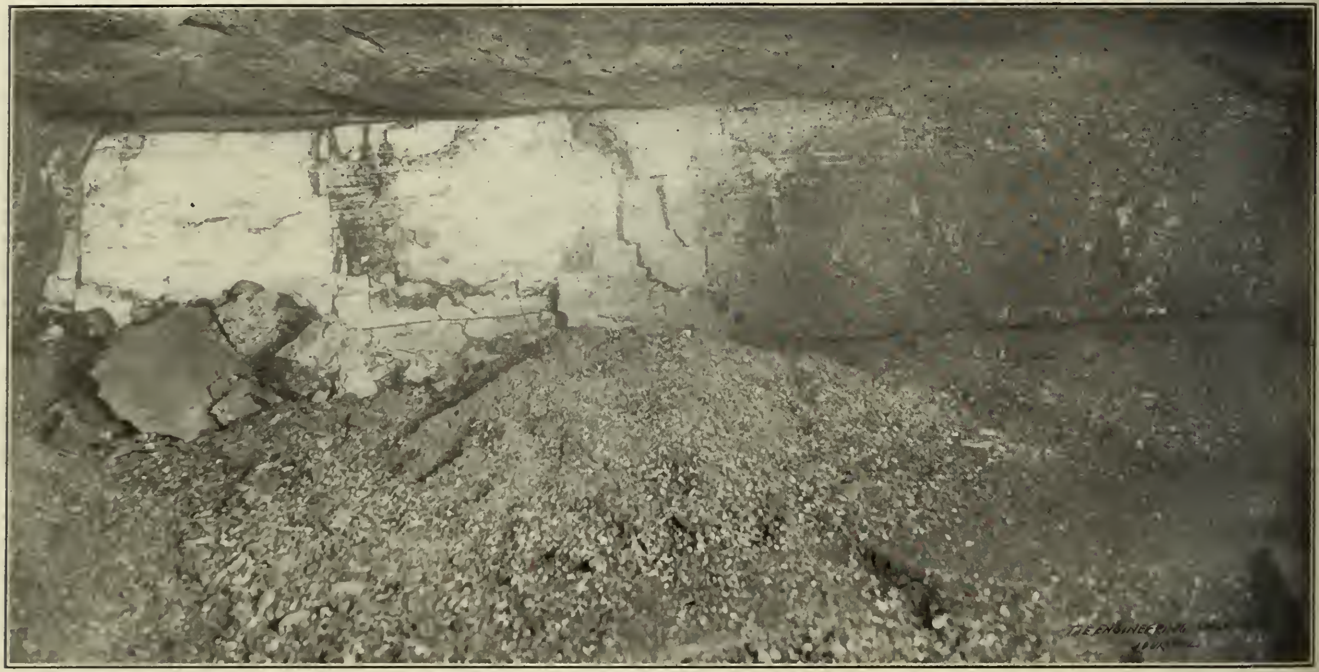
BY FLOYD W. PARSONS

The criminal practice of shooting coal from the solid is being rapidly eliminated, and the more safe and sensible system of first undercutting the seam is becoming general in practically all fields. American coal operators point with pride to the higher efficiency of American mine labor, as compared with European miners. I do not wish to detract from the credit due American workmen; however, it is a fact that the greater output credited American miners is due almost entirely to the more prevalent use of mining machines.

In the State of Ohio, for instance, 82.2 per cent. of the total coal output is machine mined. The average number tons of lump coal mined by each pick miner in Ohio per day is 2.2. In the same State, the average tons of lump coal cut by each machine runner for each day is 29.5; while the average tons of lump coal loaded by each loader per day is 3.8. In European mines, the average quantity of lump coal mined by each miner per day is less than 2 tons. This does not mean that the foreign miner is less efficient, or less industrious, but rather that the mine owner is not as progressive and looks with misgivings on the advent of the mining machine. I do not intend to convey that machines are not used in European mines, but rather that their adoption has been slow and on a small scale.

It will not be many years before each coal-producing State will, by legislation, abolish the practice of shooting from the solid; when this condition prevails, the mining industry in America will have taken a forward step from which there will be no occasion or desire to recede. Aside from the great factor of safety, shooting from the solid is wasteful, in that the coal is shattered and less of the output is commercial.

In discussing the various methods of undercutting a coal seam, I feel that it is unnecessary to compare machine mining with mining by hand, and rather confine the discussion to a comparison of the different types of undercutting machines.



SHOWING FACE OF CHAMBER AFTER BEING UNDERCUT WITH CHAIN MACHINE AND THEN SHOT. IN THIS CASE THE COAL SIMPLY SETTLED AND DID NOT ROLL OUT

VARIOUS METHODS OF UNDERCUTTING

Undercutting by hand is laborious and dangerous, having in its favor, however, the fact that when the coal face is undercut with a pick in the hands of a miner, the undercut is more on the V-shape with the wide end facing out. With this kind of an undercut less powder is required, and the coal being snubbed at the front is more likely to roll out after the face has been shot, thus enabling quicker and easier loading.

There are various kinds of undercutting machines, each having special merits under certain conditions. The selling agent for each style of machine will naturally advance numerous arguments favoring his brand. The mine superintendent, therefore, must study local conditions at his mine carefully so as to be sure that the style of machine adopted will do the work at hand.

In many mines almost any type of machine could be used to advantage; however, a close study of the local situation will generally show that some certain style of cutter is best adapted for the work at this particular mine.

It is probably true that a machine using a cutter chain traveling horizontally across the face of the coal has the largest capacity and consumes the least amount of power. A cutter of this type is commonly known as the chain-breast machine, and is more generally used than any other style of coal cutter. When first introduced, these machines were generally operated by compressed air, but at the present time, electric motors are attached to the cutter-chain machines. The early type of cutter-chain machines was rather defective and inefficient when considered from the viewpoint of present experience. These machines at the present time, however, are stronger and better able to perform hard service with a great-reduced cost of upkeep. As in all ases of mining machinery, the manuicturers have tried to get the maximum f strength with the minimum of weight, or if such a machine is unwieldy and ard to move, considerable time is lost.

Another point of great importance is ie amount of space occupied by a mahine, for in many mines the roof is of ich a character that props have to be laced near to the face of the coal. This ictor alone is sufficient to make it imracticable to use certain styles of mahines at various mines. If it is possible secure authentic figures, it is advisable compare the amount of power used by ich machine per cubic inch of coal cut. he machine should be so designed that can be loaded, unloaded, moved about nd pulled out from under the coal by its vn power. These machines are usually oved from room to room on a truck, hich latter is driven by power from the achine, or is hauled by a mule, dependg on whether or not a self-propelling uck is employed. The undercut made y a chain machine is only 5 or 6 . high, and, therefore, does not permit ie coal to fall very far, making it necesary in some cases for the miner to use a ar to pull the coal down and out. If hen the cutter-chain machine is used nd the face is shot, the coal breaks up nd comes out easily, there is then no achine that can equal this type for eed and power efficiency. In such a ine, these machines are not likely to be isplaced by any other style of cutter and re in a class of their own. The floor ft by the cutter-chain machine is genrally smooth and even, making a good ottom for the loader to shovel from.

The first type of chain-breast machine cut the coal "a board" at a time; a later development of the chain machine is designed so that it cuts the coal constantly from the time it is placed in position against the rib until it is withdrawn on the farther side of the room. The speed of these machines across the face of the room varies from 20 to 50 in. per minute, depending upon the hardness of the coal. When the machine is built to cut only a few feet at a time, and then has to back out, be moved and set up ready for the next cut, the progress across the face is much slower, averaging from 5 to 10 in. per minute. However, it must be remembered that the continuous cutter is not adapted for any and all mines.

Where a Mine Has Rolling Bottom

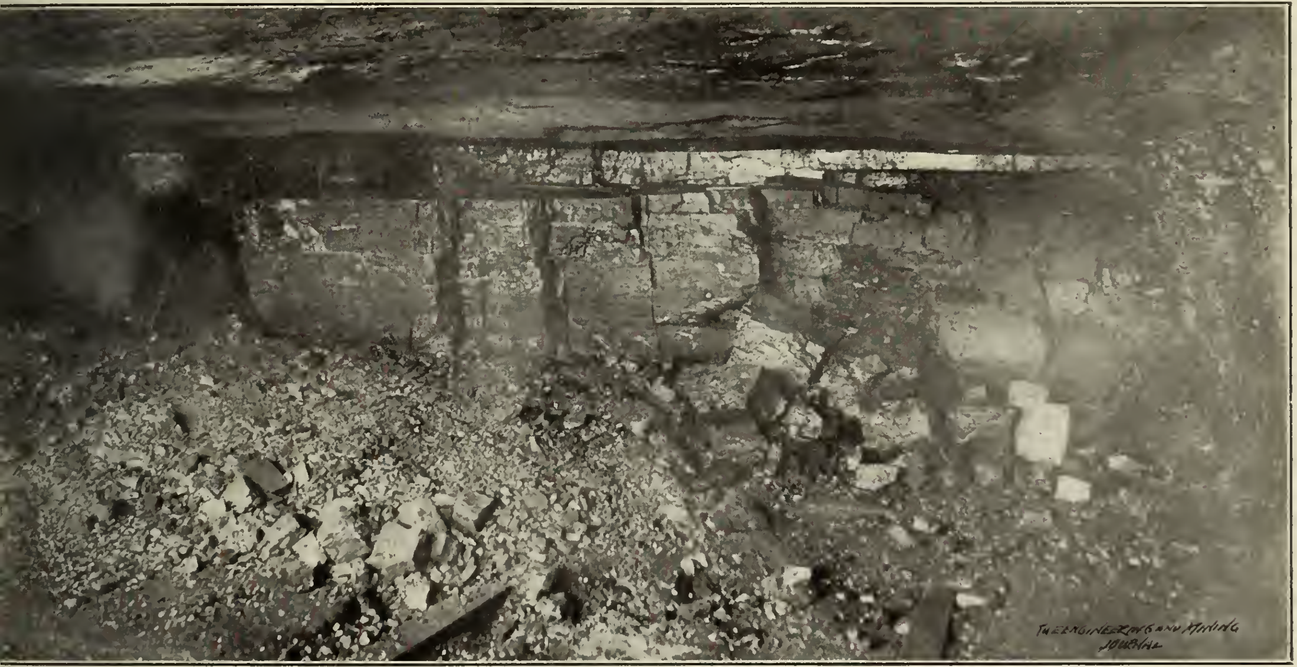
In a mine where a band of sulphur occurs near the bottom of the seam, or where the bottom is rolling, many chain-breast machines will not work satisfactorily. It is claimed by certain manufacturers that their continuous-cutting machines will follow a rolling bottom and maintain a cut parallel to the floor. In many coal seams the bottom of the bed where the undercut is made often contains hard substances, which when encountered by a machine, often cause the bits to break. For this reason it is advisable to seriously consider the flexibility of a machine operating under such conditions. In one type of cutter this difficulty is partly overcome by the use of a friction clutch, which allows the cutting mechanism to slip when hard substances, like sulphur, are suddenly encountered.

Coal-punching Machines

There are many mining men who prefer hand mining to machine mining so far as the character of the undercut is concerned. Undercutting by hand as before stated, is not only more costly, but is attended with considerable danger to the miner and prevents a rapid development of the property. In the face of such conditions, it is only natural that a mining machine would be developed, providing an undercut similar in all respects to that effected by a pick in the hands of a miner.

Until recently, electric power could not be applied as a motive force in the operation of reciprocating percussive tools, or those which strike a blow, such as coal punchers, rock drills, etc. For this reason all of the early types of pick machines were operated by compressed air. The use of steam as a motive power underground is impracticable, in the case of such machines, because of the great losses in transmission and wasteful methods of using. One mining-machinery company went a step further, believing there were numerous advantages in transmitting power by electricity, and succeeded in building a puncher machine which combines air and electricity. The main idea followed out in the construction of this machine was the utilization of air by compression and expansion in the same cylinder. This type of semi-electrical puncher has passed the experimental stage and is now an active competitor of the many different types of air punchers.

In a seam of coal where the bottom is rolly, there is little question but that the puncher type of cutting machine is better adapted, from the fact that in cutting with the puncher machine, the bottom is used as a guide for the puncher pick, and the machine cuts the coal off the bot-



Another View of Face Shown on Opposite Page, After Coal is Undercut with a Puncher and Shot. It Is Evident That in This Seam, a Puncher Machine Is Best Adapted tom, following rolls and inequalities. In a seam of coal in which the coal is burned to the bottom, the puncher follows the bottom, cutting this coal loose, allowing a smooth surface to load the coal upon, and not making it necessary for the miners to go back and dig up with a pick the coal which is left by the machine.

The Coal Rolls Better

Many advocates of the puncher machine also claim that this type is especially adaptable in coal where the cleats are not well defined, as it allows a condition of shooting which places the coal in such a shape that it is easily loaded. This is brought about by the fact that with the wedge-shaped undercut, only enough powder is required in shooting the coal to break it at the back. When it is shot, the coal readily rolls in such a shape that it can be loaded, and as a result, it does not settle, requiring a great deal of pick work to get it free.

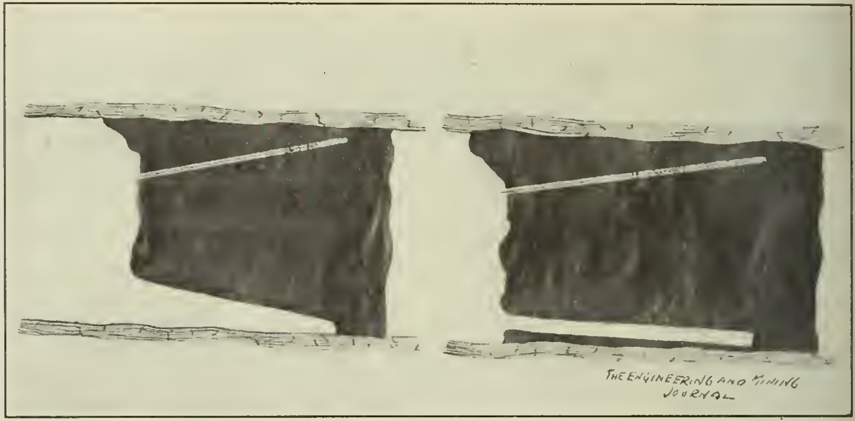
The puncher is more flexible in the nature of its cutting and will work around a sulphur band or sulphur balls, cutting them loose so that they can be removed. Where the top is bad and close timbering is required, the puncher is well adapted, for the cutting board can be placed between the timbers without their removal. In this way, when the puncher is used, timbers can be set within 2 ft. of the face, the only requirement being that the timbers must be placed at least 3 ft. apart across the width of the room.

It is evident from the foregoing discussion that the type of mining machine best adapted for any special mine can only be determined after the most careful investigation. The operator's individual point of view is a matter of supreme importance, for the points of vantage that appeal to one mine superintendent are often ignored by some other manager. At one mine, speed and enlarged output may influence the mine manager to look with favor upon the continuous-cutting electric chain machine, which has been known to produce on an average more than 120 tons per 10-hour shift, in a 6-ft. seam. Another operator is likely to place less stress on speed and capacity, consequently favoring a puncher machine because of the better grade of coal it might get him. As to the power used, electric power is most in favor, although some operators have turned to the use of compressed air purely on the ground of greater safety.

There are still other operators who advocate the use of mixed machines, using chain-cutters in rooms and puncher machines in entries.

Comparison of Cost

It is practically impossible to compare the actual cost of mining with the various types of cutting machines. The machine that would show a considerable saving at one mine might prove inefficient at some other operation. However, when it comes to comparing machine mining with hand mining, there is no difficulty. The most important point to consider is the size of the differential favoring machine mining over hand mining. In many districts this differential, or margin, amounts to about 15c. and it is out of this differential that the operator makes his profit and pays for the plant. At a mine producing 1000 tons per day and having a 15c. margin in favor of machine mining, the gross saving would be $150 a day, or $30,000 per year of 200 days. In such a case, the company can maintain its output with 20 per cent. fewer men than are required when hand mining is employed. It is also a fact that the $30,000 saving will pay for the machine plant, installation and cost of maintenance, as well as interest and depreciation, in about one year's time.



Section Through Coal Face Showing Puncher Cut on Left and Chain breast Undercut on Right

One of the last States to adopt machine mining on an important scale is Illinois. This condition in Illinois is not due to any lack of desire for the adoption of machines on the part of the operators, but rather to a peculiar attitude of the miners themselves. The general belief has prevailed among the miners that they can show increased earnings when coal is shot from the solid, and they have, therefore, strongly opposed any agreement providing a fair differential in favor of mining machines. In the face of the dangers which are sure to result from solid shooting, and aside from the great waste of commercial coal that results, it is almost unbelievable, but true, that in practically all of the districts in the United States where shooting from the solid still prevails, this dangerous practice is advocated by the miners themselves rather than the operators.

When mining machines were first introduced, the cry was raised by many miners that an effort was being made to introduce mechanical devices that would deprive them of their work. The more thoughtful miners soon came to believe that this view was not only incorrect, but impossible in this age of mechanical progress. Not only have mining machines given more regular employment to an increased number of men, but the clever machine-runner has a better opportunity to increase his daily wage. In numerous cases, machine miners average from $4 to $7 per shift. In addition, the work is done in greater comfort and frequently a day's work is completed in from 4 to 7 hours.

Mining machines are as sure to replace hand mining as the modern fan did furnace ventilation. Our steps along the line of progress have been permanent. There will be no return to hand mining, and so far as shooting from the solid is concerned, that practice before long will only be of interest as a matter of ancient history. Twenty years ago only 6 per cent. of our coal production was machine mined; at the present time, more than 36 per cent. of our total output is undercut by machines. Such facts indicate definitely the trend of the tide.

Mine Timber in the Anthracite Regions

Special Correspondence

A matter of importance that is occupying the attention of colliery proprietors is the growing scarcity of mine props. The timber within reasonable distance of the mines is vanishing at an alarming rate. Reforesting is out of the question on the hills in the anthracite regions, for the soil is of such a poor quality that it would probably take generations to develop timber fit for use; at least this is the opinion of those who have examined the situation. Of course, mine props can and are brought from places far away from the mines, but this involves considerable extra expense. Various substitutes have been suggested, such as steel or iron girders, concrete, etc., but again the question of expense comes in.

Coal-mining Methods in Siberia

Mine Superintendents Must Stand Trial When Fatal Accidents Occur; if Negligence Is Proved, Imprisonment without Option of Fine Results

SPECIAL CORRESPONDENCE

During the last two years Robert M. Percy, a nephew of the late C. M. Percy, the director of the Wigan Mining and Technical School, has been engaged in Siberia developing the collieries owned by the Spassky Copper Mines, Ltd., an English company.

The work undertaken by Mr. Percy in Siberia may be said to be that of the pioneer, and in a paper entitled "Coal Mining in Siberia as carried on by an English company," read before the Lancashire branch of the British Association of colliery managers, he has conveyed his impressions of that vast territory which is generally considered to be a land of prison cells and torture chambers. He says, however, that "the Siberia of convicts and prisons has passed away, and now one only sees indications of industry and peace," Mr. Percy says the Russian Government now realizes what enormous possibilities lie buried in Siberia and all that is necessary to develop the country as a mineral-producing region, is a railway; the capitalist is bound to follow. In the paper we are told that Siberia is a land of promise, and so far as mining is concerned there is every reason to believe that it will one day take a foremost place among the great mineral-producing countries of the world.

The collieries owned by the Spassky Copper Mines, Ltd., are situated at Karagandy, in the Akmolinsk district of Siberia, 600 miles from Petropavlovsk, which is the nearest railway station on the Trans-Siberian railway. Mr. Percy says that so far as the Akmolinsk district is concerned, the extent of the Siberian coalfield has not been fully determined, although it is known that coal does occur in the whole area between Karagandy and Akmolinsk, a distance of 180 miles. The Spassky company's claim at Karagandy is seven miles long and three miles wide. So far, three seams have been met with, although the deepest shaft is only 238 ft. deep. The measures are Upper Carboniferous, and they contain marine limestones, alternating with sandstone, shale and coal.

The three seams so far met with are 4 ft., 7 ft. 6 in., and 28 ft., respectively, but only the latter two have been opened out. The most extensively worked is No. 2 seam known as the Carnot seam. It dips 12 deg. S. E. and the coal is of a semi-bituminous nature, 5 ft. 6 in., thick, with a fairly soft layer of shale, 2 ft. thick at the top.

It also contains several very thin bands of shale near the middle, and consequently the percentage of ash is rather high, ranging from 14 to 20 per cent. The outcrop of this seam can be traced for a distance of 14 miles, to the company's second claim at Saran.

One main shaft (238 ft. deep) and four auxiliary shafts (120 ft. deep) wind coal from the Carnot seam; the main shaft is a rectangular one, 13x7 ft. (overall), and is divided into three compartments, two being used for winding and the other for pumping and ladder-way. The two winding compartments are each 3 ft. 9 in. x 5 ft. 8 in., and are fitted with wooden guides (5x4 in.) secured to the dividing timbers (10x8 in.) by coach screws. Light cages, weighing about 3/4 ton are used, and these hold one car containing 9 hundredweight.

A geared compound winding engine is used, the cylinders being 8x13½ in., by 12-in stroke. A 7/8-in. rope is used on a drum of 4 ft. 6 in. diameter, and the head gear pulleys are also 4 ft. 6 in. diameter. For pumping and winding, power is supplied by two water-tube boilers, one Cornish boiler, and two Russian style boilers.

A fairly large quantity of water is made in the mine, especially at the break of winter, when the snow starts thawing on the surface, and to deal with the water three pumps are installed.

Describing the method of working, Mr. Percy says that levels 12 ft. wide by 7 ft. high are driven east and west from the shaft bottom. At intervals of 100 ft. raises, 12 ft. wide, are driven 200 ft. long and these are connected at the top to form a second level. In this way, pillars 100x200 ft. are formed, but these pillars are again crosscut, so as to form pillars which are eventually extracted. Ribs of coal, 25 ft. thick, are left to support the top and bottom levels, which form the main intake and return airways. The remaining pillars, which are now 100 x150 ft., are eventually taken out.

Every sixth raise is made into a self-acting incline and these convey the coal from the top to the bottom level. The inclines are arranged on the "three-rail" system, with a suitable passing in the middle; to comply with the law, the rails are disconnected from the rails in the bottom levels. The system of working consists in first opening out as quickly as possible on the "room-and-pillar" system and then taking out the pillars thus formed by the "longwall system." The longwall method was tried for opening out, but the results were not satisfactory, since there is not sufficient packing dirt to fill the "gob," and this method was abandoned for the one now obtaining. The pillars are gradually worked off, starting from the top level and working toward the bottom, and the roads are allowed to fall in behind, all timber being recovered. To maintain the inclines, pillars of coal are left on each side, and although an occasional dressing is required, chiefly owing to the floor heaving, they stand well.

The work of development, or in other words, the work of forming the pillars is carried out in winter time; then in the spring, when most of the men leave to return to their villages, the work of taking out the pillars (as nearly as possible in a straight line) is commenced. In this way nearly as much coal is got during summer as during winter although there are 60 per cent. less men employed during the warm months. The coal is mined entirely by pick, and no explosives or mechanical wedges are used. The labor is all unskilled, about 70 per cent. being Kirghiz; there are also Russian and German emigrants and a few Tartars. A Kirghiz collier will average 1¼ tons and a Russian miner 2 tons per day; the coal is not strong and comes away easily.

The timbering is all done by special men, and not by the miner, most of it being done by contract while all retimbering is contract work. The timber used is quite substantial, the props being 7 ft. 6 in. long and from 12 to 16 in. in diameter.

VENTILATION IS NO PROBLEM

The ventilation question is not a difficult one, since no gas is made in the mine, no fan or furnace being required at present. All the assistance the ventilation needs is given by steam pipes in the upcast shaft, together with the exhaust steam from the pumps. Open lights are used; these consist of candles and small torch lamps which the men provide themselves.

The No. 3 seam, known as the Mariana seam, including dirt bands, is 28 ft. thick, but the full thickness is not worked; the top 8 ft. consists of a poor quality coal and this is left to form the roof. The coal from this mine is hauled up an incline shaft (dipping 1 in 5) by means of a horse whim worked by two horses. At a distance of 100 ft. apart, entries are driven right and left in the bottom 16 ft. of coal, the first level is 300 ft. from the mouth of the incline. Raises are driven at intervals of 60 ft., thus forming pillars 100 ft. by 60 ft. The coal is worked in a series of steps, both during development and also during the extraction of the pillars, but as the mine is at present only worked on a small scale scarcely any pillars have been removed.

The surface arrangements at the Carnot shaft are of the very simplest nature, the mine wagons being run out of the cage along a gangway to an "end-tipple" fixed 45 ft. from the shaft. The coal falls on to an ordinary "fixed bar" screen placed at an angle of 30 degrees. The round coal falls into 8-ton railway cars while the smalls drop through a hopper into iron side-tipping cars. These are hauled up an incline by horses and the contents tipped on the slack heap. This slack is again screened, by hand, and the nuts are used at the boilers and quarters.

Tact and good feeling are necessary in the laying out and management of the mines, for the Russian law does not recognize a "foreigner," the only responsible person whom the government recognizes being the underlooker or undermanager, who is held directly responsible to the inspector for all work carried out. The law is very severe on accidents and no matter how trivial they are they must be reported in a book provided for that purpose with a signed statement by the doctor as to the nature of the injuries. When a fatal accident occurs the Russian official has to stand for trial at the nearest court, and should negligence be proved on his part he is sentenced to a term of imprisonment without the option of a fine. Having once been subjected to imprisonment he is not allowed to act in any responsible position in the mine again, and he is also barred from holding any other government appointment. As Mr. Percy says, this is certainly severe punishment, but it has the effect of keeping the Russian officials up to the scratch so far as looking after the safety of the mine is concerned; discipline among the men is good, dismissal for misbehavior being rare.

Prevention of Runaway Cars on Inclines

Numerous appliances have been designed to prevent cars running wild down inclines. A recent article in the *Journal* of the British Society of Mining Students, by John Bell, describes a simple plan for arresting runaway cars: A beam of wood, 6 in. square in section, and 18 in. longer than the hight of the road, is fixed to the roof as follows: the upper end is hinged by means of a pin fixed in a crevice in the roof, its other end being free, but ordinarily held up by a bolt and two eyes, the bolt passing through the eye of another pin also fixed in the roof, the bolt being connected to a lever at the inclined head by a strong length of wire. On a double incline road two blocks are necessary, one over the center of each way; on long inclines two sets fixed on each road at distances of one-third and two-thirds of the length of the incline, and worked by the same wire, are preferable, so that if the cars have passed one block before power of control is lost, they may be stopped by the other. As soon as it is obvious that the cars are running wild, the bankhead boy can immediately pull the lever withdrawing the bolt, and so allow the lower end of the beam to drop to the floor and bar the way, so that the cars run against it and are derailed.

Coal Industry in Northern China

By E. Walch*

Among the most important coal mines in China are those of Kaiping at about 150 km. north from Tientsin. They are worked by the Chinese Engineering and Mining Company, Ltd., consisting mainly of French and Belgium capital. The company sank three pits called Tongsham, Noedwestshaft and Linsi, having an aggregate output of 1,200,000 tons in 1908. The market is mainly on the spot, coal being used for the North China railway, or sold in Tongku, Tientsin or Peking. A small part, 187,000 tons in 1907, was exported from Chingwantao to the northern and southern markets. The retail prices quoted at Tientsin range from $8.90 for household coal to $11.50 for double-screened large steam coal; fines are quoted $6.40 to $6.90 and coke from $12 to $18 (Chinese dollars [1]).

In the same district are many Chinese enterprises, among which we may quote the Peayang Lanchow Mining Company working a mine at Shen Cha Lin and producing 100 to 150 tons of poor coal per day.

Outside of the Kaiping enterprise, the most important coal mine in China is that of Lincheng, worked by a Belgium-Chinese company, floated by the Société Anonyme des Mines du Luhan, head office of which is in Brussels. The mines are 350 km. from Peking and 890 km. from Hankow on the Peking-Hankow railroad. The product is long flame coal. At its start, in 1905, the company resumed the Chinese workings. Now its first modern plant is almost completed and fitted with the most uptodate appliances. It includes two shafts, 12 ft. in diameter; one of which is equipped for an output of 2000 tons per day, with a screening plant for 1000 tons in 10 hours. The plant includes air drills, steam underground pumps, electric lights, fans, lamp shop, storehouse, repair shops with a foundry, etc., and eight boilers. The colliery is connected to the Peking-Hankow system. Its principal consumers will be the Peking-Hankow railway, and brick manufactories along the line.

Other Operating Companies

Its competitors are the Ting Cheou mine at 250 km. from Peking, the Feng Lo Tcheng mine at 492 km. from Peking, both Chinese enterprises, and the Peking Syndicate, which works an anthracite coal vein at Wei Huoi Fou, 589 km. from Peking. The Lincheng mines are under the management of a Belgian mining engineer.

Another mining district of future importance is known as the Shansi district. The coal seams surround the Chen-Kia-Choang to Tayuenfou railroad, a branch of the Peking-Hankow system. The only mines worked by modern contrivances are those of Ching-Ching at 13 km. from the railroad to which they are connected by a narrow-gage track. These mines belong to a German syndicate which obtained from the Imperial government a contract made under the same conditions as that of the Société des Mines de Luhan. The capital is 500,000 taels, viz., $300,000 (American). The daily output is 450 to 500 tons. Coal is sold to the Peking-Hankow railway and also in Tientsin.

A great number of local exploitations are found all along the line. For example, about 300,000 lb. of coal are produced daily at Cheou-Iang-Hien and sold at the mine at ½ to 1½ sameques per pound, but the cost of transport to the railway station of Iang-Tsuen, together with the taxes charged on coal transported, bring the price up to about $2 (Chinese) per metric ton d/d f.o.r. Iang Tsuen. The cost price of the same ton d/d Tientsin is $10.50 (Chinese) due to the railway tariff and various duties.

In the North is found another important center at Shangtung, producing two qualities, that of Fangtze and that of Hungshan, with a daily output of 100 tons for the former and 300 tons for the latter, which is mainly sold to the German warships. Selling prices are: Fangtze (Chinese dollars) $8.50 to $9, Hungshan 27 shillings.

In Manchuria, coal is found on the eastern part of the mountains along the Liao valley. The Japanese work now the mines of Fushan, Yentai and Penh-sihu with an increasing output, which was over 1000 tons per day in September, 1908.

The development of coal mining in China is therefore considerable. The local industries are scarce. The consumers are the railways and individuals for household consumption. The demand is increasing steadily.

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*Paris, France.

[1] The Chinese dollar is equivalent to about 29 cents.

NEW PUBLICATIONS

Catalog of Publications of the Geological Survey, Canada. Revised to Jan. 1, 1909. Canada Department of Mines, Geological Survey Branch.

The Geology of the Whangaroa Subdivision, by J. M. Bell and E. de C. Clarke. New Zealand Geological Survey, Bulletin No. 8. John Mackay, Government Printer.

The Mercury Minerals from Terlingua, Texas, by W. F. Hillebrand and W. T. Schaller. U. S. Geological Survey, Bulletin 405. Government Printing Office.

Bibliography of North American Geology for 1908 with Subject Index, by John M. Nickles. U. S. Geological Survey, Bulletin 409. Government Printing Office.

The Coal Fields of Manitoba, Saskatchewan, Alberta and Eastern British Columbia, by D. B. Dowling. Canada Department of Mines, Geological Survey Branch.

Algunas Regiones Petrolíferas de México, by Juan D. V. Villarello. Boletín del Instituto Geológico de México, No. 26. Imprenta y Fototipia de la Secretaria de Fomento.

Report on the Iron Ore Deposits along the Ottawa (Quebec Side) and Gatineau Rivers, by Fritz Cirkel. Canada Department of Mines, Mines Branch. Government Printing Bureau.

El Pozo de Petroleo de Dos Bocas Estado de Veracruz, by J. D. Villarello. Parergones del Instituto Geológico de Mexico, Vol. III, No. 1. Imprenta y Fototipia de la Secretaria de Fomento.

Report of the Chief Inspector of Mines in India under the Indian Mines Act (viii of 1901) for the Year Ending December 31, 1908, by J. R. R. Wilson, Superintendent Government Printing, India.

Bibliografia Geologica y Minera de la Republica Mexicana Completada Hasta el ano de 1904, by Rafael Aguilar y Sabtillán. Boletín del Instituto Geológico de México, No. 17, Bibliographia Geologica y Minera de la Republica Mexicana. Imprenta y Fototipia de la Secretaria de Fomento.

Laboratoire Portatif pour Essais des Minerais par la Voie Sèche et Nouvelle Méthode de Détermination du Poids des Boutons d'Or et d'Argent, sans le Secours de la Balance, by Adrien Braly. Extract from Bulletin et Comptes Rendus Mensuels de la Société de l'Industrie Minérale, October, 1909.

Metal Statistics, 1909. Compiled and published by the American Metal Market Company, New York.

A small and convenient book of reference containing much miscellaneous information on the course of iron and metal prices.

The Geology and Ore Deposits of Goldfield, Nevada. By F. L. Ransome, assisted by W. H. Emmons and G. H. Garry. Professional Paper No. 66, U. S. Geol. Surv. Government Printing Office.

The discoveries at Goldfield a few years since roused again the half-romantic interest which was given to the Nevada mining districts, years ago, by the Comstock lode. Ore of almost fabulous richness; the hard conditions of the desert; the high-graders, whose opportunities came from unexpired leases in ground unexpectedly rich; the struggles with lawlessness; all these combined to make an appeal to the imagination, the equal of which has not been experienced since the early days of Cripple Creek.

Now that the geological relations are systematically and clearly set forth, they furnish to the scientific reader matter not less interesting than that which the stirring events of a new mining camp present to the devotee of the sensational. The district is unusual, and reveals to careful study much that is striking and original. It has not been easy to decipher, and both field work and interpretation have evidently been done by keen and accurate observers.

The oldest rocks are Cambrian shales. No Archean gneisses or schists are visible as a foundation; nor do any other Paleozoics appear as successors to the Cambrian. One can only surmise that the Paleozoics were once existent and that they have been washed away. The next rock in time is a binary granite with little else than quartz and feldspar. Its time of entry is presumptively assigned to the close of the Jurassic or the opening of Cretacic period. Next volcanic activities broke loose in the Eocene and continued through the later Tertiary period. Thirteen or perhaps fourteen distinguishable outbreaks followed one another, with a partial interruption for the deposition of lake beds after No. 10. Even the lake beds were accompanied by a coincident basalt flow. Erosion and the deposition of gravels followed but gave way to eruptive No. 12. More sediments were succeeded by No. 13, a basalt flow, and then erosion brings us to the present. In the series of eruptives there are five rhyolites, three basalts, three andesites, two dacites and one "third-and-third-and-third" rock called latite in that it is part trachyte, part andesite, part basalt. These rocks follow one another in such complicated and repetitional succession that no regular series of chemically related parts of a parent magma, such as was described by von Richthofen, can be made out.

The ore seems to have entered after the lacustrine beds were deposited and to have preceded the gravels above cited. Its probable time of entrance is late Miocene or Pliocene. The vehicle of introduction is believed to have been magmatic waters but it seems impossible to connect the waters positively with any single igneous mass. A dacite, which is largely in the glassy condition and which is placed in the series of thirteen at No. 8, has some claims to consideration because even now it contains about 4 per cent. of water. The magmatic waters are thought to have contained much H_2S and CO_2, possibly also SO_2.

The waters rose through shattered rather than greatly faulted belts in the andesite, dacite and latite. By the impregnation and replacement of these rocks extensive mineralized zones resulted in which occur the much more restricted bodies of ore. The variety of minerals is impressive; 65 are listed, of which 53 are based on good determinations and 12 are doubtful. One new species, goldfieldite, is described. Its formula is believed to be $5CuS(SbBiAs)_2$, $(STe)_3$. The determination was based on 1.2 grams of crushed material, culled out from a mixture, and the new species is not likely to be accepted without question.

The points of particular interest in the mineralogy are the great abundance of potash alum or alunite as a vein mineral, and the presence of bismuth compounds. The gold is almost all native. Silver minerals have been observed, but are not very large factors. Copper may reach several per cent. in the assays.

When the chemistry of ore deposition is to be discussed the potash alum, alunite, is a very important feature. Mr. Ransome rather favors the following: Magmatic waters charged with H_2S and CO_2 rose through the shattered rock to the surface and there became oxidized so that much sulphuric acid resulted. The sulphuric acid either with or without associated rain water percolated downward, and reacted upon the potash feldspars in the rocks so as to yield alunite. It apparently caused or aided the precipitation of the gold contained in the uprising waters and brought about its association with the alunite. The suggestion is in accord with conclusions reached elsewhere and seems to be the most reasonable method of accounting for the mineralogical relations.

The monograph is well printed and illustrated. It contains many details of mines, well shown on colored maps, and on the scientific side many analyses and discussions of the igneous rocks. The senior author and his assistants are to be congratulated upon this creditable contribution.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Fred T. Williams is in Butte, Mont., on professional business.

Walter Proctor Jenney, of Tonopah, Nev., is visiting New York.

Alfred James, of London, is in New York this week, on his way to Mexico.

John J. Hill has succeeded A. J. King as manager of the South Tigre mine, Sonora, Mexico.

Robert H. Richards has just returned to Boston from a professional trip to New York State.

Henry Francis Lefevre is now in Central America, where he expects to remain for some months.

S. H. Brady has succeeded F. Corkill as superintendent of the Tonopah West End mine, at Tonopah, Nevada.

L. Webster Wickes has removed his office as consulting engineer to 818 Story building, Los Angeles, California.

F. W. Draper has returned from a two years' engagement in the Ural mountains in Russia, and will remain in London a short time before returning to America.

Walter Unzicker has been appointed chief engineer of the ore mines division of the Tennessee Coal, Iron and Railroad Company, with headquarters at Bessemer, Alabama.

J. F. Newsom, professor of mining in Stanford University, has resigned, in order to go into private work. D. M. Folsom, a former Stanford student, has been named as his successor.

Charles F. Shelby has resigned as superintendent of smelting works of the Greene-Cananea Company in Mexico, to take a similar position with the Cerro de Pasco Company, in Peru.

Wilson A. Luce has been appointed assistant general manager of the Ellsworth Collieries Company, at Ellsworth, Penn., effective March 1. The company is a subsidiary of the Lackawanna Steel Company.

Godfrey D. Doveton and P. G. Spilsbury, of the metallurgical staff of Spurr & Cox (Inc.), are working on the cyanide mill of the Virginia & Mexico Mine and Smelter Corporation, at Hostotipaquillo, Jalisco, Mexico.

Dr. Richard Moldenke has returned from a professional trip to Europe. At Berlin he attended a meeting of foundrymen, engineers and foundry foremen of northern Germany, and made an address on American foundry practice.

[illegible] Shoemaker, for some time connected with the Pittsburg Steel Company at Monessen, Penn., as electrical engineer, has become assistant consulting engineer of the Algoma Steel Company, Ltd., Sault Ste. Marie, Ontario.

Walter R. Hodge, recently mill superintendent for the Benito Juarez Mines Company at Salinas, San Luis Potosi, Mexico, is now general superintendent for the Duluth-Toroda Mining Company at Bodie, Okanogan county, Washington.

Wm. B. Stoop, formerly of Youngstown, Ohio, has become connected with the Portsmouth Steel Company and is superintending the construction of the new blooming mill and other additions to the company's plant at Portsmouth, Ohio.

F. H. Nickle has resigned his position as engineer for the Pennsylvania Salt Manufacturing Company at Wyandotte, Mich., and will specialize in vacuum evaporating work and salt-plant engineering. Mr. Nickle is associated with the firm of McDonald & Nickle, with headquarters at Detroit, Michigan.

Frank F. Morris has accepted a position in the mining department of the Ingersoll-Rand Drill Company, with headquarters at Pittsburg. He has served as engineer for the United States Coal and Oil Company, Holden, W. Va., and as mining engineer in the Technologic Branch of the United States Geological Survey.

Walter L. McCloy has been appointed general superintendent of the Philadelphia Company and affiliated natural-gas companies, to succeed J. F. Beatty, who remains with the company as consulting superintendent. Mr. McCloy has been with the company 22 years, and has been assistant general superintendent for eight years. J. A. Reed has been appointed assistant general superintendent.

A. J. Bettles has resigned his position with the Utah Copper Company, and will retire from active service, and will devote his time to the management of his private interests. Mr. Bettles was mill manager for the Boston Consolidated for a number of years, and worked out the milling process and designed the mill. He has been in the mining and milling business continuously for 26 years.

OBITUARY

Thomas McK. Laughlin died in Pittsburg, March 11, aged 35 years. He was born in Pittsburg, and for nearly 15 years past had been connected with the Jones & Laughlin Steel Company.

John Wahl, president of the John Wahl Commission Company, died in St. Louis, March 9. He was also president of the German Savings Institution, having been connected with it for 56 years. The John Wahl Commission Company was organized in 1860, and has grown to be one of the largest dealers in lead and spelter in the West.

Richard Coulter Olyphant died at Trenton, N. J., March 4, aged 57 years. He was born at Uniontown, Penn., and as a young man was assistant to his father in the management of the Uniontown furnace, which was among the earliest in this country to use coke as fuel. For nearly 20 years past he had been president and manager of the Trenton Malleable Iron Company.

David P. Cameron, who died at San Francisco, Feb. 24, had been closely identified with the gold-dredging industry since the beginning of this branch of mining in California. He constructed the first bucket-elevator dredge in the Oroville district, built many of the early dredges installed in the Oroville, Yuba, Folsom and Calaveras districts. In 1900, with Frank W. and Maurice E. Griffin, he formed the firm of Griffin & Cameron. In 1902 this firm was incorporated under the name of the Western Engineering & Construction Company. At the time of his death he was vice-president and superintendent of construction for this corporation. Mr. Cameron was actively engaged for years in constructing stamp-mills and milling plants, and he erected many plants in Mexico and South America. He was associated with the Pelton Water Wheel Company, for which company he installed a large number of plants. Later he became identified with the Risdon Iron Works, superintending the construction of a number of the early dredges built by that company. Mr. Cameron was a native of Nova Scotia. His knowledge of the construction of stamp-mills, water-power installations, and placer dredges was unusual.

SOCIETIES *and* TECHNICAL SCHOOLS

International Congress of Mining, Metallurgy, Applied Mechanics and Practical Geology—The committee of organization gives notice that the meeting will be held at Düsseldorf, Germany, June 19-23. Committees have already been appointed to make all necessary local preparations. Applications for membership in the congress at the end of January, numbered 750, about one-third being from outside of Germany. A large number of valuable papers have been promised for the meeting. Further applications should be sent in as early as possible, addressed to the Arbeitschuss des Internationalen Kongresses, Düsseldorf, 1910, at Jacobistrasse 3-5, Düsseldorf, Germany. Subscriptions should be made payable to the Stahlwerksverband A.-G., Düsseldorf. The subscription is 20 marks for a member and 100 marks for a patron. Several excursions to mines and works in Germany have been arranged in connection with the congress.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

March 11—The Natomas Consolidated is one of the greatest gold-dredging companies in the world. The capitalization is $25,000,000 and about 20 dredges, some with 13-cu.ft. buckets, are operating at Oroville and others near Folsom along the American river. Bonds to the amount of $5,000,000 are reported to have been placed in London recently. This company not only derives a large profit from gold dredging, but obtains likewise substantial returns by crushing cobbles and boulders and selling the same for ballast and concrete. Three mammoth crushers are said to have a capacity of 1500 tons per day each. Finally the land that has been dredged and is to all appearance worthless, is reclaimed and planted with eucalyptus and fruit trees.

The Western Federation of Miners is taking steps to enforce the California 8-hour law. Recently one of their agents found that the pump men at the Alaska mine near Pike City in Sierra county were working overtime, the day shift 11 hours and the night shift 13 hours. It is said that the manager will be prosecuted.

The suit brought by McNutt *et al.* against John Hays Hammond, John Hobbs and the Tom Reed Gold Mines Company for some of the company stock was decided in favor of the defendants. The Tom Reed mine is near Chloride, Arizona.

The American Mining Congress is to meet in Los Angeles next autumn. The Sierra Madre club of Los Angeles, made up of mining and oil men, has raised funds to send two of its influential members to Washington to assist in the establishment of the Mining Bureau. Doubtless this action is taken partly from the need of revised laws for the proper acquirement and operation of oil lands, now the chief attraction in California, it being desired to have the coöperation of the bureau and the Mining Congress in this matter. At present oil claims are taken up as placers. It is proposed to run a special train for the delegates through the oilfields to familiarize them with the conditions, possibly incidentally hoping that further investment of capital in oil will result.

The Independent Agencies are daily growing stronger from accession to the agencies of new oil companies. It is understood that the oil produced by the Union Oil Company will be pooled with that of the companies in the agencies. The Producers Transportation Company's pipe line is now completed. This line, about 200 miles in length, will carry oil from Bakersfield, Sunset, McKittrick, Midway and Coalinga to Port Harford, thence to be taken by steamers to Panama and elsewhere. The pipe line is reported to have cost $3,500,000 and to have a capacity of 3000 bbl. per day. The operation of the line will probably be under the control of the Union Oil Company which has contracted to act as sales agent of the Independent Agencies for a term of years beginning 1910. This company has tank ships and barges with a total capacity of 466,950 barrels.

Butte

March 12—The walkout of the hoisting engineers came to an end after the operating companies had convinced the engineers that the mines could be operated without their assistance, and the camp has once more resumed its normal aspect. The engineers, while they failed to vote that the walkout be declared at an end, passed a resolution to the effect that any member might be allowed to return to work without incurring the displeasure of the union, and the next day most of the men applied for their old positions. The operating companies have announced that the men who took the places of the former engineers will be retained so long as their services are satisfactory and that the old men will have to wait their turn. The Western Federation of Miners has fined a number of the engineers who were most active during the walkout, and those fines must be paid before the men will be taken into the federation again and allowed to work.

A force of men has recently been put to work on the new furnaces of the Idaho Smelting and Refining Company, and it is thought that the plant will be ready for operation by April 1. It is stated that the capacity of the plant will be increased from 250 tons to 500 tons daily.

Benjamin B. Thayer, president of the Anaconda company, arrived in Butte recently, and will remain until the first of next month, during which time he will make an inspection of the Amalgamated properties. With Mr. Thayer are a number of mining experts who will examine the Butte and other properties in the interests of the proposed copper merger. Among them are J. F. Kemp, professor of geology at Columbia University, Herman Keller, P. L. Foster and Frank Klepetko. The smelteries at Great Falls and Anaconda will be reported upon also, and it is thought that a preliminary report will be made to the stockholders of the Anaconda company at their special meeting to be held at Anaconda on March 23.

The attorney general of Montana has instituted suit against the Republic Coal Company for violating the State law with reference to providing wash rooms and locker rooms for employees. The statute provides that the company must provide a wash room and locker room for employees, to be situated within 800 ft. of the main entrance to the mine.

Denver

March 12—It is estimated that Inland well No. 16, a "gusher" struck last autumn in the Boulder oilfield, is giving off 1,000,000 cu.ft. of gas daily, and that other wells are doing likewise on a smaller scale. Owing to the difficulty, it is said, of separating the oil from the gas and retaining the latter under pressure, it is all going to waste, no effort being made to conserve it. Now, however, it is reported that plans have been made to do this and that the gas will be piped to Boulder and nearby points within 90 days.

Just now there is a decided shortage of ore in the State. This, of course, is partly attributable to the fact that most of the high mines are still in the grasp of winter, with wagon roads, trails and some of the mountain railroads not yet open for traffic, and the operations of the mines (notably in the rugged San Juan region) are confined to the development of ore for shipment as soon as weather conditions will permit. As a result, however, the American Smelting and Refining Company has only four out of its eight furnaces in Leadville working. At Pueblo, of three smelteries taken over by the company, two have been dismantled and abandoned, and the other is running at half capacity. At Denver, the Globe plant is running at half capacity, the Grant has been dismantled and the Argo is being dismantled. The Durango smeltery is running at about capacity. At Salida, out of the four furnaces controlled by the American Metal Company, two are working.

It appears that the powers of the Leadville Light and Power Company are being heavily taxed to meet the demands from the mines for power, and many of the properties hitherto worked with steam are now electrifying their plants. Among those mentioned as adopting this plan are the New Monarch mines on Little Ellen hill, the Boulder shaft and the St. Louis tunnel in the same neighborhood. Most of the big tunnels are following suit, the first to move in this direction being the Yak. The Garibaldi, at the head of California gulch, has been working machine drills with electricity for nearly two years. Many of the mines in Iowa gulch are also busy stringing wires for the installation of electric plants.

Salt Lake City

March 12—The stack for the Tooele smeltery of the International Smelting and Refining Company was completed on March 1. It is 350 ft. high; the outside diameter at the base is 45 ft., and the inside diameter 36 ft. 6 in. At the top the inside diameter is 25 ft. The wall at the base is 53 in. thick and at the top 13 in., increasing at the flare to 3 ft. 7 in. The steel work on the converter building is in place and the converter stands are on the ground but have not been assembled. Work has been started on the reverberatory building. The power-house installation has been completed, with the exception of one compressor and condensing apparatus. The sampler is practically finished. Since the weather moderated the working forces have been increased and rapid progress has been made on construction during the last few weeks.

The Santaquin power plant, erected by the Knight mining interests, has been completed and connections made to furnish power for the operation of the Tintic properties controlled by the Knights. Owing to the present contract with the Utah County Light and Power Company, the Santaquin plant is now furnishing more power than is required at the properties in operation, and during high-water time the power can be further increased.

In the case of the Silver King Consolidated vs. the Silver King Coalition, the time allowed the latter company to give evidence in support of its account expired March 6; an extension, however, has been granted. This case differs from the usual procedure in that the defense, in accounting, is compelled to give its testimony first. The evidence thus far has been given entirely by the Coalition company.

Frank Daly, foreman of the Silver King Coalition mine, testified for the defendant to the effect that there was some first-class ore, but mostly second-class and waste in the Parson's stope. From the evidence thus far introduced, it appears that the general understanding of shipping ore by the defendant company was ore that was largely or wholly galena, while the carbonate ore and more or less oxidized portions of the orebody were spoken of as second-class or mill ore. The mill ore also included unoxidized ore in the western end of the stope which carried considerable pyrite. The center and eastern end of the stope at present show no traces of ore of this character.

Regarding the cave in December, 1906, Mr. Daly said he was in the stope the day before the cave took place, and also the day it caved. Mr. Daly said he had instructions to shoot down parts of the stope to change the air current. This was some time in 1906, after all work had ceased in the stope and before the suit was begun. They wanted to improve the air in the Bonanza or Skidoo stope on the 1200 level some distance to the southwest. He used dynamite twice, which he said improved the air in the Skidoo stope. He admitted, however, that it was the custom in the mine to use canvas doors in order to change the air.

On cross examination he stated that he had been present in the McGregor ground (St. Louis-Magnolia suit), at the time the bulkhead was being put in for the purpose of concealing the workings in the St. Louis and Magnolia claims. He had been in the ground behind the bulkhead, but did not see it sealed up, nor assist in its construction. Counsel for the defendant protested strenuously against bringing into the present record anything concerning the McGregor bulkhead suit. Another point in dispute was as to whether the pay rolls of the Silver King Coalition could be examined by the plaintiff. The counsel for the Silver King Consolidated claimed that they had a right to see the pay rolls from March, 1902, to June, 1908, during the time ore was being taken from the Parson's stope. Counsel for the defendant finally consented to produce the pay rolls, but with the proviso that the names of miners who would be called as witnesses by the plaintiff be covered while the pay rolls were being examined. Plaintiff's counsel refused to accept such partial offer. As yet the pay rolls have not been produced, and it is possible that the matter will be taken before Judge Marshall for a ruling on this point.

Goldfield

March 11—A general resumption of leasing activities is noticeable in the Goldfield district. Active operation has commenced on a number of properties, negotiations are completed for a number of others to start soon and important strikes have been made on some of the older leases. The Goldfield Merger Mines Company has extended two old leases and has just granted two others for a period of two years, each of the companies being backed by eastern capital; work is about to begin on new leases on the Kendall, Silver Pick and Atlanta ground; H. B. Lind has started three shifts on the old Booth shaft; the Goldfield Annex lease has installed a compressor to push work with power drills; and a new electric hoist has been added to the equipment of the Grizzly Bear lease. The Campbell lease on Black Butte ground follows a shipment of 17 tons with a discovery of further ore shoots. The Gray lease on the Gold Bar is another new shipper.

Two suits brought by John S. Cook & Co. against the Kendall-Goldfield and Sandstorm mining companies in the district court are taken to be preliminary steps toward the merger of the two companies. It is expected that the properties will be sold at auction, the bank bidding them in, finally to be merged as the Sandstorm-Kendall Consolidated Mines Company.

The report of the Combination Fraction to the bullion-tax collector shows a deficit of $2500 for the last quarter of 1909, although 2878 tons were milled. The deficit is explained by the fact that much of the time was spent doing development work on the property.

Scranton, Penn.

March 14—Emissaries of the Philadelphia strikers have been in various parts of the anthracite regions sounding the various locals of the miners' union as to their attitude should they be called upon to enter upon a sympathetic strike. These men have been mostly investigating or intriguing in Northumberland and Schuylkill counties where the more radical and ignorant element among the miners wrok and live. However, the men from Philadelphia were informed in emphatic terms by the leading officers of the union that the miners had an agreement for three years with the operators and that under no circumstances would they break it. They told them that the matter would not be even referred to among the miners at their local meetings, and that it was useless to send further deputations.

Chief Mine Inspector James E. Roderick has issued a circular in which he calls the attention of the mine inspectors to the Act of the Legislature of May 1, 1909, which provides that the employment age for minors inside and outside of the mines shall be 14 years, and that each minor between the ages of 14 and 16 shall deposit with the company a certificate that he is of proper age and that he is able to read and write the English language; that certificate shall be filed in the office of the company for whom the minor works. In the opinion of Mr. Roderick this act makes it incumbent upon the employer to have a complete list of the minor employees who work inside of the mine and also an outside list, and to have these conspicuously displayed where they can be readily seen.

Birmingham, Ala.

March 14—The special meeting of the stockholders of the Southern Iron and Coal Company called for this week in New York to consider the issue of preferred stock to the amount of $1,000,000 additional, or to issue debentures for that amount, the present stockholders to have irst chance at the purchase, means much o the Birmingham district. The amount o be raised is to be used as working capital and to meet expenditures for new plants. The Southern company now has has its properties in good shape and in operation, save the new steel rod, wire and nail mills near Gadsden, which will be ready for operation shortly.

The steel make by the Southern Iron and Steel Company at Alabama City, near Gadsden, is being increased more as the open-hearth furnaces are put in operaion. The Southern company is accumuating steel to be used in its rod, wire and nail mills which will be ready for operation within a few weeks now. The company is shipping rails steadily from he rolling mills at Bessemer.

During the present year nearly 500 new coke ovens will be constructed, including he by-product plant of the Tennessee Coal, Iron and Railroad Company in the vicinity of Ensley.

Morgantown, W. Va.

March 14—A gas deal involving $4,-500,000 was made at Huntingdon on March 9. The property included 100,000 acres of gas land and 500 miles of pipeline, situated in Wayne and Cabell counties near the Ohio river. It was sold to the United Fuel Gas Company by the Columbia Gas and Electric Company. The buyer agreed to continue the wholesale supply of gas to Cincinnati and the seller retained part of its holdings, including the pipe-line into Kentucky from the Big Sandy river.

The New River & Pocahontas Consolidated Coal Company is planning to install in its mines electric coal cutting and haulage and will install a turbogenerator set of 1500 horsepower.

The new Farmington Coal and Coke company has acquired nearly 1000 acres of the Pittsburg seam on Plum run in Marion county, at a cost of about $250 per acre. It is planned to start development soon, as the right of way for a railroad siding was included in the price of the coal land.

Engineers are now busy in the planning of the second track of the Baltimore & Ohio railroad between Fairmont and Connellsville, Penn. This improvement will cost several millions and will include the reduction of the heavy grade between Mt. Braddock and Lemont and the construction of extensive yards at Fairmont for handling the increasing coal shipments.

Cobalt

March 12—During the month of February the ore shipments from the camp aggregated 2281 tons, which is about 226 tons in excess of the January output. This will probably be largely increased in the near future when the power companies are delivering air and electricity. At the present time the whole camp is waiting for power. The coal question is also rather serious as many companies have stopped sending coal to this district. The reason given is that the lack of yardage facilities and the high demurrage charges exacted by the Temiskaming & Northern Ontario railway cuts off any profit there is in the coal. The Mines Power, Ltd., has definitely promised 5000 h.p. for March 15.

Free gold is now reported in Bryce township on the trail between Elk lake and Charlton. This trail was traveled by hundreds of prospectors when going into Gowganda, and the finds are reported within a few hundred feet of it.

Toronto

March 12—D. D. Mann, of Toronto, vice-president of the Canadian Northern Railway, associated with a number of American and Canadian capitalists, has received control of an area of 4368 acres of rich mineral land along the Bear river, B. C., north of Prince Rupert and the main line of the Grand Trunk Pacific. Surveys have been made and preliminary work done showing the land to contain deposits of gold, silver, lead and some copper. It is stated that over $3,000,000 has already been expended on the property. Arrangements are in progress for opening up the area by a railway from Stewart, the head of navigation on the Portland canal, 15 miles along the Bear river, to the farthest limit of the camp. The equipment for the road has been purchased and a smeltery site laid out.

A committee of the Ontario Legislature is investigating the action of the government in disposing of the mining properties of the Gillies Limit, as it is claimed that their sale without sufficient time or opportunity being allowed for examination, resulted in considerable loss to the province. Evidence submitted on March 8, showed that the property now belonging to the Wyandoh Mining Company was sold by the government for $10,500 to J. A. Young and M. J. O'Brien, and shortly afterwards was resold for $330,000 by them.

The "first" shipment of ore from Porcupine was made on March 4 by Timmins Brothers, who sent 6 tons of high-grade ore from the Hollinger property to the School of Mines, Kingston.

E. A. Wallberg, president of the Mines Power Company, which is developing power from the Matebetchouan falls for supplying Cobalt, has gone to the camp to make arrangements with several companies for the delivery of electricity and compressed air. A number of contracts have already been made. The company will have two central stations at the camp for the generation of compressed air, which will be piped to the mines.

London

March 9—If the Prestea Block A mine in West Africa is not a success, it will not be for want of capital. In July, 1909, the capital was increased from £500,000 to £750,000 by the creation of 250,000 new shares, of which 200,000 were sold to Wernher, Beit & Co., at 24s., with an option over 50,000 more at 27s. 6d. This amount of money has not sufficed to complete the scheme of development and new equipment, and now a new issue of 100,-000 shares is being made, of which 70,-000 will be offered to the shareholders at 27s. 6d., the whole of which has been underwritten for a call of 30,000 shares at 32s. 6d. Provided all the options are exercised, the capital will be £850,000 nominal. The present price of the shares is 32s., so that the actual capital upon which the mine is expected to pay dividends may be taken at about £1,360,000.

The ore reserves on Dec. 31 are given as 500,014 tons, containing 9.96 dwt. per ton, which, assuming a 90 per cent. extraction, may be taken as equivalent to a yield of 38s. per ton.

In 1907 the yield was in round figures, 50s; in 1908, 34.4s.; and in 1909 (seven months), 34s. per ton. The costs in 1907 and 1908 averaged about 35s. During the seven months of 1909 when milling was going on, the costs are officially given at 24s. per ton, but they do not appear to include depreciation of plant, and not being in the form of a profit and loss account, are not altogether comparable with the figures of 1907 and 1908. The new plant now being erected is expected to handle 300,000 tons per annum. With these figures before one, and bearing in mind that on the three principal producing mines in West Africa, the Abosso, Taquah and Ashanti Goldfields, the working costs including depreciation during the last financial year all averaged over 30s. per ton, the valuation placed on the mine today appears unduly optimistic.

A new company, called the Trinidad Oilfields, Ltd., is being formed to acquire oil and other mineral rights in the Guapo and La Brea districts on the island of Trinidad. Three wells have been opened from which oil has been obtained at depths of 712, 672 and 520 ft. respectively. No part of the property is more than six miles from the sea, owing to which advantage a low cost of production is expected. The company hopes to do a large business with the Mexican and South American railways as well as with the neighboring islands.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY· INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

Ketchikan—Preparations are under way to resume operations on the It mine, which has been closed down for the winter. The Mount Andrew has another large shipment of ore in the bunkers at Kasaan bay. W. F. Polson and M. D. Ickis are sinking a shaft on their property near McLeans.

Juneau—The Wylie, Childs and Butterbahl properties at Auk bay, seven miles from Juneau, have been bonded to A. J. Stewart, of Victoria, B. C., who is planning a large amount of development work on them.

Tanana—Winter sluicing has been successfully carried on in the Tanana district. Word to this effect was brought to Seattle by two miners who deposited their winter's clean-up in a local bank. These men, Larsen and Halfinner, commenced sluicing in October and kept it up continuously with day and night shifts by heating the water used in the sluice boxes.

Arizona

COCHISE COUNTY

Copper Queen—The smeltery at Douglas produced 8,927,203 lb. of copper in February, of which 1,760,351 lb. was from custom ores.

GILA COUNTY

Cactus—The underground work is being advanced in seven faces, including drifts, crosscuts and raises. The drifts are being driven west from the Hamilton shaft to connect with the Pinto shaft on the third and fourth levels, and the connection should be made in about two weeks. The churn drill ordered for prospecting the schist area will be set at work several hundred feet north of the Hamilton shaft as soon as it arrives at the mine. W. H. Hamilton is in immediate charge and is employing 100 men.

Inspiration—About 3000 ft. of drifting and raising have been completed on and above the 400-ft. level of the Joe Bush shaft. This footage is being increased by about 900 ft. monthly. Development is being continued in nine faces of the Joe Bush workings, and three raises put up east and west of the shaft to verify the results of the churn-drill work have so far shown that the grade of ore indicated by the drill holes was two-tenths lower than that of the material taken out in underground driving. The crosscut driven south from the Scorpion shaft on the 275-ft. level is 360 ft. long and is continuing in ore. Much of the ore will be removed from the mine through the Keystone adit when extraction by the milling method is begun. Eventually, a main working shaft will be sunk about 1000 ft. outside the orebody and 1300 ft. south of the Joe Bush shaft. Manager T. R. Drummond is employing about 170 men.

Superior & Boston—The installation of a 1000-gal. Prescott pump is completed at the sixth level. Two 250-h.p. Stirling boilers are being set in their concrete foundations. Two carloads of 9 per cent. copper ore from the sixth level are being sent to the Old Dominion smeltery every day. J. D. Wanvig, superintendent, employs 100 men.

Arizona Commercial—The smeltery is treating about 210 tons of 6 per cent. ore daily from the fifth and sixth levels of the company's mine. The pumps are raising about 3,000,000 gal. per day.

Old Dominion—A contract for sinking a 400-ft. double-compartment shaft on the Transit claim of the United Globe group, adjoining the Old Dominion group, has been let to W. E. Carter, of Globe. After this depth has been reached, the ground will be worked by lease. The smeltery is receiving 675 tons of ore daily. The levels below the 10th are receiving the greater part of the work in the mine, and the smelting ore is taken from the lower levels. G. H. Dowell is manager.

Superior & Globe—Crosscuts northeast and southwest from the 500-ft. level of the Superior & Globe shaft are 180 ft. long. The work continues in diabase. The new 60-h.p. hoist is now in use, the old one having been removed. A force of 25 men is employed. H. V. Snell, of Globe, is superintendent.

Arizona-Michigan — The north and south crosscuts on the 500-ft. level of the Telfair shaft are 490 and 455 ft. long. Northward, the work continues in quartzite; southward, in diorite. Although no definite arrangement has yet been made concerning the date for the commencement of sinking a second shaft, this work will probably be started soon. This shaft will be near the outcrop of the Old Dominion vein, about 1000 ft. south of the Telfair shaft. At the present time 20 men are employed. N. A. Nelson is superintendent.

GRAHAM COUNTY

Detroit—This company at Morenci produced 1,486,400 lb. copper in February.

Arizona Copper Company—February production was 2,658,000 lb. copper.

YAVAPAI COUNTY

Mildred—This company is installing a 10-stamp mill on its St. Elmo group. D. B. Genung, Stanton, is superintendent.

Alvarado—This mine at Congress Junction is equipped to handle 150 tons of ore per day and has temporarily discontinued operations pending the electrification of its plant. E. W. Durfee is manager.

Weaver Mountain Mining Company—This company, a reorganization of the Rincon Mining Company, states that operations will soon be resumed.

California

AMADOR COUNTY

South Eureka—This mine is using its own forty stamps and 20 stamps of the Central Eureka. Its own mill is to be increased to 60 stamps.

CALAVERAS COUNTY

Fox—Dredging operations on the Calaveras river have been started. The work is done by two machines, one to dig and the other to wash the gravel.

Pilot—This mine at Cave City, near Mountain Ranch, is being opened. It was a producer in early days.

KERN COUNTY

Mohave—Near Mohave, in the Soledad region, the Queen Esther mine is working 120 men and hauling 150 tons of ore daily. The Double Standard has 40 miners employed. The Karma-Ajax and Echo group will soon employ 80 men. The Exposed Treasure will shortly start up. Water is piped 18 miles to these mines.

NEVADA COUNTY

Nassau—O. O. Howard, president of this company, operating the old Dana mine in Grass Valley district, says they have come near the works of the old Eureka, and will crosscut for the vein known to exist.

Pittsburg—In reopening this mine, Manager Mark B. Kerr has reached the 1100 level. All the underground machinery has been overhauled and repaired or replaced.

Jenny Lind—A trial run of 200 tons of gravel is being made. It is supposed that the real gravel channel has at last been struck.

Murchie—This Nevada City property, which has been idle a year, is now to be started up by a new company.

PLACER COUNTY

Dewey—C. H. Young, superintendent of this property near Butcher ranch, will soon set three shifts of miners at work. Free-gold ore has been found while running the tunnel.

SHASTA COUNTY

Trinity Copper—The Shasta King mines of this company, west of Kennett, are expected to start up shortly.

Black Tom—The litigation against this company has been settled, the owners promising that claims will be paid before May 2.

SIERRA COUNTY

Sailor Ravine—At this place, near Downieville, Jason Frye has struck a pocket mine from which he has taken $15,000 in specimens in a short time.

TUOLUMNE COUNTY

Republican—A new company has put this mine in operation under T. F. McGovern. The mine will be unwatered at once.

Erie—This company, owning the Grizly, Dead Horse, Lady Washington and New Albany mines, has paid off its indebtedness and operations will shortly be resumed.

Phoenix Lake—This company is putting up a 5-stamp mill on the Maddox & McPherson mine, near Confidence.

Colorado

LAKE COUNTY—LEADVILLE

The Arkansas Valley smeltery has four out of its eight furnaces in blast. Leadville alone is unable to keep even this number going, and a good deal of ore is brought in from the outside. Except for the operations of the Iron Silver Company, most of the work at Leadville is being done by lessees and tributers. The New Jersey Zinc Company is making plans to reopen the Colonel Sellers mine. This mine has the largest reserve of zinc ore that now exists in the Leadville district. The zinc orebodies of all of the other mines have been greatly depleted, and Leadville is now on the wane as a producer of zinc.

Blanche—In the above mine, under lease to George Campion, a 30-ft. vein of good ore is just reported as having been struck at 185 ft. depth. It is a lead sulphide carrying gold and silver.

TELLER COUNTY

Gold Sovereign—A new orebody at 1100 ft. is reported. The width of the richest portion of the 14-in. vein is four inches, and said to run $900 per ton. The lessees are the Clements Leasing Company.

Jennie Sample—Ten blocks of this mine are under lease to Van Tilburg & Cobb, and at present the work is confined to development.

Golden Cycle—Wilson, Beebe & Pettit, leasing on a portion of the Golden Cycle, shipped 900 tons in February, said to average $18 in gold per ton.

Gold Dollar and Mabel M.—During February the ten sets of lessees on these properties sent out 35 carloads of ore said to average about one ounce gold per ton. The shaft is down 600 ft., but probably will not be deepened until the drainage tunnel unwaters these Beacon Hill mines.

Acacia—The North and South Burns and Morning Star claims, on Bull hill, belonging to this company, are credited with three discoveries of good ore. On the North Burns, leased by Bunch & McNamee, two cars of ore shipped without sorting yielded $21.80 per ton. On the South Burns, under lease, C. N. Crowder, manager, six inches of 4-oz. gold ore is reported. On the Morning Star a shoot of $15 mill ore has been opened. The output of the Acacia company in the past is given at $800,000, with $198,000 paid in dividends.

Standard Tunnel—This tunnel, the first to unwater the Beacon hill section many years ago, is being operated again.

Ajax—The Ajax produced 35 cars of medium-grade ore during February. The mine is worked by 25 sets of leasers, 75 miners all told being at work.

Mohican—This mine on Battle mountain, leased by Arthur Carnduff, is said to have a foot of ore which runs $100 per ton in gold. Three feet of the vein produces screenings of good medium grade. About 20 tons per day are being broken.

Gold King—This mine, about the first big producer in the Cripple Creek district, now under lease to the former superintendent, Sam Macdonald, is said to be shipping a carload of 4-oz. ore per week. There are 12 sets of lessees on this mine.

SAN JUAN COUNTY

From Silverton it is reported that the San Juan county shipments for the month of February were 250 tons of crude ore and 2775 tons concentrates. In the Sneffels district above Ouray an important strike of 18 to 36 in. of gold ore is reported at a depth of 900 ft., and 4000 ft. from the portal of the tunnel. The ore is a gray copper carrying a high percentage of silver, but free gold has now made its appearance in the gray copper.

Tomboy—In February 9200 tons of ore were crushed, yielding $44,000 in bullion and $25,000 in concentrates. Working expenses were $43,000.

Idaho

COEUR D'ALENE DISTRICT

Hypotheek—Claiming mismanagement of the property, the Moosejaw, Canada, stockholders who own 500,000 shares, are endeavoring to gain enough proxies to control the annual meeting, at which time they expect to make a change in the officials.

Charles Dickens—Three feet of high-grade galena has been opened in the bottom of a 100-ft. winze and at a distance of several hundred feet from where the exposed orebody lies. The new strike will be developed.

Black Bear Fraction—A raise from the 1200 level has opened two feet of shipping lead-silver ore.

Cedar Creek—A snowslide carried away the compressor building and machinery, resulting in a delay in operations which will extend until warm weather.

Caledonia—During February the mine shipped $35,000 worth of ore and in January $30,000. This month the company intends to increase the amount to $40,000.

Reindeer—The crosscut of the ledge has cut a diabase dike which is believed to be the wall of the vein. Drifting along this dike has commenced, every foot showing shipping copper ore. Much shipping and milling copper ore is blocked out. A mill is to be erected this spring.

Hercules—A slide carried away the blacksmith shop and equipment and a portion of the tramway at the No. 4 tunnel, causing $5000 damage.

Idaho Giant and Bitter Root Mountain—George Huston, of Mullan, has taken 15-year leases on both properties.

Hector—A contract for a 3000-ft. crosscut to cut all three ledges has been let.

Indiana

CLAY COUNTY

The fact that the big block-coal companies have worked out their mines near Brazil is by no means discouraging. The operators have moved further from the city and have begun to develop new mines. The Schrepferman Coal Company has purchased 300 acres of block-coal land a few miles south of the city, that has a vein 4 ft. 10 in. thick. The company is arranging to put down two shafts on this land; it is also just completing a new shaft south of Hadleytown, where it has 50 acres of good coal land.

GIBSON COUNTY

Renewed activity is apparent throughout the Oakland City oilfield. Scores of new wells are being drilled and those completed during the past week proved good producers. The February figures for this field show a gain over the January report; 36 wells were completed.

Grant County

The Domestic Block Coal Company, G. W. Frederick general manager, with headquarters in Kokomo, Ind., is planning to invest $350,000 in coal mining. The company is organized under the laws of Arizona but Indiana men are back of the enterprise.

Michigan

Copper

Ojibway—A new compressor has been received and as soon as it is ready to go into commission additional drills will be added and sinking resumed in both shafts. Drifting from the 500- and 650-ft. levels of these shafts continues in a good grade of stamp rock, as also the drift from the 800-ft. level of No. 2. Drifting from this point at No. 1 shaft has been discontinued after being extended for a considerable distance in baren ground, passing out of the copper-bearing portion of the lode due to faulting. The drift from No. 2 will be continued to ascertain the course of the vein.

Copper Range—The boiler plant of the Baltic mill was practically destroyed by fire, March 6. Production from the mine will be taken care of by the Champion and Trimountain mills, each of which had two heads not in operation so that there will be no falling off in production while this plant is being repaired.

Gratiot—This subsidiary company of the Calumet & Hecla will soon enter the production list. Rock shipments are to be made to the Allouez-Centennial mill, the 5th head of which will soon be ready to go into commission. The rock will be taken from the stock pile which has accumulated during the opening of the shafts.

Indiana—Further results from the drilling outfits are being awaited with much interest. No. 6 hole is now sinking in the ledge after passing through about 140 ft. of overburden, and No. 5 hole is down about 270 ft. in a conglomerate formation. It is estimated that these holes will reach the Indiana lode at a depth of between 600 and 700 ft. There are two other outfits working on the tract.

Wolverine—An exploratory crosscut has started eastward from the 28th level to expose the various lodes paralleling the Kearsarge lode. The distance from this point to the eastern boundary of the tract is over 2500 feet.

Lake Superior Development Company—This company has recently been formed with the following officers: President, Joseph Croze, Houghton; treasurer, Joseph Seldon, Calumet; secretary, Clyde S. MacKenzie, Houghton. The tract comprises about 400 acres east of the Gratiot property. A contract for drill work has been let and operations will be started at once.

Iron—Marquette Range

West Republic—The Cambria Steel Company, which has leased this mine for some time, has now purchased it from the Wright Iron Company, of Toledo, Ohio.

Iron—Menominee Range

Florence—Preparations are being made to ship this year, and 4000 tons of ore per day are being hoisted. About 170 men are employed, most of them on development.

Munro—The shaft is now down 150 ft., and crosscuts have been run over 200 ft. on the lowest level. The mine, which is near Norway and is owned by the Buffalo & Susquehanna Iron Company, will be a large shipper this year.

Missouri

Joplin Zinc-Lead District

Oronogo Circle—The big surplus pile of zinc ore, containing about 1700 tons, was sold to the Granby Mining and Smelting company, and the ore is being hauled to the cars at the rate of 150 tons a day.

Montana

Butte District

British Butte—It has been decided not to mortgage the property as originally intended. The dredge and machinery will be sold to the London creditors of the company for an amount which would cover about half of the total indebtedness. It is possible that operations may be resumed.

Butte & Ballaklava—The new electric hoist good for 3000 ft. has arrived and is being put in place. It will be driven by a 350-h.p. motor. The management expects production to average 500 tons daily when the hoist is put in commission.

Fergus County

Barnes King—A motion to terminate operations and distribute the money in the treasury among stockholders was voted down. No definite line of action was decided upon with reference to the purchase of new property but it was decided to continue operations on the property now owned by the company. The financial report shows that the company has $259,308 cash on hand and that the operating profit was $13,992 in 1909.

Jefferson County

Corbin Metal Mining Company—The shaft is now down 350 ft. and will be sunk to the 700-ft. mark. Extensive development work will be done on the 500-ft level.

Mt. Thompson—The company plans to build a 50-stamp mill on its property north of Basin. The claims have been opened up by a tunnel 847 ft. in length. At a distance 600 ft. from the portal the management states that the Gray Eagle-Comet lead was intersected, showing a vein 14 ft. wide.

Lewis & Clark County

Montana Mining—All the property of the company was sold at auction by the United States Marshall to satisfy a judgment for $205,000 in favor of the St. Louis Mining and Milling Company. The St. Louis Company bid in the property for $150,000. The Montana company has a year from the date of sale within which to redeem the ground.

Missoula County

Iron Mountain—A dividend of 9c. per share has recently been declared, the result of the sale by the company of the old Iron Mountain mine, a lease and bond on which was recently taken up by the Iron Mountain Tunnel Company for $50,000. The company still owns the War Eagle mine which it proposes to sell and then go out of existence.

French Bar Gold—A complete new equipment is to be installed including a 300-ton mill, the machinery to be in operation by August 1. Enough ore is blocked out to keep the mill running for a year and the orebody is 9 ft. in width.

Nevada

Esmeralda County—Goldfield

Florence—At the annual meeting the old officers, headed by T. G. Lockhart, of Goldfield, were reelected. A dividend of 10c. per share, payable in April, was declared. The mill is treating 170 tons per day.

Gold Bar—The Gray lease has started regular shipments, most of the ore coming from the 200-ft. level. The leasing company has just been incorporated as "The Copper-Gold Mines Company" and will erect a 50-ton concentrating plant.

Grizzly Bear—The shaft has reached the 1025-ft. level. At 1150 lateral workings will be started.

Nye County

Tonopah Mining—The total development work for the week ended March 1 amounted to 505 ft., most of this being in the Silver Top workings. The mill report shows 3150 tons of ore treated, average value $20, extraction 91 per cent. Concentrates worth $10,800, and $43,200 in bullion were shipped.

Belmont—Further development on the 1100-ft. level shows the persistence of the rich vein recently discovered. The ratio of gold to silver is about 1:2.

Montana Tonopah—After driving continuously 1400 ft. in rhyolite, the lode porphyry, or earlier andesite, has been encountered at a point about 2700 ft. from the main shaft.

West End—Heavier and more powerful achinery about to be installed forecasts ncreased activity underground.

Tonopah Extension—The second bul-on shipment from the new mill mounted to $6000. It is planned to inrease the present capacity, 120 tons, by sing coarser screens and putting anther tube mill in commission. J. P. ontague is superintendent.

Thanksgiving—A 5-ft. vein of sulphide re is reported at a depth of 450 ft. Short- after the strike a large amount of ater came into the shaft and the pumps re now raising 24,000 gal. daily.

White Pine County—Ely

Giroux Consolidated—Laying of steel s in progress on the side tracks from he Nevada Northern main line to the iroux shaft. Seven cars of 60-lb. ails have been received to date. The ew shaft, which is 12x19½ ft., is now eing timbered with the regular shaft imbers, instead of the square sets oriinally used in the raise. The work of etimbering is progressing at the rate of wo sets per day, and will be finished beore May 1. Sinking is also in progress elow the 1000-ft. level, the dirt being aken out through the old Alpha shaft.

Nevada Consolidated—The copper proluction of the Steptoe smeltery in Febuary aggregated about 5,000,000 lb. This ompares with 3,800,000 lb. in January nd 5,700,000 in December. The smelery is receiving its entire supply f ore from the steam-shovel pit at opper Flat. The output runs from 100 o 120 sixty-ton cars per day. The ore s being loaded by two shovels, while hree are engaged in removing overburlen. The steam-shovel pit at present overs an area of about 30 acres, with a aximum depth of 185 ft. Work has been tarted grading north of the mouth of the it for ore tracks, which will facilitate xtraction below the present bottom of he pit. It appears that a portion of the urface of the recently acquired Cumerland Ely property will be used for the torage of overburden, and tracks are ow being laid from the pit for that purose.

Oklahoma

Alabama—This mine on the Catholic orty at Quapaw is to be put into opration during the present month. This s one of the shallow mines, as sheet ead was found at 36 ft. from the surace.

Oregon

Baker County

Climax—Development work is being pushed on this property under the direction of W. H. Jackson, superintendent.

Morning—H. E. Downey, manager, is considering the installation of a milling plant.

Josephine County

A shipment of 300 lb. of ore is to be made jointly by the American Mining and Milling Company, Frank Johnson and the Nutt Brothers to Swansea to ascertain the content of platinum and tin.

Oriole—This company will install new mining and milling machinery during the present year. J. C. Mattison, Galice, is manager.

Pennsylvania

Anthracite Coal

Lehigh & Wilkes-Barre Coal Company—This company has arranged to make an issue of $20,000,000 in 4 per cent. bonds, for the purpose of retiring all its outstanding issues.

Philadelphia & Reading Coal and Iron Company—This company's financial statement for the seven months of its fiscal year from July 1 to Jan. 31 gives total receipts of $19,580,239; expenses, $18,782,695; net earnings, $797,544. This shows decreases, as compared with last year, of $725,415 in gross and $377,759 in net earnings.

Bituminous Coal

Miners in the Irwin field in Westmoreland county struck on March 10, about 3000 going out. The strike was caused by the discharge of 75 men at the Keystone and other mines, who were officials of the local unions, or were active in their organization. The Irwin district has always been nonunion, but has recently been organized by delegates from the United Mine Workers. It is claimed that the strike will extend, as a large number of miners have joined the union.

A large block of coal lands in Gilmore township, Greene county, has been sold by H. Newcomer to Pittsburg people, who intend to open a mine. The block includes 1100 acres on the Pittsburg vein, and the price was $135 per acre.

A syndicate headed by Daniel B. Zimmerman, of Somerset, has secured a tract of 1600 acres of coal land north of Somerset, and is making arrangements to open a mine.

H. C. Frick Coke Company—It is reported that the coke plants in the Morgan valley, which have not been in use for some time, will be repaired and put in order; and that large coal bins will be built to hold coal brought from the mines. The plants are situated along the railroad between Owensdale and Broad Ford.

Utah

Beaver County

Frisco Consolidated—Active mining operations will be begun at this property by March 14 and development work will be continued.

Gold Crown—Ore which is said to average $104 per ton has been struck in new workings. The shaft is down 130 ft. and a drift has been run about 40 ft., which opened the ore. The property is in the Star district.

Iron County

Gold Springs Mining and Power Company—Two carloads of machinery for the new power plant have arrived at Modena and more material is in shipment. The power house is ready for the installation of the machinery, which will begin in a few days.

Juab County

Tintic ore shipments in carloads for the week ended March 4 were as followss Opohongo, 1; Grand Central, 5; Mammoth, 2; Scranton, 4; Bullion Beck, 4; Eureka Hill, 4; Eagle & Blue Bell, 6; Centennial-Eureka, 43; Yankee, 2; Uncle Sam, 2; East Tintic Development, 1; Chief Consolidated, 3; Gemini, 3; Colorado, 19; Sioux, 12; Iron Blossom, 18; Dragon Iron, 22; May Day (concentrates), 1; total, 152.

Centennial-Eureka—The connection between the tunnel and shaft was made March 1. The tunnel is 2160 ft. long, and connects with the shaft at the 535-ft. level. The tunnel will effect a saving in hoisting ore and pumping water, and in hauling supplies up the hill.

Salt Lake County

Utah Copper Company—In 1909 this company sold 51,749,233 lb. of copper for $6,683,321, averaging 12.915c. per lb.; 20,862 oz. of gold, netting $417,247; and 198,943 oz. silver, at 51.528c., netting $102,511.

Cardiff—A raise has been driven about 18 ft. on the strike recently made. The ore has widened from 15 in. to 3 ft.; it carries copper and silver.

Summit County

Park City ore shipments for the week ended March 5 were as follows: Daly West, 1,230,000 lb.; Silver King Coalition, 1,179,940; Daly-Judge, 645,000; Daly-Judge (zinc), 790,430; Little Bell, 201,000; total, 4,046,370 pounds.

Daly-Judge—The new electrical equipment of the mine will be ready for operation in a few days. A large amount of development work is being done.

Thor—Two feet of carbonate ore have been opened in a crosscut from the upper tunnel of this mine near the head of Big Cottonwood cañon. Mr. Carpenter is superintendent.

Little Bell Consolidated—During February the Little Bell made four shipments aggregating 1,249,210 lb. These shipments averaged 22.43 per cent. lead, 79.8 oz. silver, 0.048 oz. gold, and 2.46 per cent. copper. The net smelter returns on these shipments amounted to $30,773. In addition to this, a fifth shipment of 308,680 lb. is in transit on which returns have not been received. The total production for February, including this last shipment, will be in the neighborhood of $38,000.

West Virginia

It is reported that arrangements are nearly completed for the combination of a number of mines in the New River district. The mines, it is said, will be represented by a single selling agency, which will handle all their output. The principal companies included are the Chesapeake & Ohio Coal and Coke Company, the New River Consolidated Coal and Coke Company, C. G. Blake Coal and Coke Company, Smokeless Fuel Company, White Oak Coal Company, New River-Kanawha Fuel Company and the New River Coal Company. These companies are able together to mine about 8,000,000 tons yearly.

Canada

BRITISH COLUMBIA

Copeland Mining and Development—This Rossland company has arranged for a two-year extension of its bond on the LeRoi.

Silver Cup—A 9-ft. galena vein has been struck on this Hazleton property, which was recently bonded to Prince Rupert people.

British Columbia Copper—This company will in a short time begin the enlargement of its smeltery at Phœnix.

ONTARIO

Frontenac—The new company which will operate this mine has been incorporated as the North American Smelting Company, Ltd., as the name Canadian Smelting Company conflicted with other organizations.

ONTARIO-COBALT

The shipments from Cobalt for the week ended March 4 were as follows: Nipissing, 456,433 lb.; La Rose, 303,312; O'Brien, 129,900; Peterson Lake, 120,850; Crown Reserve, 146,034; McKinley-Darragh, 63,063; Right-of-Way, 62,643; Buffalo, 56,619; Coniagas, 51,600; Cobalt Central, 40,900; Temiskaming, 60,000; Millerette (Blackburn) Gowganda, 60,150; total, 1,551,504 pounds.

Provincial—No. 2 shaft will be sunk to develop a vein cut by the diamond drill. This mine was formerly owned by the government.

Badger—The main shaft will be sunk to a depth of 400 feet.

Rochester—A rich surface vein has been cut at 50 ft. depth and shows several inches of high-grade ore.

La Rose—High-grade ore has been opened up at the 135-ft. level of the Princess. This is the best ore yet found at this mine.

Buffalo—The president states that for the million ounces produced last year, three millions were put in sight. Six months' supply of mill rock is broken in the mine.

Hargraves—This property has nearly a car of high-grade ore on hand besides two cars of low-grade.

Mexico

BAJA CALIFORNIA

Boleo—The February production was 1058 metric tons of copper from ores containing an average of 3.468 per cent.

CHIHUAHUA

Socorro—This company has renewed mine operations, but will not operate its reduction works for the present.

Grand Central—An important lead-silver body has lately been opened up in this mine in the Sabinal district, and ore shipments to the El Paso smeltery are in progress. Edward Selverson is superintendent.

Mexican Quicksilver Company—A cinnabar deposit is being developed by this company in the vicinity of Saucillo. John R. Roslyn is in charge.

GUANAJUATO

Production—Ores, concentrates and bullion worth 1,055,000 pesos were shipped from the Guanajuato district in February. Shipments during the first week of March were 275,000 pesos, an increase over previous weeks, this year, due to the resumption of high-grade shipments by the Pinguico Mines Company.

Cubo—As soon as an aërial tram, now under construction, is completed, shipments of low-grade ore to the Peregrina plant will commence. Shipments will consist principally of mine fillings.

Nueva Luz—The deep shaft is now down 520 m. (over 1700 ft.) and will be sunk to the 1000-m. level, when laterals will be driven. This is the shaft on which the Mexican government pays a subsidy of 150 pesos per meter below the 500-m. level.

JALISCO

Virginia & Mexico—The weekly production now ranges from 8000 to 10,000 pesos. Difficulties at the reduction plant are being overcome and it is expected to double the output within a short time.

El Mirador—The Orito, Orito Anexas Nos. 1 and 2, Providencia and Mercedes claims on extensions of the Solomon and El Favor veins in the Hostotipaquillo district have been purchased by the El Mirador Mining Company, of New York, organized several months ago to develop the Mirador-San Francisco group in Tepic. Shipping ore was recently encountered in the Providencia.

Amparo—The receiving station of the Chapala Hydroëlectric and Irrigation Company, at the Amparo properties, is completed, and the transmission line is within a few miles of it. Current is expected in June. The Amparo will take 700 h.p. at a rate of 100 pesos per h.p. per year, and will save more than one-half in power costs.

MEXICO

El Oro—In February the output was $211,130 in bullion from 24,699 tons of ore. Working expenses were $98,970 and $25,400 were spent on development. A total profit of $93,760 was made inclusive of railway earnings.

Mexico Mines—February crushing was 10,650 tons, yielding $113,760 bullion. Working expenses were $40,350 and $11,500 was spent on development.

SONORA

Greene-Cananea—A telephone line is being installed from Cananea to Naco, Arizona.

Sierra Pinta—This company in the Altar district has drawn plans for a cyanide plant. A 5-stamp mill is running steadily.

Moctezuma-Arizpe—A resumption of exploration work will be made April 1. About 25 men will be put to work.

Africa

TRANSVAAL

Gold production of the Transvaal in February is reported at 575,622 oz. fine, a decrease of 25,746 oz. from January. For the two months ended Feb. 28 the total was 1,180,331 oz. in 1909 and 1,176,990 oz. or $24,328,383 in 1910; a decrease of 3341 oz. this year. The February production was the smallest reported in any month for a year past.

Asia

KOREA

Oriental Consolidated—Mail advices give the following figures for January: Crushed 27,738 tons; gross receipts, $126,664; operating costs, $69,029; improvements, $1571; net profit, $56,063.

Australia

WESTERN AUSTRALIA

Gold production in February was 111,035 oz. For the two months ended Feb. 28, it was 255,403 oz. in 1909, and 238,386 oz.—or $4,927,438—in 1910; a decrease of 17,017 oz. this year.

New Zealand

Gold exports in February were 36,848 oz. For the two months ended Feb. 28, the total was 77,230 oz. bullion in 1909, and 77,527 oz. in 1910; an increase of 297 oz. The bullion reported this year was equal to $1,500,087, or 72,574 oz. fine gold. Silver exports for the two months were 198,678 oz. in 1909, and 299,896 oz. in 1910; an increase of 101,218 oz. this year.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, March 16—The bituminous-coal trade in the East is quiet and rather inclined to be dull. The anthracite trade is without incident.

In the West, of course, the wage-scale settlement is the general topic of discussion. The Cincinnati conference has come to nothing, the wage-scale committee having failed to agree and presented no report. The miners continue firm in their demand for an advance and the operators equally firm in their refusal to make concessions. No date has been set for another conference, and the general opinion is that their will be a strike on April 1. The question is more fully discussed on our editorial page.

Coke Rates—On complaint of the Lackwanna Steel Company and others, the United States Circuit Court at Buffalo, N. Y., has enjoined the Pennsylvania, the New York Central, the Erie and other roads from putting into effect the proposed new rates on coke from the Connellsville district to Buffalo, until they have been submitted to the Interstate Commerce Commission. The complaint charged that the new rates would constitute a discrimination against Buffalo, in favor of Pittsburg, Gary and other points.

COAL TRAFFIC NOTES

Anthracite shipments in February were 5,031,784 tons, being 272,834 tons less than in January. For the two months ended Feb. 28 the shipments were, in long tons:

	1909.	1910.	Changes.
Reading..........	1,982,656	2,254,596	I. 271,940
Lehigh Valley....	1,642,908	1,724,779	I. 81,871
N. J. Central......	1,204,980	1,247,849	I. 42,869
Lackawanna......	1,357,001	1,604,578	I. 247,577
Del. & Hudson....	1,037,869	973,672	D. 64,197
Pennsylvania	859,088	1,020,089	I. 161,001
Erie...............	1,214,583	1,106,739	D. 107,844
N. Y., Ont. & West.	460,264	406,100	D. 54,164
Total...........	9,759,349	10,338,402	I. 579,053

Total increase this year, 5.9 per cent. Five companies reported increases this year; three—the Delaware & Hudson, the Erie and the New York, Ontario & Western—had decreases.

New York

ANTHRACITE

March 16—The anthracite trade is without incident. February production showed an increase over last year.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. The lower prices are generally for washery coal.

BITUMINOUS

The seaboard bituminous trade is dull, so far as present sales are concerned. Consumers seem to be pretty well stocked up and are rather reluctant to take on more coal at present. The contract season is now on and a great deal of discussion is forward. Consumers seem to want the lower-priced coals and are slow about closing for the better grades. So far as anything has been done prices are moderate. Georges Creek is bringing about $1.50@1.60 at mines; good Miller vein steam is closed for at $1.40@1.50 at mines, and some of the poorer grades of steam coal can be had down to $1.10 at mines. Gas coal has been quoted at $1@1.10 at mines for ¾-in. and $1 for run-of-mine, while the lower grades have sold at 95c. for ¾-in. at mine.

Car supply is a little better than it has been, but is still poor. Transportation has improved, but there are still occasional delays.

There is some discussion of the Western situation going on. A strike is expected, but the general belief is that it will not last long and will have little effect on the seaboard trade.

The coastwise trade is quiet and rates are a little irregular but are settling down to a spring basis.

Birmingham

March 14—The demand for coal requires steady operation at the coal mines in Alabama. The railroads are beginning to relieve the situation by adding more locomotive power, this having been the greatest drawback. There have been no changes in coal prices recently. Orders booked in the past few months and others in sight give promise of a steady operation of the coal mines through the summer.

A complaint was filed recently with the Interstate Commerce Commission by the Alabama Coal Operators' Association that the railroad rates on coal from this State to Georgia, South Carolina, Florida and other points were higher than from the mines in Tennessee. The operators assert that the higher rates caused some difference in the production in this State last year.

Chicago

March 14—Under the influence of mild weather and an apparently settled conviction of the retailer and consumer that there will be no scarcity of coal because of labor troubles, the market has become rather dull. All coals are in good supply, and the feature of the market which has distinguished it from the spring market of previous years, the high price of screenings from Illinois and Indiana mines, continues. At present screenings bring as much or a little more than run-of-mine coal, and they have brought nearly as much for more than a month. The use of coal for steam purposes is heavy, but many plants have accumulated stocks which they will draw upon for use rather than buy largely. Domestic coals show light buying everywhere, with the anthracite trade reduced to a low total because of the approach of April discounts.

Illinois and Indiana lump brings $2.20 @2.50; run-of-mine $2@2.15; and screenings $2@2.25, in car-lots. Eastern coals continue in good demand, but smokeless is still in too large supply, with run-of-mine at $3.20@3.30 and lump at $3.55@3.65. Hocking is in good demand and well regulated to the needs, with consequent firmness of price at $3.15. Contract making, now beginning, shows about the same prices as last year.

Cleveland

March 14—Domestic trade is falling off, but steam coal is active. Some large plants are stocking up against a possible suspension. An early opening of the Lake trade is expected and boats are loading up.

Quotations show little or no change from last week, except for Youghiogheny, which is now quoted, f.o.b. Cleveland, at $2.40 for 1¼-in., $2.25 for ¾-in., $2.15 for run-of-mine and $1.85 for slack.

Indianapolis

March 14—Work in the coalfields of Indiana, including the block-coal district, has gradually become quiet. The coal men give it as their opinion that the cause is the unsettled mining conditions growing out of the scale trouble. The demand for six weeks past has been unprecedented and the producing companies have been having a strenuous time to fill their orders. The railroads and factories have now stored all they can handle.

If the advance of 10c. a ton is made in

the price of mining after April 1, it is reported that the coal-carrying railroads have agreed to advance the freight rate 10c. also. This means that the operators will sell the coal at the mine, the purchaser paying the freight.

Pittsburg

March 15—Current opinion undoubtedly leans more toward expecting a suspension of mining than at any previous time. There is heavy inquiry for coal for stocking purposes, but the regular shippers have their hands full already with their regular trade and are not in position to take care of much extra demand. Car supply is not as good this week. Rather fancy prices are quoted for prompt coal, up to $1.25 for slack and $1.25 or higher for mine-run, the regular quotations being nominal. There has been a heavy business done in the renewal of annual contracts in the past fortnight, at slight advances over rates in expiring contracts. Nominally coal prices are unchanged, at $1.15 for mine-run and nut, $1.25 for ¾-in., $1.40 for domestic 1¼-in. and $1@1.05 for slack.

Connellsville Coke—A sale of 3000 tons of furnace coke for March and April delivery has been made at $2.15, and another sale of 8000 tons for same delivery at $2.10. We quote prompt and near-by furnace coke at $2@2.25, and contract at $2.25. Foundry coke is selling in a limited way at $2.65@2.75 per ton.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended March 5 at 467,311 tons, an increase of over 5000 tons, and shipments at 4861 cars to Pittsburg, 8627 cars to points west of Pittsburg and 886 cars to points east of Connellsville, a total of 14,374 cars.

St. Louis

March 14—There has been a temporary lull in the market for the past week owing to the weather, which has been unusually mild for even this time of the year. Prices, however, have not suffered to amount to anything and today there is a decided improvement as the joint meetings of the operators and miners at both Chicago and Cincinnati have adjourned without reaching any agreement.

The demand for coal has been very strong from steam plants and railways who had been storing coal very heavily for the past three weeks. The railroads are by far the heaviest buyers and are still absorbing coal. The larger industries are also taking a great deal of coal. The smaller plants, however, have not as yet started to store coal.

The market for anthracite is very soft today and the few cars which have been in transit lately have been sold at a sacrifice. On the whole, the anthracite market this year has been satisfactory and the tonnage larger than any preceding year, though the price war of the larger dealers during the first part of the season made a big hole in profits.

Current prices are as follows:

Standard:	F.o.b. Mine.	F.o.b. St. Louis.
6-in. lump	$2.00	$2.52
2-in. lump	1.70	2.22
Mine-run	1.60	2.12
2-in. nut	1.50	2.02
2-in. screenings	1.10	1.62
Pea and slack	0.80	1.32
Staunton, Mt. Olive & Springfield:		
6-in. lump	2.00	2.52
3-in. lump	1.75	2.27
Mine-run	1.25	1.77
2-in. nut	1.10	1.02
2″ screenings	1.25	1.77
Carterville:		
6-in. lump or egg	2.10	2.77
3-in. nut	1.80	2.47
Mine-run	1.50	2.17
1½-in. screenings	1.10	1.77
Franklin County:		
6-in. lump or egg	2.20	2.87
3-in. nut	2.00	2.67
2-in. nut	1.50	2.17
1½-in. screenings	1.20	1.87
Trenton:		
6-in. lump	2.50	3.02
6-in. egg	2.25	2.77
3-in. nut	1.75	2.27
Pennsylvania Anthracite:		
Nut, stove and egg		6.95
Grate		6.70
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	2.50	5.30
Gas house		4.40
Smithing coal	1.65	4.15

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal and coke from the United States, month of January, long tons:

	1909.	1910.	Changes.
Anthracite	165,092	215,313	I. 50,221
Bituminous	549,090	511,939	D. 37,151
Total coal	714,182	727,252	I. 13,070
Coke	74,481	70,768	D. 3,713

Canada took this year 448,013 tons of coal, or 61.7 per cent. of the total. The coke went chiefly to Mexico and Canada. Cuba took 78,909 tons of coal.

United States Coal Imports—Imports of coal and coke into the United States, month of January, long tons:

	1909.	1910.	Changes.
Anthracite	3,103	.....	D. 3,103
Bituminous	99,109	141,478	I. 42,369
Total coal	102,212	141,478	I. 39,266
Coke	13,028	13,501	I. 473

Canada furnished this year 115,056 tons of coal and nearly all the coke; Australia, 13,865 tons coal; Japan, 10,935 tons coal. Imports are chiefly on the Pacific Coast and in the northwestern States.

Nova Scotia Coal—Coal shipments from Nova Scotia mines, month of January, long tons:

Companies.	1909.	1910.	Changes.
Dominion	120,130	182,411	I. 62,281
Nova Scotia Steel	38,845	45,342	I. 6,397
Acadia	24,852	23,534	D. 1,318
Intercolonial	9,918	20,298	I. 10,380
Inverness	19,767	19,684	D. 87
Total	213,512	291,269	I. 77,757

The total increase this year was 36.4 per cent.

IRON·TRADE·REVIEW

New York, March 16—The iron and steel trades still continue to hold something of the waiting position and business has hardly come up to the expectations which were expressed last month.

In pig iron there has been more or less inquiry for basic and foundry, but buyers are asking concessions on third-quarter iron which furnaces are hardly yet prepared to accept. In the Central West only moderate sales are reported. In eastern territory there has been some call for foundry but no heavy transactions. There is still some speculative Southern iron which is offered at low prices and the market will be unsettled until this is all out of the way.

In finished material the railroads have been the chief buyers either directly or through the car companies with which they have placed very heavy orders. In structural steel there is some buying and a good deal of negotiation which has not yet come to a head. Outside of this the market is not active.

Pig-iron Production—The reports of the furnaces, as collected by the *Iron Age,* show that on March 1 there were 311 coke and anthracite furnaces in blast, having a total weekly capacity of 594,000 tons; an increase of 7500 tons over Feb. 1. Making allowance for the charcoal furnaces, the total production of pig iron in February was 2,432,500 tons; for the two months ended Feb. 28 it was 5,076,500 tons. Of this total 3,393,500 tons were made by the steelworks furnaces.

Baltimore

March 14—Imports during the week included 922 tons ferromanganese from Liverpool; 5512 tons cupreous pyrites from Spain; 10,800 tons iron ore from Cuba.

Birmingham

March 14—Southern pig-iron market shows very little change. The demand is far from being brisk but the make is still quite healthy and shipments almost as good as the make, the local consumption caring for the balance, so that there is no accumulation. The furnace companies are still quoting $14 per ton, No. 2 foundry. There is warrant and resale iron still to be obtained from 50 to 75c. below that price. The officials of the furnace companies express confidence of a recovery in the market before long. Inquiries for pig iron for delivery during the last half of the year are coming in, but very few sales are being reported. The buying for the third and fourth quarters of the year is looked for usually during the latter part of April or May. As long as there is no extensive accumulation of iron the furnace officials say there is no need for alarm. Orders in hand will require a large tonnage of iron yet.

Basic and charcoal iron continue to meet with favor and the make is being about cared for. The blowing in of Eagle furnace at Attalla, Ala., adds about 60 tons of charcoal iron to the daily make.

The Southern Railway Company has ordered 42,000 tons of rails, which will be rolled at the Ensley mills.

Chicago

March 14—Indications in the iron market are of greater strength, though the tangible evidences of improvement are slight. Buying of pig iron continues to be in small lots generally. Present and prospective needs are large. No weakness on the part of furnace agents seems to be developing. They hold to $13 Birmingham ($17.35 Chicago), as a minimum price on Southern. Northern is firm and quiet at $18.50, while much Southern iron is sold at $13.50 Birmingham. For last-half deliveries business and inquiries are steadily increasing. Lake Superior charcoal iron brings $19 and is firm.

Iron and steel products are firmer, with sales in general good, and railroad sales increasing. Coke is in fair demand and good supply at $5.75, Chicago.

Cleveland

March 14—No sales of iron ore are reported.

Pig Iron—Sales have been chiefly of small lots. There are large inquiries, but no heavy business has been closed. Furnaces are inclined to cut prices to secure orders. Quotations are, Cleveland delivery, $18.75@18.90 for bessemer; $17@17.25 for No. 2 foundry.

Finished Materials—Railroads and car-builders are the principal buyers just now. Bar iron is a little more in demand. Inquiries are in for steel bars.

Philadelphia

March 16—The pig-iron market is dull, not from lessened consumption, but from an indisposition to purchase in large lots at the present time. Makers are full of the notion of continuing strong prices, while buyers are as full of the notion that prices will weaken. Basic iron has gained in strength, owing to influences in other markets. Prices have advanced nominally, at least 25 or 50c. per ton. No. 2 foundry is weak, because of few orders. Southern foundry is being offered cheap. Forge iron is dull. No. 2 X is quoted at $18.50; best gray forge, $17.50; while $18.50@18.75 is asked for basic.

Scrap—A demand has set in which will clean up many of the yards who have been carrying heavy melting and No. 1 scrap through the winter. Dealers say there is a good deal of scrap to be had through their territory, and they are now on the war path to gather it in.

Pittsburg

March 15—Improving conditions in the steel trade are widely reported, but are supported more by reiteration than by the citation of concrete facts.

Plates and shapes for Eastern delivery are $1 a ton lower than at the beginning of the year, being 1.50c. Pittsburg, while for local and Western delivery they remain at 1.55c. Steel bars on contract are 1.45c., but 1.50c., is obtained for prompt shipment.

Pig Iron—The greatest event in the local market for several weeks was the placing of 15,000 tons of foundry iron by the Westinghouse Electric and Manufacturing Company, 5000 tons for its Allegheny works, in Pittsburg, and 10,000 tons for its Cleveland works, all for equal deliveries over the second half. The Allegheny tonnage went at $16.50, delivered, divided between the only merchant furnace in Allegheny county, which had a 35c. rate to the works, and the only furnace in Fayette county, which has an 85c. rate. The Cleveland business was divided between two of the three Cleveland furnace interests, at $16.75, delivered, the switching charge being not over 35c. As to costs of production, the Cleveland iron should have brought less than the Pittsburg iron, but it appears that there was an understanding on $16.75 by the producers. The trade was rather shocked at the price done on the Pittsburg iron. While the Valley furnaces did not sell, the business shows what they would have to do to get into Pittsburg; and if they cannot get into Pittsburg there is not much left for them. The equivalent Valley price is $15.60, whereas the market had been quoted at $16.25 for early delivery, and the talk was that inasmuch as ore is 50c. higher this season, and will come into use about June, second-half iron ought to be $1 higher than prompt iron. Nominally the prompt market is quotable 25c. lower, at $16, Valley, or $16.90, Pittsburg, but there has really been nothing done to make a market. Basic is still quotable at $16, Valley, some furnaces offering to sell at this price. There have been several transactions in basic, amounting to nearly 10,000 tons, but none of them have been straight sales. In last report a straight sale of 10,000 tons of bessemer to the Cambria Steel Company was reported at $17.50, Valley. It has developed that the business went through a Pittsburg merchant firm, which presumably received a commission, but the price paid by the consumer was nominally $18 at furnace, with an allowance of three months' interest, making the net price to consumer about $17.72. A sale of 7000 tons was made to the Lackawanna Steel Company by another seller on the same terms. The market is constructively quotable at $17.75, Valley, for last week and this.

Steel—The market for billets continues quiet, shipments being heavy however, on old contracts. Prices remain quotable at $27@27.50 for bessemer billets, $27.50@28 for open-hearth billets, $28.50@29 for sheet-bars and $33 for rods, all f.o.b. maker's mill, Pittsburg or Youngstown districts.

Sheets—There is no change, demand being good for sheets except classes of material, which depend upon outdoor work for consumption. Prices remain at 2.40c. for black, 3.50c. for galvanized, $1.70 for painted corrugated roofing and $3 for galvanized corrugated, with blue annealed sheets nominally 1.75c., but practically 1.90c. for early delivery. Corrugated sheets are being shaded $1 a ton.

METAL · MARKETS

New York, March 16—The metal markets continue rather quiet, with few changes in price or conditions.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1910..	$ 6,163,132	$ 2,131,357	Exp. $ 4,031,775
" 1909..	7,865,356	3,420,183	" 4,545,173
Year 1910..	6,163,132	2,131,357	" 4,031,775
" 1909..	7,865,356	3,420,183	" 4,445,173
Silver:			
Jan. 1910..	4,498,304	4,248,354	Exp. 249,[illegible]
" 1909..	4,542,094	3,664,752	" 877,[illegible]
Year 1910..	4,498,304	4,248,354	" 249,950
" 1909..	4,542,094	3,664,752	" 877,342

Exports from the port of New York, week ended March 12: Gold, $730,010, to Cuba and South America; silver, $449,000, to London and Paris. Imports: Gold, $137,530, from Central and South America; silver, $70,780, from Mexico and Central America.

Transvaal gold production for the two months ended Feb. 28 was $24,328,383, a decrease of $69,058 from last year.

Gold—No special demand appeared this week and prices on the open market in London continued steady at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. No exports from New York are reported.

Platinum—Business is good and the market is firmer owing to reports from abroad. Dealers are now asking $29@29.50 per oz. for refined platinum, and $35 per oz. for hard metal.

Our special correspondent writes from St. Petersburg, Russia, under date of Feb. 17, that business has improved. At Ekaterinburg the small dealers ask 6 rubles per zolotnik—equal to $22.56 per oz.—for crude metal, 83 per cent. platinum. In St. Petersburg the market is strong, and crude metal cannot be had under 24,000 rubles per pood—equal to $23.52 per oz. Even this price is subject to negotiation, higher figures being named.

Silver—The market has been steady, advancing from 23 7/16 to 23¾d. in London on buying for Chinese banks and Indian bazaars. The effect of the increased duty in India is gradually being worked out and the price is adjusting itself to the new conditions.

SILVER AND STERLING EXCHANGE

Mar.	10	11	12	14	15	16
New York....	50⅞	51¼	51⅜	51¼	51⅜	51½
London......	23 7/16	23⅝	23 11/16	23⅝	23 11/16	23¾
Sterling Ex..	4.8690	4.8680	4.8680	4.8695	4.8705	4.8700

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

Mar.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
10	13½ @13¾	13¼ @13½	59⅝	32½	4.50 @4.52½	4.35 @4.37½	5.55 @5.60
11	13½ @13¾	13¼ @13⅜	58 15/16	32⅛	4.47½ @4.52½	4.32½ @4.37½	5.52½ @5.57½
12	13½ @13¾	13¼ @13⅜	....	32¼	4.47½ @4.52½	4.32½ @4.37½	5.52½ @5.55
14	13½ @13⅝	13⅛ @13⅜	59¼	31⅝	4.45 @4.50	4.30 @4.32½	5.50 @5.52½
15	13½ @13⅝	13⅛ @13⅜	58 15/16	31¾	4.45 @4.50	4.30 @4.32½	5 50 @5.52½
16	13½ @13⅝	13⅛ @13⅜	58⅞	31¾	4.45 @4.50	4.30 @4.32½	5.50 @5.52½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The statistics published on March 10, acted as a damper on the enthusiasm of the previous week, although it is hard to see why they should have been received so pessimistically. The London market declined sharply, making it impossible to take export orders in competition with electrolytic ex-European warehouses. The few orders which offered in this market were eagerly competed for, and the inducements offered by sellers through a decided concession from their previous prices failed to attract a larger business. The market closes easy at 13½@13⅝c. for Lake copper, which is largely nominal, and 13¼@13⅜c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13@13⅛ as the average for the week.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c. base, carload lots at mill.

Transactions in the London standard market were conducted on a lower scale of values, and the publication of the statistics on March 16, showing a decrease in the visible supply abroad of 600 tons, has so far not helped the market, the close being cabled easy at practically the bottom prices, £58 17s. 6d. for spot and £59 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected, £62@£62 10s.; strong sheets, £71@£72 per ton.

The outside speculation in copper in the London market, emanating from this side, which has been a factor during the last two years, is now practically at an end, and but few of the old accounts remain. It will be remembered that this speculation was stimulated by one or more brokerage houses, whose participation in the copper business is chiefly through our own stock markets. Speaking generally, the speculative accounts in the London market for standard copper have been unprofitable.

In the suit of the United Metals Selling Company vs. the American Smelting and Refining Company, by decision of the Supreme Court of New York, Edward Brush of the defendant company must stand examination. The plaintiff in this case charges breach of contract and asks damages of $1,000,000. The defendant makes a counterclaim for $814,699. This case arises from contract for the sale of copper. In 1901 the Smelting company entered into contract with the Metals company for the latter to act as sole selling agent for a commission of 1 per cent. In 1903 it was agreed that settlement should be made weekly on the basis of JOURNAL quotations. In February, 1907, the contract was modified to the effect that the Smelting company should estimate its production for the third month ahead, settlement being made on this estimate. Thus, settlement for March would be for copper to be delivered in the following May. If actual production exceeded the estimate settlement for the surplus was to be made at the quotational average for the month of actual delivery. The Metals company claims that from May to October, 1907, the Smelting company violated the contract by delivering more than its regular product, which resulted in large loss to the Metals company owing to the great decline in the market during that period.

Copper Producers' Association—The report for February gives the following figures for the month and the two months ended Feb. 28, in pounds:

	February.	Two Months.
Stocks, Feb. 1 and Jan. 1	98,463,339	141,766,111
U. S. production.....	112,712,493	229,259,780
Total supplies	211,175,832	371,025,891
Deliveries, domestic....	66,618,322	144,776,709
Deliveries for export . .	37,369,518	119,061,190
Total deliveries	103,987,840	263,837,899
Stocks, Mar. 1	107,187,992	107,187,992
Inc. or dec. in stocks. .	I. 8,724,653	D. 34,578,119

Tin—The London market has experienced a considerable decline during the period under review. It was partly ascribed to the weaker copper market, which also had an unsettling influence on tin, and partly to heavy sales by the bull syndicate. The latter seems the more plausible reason, as the transactions on the London Metal Exchange during the decline were exceptionally large. The close is cabled as easy at £143 15s. for spot and £145 15s. for three months.

Business in the domestic market was more active at the lower level when consumers took hold more liberally than for some time past. Prices followed closely the fluctuation in London, and closed at about 31¾c. per pound.

Lead—The product of the independent Missouri concerns continues to be pressed for sale. The American Smelting and Refining Company, presumably in recognition of the situation, published a reduction in its schedule on March 15, of 10c. per 100 lb. on desilverized, which, however, was practically followed by an almost equal concession in the quotations of the outsiders. The market closes weak at 4.45@4.50c. New York, and 4.30 @4.32½c. St. Louis, and the market seems to be demoralized.

The London market is unchanged at £13 3s. 9d. for Spanish lead, and £13 6s. 3d. for English lead.

Spelter—Business has been rather light and as the supplies of ore from the West are coming forward in increased volume, the market has again given away, and closes easy at 5.65@5.67½c. New York, and 5.50 @5.52½c. St. Louis.

New York quotations for spelter, March 10, were 5.70@5.75 c.; March 11, 5.67½ @5.72½c.; March 12, 5.67½@5.70c.; March 14-16 inclusive, 5.65@5.67½ cents.

The London market is also somewhat lower at £23 for good ordinaries and £23 5s. for specials.

The property of the Lanyon Zinc Company will be sold at sheriff's sale, April 11, at 10 a.m., at the court house at Iola, Kan. Acting for bondholders, the Trust Company of America, New York, obtained a judgment for about $2,225,000 against the company and an order of foreclosure.

Other Metals

Aluminum—Business is good, and prices have a stronger tendency. Quotations current are 23@23½c. for ingots, and a further advance is possible, in view of the growing demand. In Europe the market is strong and advancing, producers being unwilling to contract far ahead.

Quicksilver—A moderate business is doing, but prices are easier. The New York quotation is $49 per flask of 75 lb.; jobbers ask 73@74c. per lb. for small lots. San Francisco, $48@49 for do-estic orders and $2 less for export. The ondon price has been reduced to £9 5s. er flask, with £9 2s. 6d. asked by bbers.

Antimony—The market is rather dull, nd prices are unchanged. Cookson's is elling at 8¼@8½c., and U. S. at 7⅞ 8c.; while 7¼@7⅜c. is asked for out- de brands.

Nickel—Large lots, contract business,)@45c. per lb. Retail spot, from 50c. r 500-lb. lots, up to 55c. for 200-lb. ts. The price for electrolytic is 5c. gher.

Magnesium—The price of pure metal $1.50 per lb. for 100-lb. lots f.o.b. ew York.

Cadmium—Current quotations are 65 70c. per lb. in 100-lb. lots at Cleve- nd, Ohio. Prices in Germany have been dvanced and are now 500@550 marks er 100 kg.—average 56.7c. per lb.—f.o.b. orks in Silesia.

Zinc and Lead Ore Markets

Colorado Zinc Ore—Zinc ore at Lead- lle is being bought upon the basis of e zinc content, less eight units, at the t. Louis price of spelter, less $17.50 r freight and treatment. On this basis, e assaying 40 per cent. zinc fetches bout $17.70 when spelter is at 5½c. t. Louis.

The silver-lead smelters in Colorado e experiencing a pronounced shortage f silicious ore, and consequently are aking concessions in rates. The zinc mit, which used to be 10 per cent., has een raised to 13, and even to 15 per ent.

Platteville, Wis., March 12—The base rice paid this week for 60 per cent. zinc re was $44@45 per ton. No sales of ad ore are reported; offerings declined $52 per ton of 80 per cent. lead.

SHIPMENTS, WEEK ENDED MAR. 12.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphui ore, lb.
ineral Point	714,000	....	....
atteville	517,880	....	244,400
nton	251,950	....	....
ighland	182,700	....	....
ioa City	170,375	....	....
arker	84,590	....	....
alena	48,700	....	....
inden	....	....	50,000
Total	1,970,195	....	294,400
ear to date	14,950,385	1,099,099	2,545,950

In addition to the above there was hipped during the week to the separating lants, 1,350,505 lb. zinc ore.

Joplin, Mo., March 12—The highest rice reported paid for zinc sulphide ore as $49, the base price for the best grades eing $44@46 per ton of 60 per cent. inc, though some ore heavy in iron, is eported sold on a $47 base. Zinc sili- ate ore sold on a base of $21@24 er ton of 40 per cent. zinc, with the high rice at $29. The average price, all rades, was $39.82 per ton. The highest price offered for lead ore this week was $53 per ton, for ores carrying 80 per cent. lead. The average price, all grades, was $52.55 per ton.

A sale of 1600 tons of stock at Oronogo was made this week at a price neither the buyer nor seller will make public. It is reported that no sale of ore was made, but that it is to be smelted by the Granby company on a fixed charge, the spelter to belong to the ore-producing company. No verification of this could be made.

SHIPMENTS. WEEK ENDED MAR. 12.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,473,760	689,040	$109,897
Joplin	1,693,060	208,970	45,272
Duenweg	867,140	25,170	17,888
Alba-Neck	804,480	16,830	17,732
Galena	710,160	77,740	15,988
Badger	691,610	......	14,869
Granby	870,000	1,700	12,875
Spurgeon	433,180	110,030	9,568
Quapaw	407,010	23,790	8,961
Carthage	385,320	......	8,284
Miami	468,450	49,120	6,676
Oronogo	212,460	68,190	6,523
Jackson	265,940	......	5,451
Aurora	296,940	......	4,043
Cave Springs	124,150	......	2,545
Sarcoxie	107,110	......	1,789
Carl Junction	74,430	......	1,500
Totals	12,885,200	1,270,580	$289,861
11 weeks	113,695,740	18,026,610	$2,883,314

Zinc value, the week, $256,478; 11 weeks, $2,382,618
Lead value, the week, 33,383; 11 weeks, 500,696

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, March 16—The general market continues steady with some disposition to improve in various directions.

Copper Sulphate—A good business is reported and the market is steady with rather a strong tone. Prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller orders.

Arsenic—The market is very dull. In the absence of sales quotations continue nominal at $2.50@2.62½ per 100 lb. for white arsenic.

Nitrate of Soda—Business continues on a large scale and sales are active. Spot nitrate has advanced a little and is now quoted at 2.12½c. per lb. On the other hand, futures have weakened to 2.07½c. per lb. in view of large imports and the heavy shipments reported afloat.

MINING · STOCKS

New York, March 16—The general stock market was rather weak at first, but grew a little firmer toward the close, Steel Corporation issues being especially strong. It has been, however, distinctly an inside market, in which the general public seems to be taking little interest.

On the Curb, trading followed the course of the Stock Exchange. The copper stocks generally were at first weak, but toward the close recovered a little and several of the more prominent issues showed some strength. Outside of the coppers, trading was inclined to be dull, Cobalt stocks making the best showing.

A sale of 500 shares of United Verde Copper Company at $70 per share at public auction was reported March 9. Also 10,000 shares of San Luis Mining Company at $1040 for the lot, and 1000 shares of Tenabo Mining and Smelting Company at $320 for the lot.

Boston, March 15—The report of the Copper Producers' Association gave the market a chill, from which it has not recovered. Prominent has been a sharp decline in Arizona Commercial shares, which carried the price off almost $8 to low of $32.50. North Butte, after touching $44.25, fell back to $41, but with no undue selling pressure. Superior & Boston recorded a sudden burst of activity, which took the price up to $16.50, an advance of $3; subsequently, it reacted to $14.50. Less activity has been witnessed in the new Lake coppers. Mass mining has been more or less of a feature, and recorded a $2.37½ advance to $7.37½ on the levying of a $2 assessment. New blood has come into the directorate, members of a prominent local brokerage house.

Amalgamated has had a $7.12½ break during the week, to $76.62½. Franklin and La Salle, after strong and active periods, also lost their buoyancy.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev	Mar. 12	Apr. 7	$0.05
Bader, Cal	Feb. 24	Mar. 14	0.10
Belcher, Nev	Mar. 9	Mar. 29	0.10
Cardiff, Utah	Mar. 10	Mar. 28	0.00½
Central Eureka, Nev	Mar. 13	Apr. 23	0.02½
Chollar, Nev	Mar. 8	Mar. 31	0.10
Confidence, Nev	Mar. 25	Apr. 15	0.20
Crown Point, Nev	Mar. 8	Mar. 28	0.10
Gould & Curry, Nev	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev	Mar. 9	Mar. 31	0.10
Mexican, Nev	Feb. 21	Mar. 17	0.15
New Arcadian, Mich	Mar. 10	....	1.00
Ojibway, Mich	Mr.Oct.	....	2.00
Oneco, Mich	Feb. 15	....	1.00
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Seg. Belcher, Nev	Mar. 8	Mar. 28	0.10
Seven Troughs Mon., Utah	Mar. 12	Apr. 2	0 00½
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Union, Nev	Mar. 7	Mar. 31	0.10
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Boston Ely and Rhode Island Coal have both been strong Curb features. National Exploration took quite a break, but has since recovered. The time for exchanging bonds into stock has been extended.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
III, 1909	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1909	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	......	23.227	......
April	51.428	......	23.708	......
May	52 905	......	24.343	......
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51 502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	......	12.826	......	56.231	......
April	12.56[illegible]	......	12.93[illegible]	......	57.363	......
May	12.893	......	13.238	......	59.338	......
June	13.214	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.493	......
September	12.87[illegible]	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.[illegible]	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.[illegible]	......	58.[illegible]2	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	......	15.84	......	15.62	......
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Mar. 15

Name of Comp.	Bid.
Listed	
Acacia	.06
Cripple Cr'k Con.	.02⅞
C. K. & N.	.10
Doctor Jack Pot	.07¼
Elkton Con	.68
El Paso	.66
Fannie Rawlins	.05
Findlay	.09¼
Gold Dollar	.10
Gold Sovereign	.04
Isabella	.17
Mary McKinney	.46
Pharmacist	.03
Portland	1.06½
Vindicator	.79½
Work	.05½
Unlisted	
Golden Cycle	1.40
United Gold Mines	.08

SALT LAKE Mar. 15

Name of Comp.	Clg.
Carisa	.60
Colorado Mining	.77
Columbus Con.	.49
Daly Judge	3.50
Grand Central	1.62½
Iron Blossom	.94
Little Bell	1.70
Little Chief	.45
Lower Mammoth	.50
Mason Valley	1.82½
Maj. Mines	2.32½
May Day	.19½
Nevada Hills	.52
New York	‡ .13
Prince Con	.75
Red Warrior	6.00
Silver King Coal'n	2.50
Sioux Con.	.38
Uncle Sam	.39
Victoria	‡1.05

SAN FRANCISCO. Mar. 15.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.15	Belmont	2.30
Belcher	1.30	Daisy	.06
Best & Belcher	‡.75	Jim Butler	.12
Caledonia	.69	MacNamara	.27
Challenge Con	.30	Midway	.31
Chollar	.30	North Star	.02
Confidence	1.02	West End Con	.40
Con. Cal. & Va.	1.25	Atlanta	.15
Crown Point	1.25	Booth	.16
Exchequer	.35	C.O.D. Con	.09
Gould & Curry	.32	Columbia Mt.	.06
Hale & Norcross	.49	Comb. Frac.	.34
Mexican	1.57	Great Bend	.03
Ophir	1.47	Jumbo Extension	.37
Overman	1.17	Oro	.07
Potosi	.54	Red Hill	.04
Savage	.37	Sandstorm	.03
Sierra Nevada	.58	Silver Pick	.09
Union	.76	St. Ives	.20
Yellow Jacket	1.20	Tramps Con	.04

N. Y. EXCH. Mar. 15

Name of Comp.	Clg.
Amalgamated	77⅜
Am. Agri. Chem.	45½
Am.Sm.&Ref.,com	85⅝
Am. Sm. & Ref., pf.	108
Anaconda	49
Bethlehem Steel	31
Col. & Hock. C. & I.	15
Colo. Fuel & Iron.	39⅝
Du Pont P'd'r, pf.	‡85
Federal M. & S.	53½
Great Nor., ore ctf.	69
Nat'nal Lead, com.	83¼
National Lead, pf.	‡109½
Pittsburg Coal	21
Republic I&S, com.	39½
Republic I & S, pf.	103
Sloss Sheffi'd, com.	78
Sloss Sheffield, pf.	117½
Tennessee Copper	33
Utah Copper	49¼
U. S. Steel, com.	85¼
U. S. Steel, pf.	121½
Va. Car. Chem.	57

N. Y. CURB Mar. 15

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19¼
Braden Copper	5 3/16
B. C. Copper	6⅞
Buffalo Mines	3½
Butte Coalition	25½
Chino Copper	14½
Cobalt Central	.18
Combination Fra.	.34
Con. Ariz. Sm.	2¾
Cumberland Ely	‡9
Davis-Daly	3½
Dominion Cop.	7
Ely Con	13/16
El Rayo	2 11/16
Florence	3⅛
Gila Copper	8⅛
Giroux	9¼
Gold Hill	1½
Goldfield Con	8⅜
Greene Cananea	10⅜
Guanajuato	1⅝
Guggen. Exp.	215
Kerr Lake	.08 11/16
La Rose	4 9/16
McKinley-Dar-Sa.	.95
Miami Copper	23⅞
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1¼
Newhouse M. & S.	‡3½
Nipissing Mines	10¼
Ohio Copper	4⅜
Pacific Sm. & M.	⅞
Silver Queen	.20
Standard Oil	645
Stewart	½
Tonopah	7⅜
Tonopah Ex.	.76
Tri-Bullion	⅛
Utah Apex	5⅛
W. Va. Wyo. Cop.	2⅛
Yukon Gold	4½

LONDON Mar. 16

Name of Com.	Clg.		
Dolores	£1	8s	3d
Stratton's Ind.	0	3	3
Camp Bird	1	7	3
Esperanza	2	17	6
Tomboy	0	17	1½
El Oro	1	7	9
Oroville	0	10	0

BOSTON EXCH. Mar. 15

Name of Comp.	Clg.
Adventure	9¼
Allouez	51
Am. Zinc	29
Arcadian	7¼
Arizona Com	33
Atlantic	9½
Boston Con	19
Calumet & Ariz.	73
Calumet & Hecla	625
Centennial	21⅜
Con. Mercur	.15
Copper Range	76½
Daly-West	9
East Butte	10⅜
Franklin	19¾
Greene—Can.	10¼
Hancock	23
Isle Royal	21
Keweenaw	4¾
La Salle	16⅜
Mass	6⅝
Michigan	7⅛
Mohawk	60½
Nevada	23¼
North Butte	41
Ojibway	10
Old Dominion	42½
Osceola	153
Parrot	18
Quincy	88
Shannon	14½
Superior	55
Superior & Bost.	14¾
Superior & Pitts.	13⅞
Tamarack	70
Trinity	8½
U. S. Smg. & Ref.	46½
U.S.Sm. & Re., pd.	51½
Utah Con	32
Victoria	4¼
Winona	10¾
Wolverine	143
Wyandotte	2½

BOSTON CURB Mar. 15

Name of Comp.	Clg.
Ahmeek	‡210
Bingham Mines	‡5
Boston Ely	3¾
Calaveras	5½
Champion	.10
Chemung	‡12½
Chief Cons	2 7/16
Chino	14¾
Corbin	.10⅛
Cactus	4⅞
Crown Reserve	‡3⅝
First Nat. Cop.	4½
Gila Copper	‡8½
Indiana	34½
Inspiration	8 11/16
Majestic	.90
Ray Central	3⅜
Ray Con	21½
Rawhide Coal	.29
Rhode Island Coal	11⅛
San Antonio	11½
South Lake	11
Trethewey	‡1⅜
Vulture	9⅝
Yuma	1¼

ST. LOUIS Mar. 12

N. of Com.	High.	Low.
Adams	.35	.30
Am. Nettie	.07	.06
Center Cr'k	1.75	1.40
Cent.C.&C.	82.00	81.00
C.C. & C. pf.	84.00	83.00
Cent. Oil	115.00	100.00
Con. Coal	20.00	19.00
Doe Run	105.00	100.00
Gra. Bimet.	.30	.28
St. Joe	14.00	12.00

‡ Last quotation.

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**Illustrated.*

The Steel Corporation Report

The report of the United States Steel Corporation covers such vast and varied interests that it is difficult to summarize or comment upon it in a brief space. There are a few points, however, to which attention may be drawn. As might have been expected, the operations show a large increase over 1908; the gross receipts having been $653,200,250 in 1909, or 34 per cent. greater than those of the preceding year. They were, however, 14.6 per cent. less than those of 1907. The difference in the surplus over all expenses was greater in proportion, the total of $131,491,414 being 43.2 per cent. more than in 1908, and 18.3 per cent. less than in 1907. The differences in production, on the other hand, were slightly less than those in earnings, a result of the comparatively lower prices prevailing over nearly three-quarters of the year. While 1907 was a boom year almost up to its close, and 1908 was a lean year throughout, 1909 was a year of mixed results; the first half having shown rather poor earnings, so that the gains reported were made almost entirely in the second half.

While noting these facts, it is a little curious that the report makes no specific reference to what was undoubtedly one of the chief moving causes for the improvement of the latter half—the reduction in prices and the opening of the market to general competition. The report refers only in a few lines to the lower prices made. It was, perhaps, hardly to be expected that much would be said as to the failure of a policy so long and persistently carried out and the success following its reversal. Taking the entire year the average decrease in prices, as compared with 1908, was 14.3 per cent. on domestic sales and 7.8 per cent, on export business. By the end of the year, owing to the increase in business prices had nearly regained the reduction made early in the year. But it is to be noted that the advances were the normal result of an active demand, not the maintenance of an arbitrary level.

The corporation is primarily a maker of finished steel products, and those are the forms in which, mainly, its output reaches the consumer. Its sales of other products are incidental, and in the nature of disposal of by-products. Thus in pig iron—which has always been its weaker side—it has always been a buyer rather than a seller; and it never had much, or any, pig to sell until after it acquired the merchant furnaces of the Tennessee company. Even those are gradually being turned from foundry iron to basic pig for the supply of its new steel furnaces. The total output of finished steel in 1909 was 9,859,660 tons; the total sales and deliveries to consumers were 9,691,990 tons. Of these deliveries 89.7 per cent. were to domestic buyers and 10.3 per cent. were exported; the increase over 1908 being 57.9 per cent. in domestic sales and 28.8 per cent. in the exports. The latter were the largest ever reported, slightly exceeding a million tons.

In the manufacture of steel there was a notable change, due chiefly to the opening of the Gary plant and the extensions at Ensley. Passing over 1908 as an exceptional year, we find that in 1907 the proportion of bessemer steel made was 56.6 per cent. of the total, and of open-hearth, 43.4; while in 1909 the proportions were 43.8 converter and 56.2 open-hearth—almost exactly reversed. The change will be still greater during the current year, when the substitution of open-hearth furnaces for bessemer converters at the Carnegie works will have its full effect.

During the two years past, it hardly seems as if full allowance had been made for depreciation of plants. The form of the report, however, makes it difficult to give an exact opinion on this point, as part of the renewals are charged to working expenses and part to special funds, so that the total amount spent to make good the depreciation cannot be exactly ascertained. This, it may be said, is one of the weaker points of the report, otherwise a complete one. The appropriations for new property, necessarily suspended in 1908, as the smaller earnings of that year made it necessary either to omit them or to reduce the dividends, were renewed last year, a total of $15,000,000 being set aside for that purpose. The corporation has always recognized the necessity of adding to its works if its position in the industry is to be maintained; and since its organization it has spent the great sum of $495,212,000 for that purpose. Nearly one-third of its present property account is made up by these contributions.

The army of employees grew from 165,211 reported in 1908, to 195,500 in 1909; an increase of over 30,000 persons, though the total number was 14,180 less than that reported in 1907. The average earnings were $776 per head; there were few changes during the year in the rates of wages paid.

It is of some interest to note that the corporation is, apart from its other interests, a transportation company of some importance, operating 1914 miles of road, equipped with 1024 locomotives and 45,224 cars. On the water it owns 77 steamers and 121 barges, a number of the steamships being of large size. Moreover, at the end of the year it had contracts let for 49 additional locomotives, 4900 cars and five steamships having a capacity for 12,500 tons of iron ore each. This transportation alone constitutes a considerable business, but is a necessary adjunct to the other activities.

The list of properties owned is fairly complete so far as the manufacturing plants, the coal mines and the coke plants are concerned. As to iron ore the statement is limited to a brief list of developed mines in the Lake Superior region and in Alabama. In fact there is—as in previous reports—a noticeable reticence as to iron ores owned and controlled. Thus nothing is said with regard to the Great Northern leases and the results on that part of the Mesabi range last year. For the current year, also, nothing is said. There is, however, among the appropriations for 1910 one of $3,200,000 for "reserve fund to cover advanced mining royalties:" and this, or the greater part of it is obviously intended to meet the minimum royalties and charges on those leases, which are not yet productive. The corporation seems to be paying rather a heavy price for this addition to its ore reserves; but from its point of view their control was essential to its plans.

What a Mining Bureau May Do

We have wondered heretofore as to what a bureau of mines is expected to do. The report of the Senate committee is illuminating. We are no longer in doubt. This report refers to the saving of life and to the conservation of resources, the themes heretofore harped upon, but those subjects are now relegated to the background. It appears that mining is a "giant, unorganized industry," calling for the leadership of a bureau of mines, and inasmuch as the industry needs such a leadership, a beneficent Congress, assisted by a lobby, is going to give it to us, unless some talkative senator interposes.

It seems that we need systematic investigations as to the theory and practice of ore dressing, because in recent years many new methods have been developed, about which little is understood. Even when individual tests by private interests are performed, the Solons of the Senate committee conceive it to be a useless waste of capital to have such examinations duplicated all over the country, under such imperfect conditions that it is rare for any two persons, operating on similar ores, to obtain the same results.

The ideas expressed by this dignified committee are so wonderful that we strain ourselves in trying to surmise the source of inspiration. Inspiration there must have been, or the senatorial dignitaries must have partaken of the stuff that dreams are made of. Such ideas could hardly have been evolved from senatorial inner consciousness. Anyway, we hear now that a correct process to adopt for any given ore is too often a matter of conjecture, instead of scientific knowledge, wherefore "enormous amounts are lost each year, not only to Western miners, but to Eastern investors, who furnish the capital for the erection of now idle mills and smelteries, and who bemoan their losses and declare that mining is a wild gamble; whereas, if based on proper knowledge, it can be made as legitimate and safe as any other department of industry."

Hurrah for the investor! He is just aching for the Government's stamp of safety and promise to make him rich quick. Mining is then to be no longer a wild gamble, but is to be a sort of Government bond at 10 per cent. interest, by act of Congress, and the instrumentality of a director of mines at $6000 per annum. If this will not beat the produce of senatorial plum trees, what will?

A bureau of mines, we are told moreover, will lift many departments of metallurgy from their present "partially understood reactions and haphazard application to the domain of something like an exact science, and would render incalculable service to the industry."

This rot has gone on the records of Congress as the official pronouncement of a committee of the Senate in the year of our Lord, 1910. Oh, shades of Agricola, Humboldt, Plattner, Bessemer! Have you lived for nought? Have you failed to father a profession which was thought to exist and to have created a marvelous development of industry, well able to take care of itself? Is there to be no longer any use for the private engineer because he has failed so utterly to show the best methods for the treatment of all ores that a benign Government is now going to take the matter in charge?

Yet, a fear creeps over us that to the director of mines at $6000 per year, who can do these things, the temptation of 10 times as much will quickly come from some trust, and that the Guggenheims will get him if he doesn't watch out. What then should we do? Possibly we might go on in much the same way as in the past, and with the aid of the engineering profession develop cyanide processes, dry-air blasts, pyritic smelting methods, etc., such as have contributed to the economy of our times; and we have lurking in the back of our minds the idea that these engineers and the industrial companies that employ them are the real conservationists; that the technical press is the real agent for dissemination of news of their progress; and that the chief purpose of a bureau of mines is to provide agreeable jobs for some amiable gentlemen, whom the industry will have to watch to keep them out of mischief.

The Smoke Question Once More

The mischief and danger of bureaucratic interference with an industry is exemplified by the experience of the Anaconda Copper Mining Company against which the Government last week brought an action based upon the hoary old smoke complaint. After its long series of trials and tribulations and victories in the courts it was supposed that this company and the population dependent upon it were to have peace. But some Government officials are not of that mind. The one sure method of abolishing the nuisance of sulphurous smoke is to make sulphuric acid out of it. A certain official genius for observation and deduction reported how this was done by the copper smelters in Tennessee, and if there why not in Montana? "But," said the Anaconda management, "We could not market the output of acid if we thus utilized our smoke." There is a story, perhaps apocryphal, that they were told that at least they could prevent the damage to vegetation by making acid and conveying it by pipe line to the Pacific ocean into which it might be poured. This suggestion was not taken seriously.

Now the Government in its wisdom has made up its mind that the Anaconda ought to make acid and use it with the phosphates of Idaho to make fertilizer of which the western soil is more in need than that of the South. For further particulars the reader is referred to the report elsewhere in this issue.

The Anaconda Copper Mining Company is one of the great industrial concerns of the United States and technologically at least ranks among those of which the Nation has most reason to feel proud. In the practical development of the metallurgy of copper it has been a leader. Its works are the "show" plant of the country. Its technical methods are the most scientific. This position has been attained through the exercise of the most enlightened ideas of management, which naturally implies the employment of the best technical assistance that the world offers. Economy and efficiency are the watchwords of this business, and we are quite sure that if anybody can show the company how it can save 1c. per ton of ore treated, even if large outlay of capital be involved, the company will adopt the idea and give employment to the proposer at a salary that the Government cannot match. The company has considered carefully, with the aid of the best professional advice, the scheme upon which the Government experts now insist, and knows it to be uneconomical and impracticable; indeed, we can be stronger, and say absurd.

The Washoe chimneys discharge daily nearly 1000 tons of sulphur, or an amount that would make annually about 1,400,000 tons of tower acid. Statistics of the domestic production and consumption of acid in recent years do not exist, but the present rate is probably about 2,100,000 tons, basis of tower acid. Save for a relatively trifling quantity, all of this acid is produced east of the Mississippi river. A little more than one-half of the acid consumption is for making acid phosphate. The use of that commodity is chiefly in the South and on the Atlantic coast. West of the Mississippi river the consumption is insignificant, although it will doubtless increase as the years roll on. However, there is not any prospect in human vision that until many, many years have elapsed will Montana be able to market a supply of acid phosphate superior to the present total consumption of the United States even if commercial conditions were as favorable as in Tennessee, which decidedly they are not.

It is highly doubtful if the Washoe smoke damages the Government's forests to the extent that is alleged. Even if it does it is better to suffer some damage than to check a mining industry upon which large cities, we might almost say the State of Montana, are dependent. This conclusion has been distinctly expressed in the opinion of the Federal courts in previous cases decided in favor of the company. The Government now flies in the face of these decisions with an absurd proposition which seems to be based chiefly upon the idea of conservation run mad, and the desire of some Government experts to magnify their importance. There is not much doubt about the company successfully defending its case, but it is unjust for the Government to put any of its citizens to expense in the exploitation of such an absurdity as the present basis of action.

Iron Ore Imports

Our contemporary, the London *Economist,* sees an end to the expansion of iron production in the United States in the unusually heavy contracts made for the shipment of Spanish and Swedish ore to this country during the present year. This it takes as an indication that pig-iron production here is beginning to outrun the available supplies of iron ore.

In view of the fact that such contracts have been made and have attracted much attention in Europe, the conclusions of the *Economist* are excusable, but they are far from being correct. The Lake Superior region alone is easily able to supply ore for a make of pig iron much larger than we are likely to see this year. The expected increase in ore imports is due to a conjunction of the decrease in duty and a general low level of ocean freights, which together have made it possible for some Eastern furnaces to contract for foreign ore.

Coal Miners' Strikes

Not only in our own country but in Great Britain there is considerable commotion in the coal-mining industry. The troubles in the important South Wales district in Great Britain have been gradually coming to a head. These arose mostly from the passage of the 8-hour law, a continued discussion having been in progress between operators and miners ever since that time. The latest advices are that a general strike, which will involve nearly 200,000 men, is expected almost immediately.

On the other hand the long and stubbornly contested strike of the coal miners in New South Wales appears to be at an end. Cable advices report that the strike was called off March 11, but do not state the particulars of the settlement. This strike has lasted about four months and has seriously embarrassed business in Australia, forcing even the importation of coal from India to operate the government railroads. The large export business of New South Wales has been almost destroyed, to the great profit of the Japanese operators.

DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Cleaning Up an Old Mill Yard

By W. H. Storms*

In the operation of every stamp mill, whether treating gold or silver ores, there is always a loss and waste of the precious metal, be it ever so small. As a natural consequence when a mill has been in operation for a long period, this constant though small daily waste results in the accumulation of a large amount of the metals beneath the mill floors and in the adjacent mill yard, sometimes reaching many thousands of dollars.

On the Mother lode in California, the loss is principally in gold. This loss occurs in many ways: Chips of wood and iron fragments from the batteries, small quantities of sulphurets, mill sweepings and various other kinds of otherwise useless trash are daily thrown out, all of which contain gold.

This rubbish generally finds its way outside the mill and may or may not be cleaned up periodically by burning the combustible portions and working the ashes and the metallic parts in the cleanup barrel; but whether these are periodically cleaned up or not there is always more or less unavoidable waste, which in time so enriches the mill yard that it becomes valuable to treat as a placer.

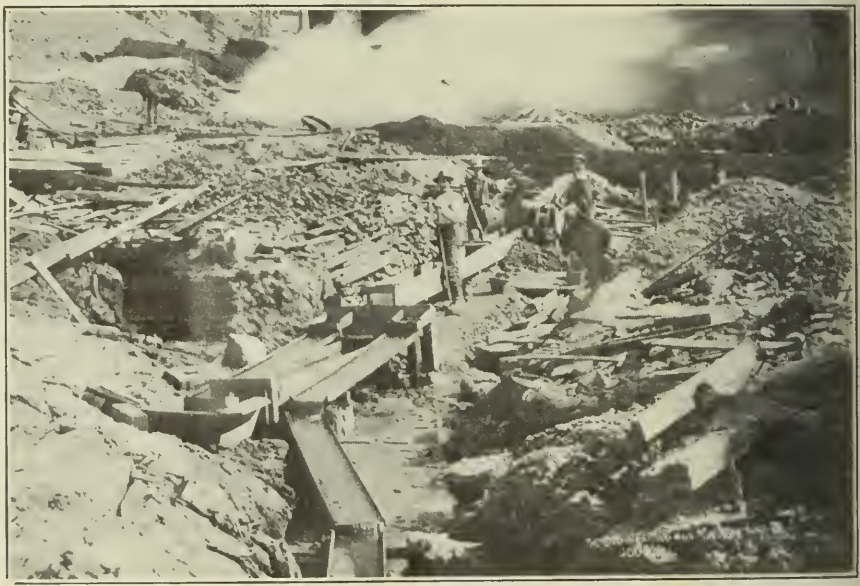
Lately a number of men have been engaged in working over the ground near the mill of the famous Keystone mine at Amador City, Cal. The ground was a nearly level, partly filled tract when the work of cleaning up was commenced under arrangement with the Keystone management, but the portion that has been worked is now a mass of rock tailings, old timbers, iron, ancient machinery and other miscellaneous dèbris. The accompanying photograph gives a good idea of the present situation, the character of the work in progress and the arrangement of sluices.

Several thousand dollars in gold amalgam and sulphurets have already been recovered from this old mill dump, a portion of which was at one time covered by a canvas plant and later by cyanide works, both since removed; but it is quite likely that a still larger amount remains to be recovered.

The Keystone mine has been in almost constant operation since 1851, and has produced about $17,000,000, in consideration of which it is evident that it would require but a small percentage of this large output to make a large aggregate loss.

The method by which the gold is recovered from this old mill yard consists of a line of sluice boxes built of 1x12-in. lumber, with auxiliary shallow sluices as shown. The dirt is picked and shoveled up after the manner of placer mining, and either thrown directly into the sluice box or dumped into it from a wheelbarrow.

Water is obtained from the waste stream flowing from an impulse wheel that drives the mill rock breaker. The necessary amount is carried to the sluice box in a 4-in. launder, the quantity used being regulated to suit the material treated, fine light material requiring less than that which is heavy or mixed with clay.



Reworking Mill Rubbish in California

The sluice box is provided with a sheet-steel false bottom, the lower half of which is perforated with ¼-in. holes. This false bottom is set about 4 in. above the bottom of the box and is about 6 ft. in length. The dirt is thrown upon the steel sheet and vigorously puddled with shovel or hoe while the stream of water is pouring upon it. Only the fine part of the material passes through the perforations, the coarse being shoveled out to the tailings pile.

From beneath the screen the fine dirt is carried by water to a box 3 ft. long and 6 in. wide and deep, arranged transversely to the main sluice. This box is provided with ½-in. augur holes on one side near the ends, and through these holes the material passes to two short lengths of shallow sluice, which in turn discharge upon two movable sluices, 10 ft. long, 12 in. wide and 2 in. deep. These shallow sluices are cleaned at varying intervals, from five minutes to half an hour, depending upon the character of material under treatment, the percentage of sulphurets and other heavy stuff present in the dirt being important. The bottoms are covered with canvas tacked around the edges, and over the canvas is tacked 14-mesh wire-screen cloth.

The free gold, amalgam, sulphurets and other heavy minerals and metals present are caught in the meshes of the wire screen and remain there until removed by the workman lifting the screen from its place and inverting it in a tank of water which stands between the sluices. When the sluices have been cleaned by inverting and shaking in the tank, they are replaced and the work of sluicing again proceeds as before.

The grade of the wire-covered sluices is adjustable and the amount of water used is regulated at the intake by a gate. The greatly varying character of the material treated makes considerable latitude in these things necessary. These changing conditions require constant watching and experienced attention to insure success.

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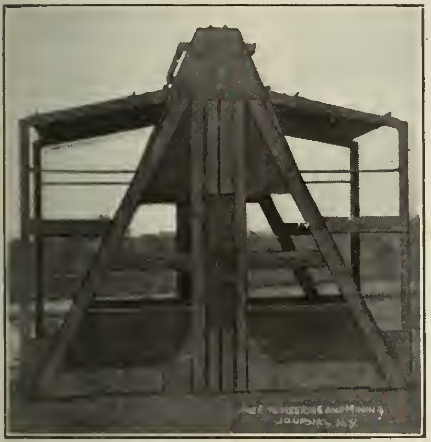
*Mining engineer, Sutter Creek, Cal

The smoke shown in the photograph is from a large pile of chips and other mill refuse that had accumulated and which was being burned at the time the photograph was taken. This is one of the sources of loss referred to in the beginning of this article, and had been going on for many years.

Cage Used in Marquette Range

The accompanying illustration shows the type of cage used in the Marquette range, Mich., for handling men and timbers in vertical shafts. The cage is about 5x10 ft. and constructed of angle and sheet iron.

The timber is loaded on trucks and run on the cage. This saves a large amount of labor in handling heavy timbers as the cars are run off this cage and taken direct to the place where the timber is to be used. For lengths over 9 ft. 6 in. the hood is raised and the timbers placed on end. The cage is provided with safety dogs, which are not shown in the illustration.



Cage for Lowering Men and Timber

Ratio of Stamps to Tube Mills In City Deep Mill

Though on the Rand only one tube mill is usually provided for 50 stamps, the new City Deep mill is to have a tube mill for each 25 stamps. These figures should be compared with the Waihi, of New Zealand, where it is intended to have a tube mill for each four stamps. The difference is of course largely due to the fact that the New Zealand idea is to slime the ore, while sand leaching is preferred in Africa.

Labor Wasting and Labor Saving

By S. A. Worcester *

The persistent use of such antiquated devices as hand-trammed cars and barrows, shovels, forks, scrapers, rakes and hand-feeding operations of various kinds in large plants operated with ample capital for many years after uptodate devices have been brought to the attention of the management, is difficult for the observing visitor to understand. The army of laborers necessary is always ready for a strike whenever the agitator appears, and the operation of the plant is therefore largely subject to the caprice of this element. Lack of intelligence is a most fruitful source of annoyance and of accident to the laborer and the plant.

I have in mind a corporation operating several different plants, one of which was partly modernized at least 15 years ago with complete success, the improvements repaying their cost in a few months. This concern is still operating the other two plants with antiquated back-number devices, employing large forces of unskilled men. If the modernized plant had been a failure, it is a safe assumption that the new features would have been promptly abandoned, but they are still in continuous operation with improving rather than retrograding results. Yet no steps are taken to modernize the other plants.

Antiquated Designs in Mills

The attitude of managers toward improvements finds, unfortunately, much support in the antiquated designs which are regularly being offered and erected by machinery builders and consulting engineers. An instance of this was the erection of several concentrating mills designed by engineers of recognized standing. In these mills the concentrates are shoveled and wheeled from the table boxes, and, after drying or draining, again shoveled and wheeled to box cars or wagons. One 100-ton mill, recently designed by a well known engineer, requires 5 men per day shift and 4 men per night shift; another mill doing exactly similar work, but using modern devices economically arranged, employs but 3 men per day shift and 2 men per night shift, with 150 tons capacity.

In the old-line mills referred to, one man per shift is usually employed as crusher feeder, whereas many well known plants eliminate this attendance most successfully by using either a simple automatic feeder or a crusher hopper large enough to receive the mine run. Such simple and practical devices as shaking launders, conveyers, etc., for moving concentrates, are in use in a number of mills and are familiar to every progressive designer, so that there is no justification for shoveling and wheeling.

Many cyanide plants employ one or more men per shift filling sand tanks by tramming a car from a sand bin to the tanks. Automatic appliances which would save their cost in a brief period of continuous operation were available for this work when these mills were built. Well designed excavator and conveyer systems for handling tailings and sands were proved successful a number of years ago, and the shovel and tram car are obsolete.

Many managers and some engineers contend that automatic machinery involves necessarily a large outlay, and is, therefore, prohibited except for permanent operations. While it is no doubt true that the probable life of the plant must determine the outlay within reasonable limits, yet there are many instances of labor-wasting plants which have cost more than completely automatic arrangements would have cost. Automatic devices are not necessarily cumbersome and complicated. Highly economical results can often be accomplished by simple and inexpensive apparatus, if the designer has the result fully in mind.

Mills are frequently designed so that a large sample has to be reduced or cut down daily by hand. A large sample is then taken to the assay office and recrushed and ground, the rejection being returned to the mill. In nearly all cases a laboratory crusher with proper automatic sampling apparatus can be so placed by the designer that the sample made in the mill is ready for grinding, and small enough for convenient handling, all rejections being returned by the automatic splitter to the mill. The work thus done is likely to be more accurate than hand work and the labor saved is well worth considering.

Waste of Labor in Mines

In mining operations the same disregard for economy of labor is evident. Nothing is more common than ore bins so designed that they can neither be filled to nearly the full capacity nor emptied entirely without using a shovel or scraper. Hoisting cages are still being frequently installed in metal-mine shafts, involving higher labor and power costs, greater first outlay and maintenance, greater dead weight and smaller capacity by far than the skip, which is an old and thoroughly proved appliance. In view of the present state of the art, nothing but ignorance, in most cases, can explain this blunder.

The employment of cages, with a number of laborers on each shift tramming small-capacity cars from cage to ore house or waste dump, is one of the most common labor- and power-wasting arrangements now in use. One skip-hoist-

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*Mechanical engineer, Victor, Colo.

ing plant of my design displaced four laborers per shift, a net saving of $24 per day, by replacing cages with skips dumping into a motor car which delivers the ore to the ore house. This car is operated by a motorman. At two other plants, where the motor car is at all times visible from the engine room, the car is operated by the engineer, using a controller placed at the hoist. At two plants, where circumstances favor such an arrangement, the skip empties its load into a chute leading direct to the ore house and having deflecting doors which direct the ore to any desired bin.

At smaller hoisting plants, using the bucket, there are now several different styles of automatic bucket dumpers in use, which in many cases save one man's labor per shift. These dumpers can be placed at the top of the headframe so as to dump the ore directly into the ore house, thereby saving the wages of a top trammer. In spite of the evident economy of these simple devices, mining operators are still frequently erecting labor wasters at actually a greater outlay than would be required for uptodate rigs. The ancient hook-and-ring arrangement for dumping buckets is still being frequently erected in places where the inexpensive automatic device would save one man's wages per shift.

One favorite argument advanced against placing the ore house close to the shaft, in order to save tramming, is that the headframe must usually be made higher for this arrangement. It is also a popular belief among hoisting engineers that the more nearly vertical rope pull of the headframe has an undesirable effect on the hoist. I am positive that a careful analysis of conditions will fully dispel this belief and show the nearly vertical pull to be preferable for various reasons. Mine operators seem to have an aversion toward headframes of any considerable hight, and when an extension can be no longer avoided it is made about half as much as it should be to give ample head room. As a rule it is far better economy to gain head room for ore-handling operations by a headframe of sufficient hight, rather than to tram a car from the shaft over a dump or trestle to a point where sufficient hight exists.

Bins and Ore Houses

An almost invariable mistake in the design of ore houses and bins is the practice of placing the grizzly or spout which delivers ore to the bin at so low a hight that the bin can be only partly filled when the rising ore chokes the spout or grizzly. Then no further filling can be done until the ore is shoveled away toward the sides and corners of the bin. The spout or grizzly must be so placed as to form a rock cone whose sides slope naturally from the top edges of the bin to the end of the spout, in order to fill the bin to its capacity without shoveling.

The moss-covered error of insufficient slope in bin bottoms and chutes still continues, and it is probable that fully 50 per cent. of all wooden bins built by small operators in the Rocky mountains today have bottoms so flat that they cannot be emptied without using the shovel. Horizontal bin bottoms are still being built occasionally, although careful consideration of the working of this bin will nearly always place it in deserved disfavor.

The practice of arranging bins from which ore is to be hauled by wagon, so that every pound of ore has to be shoveled into the wagon, is hardly defensible. Where the hauling is to be done by contractors and no lower price can be gained by using bin gates with ample hight for saving shoveling, there is still the advantage that the operator having a convenient arrangement is reasonably certain of better service than the concern which has to have its ore shoveled. Teamsters' unions sometimes limit the number of loads per day per man or team, but in case of any delay the mine having spouts and gates is more likely to get its full number of loads hauled than the concern without conveniences.

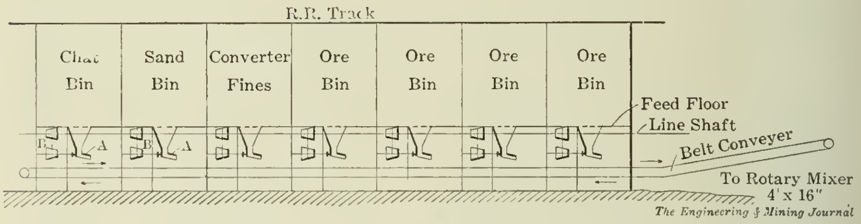
In many places ore bins for loading railroad cars are still erected with spouts so low that much scraping is necessary to empty the bins, and much shoveling necessary to trim the load. By proper attention to this matter when the design is under way, gondola cars can be loaded rapidly without the use of either shovel or scraper. By using portable diverting spouts, box cars can be loaded and the load nicely trimmed without any shoveling. For loading fine ore, slimes and concentrates into box cars, a short portable conveyer operated by a small motor will carry the ore from the bin spout to the ends of the car and trim the load without wheeling or shoveling.

If designing engineers will adopt as a cardinal principle the elimination, as completely as possible, of shoveling, wheeling, hand-tramming and all manual work, there will be materially less encouragement and support for works managers who persist in labor-wasting methods. If managers will exhibit, in the adaptation of modern appliances to their work, a minute fraction of the ingenuity and dogged persistence with which they at present defend and adhere to their evidently obsolete equipment, labor problems will be speedily solved and net profits will increase.

A Conveying and Mixing System

A combined conveying and mixing system has been installed recently by the St. Joseph Lead Company at Herculaneum, Mo., to handle lead concentrates preparatory to roasting. The lead concentrates, sand and limestone chats (tailings for fluxing) are delivered into the bin from railroad cars.

The floor of the bins is flat and all the material is shoveled by hand to the seven hoppers. One hopper is used for chats, one for sand, one for dust that has been returned from the converter room and four for lead concentrates. Each hopper is 4x4 ft. at the top. At the bottom of the hopper is a 6-in. screw feed *A*, which can be adjusted by means of conical belt drums *B* to feed fast or slow. This gives a continuous feed of chats, sand and ore, distributed evenly in thin bands on the belt. A still more intimate mixture is obtained as the material passes through the revolving mixer.



The Engineering & Mining Journal

Arrangement of Ore Bins, Feeders and Conveyers, St. Joseph Lead Company, Herculaneum, Mo.

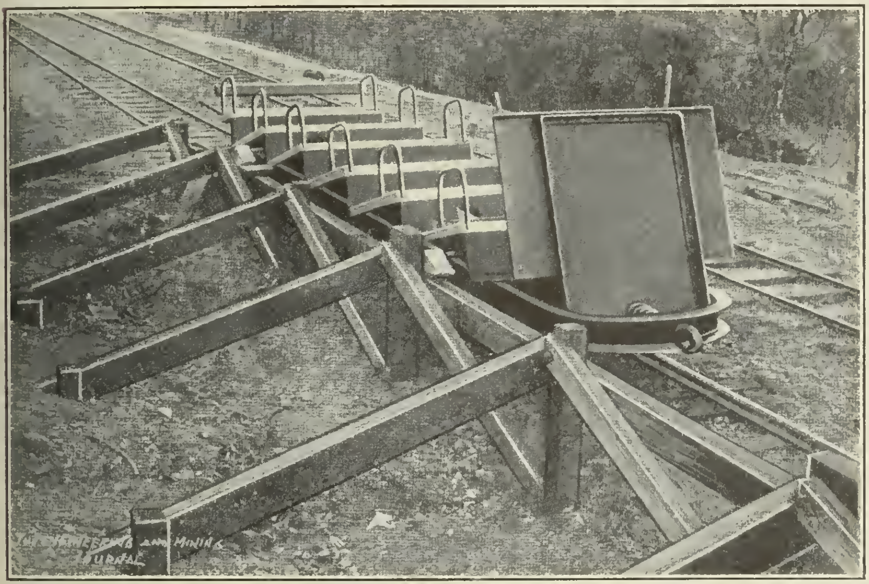
The accompanying illustration shows the arrangement of the belt and the automatic feeders. A Jeffrey belt conveyer is used. This belt passes underneath the ore bins and carries the material to a 4x6-ft. revolving mixer. From the mixer the feed is carried by a 12-in. screw conveyer to a Jeffrey bucket conveyer and elevator to a 300-ton storage bin. From this bin the ore is taken in cars of one-ton capacity to the roasting pots.

The conical drums for adjusting the speed of the feeders are 14 in. in diameter at one end, 16 in. at the other and about 3 ft. long. The belt from the driving-shaft drum to the drum driving the feeders can be slipped from one end of the drum to the other by means of an adjusting lever placed between the two. This device is similar to that used in shifting belts on tight and loose pulleys. The screw conveyers which act as the feeders are driven by beveled gears. The capacity of the conveying system is 30 to 40 tons per hour.

New Safety Cage at Mount Morgan

The completion of the Linda man and supply shaft at Mount Morgan has led to the necessity for an efficient safety gear for hoisting and lowering men. A cage and safety gear designed to suit the conditions in this shaft are described by the *Queensland Gov. Min. Journ.* It is expected that this gear will supply a want that has long been felt, as up to the present time no satisfactory safety gear is in successful operation in flat inclined shafts.

The cage is designed to seat 18 men, and, except for the pine seats, is constructed entirely of steel. The photograph shows the grips holding the cage in position on an incline. The safety catch and gear for operating the same present some novel features, and the use of the principle involved for this purpose and the method of employing same are believed to be original. Trials have been made on a specially prepared incline, and these have been entirely successful. The principle involved is the same as that controlling an ordinary centrifugal engine governor. The application of this principle to the closing of the ordinary toothed catches is accomplished by means of several mechanical devices, which are designed with the view to extreme sensitiveness.



Safety Man-truck at Mount Morgan, Showing Iron Guard. Dogs Shown at Side

The following are some of the claims put forward for this gear: (1) It is entirely dependent on the speed of winding, and will come into action when the speed has attained a predetermined limit from any cause whatever—e.g., breaking of rope, engine getting out of control of driver, and engine driver lowering at an excessive speed. (2) It can be adjusted exactly to come into action at the arranged limit of speed. (3) It is entirely independent of the engine driver. (4) It is arranged with hand control, so that it may be brought into action by a man riding on the cage, in case of emergency. (5) It is positive in action. In the trials, the cage has come to rest within a few inches of the calculated distance, after the rope had been cut.

Driving Spiling with a Stoping Drill

Harvey S. Brown, of Victor, Colo., suggests the use of any powerful machine drill of the air-feed, hammer type, for the purpose of driving spiling when drifting in running ground. The present system is to drive these up with a sledge, always with more or less splintering of the butts of the timbers, and usually at a slow speed. A driving shoe made to fit loosely over the butt of the spiling piece might be welded to a shank of cruciform steel of suitable length, and the machine supported against a temporary plank or prop. The scheme seems entirely feasible.

A Big Blast in Pennsylvania

One of the largest blasts ever fired in central Pennsylvania was set off in the C. C. Cumbler quarry, near Steelton. The rock from the Cumbler quarry is used by the Pennsylvania Steel Company for flux in its blast furnaces, and the stone broken by this single blast will be enough to last the company four months.

Thirteen holes, each 6 in. in diameter, were first drilled to the depth of 125 ft. This depth took the bottom of the holes below the level of the ground at the foot of the cliff. The holes were 25 ft. back from the face of the cliff, and were from 18 to 22 ft. apart, running 250 ft. along the brow of the bluff. In each of these holes were placed eighteen or nineteen 50-pound cases of the explosive, filling up the drill hole for 45 ft. Above this, all the way to the top of the hole, earth was tamped in hard.

It is estimated by *Stone* that 70,000 tons of rock were loosened by the blast. The rock was broken so small that practically no more powder will be required to reduce it to what is called "one man size."

Endless Rope Haulage, Premier Diamond Mine

At the Premier Diamond mine, according to H. G. Kay (*Journal* of the Chem., Met. and Min. Soc. of South Africa, Dec., 1909), endless rope haulage is used throughout the workings. The main haulage at No. 3 gear has three changes of grade, the steepest being 1 in 8, or 12½ per cent. The tracks are laid with 40-lb. rails set on wooden sleepers; width between up and down tracks is 6 ft. The rope is of plough steel, 1¼ in. diameter, traveling about 4½ miles per hour. The rate of hooking on this haulage is from 1000 to 1200 loads per hour, although over 26,000 loads have been hauled in a working day of 21 hours, and over 140,000 loads in one week. The length on incline is 3123 ft., and the vertical lift 239 ft.

The new incline at No. 4 gear on the same mine has two changes of grade, 1 in 8.9 (11.2 per cent), and 1 in 8 (12½ per cent.) respectively; the tracks are also laid with 40-lb. rails; the rope is 1¼ in. diameter plow steel, and travels at about the same rate and has the same capacity as the system at No. 3. The length of incline is 2425 ft., and the vertical lift, 270 feet.

Grinding Valve Seats of Piston Drills

Much trouble is frequently caused by worn valve seats in piston drills. In any odd corner of the machine shop a little device may be rigged up so as to give a reciprocating motion of 1½ or 2 in. to a piece of gray iron. This iron should be, say, 6 or 8 in. long, 5 in. broad, and 1 in. thick. The worn valve seat may be placed under the iron plate, a little oil and emery applied and the plate left to rub back and forth on the valve seat as long as is necessary with no attention other than an occasional adding of oil or emery. In this way the seat will always be kept true with practically no expense.

The Government Sues Anaconda

Asserting that the operation of the Washoe smeltery is destroying vegetation and timber, and injuring approximately 1000 square miles of counery in the counties of Jefferson, Silver Bow, Deer Lodge, Powell and Granite, suit was filed in the U. S. district court at Helena, March 16, on behalf of the United States against the Anaconda Copper Mining Company, for an injunction to close down the plant. Ligon Johnson, of New York and Washington, special assistant to the attorney-general, who is in charge of the case for the Government, said that it was the purpose to compel the company to install appliances which will render harmless the now noxious fumes.

The Department of Justice on March 16 issued the following statement on the suit begun against Anaconda:

"This suit was not filed until every possible friendly means for securing a change of smelter methods had been exhausted. Efforts to secure a cessation of the smelter injuries were under way some time before the close of President Roosevelt's administration and the company was then notified that suit would be brought unless definite action were taken to stop the wholesale destruction of the forests resulting from the distribution of sulphur and arsenic fumes over a wide area of country.

NUISANCE STOPPED ELSEWHERE

"Instead of attempting to remedy the situation the company represented to President Roosevelt that it could operate its plant in no other manner than that then in vogue, and that it was better for the Government to submit to the injury to its national forests than to close the smeltery.

"President Roosevelt ordered a full investigation and personally conducted the hearings of the matter. They were identical with those made in two other suits under which similar injuries were stopped, one case being by the United States against the Mountain Copper Company in California, and the other by the State of Georgia against the Ducktown, Tenn., companies.

"In each of these cases, the smelter companies declared that the smelters could not be operated in any manner different from that then in vogue and that any action by the court would mean the closing of the mines and smelters and the discharge of thousands of men.

"Injunctions were, however, granted in both these cases, but neither the smelters nor the mines were closed. Instead the companies spent the money necessary to convert the harmful fumes into a valuable product and many additional men were given work. It was, however, contended on behalf of the Montana smelters that they could not do as the California and Tennessee companies had done, convert their fumes into acid, because they were of a wholly different character from those of the Tennessee and California smelters.

PRESENT METHODS NEEDLESS

"A full investigation of this claim by leading experts has, however, satisfied the Government of the entire feasibility of converting at Anaconda the fumes into acid and that there are large phosphate deposits near Anaconda which can be used in connection with such acid in the manufacture of fertilizers of which the western soil is more in need than that of the South.

"Being, therefore, satisfied that the present methods of operating the smelters are not only destructive of natural forests but unnecessary, the attorney-general has caused the bill in equity to be filed and will press the suit vigorously for a decree, unless, as is hoped, the company will now voluntarily coöperate with the Government to bring about a termination of the existing conditions at the earliest possible moment."

Building for the Geological Survey

SPECIAL CORRESPONDENCE

Director George Otis Smith, of the Geological Survey, has presented to the House committee on public buildings an argument in favor of the construction of a new building for the Geological Survey and for sundry allied bureaus along the lines that were suggested in former years. In view of the fact that the Survey now has in its present inadequate and rented quarters, maps and other material of unpublished character (in addition to the plates, etc., from which published maps and other data have been printed) estimated to be worth almost $5,000,000, Mr. Smith urged that it was the part of wisdom to provide some safe place of deposit for the material thus in danger from fires. Reference was made to recent fires which have jeopardized the whole of this mass of data.

In speaking of the present quarters and their inadequacy Mr. Smith called attention to the fact that the rented building at present occupied by the Survey is overcrowded and unhealthful, while the necessary use of artificial light so hampers the transaction of public business as to cause a serious loss in efficiency of the public service. Geologists, topographers, chemists, physicists, photographers, draftsmen, engravers, lithographers and other specialists must have room for their instruments, specimens, maps, etc., and the degree of crowding to which the force is now subjected diminishes the quantity and quality of the work.

Because of the fact that somewhat similar conditions are found also in the General Land Office, the office of Indian Affairs and the Reclamation Service, the committee has been strongly urged by Director Smith to provide for one adequate building which would accommodate these three bureaus of the Interior Department and also the Geological Survey, and would afford not less than 435,000 sq.ft. of floor space, amply lighted and with suitable basement quarters for collections, printing presses and publications, as well as with floor space free from vibrations for the chemical and physical laboratories, the whole to be thoroughly fireproof. The estimated cost of such a building is $2,500,000. At the present time the Geological Survey (including its recent additions) is paying $37,400 and the Reclamation Service $8000 rental per year.

Copper Production

The following mining companies report monthly their production of blister copper (fine copper content). Their figures for the last three months are given.

Company.	December.	January.	February.
Arizona	2,600,000	2,646,000	2,658,000
Boleo (*a*)	3,037,939	2,644,800	2,331,832
Copper Queen	9,504,500	10,001,000	8,927,203
Calumet & Ariz.	2,275,000	2,331,000	2,024,000
Cananea	6,352,000	3,500,000	3,586,000
Detroit	1,498,000	2,166,156	1,486,400
Imperial	800,000	850,000	750,000
Nevada Cons.	5,700,000	3,800,000	5,000,000
Old Dominion	2,400,000	2,130,000	2,035,000
Shannon	1,498,000	1,510,696	1,526,000
Superior & Pitts.	2,030,000	2,166,000	1,864,000
	37,695,439	33,745,652	32,188,435
Butte (*b*)	16,867,800	22,867,800	13,758,620
Lake Superior (*b*)	19,920,458	19,260,127	....
Imports (*c*)	27,613,440	24,305,526	....
Imp. in ore (*d*)	6,378,911	7,053,522	....
	108,476,048	107,232,627	....

(*a*) This production does not come to American refiners.

(*b*) These figures are unofficial estimates of the mine production, and are to be accepted as only approximately correct.

(*c*) These figures, officially reported, duplicate the production of Cananea.

(*d*) These figures, officially reported, duplicate a part of the Copper Queen production, especially that originating at Nacozari.

Utah Copper Company

The disposition of the 2,500,000 Utah shares authorized at the recent special meeting of the shareholders, when the exchanges for Boston Consolidated and Nevada Consolidated have been completed, will be as follows:

		Shares.
Old stock		731,000
Exchanged for Boston Consolidated		310,000
Exchanged for 950,000 shares Nevada Consolidated		422,222
New subscription stock		73,000
Total outstanding		1,539,222
Treasury stock against unexchanged Nevada stock	166,666	
Unissued	191,112	
Total treasury stock		960,778
Total authorized		2,500,000

No plans have yet been announced for the disposition of the treasury stock.

J. J. Hill on Extravagance

The following sound and lucid remarks were made by James J. Hill at the Minnesota Conservation Convention at St. Paul, Minn., March 17:

"The immense increase of wealth all over the world has greatly augmented the supply of capital. The mobility of this capital, the ease by which through international exchanges it can be made to satisfy a need, now in one country and now in another, strengthens the impression that it is inexhaustible. The addition of uncounted billions to the aggregate wealth of the world has stimulated the spirit of mankind. Its availability has lulled to sleep natural prudence and quieted the alarm of moments of sanity in the spendthrift's life. The increase of apparent resources by an easy resort to borrowing, the mortgaging of a patrimony not our own to obtain material for present extravagance, the diversion of wealth from productive to unproductive uses—all these have gone further than most people realize. The people of the United States inherited from its founders a wholesome tradition against debt, which is only now disappearing from the conduct of national affairs."

"In our cities, modern extravagance finds its most untrammeled expression. The total debt of the States, including all minor civil divisions, increased $13,921.443, or 1.25 per cent., between 1880 and 1890. Between 1890 and 1902 it increased $727,778,393, or 64 per cent. Nearly three-quarters of a billion in 12 years, an average of $60,000,000 a year in the amount borrowed by the people, ought to make any country stop and think. Most of the actual material development is privately financed and carries its own bonded indebtedness, which the public finances cannot take into account. The figures down to 1910, outside of and in addition to the national debt, would probably show an increase of a billion and a quarter to a billion and a half dollars for the last 20 years, and a grand total of over two and a quarter billion dollars; about double what it was in 1890.

Increased Taxation

"Debt figures, however, do not begin to tell the story of our national extravagance. Only a small part of our expenditure is represented by debt tables. The rest is raised by increased taxation. I know of nothing bearing more directly or forcibly upon the subject of national waste, and the conservation of national resources than the profligacy disclosed by our public expense ledgers.

"The phenomenal increase of public expenditure has already produced a plentiful crop of public ills. It is one of the causes of the increase in prices now disturbing the people.

"Something is due to enormous currency inflation. The total per capita in the United States in 1896 was $21.41, and in 1909 it was $35.01. Although population had grown by many millions in these years, the amount of money to each individual had increased by $13.60, or more than 60 per cent. The increase in the total gold production of the world, which rose from $118,848,000 in 1890 to over $427,000,000 in 1908, has been made the basis for one form and another of credit issues aggregating a vast sum.

"The tariff is another contributing cause. It is true that it can furnish but a partial explanation. For to only a limited extent can the rise in food prices be affected by or traced to the tariff. As to commodities that we export, the tariff is inoperative. It generally affects prices directly as we become importers.

"Combinations which are actually in restraint of trade, which have monopolized their field, and are either controlled by a common secret management or a secret agreement to maintain exorbitant charges are partly responsible. Still more of the rise of prices is due to the decline of agricultural products as compared with the increase of population."

"When due allowance has been made for the effect of these forces that make for dearer living, there still remains a large unexplained balance," said Mr. Hill. "This must be credited to the lavish expenditure which has now grown to be a national trait.

Waste, Idleness and Rising Wages

"Waste, idleness, and rising wages, all interrelated to one another, now as cause and now as effect, are, next to an overissue of irredeemable paper, the three most powerful forces in the world to raise prices.

"Perhaps the greatest factor of all in the price problem is the wage rate. Everybody knows that labor cost is the principal item in all forms of industry. The wage rate has been rising steadily in this country. Powerful forces are back of this movement. It has public sympathy. To restrict it is difficult and may be dangerous. As cost of production is chiefly labor cost, the price of the finished article must go up if the price of labor is raised. This is just as true of the farm as of the factory.

"The effect of national waste of capital is felt immediately in the added weight of taxation. The taxes collected annually from the railroads of the country have increased more than 200 per cent. since 1889. They increased by 40 million dollars and by more than $100 per mile of track between 1900 and 1908.

"The modern theory that you can safely tax the wealthy is just as obnoxious as the medieval theory that you can safely oppress or kill the poor. It is obnoxious, not because wealth deserves special consideration, but because capital is the mainspring of all industry and material development, and, after you have devoted so much of it to the unproductive purposes that the State represents when it transcends its primary function as keeper of the peace and administrator of justice, there will be just so much less left to pay out in wages and devote to the creation of other wealth.

Economy the Cure

"The saving feature of our situation is that it is not complex, and that the remedy is not obscure. The ideal of the intelligent economy must be restored. Let the rule be that every dollar unprofitably spent marks a crime against posterity, just as much as does the dissipation of material resources. Expenditure must be cut down all along the line.

"Credit everywhere should be conserved by a sharp scrutiny of new bond issues. The nation should reserve them for the crisis of war."

Granby Consolidated Statement

In connection with the sharp decline in the price of its stock, which opened on March 23 at $80 and dropped abruptly to $65, closing at $67, the Granby Consolidated Mining, Smelting and Power Company, Ltd., operating copper mines in the Boundary district of British Columbia, has issued the following statement:

"Incidental to the retirement of A. B. W. Hodges as superintendent, taking effect March 15, the president, Mr. Langeloth, accompanied by George Crawford Clark, Jr., one of the directors, visited the company's properties, where they had been preceded by Dr. Otto Sussman, mining engineer.

"A full report of this visit is now in course of preparation, and as soon as completed, will be presented to the directors at a meeting to be held early in April, whereupon the stockholders will be fully advised of all matters affecting their interests. In advance of the completion of this report, it may be said that it will be disappointing as to the tonnage of ore available for stoping, which will probably not exceed 6,000,000 tons."

Tungsten Production in the United States

According to statistics collected for "The Mineral Industry," the production of tungsten-ore concentrates in the United States in 1909 was larger than in any previous year, amounting to 1607 short tons, valued at $559,500. The producing States in order of their importance were Colorado, California and Arizona. Of the total output, Colorado (Boulder county) produced 1100 tons. In 1908 the total domestic production was 497 tons valued at $126,281.

Pittsburg Coal Company

This company owns and leases a large area of coal lands in the Pittsburg district in Pennsylvania and in Ohio. It controls also several important coal companies by ownership of stock, chief among them being the Monongahela River Consolidated Coal and Coke Company. The report for the year ended Dec. 31, 1909, shows $32,000,000 preferred and $32,000,000 common stock; $23,402,060 funded debt. The company holds $3,895,400 common and $4,928,200 preferred stock in its treasury. The bonded debt was decreased by $422,933 during the year.

The acreage of coal land controlled at the close of 1909 was as follows:

	Pitts. District.	Hocking District.	Total.
Owned	185,196	8,113	193,309
Leased........	22,611	1,736	24,347
Total........	207,807	9,849	217,656

This shows a decrease of 17,342 acres during the year, 2038 acres being worked out and 15,304 acres lost by sale or exchange, chiefly through the termination of the lease of the Pittsburg Terminal Railroad and Coal Company. The coal statement for the year is as follows, in short tons:

	1908.	1909.	Changes.
Pittsburg district.	13,217,545	14,560,231	I.1,342,686
Hocking district...	1,064,586	1,005,437	D. 59,149
Total coal........	14,282,131	15,565,668	I.1,283,537
Coke made........	55,099	484,903	I. 429,804

The total coal mined shows an increase of 9 per cent. over 1908; but as compared with 1907 there was a decrease of 3,787,826 tons, or 19.6 per cent.

The income statement for two years is as follows; earnings being the net receipts after deducting working expenses, rentals and charges of subsidiary companies:

	1908.	1909.	Changes.
Net earnings....	$3,024,921	$3,448,395	I. $423,474
Depreciation of coal lands......	$ 564,062	$ 697,968	I. $133,906
Dep. plant and equipment.....	952,346	927,870	D. 24,476
Interest on bonds	1,042,797	1,012,458	D. 30,339
Total charges..	$2,559,205	$2,638,296	I. $ 79,091
Surplus........	$ 465,716	$ 810,099	I. $344,383

Adding the amount brought forward from previous year, the total surplus as of Dec. 31, 1909 was $7,831,333. Since the close of the year a dividend of 1¼ per cent. on the preferred stock, amounting to $338,398, has been paid. The last previous dividend paid was in April, 1905. As dividends are cumulative, there was due on March 1, 1910, a total of 33¼ per cent. on preferred stock.

The president's report says, in substance, that although an improvement in demand increased the output, the gain in net earnings was not secured through any improvement in coal selling value, which fell below the low average of 1908. The increase came partly from an increase in the output and selling value of coke but chiefly from a decrease in coal production cost.

The working capital as of Dec. 31, 1909, was $4,570,493, or an increase of $1,214,932, in which, however, is included the unexpended balance realized from the sale of the bonds of the Pittsburg Coal-Dock and Wharf Company, of $567,925. The remaining net balance, deducting this amount, would be the true working capital, or $4,002,568; this is the largest free working balance that the company has had.

The lease of the Pittsburg Terminal Railroad and Coal Company was terminated June 1, 1909, by mutual agreement. The Pittsburg Coal Dock and Wharf Company has been organized to build docks at Duluth, Minn., and has issued $1,000,000 bonds, guaranteed by the Pittsburg Coal Company.

Of the $927,870 charged to operating expenses for the year and credited to depreciation fund, $287,248 has been expended in additions and renewals; there has also been charged against this fund during the year $341,928 in revaluation of equipments, chiefly of railroad cars, leaving a net increase in fund for year of $298,694, and a net accumulation of $1,334,977 since the 1906 revaluation.

The outlook is encouraging as to tonnage. While the selling value of coal will continue to be influenced by the competition from other fields, based upon relative quality, a better average realization is expected; but the earning power of the business will never be what it should until the Pittsburg district is put on an equal basis with the competitive districts as to wages and railroad freight rates.

A New Gusher in the Midway Field in California

Special Correspondence

The oil well of the Mays Oil Company on "wildcat" ground in the Midway field in the San Joaquin valley, for a short period made a gush of 50,000 bbl. per day finally coming down to an average of 12,000 bbl. This at first eclipsed both the Hartnell and the Silver Tip gushers, the former of which flowed at the rate of 24,000 bbl. daily and the latter 21,000 bbl. At the Mays the force of the flow brought into the casing large stones and gravel and finally the hole was choked entirely, or "sanded up," giving a chance to build pipe lines and reservoirs to care for the flow when again started. The Mays is a mile west of other producing wells in the field, in a locality where it was predicted no oil could be found, so this is a triumph for "wildcatters." In the Coalinga field the Coalinga-Mohawk Company has brought in a 4000-bbl. well outside the "proven" territory and where geologists and oil experts did not expect oil could be found. These two examples of finding wells in "outside" territory are encouraging speculation and prospecting as they bring into the market what has been considered by experts as barren territory. The company has lease of 40 acres on royalty from Pioneer Midway Company, which now values its whole property at $5,000,000. The Mays lease could hardly be purchased now at any price as it has big value in formerly unproven part of field, which it did not have before. In same field this week Union Oil Company struck a new gusher yielding 35,000 bbl. the first 10 hours and since has flowed 1000 bbl. hourly. The Midway field is the most productive in the State. The Standard Oil Company has contracts there to purchase 40,000,000 barrels.

Notwithstanding all the criticisms made against the companies which are "wildcatting" or otherwise working on territory which has as yet not proved its value in oil, and the threats of proceedings against them by certain State officials, many of these companies seem to be performing legitimate functions in opening either new fields, or new portions of old fields, in their operations. This is shown to be true in the instances mentioned above as well as in many others.

In the Maricopa district the Standard No. 2 well which started in February at the rate of 800 bbl. daily, has been increasing the product until it has come up to 10,000 bbl. It is to be noted that a number of Alaska gold miners have of late been investing in the oilfields of California and have started new enterprises.

The Raymond Testimonial

A testimonial dinner to Dr. Rossiter W. Raymond, in honor of his seventieth birthday, will be given at the Plaza hotel, New York, on the evening of April 30, 1910, to permit his friends to present their congratulations and to express their appreciation of his many years of labor in the various fields of activity in which he has so signally distinguished himself.

It is intended that the participation in this dinner shall not be confined solely to the members of engineering societies to which Doctor Raymond belongs, but shall include all his personal friends as well, and, with the view of making the occasion more sociable, ladies also will be cordially welcomed.

The arrangements are in charge of a committee, of which E. Gybbon Spilsbury is chairman; D. M. Riordan, treasurer; Joseph Struthers, 29 West Thirty-ninth street, New York, secretary.

Only 205 tons of chrome ore were produced in the United States in 1909. The entire amount was mined in California and was valued at approximately $20 per ton. In 1908, the production was 200 tons.

The Pahang Consolidated

From the tin mines of the Pahang Conolidated, situated in the Malay peninsula, 3,856 tons were crushed and treated durng the year ended July 31, 1909, from hich 893 tons of black tin were prouced. In addition to this, 26 tons of aluvial tin were also obtained, making a otal output of 919 tons of a value of 79,576. The net result was a small prot which was converted into a loss by inerest charges on towns and overdraft.

During the year the affairs of this comany were brought prominently before e public. At the last general meeting eld at the close of 1908 a favorable reort on the prospects of the mine had een presented, and in consequence of e satisfactory developments underround additional stamping machinery ad been ordered. Up to July everything ppeared to be going well, when suddenly e acting manager cabled that the ore eserves were not there and that it was esirable to stop the machinery on order. his unwelcome news brought the shares own from 30s. to about 6s. An inquiry as been held and the report of the acting anager confirmed. It is estimated now at the present ore developed will supply e mill for nine to twelve months. A igorous scheme of development, which is cost £70,000, has been advised. Beore embarking on this expenditure the irectors have decided to obtain another eport, and William Frecheville, of Lonon, has been commissioned to make the xamination.

In the acting superintendent's report n explanation is given as to how the ver estimation of the ore reserves ocurred. The lode is described as an imregnation from a central line of weakess, the major portion of the valuable etal occurring in the immediate neighorhood of this line. The slate is highly isturbed, and in places certain zones ave been fissured along the original edding planes, such fissures extending or considerable distances into the couny both north and south of the central ne of weakness. These fissures along e bedding planes, which are at right ngles to the dip of the lode, have been lled with lode matter, and in many cases orm solid stringers of tin oxide.

In the crosscuts along the levels the tringers have been followed as much as 0 ft. indicating wide stopes. By an unortunate coincidence these local bulges f the lode occurred at the levels, and hen stoping took place it was found that e ore did not extend for the width inicated. This is the explanation given of e overestimation of the ore reserves. he manager, who arrived home shortly fter the receipt of the cable, admitted at, having regard to the irregular nature f the oredeposit, his methods of calcuating the reserves were faulty. Want of judgment appears to have been the sole cause of this regrettable occurrence.

Colorado Production in 1909

The mineral production of the State of Colorado for the year ended Dec. 31, 1909, is reported by T. J. Dalzell, commissioner of mines, as shown in the accompanying table. In addition to this, Boulder county produced 1100 tons of tungsten concentrates.

MINERAL PRODUCTION OF COLORADO IN 1909.

County.	Gold. Ounces.	Silver. Ounces.	Lead. Pounds.	Copper. Pounds.
Boulder	7,829.636	49,362.50	412,538	11,499
Chaffee	1,464.559	34,617.68	531,808	560,579
Clear Creek	23,423.435	457,671.50	2,990,034	237,762
Custer	617.296	14,594.95	41,718	577
Dolores	1,127.951	107,381.41	463,360	30,449
Eagle	2,642.587	123,875.51	147,770	221,169
Fremont	23.757	313.27	6,906	926
Gilpin	45,708.737	214,084.64	663,337	499.560
Grand	45.620	3,596.77	....	....
Gunnison	5,218.039	30,454.66	419,723	4,762
Hinsdale	264.184	73,825.88	100,692	544,663
Lake	67,465.398	3,340,589.84	14,122,282	5,031,576
La Plata	6,160.845	74,871.70	2,980	392
Mineral	5,440.185	911,222.47	9,052,061	14,346
Ouray	145,686.412	341,904.90	2,708,369	805,608
Park	26,889.970	101,900.42	2,234,181	49,646
Pitkin	64.328	653,237.06	12,630,028	21,708
Rio Grande	....	654.35	245	....
Routt	90.284	20.81	....	....
Saguache	12.586	2,864.71	102,226	3,226
San Juan	34,076.241	848,669.42	9,841,112	1,566,524
San Miguel	112,222.111	1,361,966.54	4,909,422	178,437
Summit	20,461.175	97,160.85	3,303,134	3,833
Teller	554,727.943	63,203.70	36,720	668
Total	1,061,663.279	8,908,045.54	64,720,646	10,087,950

South Crofty, Cornwall

SPECIAL CORRESPONDENCE

Cornish mining as a whole has been passing through evil times of late years, and it is therefore pleasant to be able to record a satisfactory year's working for South Crofty, which has recently come under new management. The profits earned have admitted of a dividend of 15 per cent. being paid, an event which had last taken place about 30 years ago. The mine has been reëquipped and a modern 60-stamp mill has been erected. The water has been drained to the 225-fathom level, which is not, however, the bottom of the old workings.

During 1909 59,327 tons of ore were treated, yielding tin, wolfram and arsenic to the value of £72,893 the principal mineral being tin. The yield per ton was 26.28 lb. tin oxide, 5.38 lb. wolfram and 25.16 white arsenic, having an aggregate value of 24.6s. ($5.98) per ton, the mine costs being 19.4s. ($4.71) per ton. Both the grade and the costs show improved figures over those of the preceding year.

Much attention has been paid to the separation of by-products; indeed, if it were not for the marketing of wolfram and arsenic there would have been no profit. The development of the mine is reported to be satisfactory, and, unless there is a great break in the price of tin and wolfram, another prosperous year seems assured. Now that the profit-earning stage has been reached, it seems a pity that the directors have not placed a considerable sum to reserve instead of distributing the profits almost up to the limit. It has been the sad experience of many a Cornish mine to come to grief for want of capital to tide over lean years or to meet some extraordinary demand such as might be caused by an accident.

Name and Signature

One would imagine, says the London *Globe*, that people who are in the habit of writing letters would not be long in realizing that the word which ought to be the most legible is the signature, names being proper nouns which one cannot reconstruct by induction. When one has to write for printers or the press one quickly learns the habit of writing all proper nouns so legibly that there is no excuse for making a mistake.

M. Emile Faguet, of the French Academy, relates of one of his wise old professors whom the undergrads nicknamed "Soleil" that when the students had to pass a written examination he used always to say to them gravely:

"Sign your name at the bottom of your paper, and put your name alongside your signature."

The old man had learned by experience that a signature—at least that of a Frenchman—is not a name, but a zigzag.

The Bethlehem Steel Company has completed arrangements with a German company to build a large by-product coke plant at South Bethlehem, Penn., near the Saucon steel works of the company. The coke company will begin work soon and agrees to supply coke within two years. The plans call for 450 by-product ovens, having a daily capacity of 3000 tons.

Litigation over Siemens Zinc Distillation Furnace

There has been litigation of several years duration between Charles F. Neureuther, of the Illinois Zinc Company, and the Mineral Point Zinc Company, over alleged infringement of Neureuther's patent on a zinc distillation furnace by the use of a similar furnace in the works of the Mineral Point Zinc Company, at Depue, Ill. A decision was recently made by the United States Circuit Court of Appeals for the Seventh Circuit, in which case Neureuther appeared as appellant. The following excerpts from the opinion of the court, delivered by Judge Seaman, are of much historical and technical interest:

The Three Port Feature

The patent in suit No. 666,390, was issued to the appellant Jan. 22, 1901, for an "improvement in regenerative retort-heating furnaces," having special reference to zinc-smelting furnaces. In the light of the prior art, including the conceded facts of regenerative zinc-smelting furnaces in prior use for many years, the test of patentable novelty in the appellant's device rests on a single feature—disclosing a "three-port" form of such furnace, as distinguished from the "one-port" and "two-port" forms in prior use, with no serious complications of fact involved in the inquiry.

The patentee, Neureuther, is superintendent of the furnace department of the Illinois Zinc Company, at Peru, and has been such superintendent since 1869. In his plant Belgian furnaces were originally installed, but in 1877 he introduced a Siemens furnace, later installing two others of like one-port type, operated conjointly with their Belgians, each having three horizontal rows of retorts in each compartment, heated by the combustion of air and gas admitted through the single rows of ports. These one-port furnaces are referred to in the record as furnaces Nos. 1, 2 and 3. In 1892, they installed an additional Siemens type of furnace, provided with two horizontal rows of ports opening into each compartment (the upper ports half the size of the lower), and four rows of retorts, instead of three (referred to as two-port furnace No. 4) and in 1903, a duplicate thereof was installed, called No. 5. Two of the one-port furnaces (2 and 3) were changed to two-port furnaces in 1894, and No. 1 was so changed in 1897, in each instance making four rows of retorts and two rows of ports on each side, increasing the number of retorts from 144 to 192. Thus five two-port furnaces were in operation (with the first one in use about seven years), when a sixth furnace was added in 1899, provided with a third row of ports and a fifth row of retorts (No. 6) which was a structure described in the present patent, for which Neureuther's application was filed Aug. 1, 1900; and in reference to such structure, it may well be remarked, that no deviation appears from the prior two-port form, except the additional rows of retorts and ports, of like size and form with the upper rows of the two-port furnace, together with raising the arch sufficiently for their accommodation. During 1900 and 1901, the five two-port furnaces were changed over by raising the arch and adding the fifth row of retorts and third row of ports conforming to No. 6; and in 1903 a seventh three-port furnace was built, called No. 7.

Economy of Fuel and Space

Through the above recited evolution of furnace building and trial, in the plant of the Illinois Zinc Company, Neureuther achieved superior results in the three-port form of furnace, as an improvement both on the original Siemens device and on his own two-port furnaces, after the latter had continued in practical operation for about seven years. The outcome of his efforts was an improved zinc-smelting furnace of the Siemens type, and its superiority over other forms of furnace, at least in economy of fuel and space, appears from the testimony. Were the new and useful qualities of the three-port furnace, therefore, the test of patentability, no difficulty would appear in upholding the patent; but invention is the test which must be applied and for solution of that inquiry under the facts stated, we believe one rule to be well settled and applicable, namely: That "a mere carrying forward or new or more extended application of the original thought, a change only in form, proportions or degree, the substitution of equivalents, doing substantially the same thing in the same way by substantially the same means with better results, is not such invention as will sustain a patent." Smith v. Nichols, 21 Wall. 112, 119; 8 Notes U. S. Rep. 389; Wilce v. Bush Temple of Music Co., 134 Fed. 389, 391; 67 C. C. A. 371.

The disclosure of invention in this patent, beyond that of the Siemens patent, is stated in the appellant's brief to reside in the following statement of the specifications: "flues extending upwardly within such division wall and opening at different hights into the combustion chamber, one set into one compartment and the other set into the other compartment thereof, so that the gases and flame will enter the combustion chamber at the base of one compartment and at different points above the base within the mass of retorts." And the contention is, in substance, that the heat was thus evenly distributed and utilized, greatly improving distillation in the retorts, and saving the overheating and breaking down of retorts under the prior methods.

Multiple Port Idea No Longer Patentable

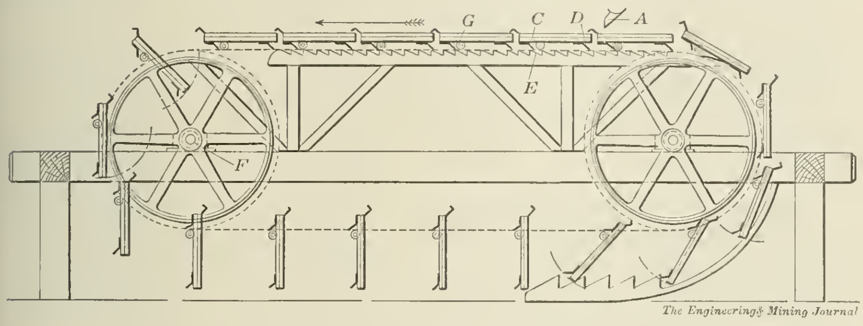
While it satisfactorily appears, as we believe, that the one-port arrangement of the Siemens patent was insufficient for this desirable even distribution of the heat, and that additional ports, with additional hight for the retort-heating chambers, tend to better distribuion, we are of opinion that the problem thus presented was solved, except it may be in degree, by the two-port furnaces, which were installed and constantly used in the plant for a period of seven years prior to the patent device. If these changes of structure to that end amount to invention, in the light of numerous patents introduced showing like provision in other types of furnace, it became vested in the public through such use, and the above stated rule governs alike whether the prior conception rests in the Siemens patent or in such public use. Smith v. Nichols, *ante*.

The only departure from the Siemens patent in either of these new forms of furnace introduced by the appellant, as before stated, is in the combustion chamber, making additional ports and retorts, with corresponding increase in the hight of the chamber; and both departed alike, except in degree. The testimony in reference to the practical operation of the two-port and three-port furnaces respectively, is convincing that both were substantial improvements over the primary device, and that the three port is the superior form. It is not convincing, however, that the two-port furnaces were impracticable for the improvement sought, in better distribution of heat, nor that they failed to disclose the means to that end. The facts in evidence, showing both their length of actual service and efficiency, and their retention in service long after the three-port furnace had demonstrated its value, are more persuasive upon that issue than the oral criticisms which are now offered as to their defects, unsupported by other evidence. They clearly anticipate the above stated claim of invention in the three-port device, and the multiple-port conception therein (1892) having become public property, was not patentable subject matter in 1900, when the application was filed for a patent. The alleged improvement then made, was the expedient of the mechanic, carrying out the original conception as exemplified by the testimony of appellant's construction engineer; that the change was made "simply to run the furnace more economically, that is to get more retorts on the same ground, the same space." It provided 720 retorts in No. 6 and 800 in No. 7, whereas, each of the first three two-port furnaces had only 384 retorts.

We are of opinion, therefore, that the grant of a patent was unauthorized, and the decree accordingly is affirmed.

Screening Device

A device for screening, sizing and classifying granular materials such as ore and sand was patented Oct. 5, 1909, (U. S. Pat. 936,162 assigned to the Calera Mining Company) by Charles A. Pringle, Chihuahua, Mexico. The material to be treated is supported on traveling screen trays which are vibrated to thoroughly agitate the material and facilitate its passage through screens.



The Engineering & Mining Journal

Horizontal Moving Screen

A longitudinal section of Mr. Pringle's apparatus is shown in the accompanying illustration. Spout *A* feeds the trays, which travel on a pair of link belts or chains over sprocket wheels. The trays practically form a continuous conveyer and are pivoted to permit an independent tilting movement at certain points of their travel. On the under side of each, adjacent to the forward and rear edges, are a pair of bumpers *C* and *D* which coöperate alternately with the teeth of the racks *E*, the bumpers dropping suddenly into the recesses of the teeth, thus producing rocking movements of the tray about the shaft *G* as an axis. When the trays have passed over the wheel *F* they swing into an upright position, dumping off the unscreened material. As they travel along the under side of the apparatus the lower edges encounter a rack with ratchet teeth. The trays passing over the teeth will receive a succession of jars or bumps to dislodge any material from the trays.

A company has been formed in Vienna to work the extensive tin deposits discovered below the old workings in the communities of Frühbuss, Sauersack, Neuhaus, and Hirschenstand.

A Precision Slide Rule*

By A. N. Lurie.

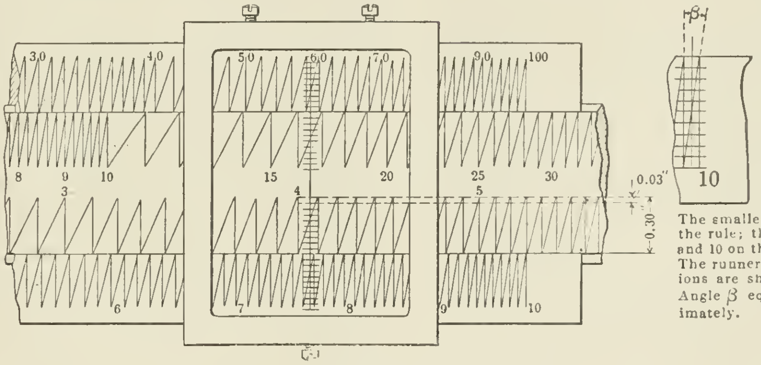
The Mannheim slide rule, as arranged fifty or sixty years ago by Colonel Mannheim of the Austrian Engineer corps, has served the engineer and scientist for half a century, as a valuable instrument.

The engineer in general understands that without going to any great pains the error in any reading can be kept as low as 1 per cent., that is, the first doubtful figure, varying by one, plus or minus, is the third significant digit.

With the idea in mind of increasing the accuracy of the slide rule, and at the same time of avoiding an involved instrument, I stumbled upon a device which I believe will make a more accurate and desirable tool. The accompanying drawing shows a full size layout of the middle portion of the scales. The fundamental principle is not a new one by any means. In this slide rule, it consists substantially of lengthening the graduations several hundred per cent., without increasing the length of the rule. A perpendicular to the longitudinal center line is erected at each major division, a major division being, for example, the distance between 5.1 and 5.2. A series of perpendiculars, all of the same length, is formed and lines are drawn from that extremity of each perpendicular farthest from the slide to the foot of the next one. These lines, the hypotenuses of a series of right triangles whose bases are the logarithmic divisions, and whose altitudes a given distance, now become the scale proper. Horizontal graduations on the runner-glass, which are intersected at right angles by the hair line, divide the perpendiculars, and, of course, at the same time the hypotenuses, into ten equal divisions.

In the rule herein the distance between indices is 25 cm., known commercially as the "ten-inch rule," the increase in scale length in *C* and *D* or lower scales will be a little over 200 per cent., while in the upper, or *A* and *B* scales it will probably reach as much as 300 per cent. or more. The length of the perpendiculars is 0.3 in., making each division on the runner glass 0.03 in. or about 1/32. This makes the rule easy to read. The smallest angle which occurs between the hair line and any hypotenuse is that on the *C* and *D* scales, between the divisions 9.9 and 10. This angle is 9 deg. The runner glass is very thin and close to the scales, so as to avoid parallax as much as possible. It is adjusted by four small set screws, two above and two below. The operation of this rule and the Mannheim are identical.

The accuracy is increased from one in a hundred to one in a thousand. This instrument is easier to construct than the Mannheim, as it reduces the number of lines in the scale from 1284 to 820, or a reduction of nearly 36 per cent. It is a simpler and at the same time more accurate instrument.



The smallest division on the rule; that between 9.9 and 10 on the D scale. The runner-line and divisions are shown. Angle β equals 9° approximately.

A Precision Slide Rule

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*Condensed from *The Technograph*.

Iron Ore in Alabama

Since 1894 Alabama has held third place among the iron-mining States and in 1909 produced more than 4,000,000 long tons of ore, according to the *Press Bulletin* of the U. S. Geological Survey. Of this total product the Birmingham district produced over 3,000,000 tons. Practically all this ore is made into pig iron in the Birmingham district, in which there are 29 coke furnaces. The ores, broadly considered, are of two kinds—red or Clinton ore and brown ore. Seven-eighths of the ore mined in the district is red ore. It is estimated that 500,000,000 tons of the red ore is available for mining by present methods—a supply that will last more than a hundred years.

The United States Steel Corporation in 1909

Capital Liabilities; $1,478,350.000, Gross Receipts Were $653,200,000.
Products Included 9,860,000 Tons Finished Steel, Besides Crude Iron

REPORT OF OPERATIONS

The report of the United States Steel Corporation for the year 1909 shows a large increase in earnings over 1908, though the total was not equal to that of 1907. The report covers, as concisely as could be expected, the vast and varied transactions of the company, and lacks completeness only at one or two points.

At the close of the year the corporation owned 143 separate manufacturing plants, several of them of great size. Its iron-ore properties included 42 developed mines in the Lake Superior region and 21 in Alabama. Its coal holding covered 180,572 acres in Pennsylvania, West Virginia, Indiana and Illinois, with 98 operating mines; and 335,336 acres, with 24 open mines, in Alabama. In Pennsylvania, West Virginia and Illinois, it had 75 coke plants, with 23,084 beehive and 612 by-product ovens; in Alabama 7 coking plants with 2974 beehive ovens.

Capital Account

A very condensed statement of the balance sheet as of Dec. 31, 1909, is as follows:

Stocks	$869,202,602
Bonded debt	609,147,905
Current liabilities	61,144,726
Sinking and reserve funds	114,735,986
Appropriations unexpended	16,379,808
Undivided surplus	151,354,528
Total liabilities	$1,821,965,555
Property accounts	$1,502,445,244
Sinking and reserve funds	21,738,953
Deferred charges to operation	6,763,191
Current assets	291,018,167
Total assets	$1,821,965,555

Stocks include $508,302,500 common, $360,281,100 preferred and $619,002 stocks of subsidary companies not owned. Bonded debt includes $470,260,500 Steel Corporation bonds, $136,123,619 bonds of subsidiary companies and $2,763,786 mortgages. The bonded debt was increased by $11,754,715 during the year.

Earnings and Income

The total receipts during the year, with the charges which precede net earnings are stated as follows:

Gross sales and earnings	$646,382,251
Miscellaneous income	6,817,999
Total receipts	$653,200,250
Working expenses and repairs	$483,417,842
General expenses, taxes, etc	27,786,420
Subsidiary companies obligations	7,887,178
Profits subsidiary companies not realized	2,617,396
Total deductions	$521,708,836
Net earnings	$131,491,414

The gross sales and earnings exceeded those for 1908 by $164,074,411, or 34 per cent.; but they were less than those reported for 1907 by $110,632,516, or 14.6 per cent.

The income acount for the year may be stated as follows:

Net earnings, as above	$131,491,414
Premium on bonds sold, etc	548,445
Total net	$132,039,859
Sinking funds, subsidiary companies	$1,724,260
Depreciation funds, etc	5,884,367
Extraordinary replacement funds	16,109,687
Interest on U. S. Steel bonds	23,617,293
Sinking fund U. S. Steel bonds	5,630,557
Total charges	$52,966,164
Net surplus	$79,073,695
Dividends paid	$45,551,777
Additional property	10,000,000
Gary plant	5,000,000
Reserve fund, mining royalties	3,200,000
Total appropriations	$63,751,777
Undivided surplus	$15,321,918

Dividends paid were $25,219,677, or 7 per cent., on preferred stock, and $20,332,100, or 4 per cent., on common stock. The total undivided surplus on Dec. 31 was $151,354,528, this representing the working capital of the company. As compared with 1908, the net earnings increased $39,643,703; the net surplus, $33,324,982. Dividends on common stock increased $10,166,050, and appropriations for new property $18,200,000, none having been made in 1908. There was an increase of $4,978,932 in undivided surplus. Expenditures for ordinary maintenance and repairs were $34,002,389; for extraordinary replacements, $8,514,716; total, $42,517,105. These were divided as follows: $28,108,271 on manufacturing properties; $2,743,600 on coal properties; $944,079 on iron ore properties; $10,473,786 on transportation properties; $247,369 miscellaneous. The unexpended balances to credit of replacement and improvement were $53,828,284 at the close of the year.

The total appropriations made for the new plant at Gary have been $55,000,000 of which $48,620,192 had been expended at the end of the year.

The total inventory valuations on Dec. 31 were $163,811,280, including raw and finished materials of all kinds in hand.

Production

The production statement for 1908 and 1909 is given in the accompanying table, all figures being in long tons, except cement, which is given in barrels:

The figures given do not make it possible to work out the cost of finished products.

PRODUCTION OF THE UNITED STATES STEEL CORPORATION.

Products.	1908.	1909.
Iron Ore Mined		
In Lake Superior Region		
Marquette range	830,087	899,002
Menominee range	1,021,598	1,359,415
Gogebic range	1,078,025	1,312,701
Vermillion range	927,206	1,066,474
Mesaba range	11,272,397	16,968,592
In Southern Region		
Tennessee Co.'s mines	1,533,402	1,824,863
Total	16,662,715	23,431,047
Coke Manufactured		
Bee-hive ovens	7,591,062	11,896,211
By-product ovens	578,869	1,693,901
Total coke	8,169,931	13,590,112
Coal Mined, not including that used in making coke	3,008,810	3,089,021
Limestone Quarried	2,186,007	3,496,071
Blast Furnace Production		
Pig iron	6,810,831	11,436,570
Spiegel	74,716	80,942
Ferro-manganese and silicon	48,861	100,838
Total pig	6,934,408	11,618,350
Steel Ingot Production		
Bessemer	4,055,275	5,846,300
Open-hearth	3,783,438	7,508,889
Total steel	7,838,713	13,355,189
Rolled and Other Finished Steel Products for Sale		
Steel rails	1,050,389	1,719,486
Blooms, billets, slabs, sheet and tinplate bars	551,106	675,614
Plates	312,470	729,790
Heavy structural shapes	313,733	658,516
Merchant steel, bars, hoops, bands, skelp, etc	577,591	1,290,970
Tubing and pipe	654,428	1,013,071
Rods	93,406	139,149
Wire and wire products	1,275,785	1,607,689
Sheets — black, galvanized and tinplate	770,321	1,024,985
Finished structural work	403,832	530,766
Angle, splice bars and other rail joints	84,669	190,226
Spikes, bolts, nuts and rivets	40,252	72,076
Axles	24,057	68,366
Steel car wheels	7,223	67,985
Sundry steel and iron products	47,670	70,971
Total	6,206,932	9,859,660
Spelter	28,057	27,853
Sulphate of iron	26,411	33,582
	Bbl.	Bbl.
Universal portland cement	4,535,300	5,786,000

The shipments of all kinds of products to buyers—not including material shipped from one plant to another—in 1909 were, in long tons except for cement:

	Domestic.	Export.	Total.
Finished products	8,690,133	1,001,857	9,691,990
Pig iron and scrap	444,562	8,337	452,899
Iron ore, coal and coke	1,409,751	252	1,410,003
By-products, etc.	42,435	......	42,435
Cement, bbl.	5,600,891	......	5,600,891

The increase over 1908 in domestic shipments of finished products was 57.9 per cent.; in export shipments, 28.8 per cent. The export shipments in 1909 were 10.3 per cent. of the total.

EMPLOYEES

The average number of persons employed by the corporation during 1908 and 1909 was:

	1908.	1909.
Manufacturing plants	118,557	138,865
Coal mines and coke plants............	17,164	21,867
Iron ore mines......	13,135	15,077
Transportation lines..	14,165	17,104
Miscellaneous.......	2,190	2,587
Total............	165,211	195,500
Amount paid in wages	$120,510,829	$151,663,394

The increase in number of persons employed in 1909 was 30,287, or 18.3 per cent.; in wages paid, $31,152,565, or 25.9 per cent.

STOCK SALES TO EMPLOYEES

In January, 1910, there was offered to the employees of the Steel Corporation and of the subsidiary companies the privilege of subscribing for 25,000 shares of preferred stock. The conditions attached to the offer and subscription were substantially the same as those under which preferred stock had been offered in each of the previous seven years, excepting as to the subscription price, which was fixed at $124 per share. Subscriptions were received from 17,444 employees for an aggregate of 24,672 shares. At Dec. 31, 1909, there were 21,458 employees who had purchased preferred or common stock under offers made by the corporation, and who on that date either held the certificates of stock or were making monthly payments on account of the purchase price.

GENERAL AND EXPORT BUSINESS

The substantial revival in business activity, which became evident in the spring of 1909, continued with increasing volume throughout the balance of the year. Accordingly, the output and earnings of the subsidiary companies show material increases over the results for the preceding year. The total production of finished products for sale in 1909 equaled about 75 per cent. of the normal maximum productive capacity of the properties. The prices received in 1909 were less than those of the preceding year. On domestic business, the average prices received in 1909 on all rolled and other finished products shipped were 14.3 per cent. less than the average received in 1908. On export shipments, the average price received in 1909 was 7.8 per cent. less than that of 1908. The export shipments during the year were 26.3 per cent. greater than in 1908, and equal to 10.3 per cent. of the total shipments of rolled and other finished products. This increase was largely due to the improved conditions in the principal foreign markets. At the close of the year, the unfilled export orders on the books of the United States Steel Products Export Company amounted to 462,603 tons.

At the beginning of 1910, order books of the subsidiary companies contained unfilled orders for finished products of 5,927,031 tons. The demand for immediate and early shipments against these contracts on specifications received was large and called for substantially the maximum capacity of nearly all the producing mills. Since the first of the current year, the tonnage of new business booked has been satisfactory and quite equal to expectations considering the unusually heavy placing of new business for future delivery which took place during the closing quarter of last year.

NEW CONSTRUCTION

During the year there was expended by the corporation and subsidiary companies for additional property, extensions and construction, and for stripping and development work at mines, the total sum of $37,916,251, of which $11,081,368 was for the Gary plant. The increasing requirements for coal on the part of subsidiary companies having plants located in the Chicago district, and their inability to obtain necessary quantities of proper quality under satisfactory terms as to delivery, etc., have influenced the acquisition of a considerable acreage of developed and undeveloped coal property in the Danville district, Illinois, and in the Clinton field, Indiana. Such expenditures as had been made in 1909 on account of this purchase are included in the outlays on capital account. Further particulars of the extent and details of the purchase will be presented in the next annual report.

During the year a large amount of new construction and improvement work was authorized. Some of the more important items, other than extensions at the Gary, Indiana plant, are the following: The construction of an additional modern type of blast furnace at Cleveland by the American Steel and Wire Company. At South Works, of Illinois Steel Company, the construction of a new light structural mill; at Buffington, Indiana, an extension to the present cement plant, increasing the capacity of output 2,000,000 bbl. annually. The American Steel and Wire Company has authorized the construction at Birmingham, Ala., of a rod mill and wire plant, having a capacity of 400 tons of finished product per day. The Tennessee Coal, Iron and Railroad Company will construct two additional open-hearth furnaces and a central power plant to enable it to supply steel for the rod and wire plant mentioned. The Tennessee company is also engaged in the construction of a by-product coke plant, to consist of 280 ovens; also in a large undertaking in the construction of a reservoir, pumping station and water transmission lines to meet the water-supply requirements of the furnaces and steel works at Birmingham. During the year the Tennessee company has acquired in the territory adjacent to its present plants and properties about 1800 acres of property available for manufacturing sites, 1300 acres of property for the water reservoir and system referred to and upward of 900 acres of surface for proposed new mining slopes and to protect mining operations. There have been ordered by the subsidiary transportation companies for delivery in 1910, 53 locomotives, 4900 steel freight cars, 25 refrigerator cars, and five 12,000-ton (cargo capacity) ore-carrying steamers.

THE GARY PLANT

During the year 1909 there were completed and placed in operation at the Gary plant four blast furnaces (making a total of six blast furnaces in operation at the close of the year), 28 open-hearth steel furnaces, the heavy-rail mill, the blooming and large-billet mill, and the 18-in. merchant bar mill. Substantial progress was made toward the completion of further units, the construction of which was under way at close of preceding year, and it is now expected that these will be ready for operation at approximately the following dates: Two additional blast furnaces, the car-axle plant and the 14-inch merchant bar mill, in April, 1910; 14 additional open-hearth steel furnaces in July, 1910; the 60-in. universal plate mill, the 10-in. and two 12-in. merchant bar mills in August, 1910. The only new producing unit on which construction work was commenced during the year was a by-product coke plant, which is to consist of 560 ovens of the Koppers type. This plant when completed will have an annual normal capacity of 1,900,000 net tons of coke, a quantity sufficient to supply the annual requirements of 12 blast furnaces. It is expected the first battery of 70 ovens will be ready for operation by September next.

During the year there were produced at the Gary plant 519,197 tons pig iron, 511,601 tons open-hearth steel ingots, 324,856 tons open-hearth steel rails, 73,480 tons of billets and merchant mill products for sale and 6862 tons of foundry products.

NEW PLANTS AT GARY

There has been authorized to be constructed at Gary by the American Sheet and Tin Plate Company a plant for the manufacture of plates and sheets which will comprise two 72-in. plate mills, four jobbing mills, and 16 sheet mills, together with galvanizing department and auxiliary facilities. The construction of this plant will be commenced in April, 1910. The plant will have an annual capacity of finished product of about 200,000 gross tons of plates and sheets. There has also been authorized to be constructed at Gary by the American Bridge Company a bridge and structural plant consisting of two units, together with necessary auxiliary departments. The plant will have a yearly capacity of 120,000 tons of fabricated structural material.

Some Thoughts on Conservation

BY HOWARD MATTHEWS

"Ben, what do you think of this 'conservation' which fills so much space in the papers lately?" the wiper asked of the hoisting engineer.

"There are many 'conservations,' Chris, such as water power, natural gas, oil, forests, public lands, coal and copper. Which one is on your mind?"

"The magazines say that all the water powers are in the hands of a power trust," said Chris, "which has robbed the public."

"The same thing was said, Chris, when gas was found in Ohio. The college theorists and the Government experts say that the waste of such things as water power, gas and oil should be prevented by laws, but who better than the man who owns a thing is competent to say when it is being wasted and when it is not worth saving?"

"You will certainly admit that the Standard Oil Company is robbing the public!" exclaimed Chris.

"Oh, certainly, if you insist," smiled Ben, "but the independent refiners get the same prices, and kerosene is lower in the United States than in any other country."

"Van Hise says that oil producers should be prohibited from shipping crude material abroad, particularly to Mexico," retorted Chris.

Ben grinned. "He also says that copper producers should be treated likewise, while the oil that goes to Mexico is used in making copper which is shipped to the United States."

"Well, anyway, it is a shame to cut down our forests because it increases the floods and washes away the soil, and besides that, posterity will need the wood!" said Chris triumphantly, confident that there could be no contradiction of these time-honored statements.

"I remember," replied Ben, "when I was a lad and we went 'West' to Ohio in an ox cart. It was all forest then. The trees are all cut away now, and I suppose that is why Ohio is so rocky and barren, and has so many floods. Had it occurred to you, dear Chris, that where you have rain on mountains there will be floods, trees or no trees? Have you ever passed a season on the eastern slope of the Andes? The monster forests of monster trees there do not prevent the occurrence of daily floods, holidays excepted. Perhaps posterity will have a better use for good soil than timber culture, and instead, will use South American, Central American, Mexican, Alaskan and Asiatic timber. Did you know that sawmills are still being built in the Tyrol? People have lived in Switzerland much longer than in the United States, remember."

"I am not posted on forests," replied Chris, "but I was in Alaska and I know that the coalfields there are enormous. In the Katalla country there are thousands of square miles of good coal lands. It's a shame for the rich men to get it all."

"Did you locate any of the coal land, Chris?" asked Ben, innocently.

"No, certainly not! What would I do with it? It was hundreds of miles from transportation when I was there. It was not worth the trouble of setting stakes."

"It must be a great coal bed," mused Ben. "With Pennsylvania coal worth only 10c. a ton in the seam, Ballaine, of Seattle, is said to have offered the Government a royalty of 50c. a ton for that Alaska coal. He is quoted as saying that the royalty would amount to $10,000,000 per acre which figures out a bed of coal just 20,000 ft. thick!" Ben laughed. In a moment he asked, "If the Government is now so fearful that someone will get this valuable coal without paying for it and is so confident of its worth, why was it not valuable when you were in Alaska?"

"The new railway gives it its value," explained Chris.

"Oh, indeed! And the Government built the railway?" asked Ben.

"Surely not!" exclaimed Chris. "The Guggenheims and Morgan built it."

"Then instead of the coal miners taking something of value from the Government, it is the Government trying to take back something which was useless until the coal-miners' railway made it valuable. Am I right?"

"Sure you are right," admitted Chris. "It was not worth 50c. a ton—nor 5c. a ton when I was there. It is a good thing so much coal is in Alaska. We are using up the world's supply pretty fast, the papers say."

"Yes," replied Ben. "Any geologist can tell you to the minute when the furnace in the basement will grow cold. Of course, it is necessary to revise the figures and set the date ahead when such patches of coal as that in Alaska are found. Their figures are all right except for the coal not yet found, that is, unless the coal-miners' union has its way."

"What does that union want?" asked Chris.

"It demands that the Government proclaim a short strike in a different line of business each week. Do you remember how much coal and copper this company 'conserved' when the switchmen and copper miners were out, a short time ago? And did Pinchot give us any credit for it? All the coal mining is stopped in Australia—but is anyone pleased except coal miners in Japan who are shipping to Australia?"

"But, don't you think we are using the coal too fast?" asked Chris.

"I am not sure what I think," replied Ben. "I guess it makes little difference how fast it goes. If we use it now, posterity will use something else. If w do not use it now we must shut down some of the factories, stop the building of new ones and lose the interest on the coal so that posterity may have the principal. We cannot have our cake and eat it also, Chris."

"The conservationists say that the Government should compel power users to scrap their steam engines because coal and oil does twice the work in gas engines. Is such a saving possible?" asked Chris.

"Sometimes, Chris. But if the chief engineer of this mine, for example, thought gas engines would save money, would he need Government persuasion to make the change? The fact is that sometimes the gas engine is better than a steam engine and sometimes not."

"There are 100,000-h.p. in gas engines at the Gary steel plant. Why are there so few gas engines in Pittsburg?" urged Chris.

"No one could build them when Pittsburg started," replied Ben.

"Why not?" persisted Chris.

"No steel maker would put up for the experimenting and there was little actual experience back of the faith of the gas-engine manufacturer," replied Ben.

"Could they not have asked the conservationists?" asked Chris. A look of disgust was the only reply he got. After a pause he plucked up courage to ask. "Well, anyway, Ben, the miners in the United States can control the iron and copper situation. Guggenheim says the Government should help them get a higher price for copper which is shipped abroad."

"Mercy! Do you believe that also, Chris? Why, before two years have passed, the Tanganyika in the Congo will be shipping more copper than the entire Lake Superior district now produces, and before three years the Congo will ship more copper than the whole production of the United States! I have the chief engineer's own word for it that the copper will cost only six cents per pound laid down in London. American copper miners should dig out their mines and market the metal as soon as possible. As for iron, Brazil alone can supply the world for centuries."

"Ben!" protested Chris, "you talk as though you do not believe we will run out of any of these necessaries of life!"

"We may," he replied, "but I doubt it. Can you mention any natural resource—except the Indian and the buffalo—which has been exhausted to date?"

"Then," retorted Chris, weakly, "why is there so much talk of it in the papers?"

"For the same reason," drawled his mentor, "that so much waste rock comes mixed with the ore when the mine gets behind the smelter—it gives some men an excuse for drawing pay—and the stuff fills space."

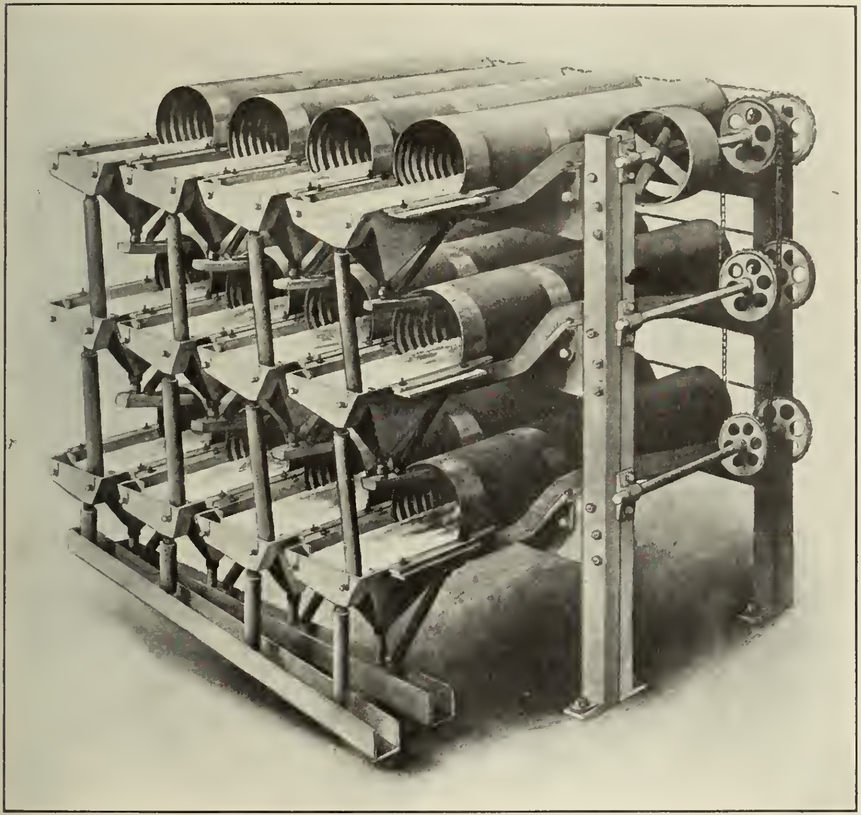
Tungsten Ore

The present value of tungsten ore in the United States is $6.50 to $7 per unit per ton of 2000 lb. for ore containing 60 per cent. of tungsten trioxide. This price is paid for ferberite, wolframite and hueberite ores.

For special lots of very high-grade ore more is paid, depending upon the analysis, etc. Scheelite ores command from 50c. to $1.50 per unit less than the above prices. The market for tungsten ores fluctuates very much and it is difficult to state prices that hold good for any great length of time.

The Macquisten Concentrating Process

The Macquisten concentrating process was fully described in the JOURNAL of Oct. 26, 1907. Since that time little has been heard of the process or of the American Direct Concentrating Company, Salt Lake City, Utah, which controls the A. P. S. Macquisten patents. At the present time there are a double set of three 72x8½-in. tubes fitted for continuous operation, and one experimental 4-ft. tube in the testing laboratory of the General Engineering Company, in Salt Lake.



THE MACQUISTEN CONCENTRATOR

The mill at Golconda, Nev., where the tubes were first tried in this country, was closed down about a year ago, it is claimed on account of the long haul from the mines to the mill which precluded profitable operation. Since that time, part of the mill has been torn out and amalgamation plates installed, presumably to treat gold ore from nearby mines controlled by the same company.

A set of four tubes has been placed for trial in the Cactus mill at Newhouse, Utah, but this mill is not in operation at present. The only other installation reported is in a zinc mill at Victor, Mont. there four sets of four tubes were installed to treat 20 tons per 24 hours. This mill has recently been closed down on account of severe weather conditions.

A carload of ore from the Nevada Consolidated mines at Ely, Nev., has been shipped to Salt Lake for a trial run, and it is reported that if this test run is successful, tubes will be installed to treat the tailings from the Steptoe mill.

Recovering Sunken Steel by Use of Magnets

With a large magnet, manufactured in the shops of the Cutler-Hammer Company, Milwaukee, Wis., steel cargoes are being recovered from the bed of the Mississippi river for the first time. The experiment is being made near New Orleans, where a barge load of kegged nails is being raised. A load of cotton ties, sunk near Natchez, will be taken up, also a load of woven wire, sunk near Pittsburg. These sunken cargoes are property of the United States Steel Corporation.

The magnet used in the work is 3½ ft. in diameter, and weighs 3000 lb. It is dropped into the stream, the current turned on, and five or six kegs of nails raised at one time, from a depth of 70 ft. A great saving is being realized by the use of the magnet, which could not be otherwise effected. Were a dredge used, kegs would be broken open, and much valuable material lost. In this way the kegs are raised intact, and the nails are uninjured, except for slight rust. Between 85 and 95 per cent. of the cargo can be raised. It is valued at $45 per ton.

Asbestos in The United States

The production of asbestos in the United States in 1909, as reported for "The Mineral Industry," was larger than in any previous year, amounting to 4025 short tons, valued at $87,625. In 1908 the production was 1350 tons, valued at $24,000. Vermont, supplying chrysotile fiber, and Georgia and Idaho, with an output of the amphibole variety of asbestos, were the only producing States. During the year, considerable work was done in developing the recently discovered chrysotile asbestos deposits in the Caspar Mountain district, Wyoming. There are four companies operating in this field: Wyoming Consolidated Asbestos Company, North American Asbestos Company, International Asbestos Mills and Power Company, and United States Asbestos Mining and Fiberizing Company. The first and second companies have mills for the treatment of their rock already in course of construction, while the International company will commence the erection of a mill this summer. While no production was made in 1909, the development work done has proved the existence of extensive deposits of high-grade fiber, and there is every reason to believe that the district will soon become a producer of consequence.

Statement of Amalgamated Copper Company

An interesting statement has been submitted by the Amalgamated Copper Company to the New York Stock Exchange in connection with the transfer of the company's stock to the regular list, on account of the abolition of the so-called "unlisted department" of the exchange—a department hitherto reserved for the shares of companies unwilling to make public reports.

The Amalgamated Copper Company was incorporated April 27, 1899, under the laws of the State of New Jersey, with an authorized capital stock of $155,000,000, of which there is now issued and outstanding $153,887,900, consisting of 1,538,879 shares, of $100 each. The duration of the corporation is unlimited and no personal liability attaches to its ownership. Dividends have been paid quarterly, beginning in October, 1899, at rates varying from 8 per cent. to 2 per cent. per annum. Recently dividends have been at the rate of 2 per cent. per annum, payable in the months of February, May, August and November. The company has no bonded debt and has paid in dividends an aggregate amount of $60,501,567.

AMALGAMATED COPPER INTEREST IN OTHER COMPANIES.

	No. Shares Issued.	Par Value.	No. Shares Owned by Amalgamated Copper Company.
Anaconda . .	1,200,000	$25	620,000
Boston & Montana.......	150,000	25	147,915
Butte & Boston........	200,000	10	197,220
Parrot Silver and Copper Company...	229,850	10	115,299
*Trenton Mining and Development Company. .	10,000	100	9,995
Washoe Copper Company..... .	30,464	100	31,459
Big Blackfoot Milling Co	6,400	100	6,395
Diamond Coal and Coke Company. .	150,000	10	149,993
Mountain Trading Company.	1,100	100	1,107
Greene-Cananea Copper Company . .	2,500,000	20	100,000
Butte Coalition Mining Company..... .	1,000,000	15	50,000

*Successor of Colorado Smelting and Mining Company.

The company does not entirely own or operate any mining properties, mills or smelteries, its interests therein being represented by its investments in stocks and notes or evidences of indebtedness of other corporations, as shown in the accompanying table.

The Amalgamated Copper Company also holds bonds of Butte & Boston Consolidated Mining Company, and notes of the Washoe Copper Company for money advanced in purchase of real estate and construction of smelting works, and of the Blackfoot Milling Company for the purchase of timber lands.

The companies, owned solely or in part by the Amalgamated Copper Company, produced for the calendar year 1909, from their own and custom ores, about 292,000,000 lb. of refined copper, of which amount the Amalgamated Copper Company received the benefit from about 251,000,000 pounds.

It has never been considered a wise policy by this company to endeavor to put in sight extraordinary measurable ore reserves, on account of the cost of maintenance of development shafts and drifts, when carried beyond the scope of regular stoping operations. It is the opinion, however, of the engineers, that there is at the present time as much commercial ore blocked out as at any time in the history of this company. The statement of the Anaconda company's operations and holdings was published in the Journal of March 5, 1910.

Production for Year, 1909

	Lb. Copper.	Oz. Silver.	Oz. Gold.
Anaconda.......	75,860,194	2,363,184	7,466
Washoe and custom ores......	80,559,625	3,500,878	31,161
Parrot..........	5,407,255	308,757	723
Butte & Boston..	20,955,910	1,158,672	7,376
Trenton.........	7,168,318	623,728	577
Boston-Montana..	101,951,350	1,882,046	11,769
Totals.........	291,902,352	9,837,268	59,074

Boston & Montana

The copper mines of this company at Butte have been developed and are being operated through seven large working shafts known as the East Colusa, West Colusa, Leonard No. 1, Leonard No. 2, Mountain View and Badger State shafts, varying in depth from 900 to 2200 ft., each fully equipped with modern hoisting machinery and situated adjacent to the tracks of the Great Northern Railroad, over which road the ores are transported from the mines to the reduction works owned by the company and situated at Great Falls, Mont. The orebodies have in most cases shown a marked increase in size as depth has been attained, with only a slight diminution in copper content, and the mines have now reached such a stage of development that they are able to output a supply of ore greater than the capacity of the Great Falls works, and the excess tonnage is treated at the Washoe smeltery.

Great Falls Smeltery

The reduction works of the Boston & Montana Company, including an electrolytic refinery, are situated at Great Falls, 172 miles north of Butte, and while portions of the smeltery were erected upward of 20 years ago, betterments have been made from time to time so that the present plant is modern in every particular. The recent erection of a stack of 506 ft. in hight and 50 ft. in diameter, with accompanying flues and dust chambers, is effecting a great saving, while low working costs are obtained, due to the available electric power generated by the falls of the Missouri river. The Boston & Montana company is now treating approximately 4000 tons of ore per day, and is contemplating extensive additions to the present works in order to handle the tonnage which the mines are now prepared to furnish. The output from the works is in the form of both blister and refined copper.

Butte & Boston

The mining claims from which the production of the Butte & Boston company is obtained lie in practically two distinct groups, one in the southeastern section of the great copper producing area, the other in the northwestern section. The former group is developed to a depth of 1000 ft. by four shafts: Silver Bow No. 1, Silver Bow No. 2, Silver Bow No. 3 and Berkeley, all having underground connections, while the extraction of ore is carried on solely through the Silver Bow No. 1 and Berkeley shafts. The northwestern group is operated through the East Grayrock and West Grayrock shafts.

In addition to the shafts mentioned, the Butte & Boston Consolidated Mining Company owns an interest in the Tramway shaft with the Red Metal Mining Company, this shaft having been sunk jointly by the Red Metal and Butte & Boston companies, and through it are hoisted the ores from the Tramway and Snohomish mines, in which this company owns a large interest.

The orebodies in the mines of this company are seldom found in large, irregular masses, as is the case in many of the mines at Butte, but rather as regular oreshoots in well defined veins. The mines of the company are all tributary to the Butte, Anaconda & Pacific Railroad, and by this road the ores are carried to the Washoe works at Anaconda, and there concentrated and smelted.

Parrot Silver and Copper Company

The Parrot mine proper adjoins the Anaconda property on the west and has been developed by a shaft 2100 ft. in depth. The vein on the property is continuous in depth, but at the present time it is impossible to make a profit at the ruling price of copper.

In addition ot the workings mentioned above, a shaft 1200 ft. in depth has been sunk on the Little Mina claim, and levels have been driven on the vein at depths of 800, 1000, 1100, and 1200 ft. from surface, with varying success. The ore developed is of good grade, but occurs in irregular lenticular masses in a large vein. A considerable tonnage is extracted from this property, but the future of this portion of the Parrot company holdings will depend on the result of the developments at greater depth. The company owns 27 mining claims and a part interest in two other claims, all in Silver Bow county; 5 lots in Butte; and 160 acres at Gaylord, Madison county, Montana.

TRENTON

The mining claims of the Trenton Mining and Development Company have been developed by means of a shaft known as the Gagnon shaft, which is the most westerly shaft at present being operated in the so-called "copper belt." This mine originally carried a large percentage of zinc in the upper workings, but as depth was reached, the zinc has become less and less prominent. It appeared several years ago as though the workings had arrived at what was apparently an impoverished zone in the mine, but the Gagnon shaft was carried to a depth of 2300 ft. from surface, and levels at every 100 ft. were driven both easterly and westerly from the shaft. Some large orebodies of an excellent grade have been encountered on the 1800, 1900, 2000, 2100, 2200 and 2300-ft. levels of this mine, and at many points they were of great width. The Gagnon shaft was sunk in the early days on the dip of the vein, and is in consequence an inclined shaft for its entire depth. On account of the large amount of positive ore which has been developed, and the generally flattering prospects in the bottom levels of the mine, it was deemed advisable to equip the property with an uptodate shaft. A site was chosen west of the present shaft and work begun. The shaft has now reached a depth of nearly 600 ft. and will be carried to a depth of 2300 ft. when crosscuts from advantageous points in the shaft will be driven, making common levels with the Gagnon shaft.

WASHOE COPPER COMPANY

The reduction works of the Washoe company in Anaconda, were built in the year 1902, and are the largest and most complete in the world, having a capacity of treating 10,000 tons of ore per day under normal conditions. The Washoe smeltery is situated about two miles east of the city of Anaconda, the site comprising about 240 acres of land, and is peculiarly adapted to the efficient handling of material. The plant itself is made up of 10 separate departments, as follows:

The sampling mill consists of two complete sections, each section having a capacity of 1800 tons in 24 hours, and is most complete in every detail.

The power house is fully equipped with triple-expansion condensing engines, and uptodate electrical machinery, and at the present time a large portion of the power is furnished by the waste heat from the reverberatory furnaces and by the power companies operating upon the Missouri river.

The roaster building contains 64 McDougall calcining furnaces of the most approved type, each furnace capable of handling from 45 to 50 tons of material per 24 hours.

The reverberatory building contains eight reverberatory furnaces 19 ft. in width and from 102 to 116 ft. in length, each having a smelting capacity of approximately 300 tons in 24 hours.

The briquetting plant contains four briquetting machines, each machine having a capacity of 700 tons of briquets in 24 hours.

The blast-furnace department contains three furnaces, two of which are 51 ft. long, and the other 87 ft. long, having a width of 56 in. The smaller furnaces have a capacity of 1600 tons, the larger 3000 tons of charge in 24 hours.

The converter building is fully equipped with converters of the horizontal barrel type, capable of converting 20,000,000 lb. of copper per month, and under the same roof is the refining and casting department, in which are located three casting furnaces, two having a capacity of 95 tons and one of 110 tons. Two of these are in operation most of the time.

The smeltery power house is a brick and steel building, 85 by 526 ft., and contains the various engines, compressors, blowers and auxiliaries necessary to produce the various pressures of air required. The material is handled from one department to another by means of locomotives operated with 900-lb. air pressure in the receivers, and there are 48 miles of standard-gage tracks in the works.

The flues and stack have practically been rebuilt since the smeltery was put into operation. The principal flues, the blast, recaster and reverberatory, are 20 ft. wide and 15 ft. high, and of brick and steel construction and are connected with their respective dust chambers. The main flue for the first 1200 ft. is 60 ft. in width and 20 ft. in hight, the roof being of one-beam and brick arch construction. The remaining distance to the stack is 1122 ft., of the flue 120 ft. in width.

In addition to the above-mentioned departments, a complete arsenic plant is in operation, which turns out a product 99.8 fine and is ground and barreled for shipment at that point.

WASHOE COAL PROPERTIES

The coal mines owned by the Washoe Copper Company are situated at the town of Washoe, about 45 miles south of the city of Billings, Mont., on a small stream known as Bear creek, which is a tributary to Clark's fork of the Yellowstone river. Three veins of excellent coal are known to exist at this property, their existence having been proved by diamond-drill borings, and two of these veins have been developed by shafts, and the development has shown a uniform vein of steam coal of excellent quality and great extent. This coal at present is being shipped to the cities of Billings, Helena, Butte, Anaconda and Great Falls.

BIG BLACKFOOT TIMBER LANDS

The Big Blackfoot Milling Company is a corporation organized under the laws of Montana. The period of its existence has been extended to Nov. 18, 1931. It owns over 1,000,000 acres of timber lands, and two large sawmills situated respectively at Bonner and St. Regis, Mont. No dividends have been paid by the company for a long time, its net profits having been invested in additional property. A contract has been made to sell the property to the Big Blackfoot Lumber Company, a corporation organized under the laws of Montana, with a duration of 40 years from October 1, 1909, having a capital stock of $25,000,000, all of which is to be issued in payment for the property, real and personal, of the Big Blackfoot Milling Company, which will be liquidated. The Amalgamated Copper Company is the holder of about $3,000,000 of the notes of the Big Blackfoot Milling Company, part of which have been acquired since Jan. 1, 1910. Practically all of the capital stock of the new company will be owned by the Amalgamated Copper Company.

A large portion of the timber sawed by the two mills mentioned above is consumed by the mines at Butte, the remainder being sold commercially in the adjacent territory. The logging operations of the company are extensive. The Big Blackfoot Milling Company owns the following property:

Counties of Montana.	Acreage.	Feet of lumber based on Cruisers' Estimates and Cutting at the Mills.
Lincoln	192,482.93	1,196,800,000
Sanders	176,001.12	780,434,000
Flathead	176,441.97	1,165,251,000
Missoula	358,580.09	1,639,371,000
Ravalli	28,512.10	159,664,000
Granite	32,151.62	37,117,000
Lewis & Clarke	12,778.65	51,530,000
Powell	118,564.97	531,936,000
Total	1,095,513.15	5,562,103,000

The mill at Bonner, Mont., has a capacity of 250,000 ft. of lumber per day; the St. Regis mill, 135,000 ft.; the mill at Hope, 100,000 ft. per day.

WYOMING COAL MINES

The property of the Diamond Coal and Coke Company, a Utah corporation, consists of 12,500 acres of coal lands on the line of the Oregon Short Line Railway, in the vicinity of Diamondville, Utah, and has been developed by four inclined shafts on the dip of the coal seams. A large amount of coal has been developed by these shafts, and the entries driven from them, and the different mines with their present equipment are in a position to make a large output of coal. The character of the coal is of the best, and in addition to its value for steam purposes, it is essential to the successful operation of the long reverberatory furnaces now operated by the Washoe smeltery, owing to the fact that it is of a variety known as "long-flame" coal. The coal measures have been developed by the shafts mentioned for a distance of over six miles on the outcrop of the vein. A large portion of the coal mined is shipped to Anaconda for the Washoe smeltery, and also commercially to other cities in Montana, Utah and Wyoming.

A New Method of Agitating Cyanide Pulps

BY E. GYBBON SPILSBURY*

When the Brown (Pachuca) tank was put upon the market, it was generally considered that the limit of economy and efficiency in the treatment of slimes by the cyanide process had been reached. A new porous mineral diaphragm, now being put on the market by the Just Process Company, appears to make possible a still more efficient treatment than even the use of the Pachuca tank offered, and introduces an entirely new method of cyanidation.

The object to be attained by all cyaniding methods is the intimate intermingling of each particle of ore with the solvent solution, so as to insure the extraction of the gold and silver contents. The specific gravity of the ore tends to a sedimentation which would result in a gradual separation of the ore from the solution. The agitation devices for obviating this are numerous, and more or less efficient, beginning with the simple revolving paddle, and through every known device for producing a more or less violent circulation of the pulp in the solution, up to the air circulation in the Pachuca tanks.

Effect of Circulation on Leaching Period

The underlying principle of all these methods, however, is circulation, in which the ore particles are propelled in the same direction as the fluid in which they are suspended. In the ordinary agitation tanks this circulation is horizontal while in the Pachuca tank it is vertical, but with that exception the method is the same. They all have the same objection of only partially and slowly moving the ore particles from one portion of the solution to another, due to the fact that both ore and solution are travelling in the same direction, and the only possible movement of the one through the other is due to their different specific gravities.

As a result, a long time is required for a given extraction, while the losses of cyanide, due to oxidation, are also proportionate to the length of time the solution is exposed to the air currents used for aëration as well as agitation. Any method which obviates the above faults will naturally result in a great saving of time, and in the consumption of cyanide.

The Just Process

The Just method of treatment is mainly the invention of J. E. Porter, of Syracuse, N. Y., who, while experimenting with a porous material for another purpose, was quick enough to see its advantages in the cyanide process. From a small beginning in the laboratory, the process has now been developed on a practical working scale and is being introduced in cyanide mills both in this country and Mexico. The simplicity of the installation combined with the dispensing of all expensive mechanical appliances, and also of circulating sand pumps, will appeal to all mill operators.

The arrangement consists in placing a false bottom in the treatment tank, raised about 4 in. above the real bottom. This false bottom is composed of slabs of the silica sponge about 2 in. in thickness; connections for the admission of air from a blower are introduced under the diaphragm bottom. This completes the installation.

The operation commences by the admission of air at a pressure of about half a pound into the chamber below the diaphragm, and running the charge into the tank above the diaphragm. As the depth of the charge increases, the air pressure is augmented, but no greater pressure is ever required than sufficient to overcome the static head due to the depth of the charge.

The whole charge at once becomes a seething mass, in complete and even but gentle agitation. No direct currents in any direction are visible, the whole surface assuming the appearance of working yeast. There is no tendency to sedimentation. The absence of currents is due to the fact that no continuous streams of air are injected through the pulp. The subdivision of the air passing through the minute cells of the diaphragm is complete, and these air particles once projected through the sponge are subject to no further pressure, but due to their buoyancy levitate through the mass of the charge without following any one direct line.

The results obtained from this absolute commingling of the air, ore, and solution are noteworthy. With most ores an extraction of from 60 to 75 per cent. of the combined gold and silver content is obtained in the first two hours, and the complete extraction amounting generally to 99 per cent. of the gold and from 91 to 95 per cent. of the silver is reached in from 10 to 12 hours, even with the most refractory ores.

Low Consumption of Cyanide

Another feature of the process is the low consumption of cyanide. This, I think, is due primarily to the shortening of the time of exposure of the solution to the oxidizing effect of the air, but it may also be accentuated by the fact that there is no forced passage of rapid currents of air through the solution, and also that the best results by this process have always been obtained on much thicker pulp than is permissible with the regular methods of agitation. A mixture of 1½ solution to 1 of pulp has been found to give the best results, but in general practice a 2:1 mixture is found to be the easiest handled in charging and discharging the tanks, owing to its greater fluidity.

Filtration Method

The next obvious application of this porous medium is in its use for filtering, and here again the advantages it presents over any other medium are remarkable. When the first experiments were made it was feared that after a short period the pores of the material would gradually become closed by the fine particles of solid being drawn into them.

After more than a year's testing with the determination of this point in view, it has been clearly demonstrated that no such inclusion takes place. The finest ground cement on the market has been filtered to dryness on the plates, then thoroughly dried by heat. The cake thus formed, when finally detached from the sponge, showed a perfectly smooth surface and apparently the entire mass was retained on the surface. Again and again filter plates of this material have been exposed to the passage of milk of lime in order to see whether there would be any deposition of lime in the medium; but in no case has this been found, all the solids being deposited on the surface only, and none penetrating the pores.

The filter now being prepared for the market is probably the most rapid ilter yet devised, being able to pass '5 gal. of water per square foot of sur'ace per hour under a pressure of 1 'oot head. Its construction, offering a iorizontal surface, permits the formation ıf a much thicker cake than is possible vith vertical filter leaves, the thickness ɔeing only limited by the porosity of the :ake itself, so that it can have the wash vater drawn through it. The discharge ıf the cake is effected by tilting the filter o a vertical position and blowing it off vith air pressure. The filter plates ıold a certain amount of moisture. This is blown out by the air and 'orms a lubricating surface which deaches the cake instantaneously.

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*Consulting mining and metallurgical engineer, 17 Broadway, New York.

[illegible] from a paper read at the [illegible] meeting of the American Institute of Mining Engineers, March, 1910.

When placed tandem with an agitation ank between the two filters, the capacity ıf the plant is greatly increased. The primary cake is made as thick as possible and after being dried, is discharged into the treatment tank for washing; from there it is filtered through the second leaf and when discharged it contains not over 25 per cent. moisture.

Other Uses for Silica Diaphragm

Aside from their use in the cyanide process, these diaphragms are being applied by the Just Process Company with marked success to other lines of filtration. The company claims that these porous diaphragms may be used as a means of catching flue dust and other solid particles from the gaseous discharges of furnaces. Being acid proof, it is not subject to the rapid deterioration which is the chief item of cost in the use of flannel or cotton bags in the ordinary bag houses. Being heat proof avoids the necessity of cooling the gases before attempting their separation from the solids. The material also has great possibilities for general filtration purposes on a large scale, for city water supply and sewage separation. Its physical strength, its compactness and the great facility with which its surfaces can be cleaned form a combination of advantages possessed by few other filtering mediums.

Another application of this sponge is in the form of a catalytic plate to replace the platinum-covered asbestos sponges now in use in the production of sulphuric acid. The latter are difficult to clean, whereas the platinum-coated silica sponge retains all refuse material on its surfac and its removal is simple.

Plant of the Dominion Asbestos Fibre Company

The new factory of the Dominion Asɔestos Fibre Company is one of the most ıptodate asbestos plants in the Black Lake district of Quebec. It is considerably above the level of the main line of the Quebec Central Railroad, and consequently lacking in transportation and ɔuilding facilities. The details involved in mining and grading the fiber were successfully worked out by F. W. Dean and his associate William W. Crosby, mill engineers and architects, Boston, Mass. The No. 1 mill, which is the beginning of an extensive development, is completed.

Plant of the Dominion Asbestos Fibre Company

The structure is of slow-burning mill construction inside, but boarded with matched sheathing covered with asbestos protected metal on the outside, thus securing a risk upon practically the same basis as that taken on regular mill construction with brick walls. The building, which is 60x120 ft., has three 16-ft. stories. The floors are 4 in. thick supported by 12x14-in. spruce beams. Spruce columns, 12x12 in., at intervals of 15 ft. furnish support for the beams. The foundation of the building consists of concrete piers upon which rest the supporting columns of the first floor provided with cast-iron pier caps.

The plant was designed for handling 25 tons of asbestos - bearing rock per hour, the work being carried on in two shifts of 10 hours each. The open-pit method of mining is employed, and by means of cables and derricks the material is raised to the surface and deposited in tram cars.

Asbestos Grading

The longest and most valuable fiber is picked out by hand in the mining pit. Facilities at the pit allow of taking out 1000 tons per day, 40 to 60 per cent. of which is rejected as carrying too little fiber to pay for its extraction. The remainder is carried by the tram cars to the crusher house where in two operations the rock is reduced to pass through a 1-in. screen, and delivered by bucket elevators to revolving driers of the shell type. These deliver the dried material on a 16-in. belt conveyer which carries the crushed rock to the bin adjoining the mill.

The final mill process is made up of four successive reductions of the rock in the crushing rolls, each reduction being followed by screening to sift out the sand and pulverized stone. The asbestos fiber remains on the screens and is conveyed to bins by vacuum pipes; the screenings are taken to the waste pile by belt conveyer. The grading screens are of the revolving type.

Electric power, generated several miles away by water power, furnishes alternating current of 16,000 volts, 3 phase, 60 cycle, stepped down to 2200 volts at the substation close by. This voltage is used on motors without further reduction. The crushers are driven by Allis-Chalmers motors aggregating 250 horsepower.

The matter of ventilation and lighting has been given ample consideration. In addition to sufficient window area, a monitor roof firmly braced to resist the wind pressure, which is particularly severe in this part of the province, has been provided with the idea of furnishing ventilation as well as additional light.

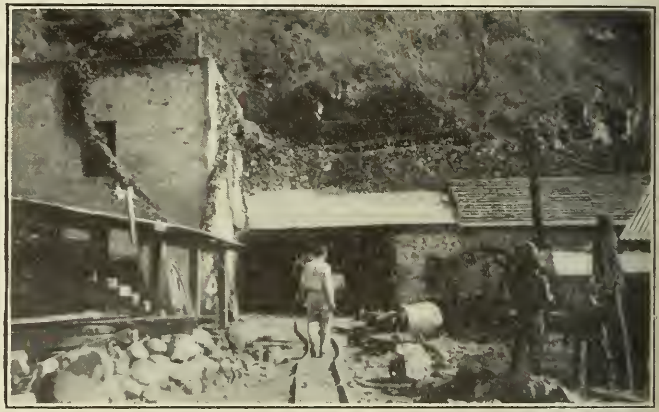
Native Silver in Southwestern Chihuahua

BY WALTER M. BRODIE *

Native silver is often found in oxidized surface ores, but in a number of mines it has also been found in depth, generally together with silver sulphide (argentite) and sulpharsenates or sulphantimonates (ruby silver, stephanite, etc.). The mines at Kongsberg, Norway, furnished most of the fine specimens seen in the older collections of minerals, but Saxony, the Harz mountains, Bohemia, Hungary, France and Spain have all produced the metal in its natural state in considerable quantity.

In the United States and Canada native silver has been found in a number of mines. Arizona, Nevada, California, Colorado, Ontario and the Lake Superior region have produced native silver, and it has been observed in numerous mining districts in other States. In Mexico and South America native silver has been found, but not in the quantities generally supposed. As a rule the occurrence is a rarity and only in a few districts or places has native-silver mining been carried on as a separate business. Of these places Batopilas in the state of Chihuahua has been the greatest producer.

Village of Batopilas, Chihuahua, Mex.



Entrance to San Antonio Mine

Generally the native silver is found in small quantities, filling up splits or cracks in a vein, or finely disseminated or crystallized throughout the vein matter. Sometimes, however, it occurs in large, solid masses. Massive specimens, one weighing as high as 500 lb., were taken out of the Kongsberg mine. One weighing 2700 lb. James D. Dana mentions as having come from Arizona; another mass weighing 800 lb. he mentions as having come from the Huantajaya mines of Peru.

The mines of Batopilas and Morelos have repeatedly given masses of solid silver, which had to be cut up to get them out of the workings. To the outsider the most interesting native silver is that which shows crystallization. The forms in which the silver occurs are many, varying from heavy spikes, grouped in arborescent shapes, to the very finest hairlike forms, scarcely to be distinguished.

The district of Batopilas has been known for centuries for its beautiful specimens, and lately again in one of its mines, the San Antonio vein of the Batopilas Mining Company, a quantity of curiously crystallized silver was found, of which a photograph is shown. The ores from which the picture was taken contained only calcite and native silver. The calcite is white, and the silver has the customary luster.

History of the San Antonio Mine

It may be interesting to know something of the history of the San Antonio mine, from which these specimens were taken. Batopilas was discovered in 1632 and during the 17th and 18th centuries was an intermittently flourishing village. Isolated in the mountains, dependent entirely on the results given by irregularly producing mines, it was inevitable that its fortunes would go up and down.

One of the miners living in Batopilas in the latter part of the 18th century was Cristobal Perez, whose application was registered in January, 1775. He worked the San Antonio mine and struck a bonanza of silver, which lasted without interruption for 14 years. This placed him, and later his son, among the most important personages in that part of the country. They were known far and wide as the Cristobalillos (the little Christophers).

Many stories are told of the extravagance of Perez and his son, and when the latter died in 1813, there was nothing left of the fortune of millions of dollars, which they had taken out of the San Antonio mine and about which the miners of Batopilas still talk.

Old documents show that on Sept. 25, 1815, there appeared before the commissioner of mining, Juan Miguel Gill, who represented the territorial deputation of Parral, Juan Nepumuceno Sanchez, attorney for the estate of José Cristobal Perez and also attorney for one of the two firms that had backed him financially, and Vicente Rodriguez, attorney for the estate of the other firm. These representatives stated that for more than 20 years the two firms together had furnished the funds for the Perez mining business and that the head of one firm being sick in Chihuahua, the other firm would for a year's time furnish the necessary funds and receive the returns. It was further stated that at that time the mine was totally out of ore.

San Antonio Mine Relocated

Evidently the result of the work of the following years was not satisfactory, for on April 2, 1820, José Esparza addressed a petition to the mining commissioner, in which he states that some time ago he denounced as an abandoned mine the San Anontio mine; that the documents of his denouncement had been forwarded to the mining deputation in Parral, and that up to that date no answer had been received.

He states that at that time the town was in a most miserable condition, as only the Cata mine and the Martinez mine were being worked with a small number of workmen. The rest of the laborers, not being able to support their families, were roaming over the hills to find what they could, and that some had

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*Mining engineer, Batopilas Mining Company.

broken through the entrance gates of the San Antonio mine, which was prejudicial and unfair to his application and denouncement.

He therefore asked for permission to open up and fortify a working, in which according to law the ceremony of taking possession might take place, so that the work in the mine might be started and go ahead without intermission, as required by law. If the mine had ore in sight, it would be necessary for the court to name an *interventor,* in view of possible opposition of the former owners, but as the workings had fallen in and as money had to be spent to put them in shape, this was for the time unnecessary.

The judge, subject to the decision of the President and deputies in Parral, gave José Esparza permission to prepare a working, but refused to let him open the doors which were closed with lock and key, and told him to give immediate notification in case he found pay ore.

On April 4, Esparza brought complaint that the *gambucinos* were breaking into the mine and were stealing ore, but that he did not know how they did it. The judge therefore sent the following day two trusted men to inspect the mine. They found that the gate had been forced at the upper entrance, but they could only proceed a short distance to a working called the Carmen, where the roof had caved in. At the mouth of the adit they found that the gate could be lifted out bodily. They entered and went down three ladders as far as the workings of the Three Holy Kings. From there everything was filled with waste and water, and they could not see anything that would pay to take out. Hereupon the court gave permission to Esparza to work in both openings, pending the decision of the higher court.

Crystals of Native Silver from San Antonio Mine

What result Esparza obtained we do not know. Probably he did not work long, as soon the war of the rebellion stopped all mining work.

From 1825 to 1861 little systematic work was done in any part of the old mine, certainly not in the lower workings which were filled with waste and water and from where everything had to be carried out in sacks on men's backs. The pillars were taken out; good ore was scraped out wherever it could be reached; the waste was left in the workings and the mine soon became inaccessible. There is no record of any bonanza during this time.

Property Passes to Americans

In 1852 the property got into the hands of Manuel Mendazona, a merchant from Culiacan, who had made money in the districts of Dolores and Guadalupe y Calvo. He acquired the properties and started a tunnel which was to cut the veins of the Carmen and San Antonio mines 500 ft. below the surface. In 1856 Mendazona died and his brother-in-law a few years later sold the property to Americans, who again in 1861 sold to an American company. This company was represented in Mexico by John R. Robinson. The tunnel was then only started, but Mr. Robinson continued the work and connected the tunnel with the lower workings of the San Antonio mine. San Antonio was the mine which he intended to work, as it was the mine of most fame in that section. On the way in, the tunnel cut another vein, which at first was considered of little importance; indications of silver were found which developed into what was later called the Veta Grande, containing heavy silver. Attention, therefore, was concentrated on the new find and San Antonio was solely used for ventilation purposes.

Formation of the Batopilas Company

In 1880 the property was bought by the Consolidated Batopilas Silver Mining Company, one of various companies formed by the late Alexander R. Shepherd of Washington; these were merged in 1887 into the Batopilas Mining Company.

Until 1904 little work was done on the San Antonio vein, seeing that exploration work had given no immediate returns. In that year heavy silver was found and since then the vein has been worked continuously in different parts. It has produced, together with the cross veins and feeders, during the last five years almost 3,000,000 oz. of silver. The workings at present extend over 1000 ft. horizontally on the vein and are more than 1000 ft. in depth. The vein is strong and well defined, but rich native silver is found irregularly, in shoots or spots, gratifying when met but generally hard to find.

Only a few months ago the southern part of the old workings was cut by the regular exploration work, after a rest of 100 years, and it is expected that profitable new ground will be opened up in this direction. Though all the Batopilas ores look more or less alike, to the local miner every vein has its own particularities. The neighboring veins, Carmen and San Antonio, both gave bonanza about 100 years ago, their production being estimated in 1860 by George Lebrun at 3,000,000 oz. for the Carmen and at 5,000,000 oz. for the San Antonio. It has been said that Carmen has silver in the main vein and San Antonio yields it in the stringers that feed the vein.

In southern Chihuahua the native silver-bearing rock outcrops irregularly for a distance of 40 miles.

Native silver has been found in Los Cueros, Realito, Batopilas, San Joaquin, Morelos, but as yet only Batopilas and Morelos have produced silver in quantity large enough to warrant the formation of mining towns. At present Morelos is passing through a trying period, but the chances are that before long it will again be as prominent as it was 50 years ago.

Centennial Copper Company

In the year ended Dec. 31, 1909, the Centennial Copper Mining Company, of Michigan, reports the sale of 2,583,793 lb. of copper. Operations were conducted at a loss of $57,625 during the year, although the total cost of refined copper was reduced about 2.8c. per lb. below that of 1908. The president states that though there was a slight increase in the copper content of the rock, the general underground conditions, Jan. 1, were not especially promising and efforts will be made toward opening higher grade ground rather than increasing the output.

OPERATIONS OF CENTENNIAL IN 1909.

Tons of rock stamped............	196,525
Cost of mining, transportation, stamping and taxes per ton of rock	$1.818
Product of refined copper.........	2,583,793
Pounds refined copper per ton of rock stamped.................	13.15
Cost per pound at mine, excluding construction	13.82c.
Cost per pound construction.......	0.08c.
Cost per pound of smelting, freight, commission, eastern office and all other charges.................	1.56c.
Cost per pound of interest paid....	0.15c.
Total cost per pound refined copper	15.61c.

That the silver area in northern Ontario is continually being widened is evidenced by the discovery of native metal about 50 miles west of Cochrane on the Grand Trunk Pacific. It is understood that the discovery was made in blasting out a railway cut. When the news reached Cochrane, 60 prospectors started out the next morning and this number is being constantly augmented by fresh arrivals.

Sampling Copper Anodes at Anaconda

BY WILLIAM WRAITH *

At the Washoe smeltery, Anaconda, Mont., the blister copper from the converters is transferred, by means of a crane, to a refining furnace in which it is brought to proper pitch for casting anodes. From this furnace the refined copper containing gold and silver is poured into cast-iron molds placed on a platform conveyer, giving an anode 36.75 in. long, 28 in. wide, and 2 1/16 in. thick. By reason of a disagreement between the smeltery and the refinery in reference to the silver content of the anode it became necessary to investigate the methods of sampling used.

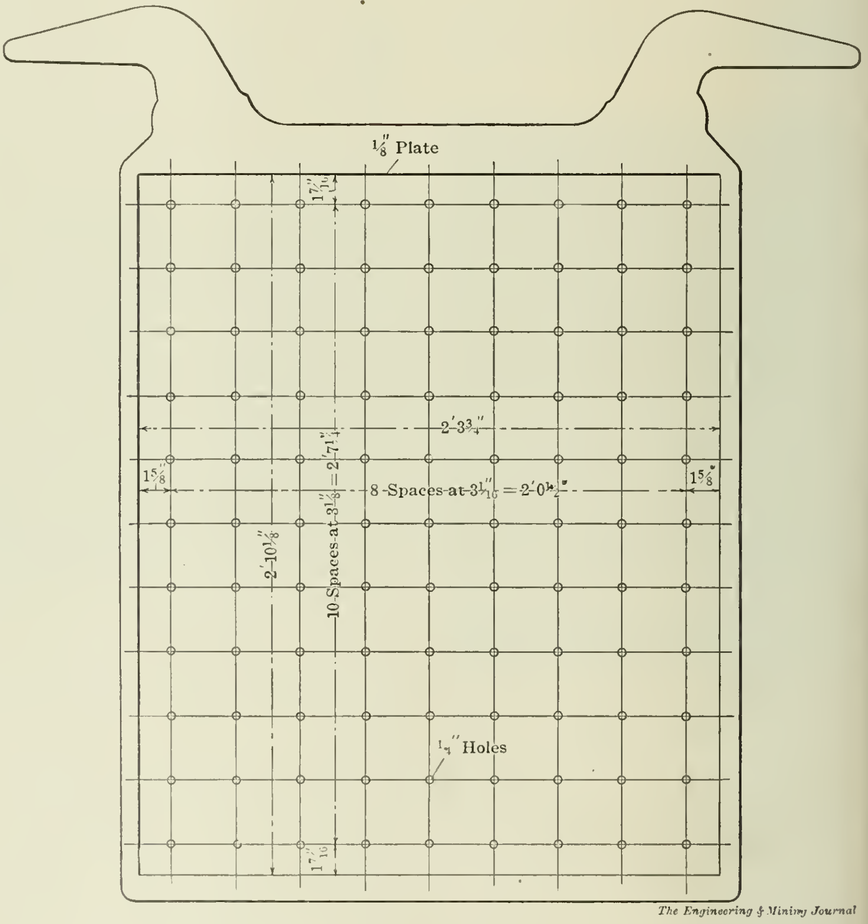
SMELTERY METHOD OF SAMPLING

At the smeltery the sampling is done by "shotting" into water a small portion of the molten stream of copper as it flows from the furnace, by "batting" the stream with a wooden paddle. The first sample is taken 30 min. after the pouring is started, three other samples being taken at one-hour intervals, each sample weighing from 4 to 6 oz. The samples are dried, examined for particles of burnt wood, screened on a 10-mesh screen of No. 8 wire to remove the fines, the oversize then screened on a 4-mesh screen of No. 20 wire to remove the coarse, the undersize of this screen being taken as the sample. The four portions thus obtained are thoroughly mixed and split in half by passing over a 16-slot splitting device, the slot being 0.5 inch wide. One-half of the sample is sent to the laboratory for analysis and one-half is kept as a duplicate.

REFINERY METHOD OF SAMPLING

The method used at the refinery and also used in this investigation is the one developed by Dr. Edward Keller of Perth Amboy, N. J. In this method every fourth anode of a lot is drilled, using a 99-hole templet, as shown in the accompanying figure. The holes of the templet are used in continuous order, one hole to the anode. For example, if in lot No. 890, holes from No. 1 to 90 were used then in lot No. 891 the sampling would commence with hole No. 91.

The anodes are carefully swept to remove foreign matter, then drilled with a 0.5-in. drill from the bottom side completely through the anode, every portion of the drilling being saved. The drillings from the entire lot are run through a grinder until the sample will pass through a 16-mesh screen. The sample is then thoroughly mixed and quartered, each quarter weighing about 1 lb. The 1-lb. sample is screened over a 40-mesh screen, weighing the oversize and undersize, thus determining the ratio of coarse to fine, the same ratio being maintained in the assay ton made up for analysis.



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DRILLING TEMPLET FOR SAMPLING ANACONDA ANODES

Incidentally, another method of sampling was investigated, namely, the taking of a ladleful of copper from the furnace or furnace stream, and shotting it by pouring over a wooden paddle into water, thus making shot, which was treated in the same manner as the "regular shot samples."

INVESTIGATION OF SMELTERY SHOTTING METHOD

To determine the uniformity of the charge during the pour, shot samples were taken each hour of the pour, the results for a typical lot being as follows: 76.07, 75.95, 76.19, 76.37 oz. silver per hour. To determine the possibility of segregation of silver in some portion of the stream as it flows from the furnace, samples were taken from different parts of the stream. A typical analysis of this showed the silver content in the front of the stream as 72.38 oz. per ton, in the middle of the stream 72.29, at the back of the stream 72.28 oz. per ton. In determining the possibility of the segregation of silver by using a cold wooden paddle, shot samples were taken, using a wooden paddle and a red-hot clay paddle. Little difference was shown by these samples.

INVESTIGATION OF REFINERY DRILLING METHOD

To test the uniformity of the anodes, six anodes were selected at equal intervals during the casting of a lot. The anodes varied from 71.21 to 71.68 oz. of silver per ton. The regular sample

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*Abstract of a paper read at the February meeting of the American Institute of Mining Engineers.

*Anaconda, Mont.

of lot No. 885 showed 73.76 and a random anode from the same lot assayed 73.41 oz. silver per ton.

Two lots of anodes were taken from lot No. 911 for drilling samples. One of these was the regular drilling sample obtained by drilling one hole in every fourth anode according to the templet, and commencing with the first anode cast. This showed a silver content of 74.31 oz. per ton.

Starting with the third anode cast, a similar sample was taken from the same lot and showed 74.50 oz. per ton. A careful comparison of the results obtained by the shot sampling from the furnace stream and by the drilling method on 28 lots of approximately 100 tons each indicated that checking results could be obtained in this manner.

Ladle Samples

A series of tests made by the ladle-shot method indicated that too high results would be obtained in this manner by the segregation of the silver. An 8-in. ladle was half filled with copper from the furnace stream and separate shot samples taken from it at the same time a shot sample was taken from the furnace stream itself. The ladle-shot samples showed from 76 to 81 oz. of silver, and the skull left in the ladle showed only 72.89, while the regular shot sample taken from the furnace stream assayed 74.99 ounces.

An 8-in. ladle was half filled and allowed to cool completely. The resultant button was drilled with the following results: Top of button, 79.45; center of button, 75.73; bottom of button, 68.91 oz. of silver per ton. In order to see how high a result could be obtained by the ladle-shot method, an 8-in. ladle was filled with copper and allowed to stand until nearly frozen, when the metal remaining molten was shotted, with the result that the ladle-shot sample showed 86.17 oz. of silver as against 73.67 oz. from the correct shot sample taken from the furnace stream.

Conclusion

The conclusions reached were: (1) That the shot sample taken from the furnace stream and the drillings of every fourth anode, according to Dr. Keller's templet, will check within practical limits and give the true silver content of the copper; (2) that the ladle-shot method will give high silver results, due to a segregation of silver toward the portion that solidifies last.

Cyaniding the Ores of Eastern Oregon

BY ALGERNON DEL MAR *

Of the many gold mines that have at various times been on a producing basis in Baker and Grant counties, Oregon, but few are now being worked. The natural conclusion is that these mines were closed down from the lack of ore or the paucity of the metallic contents. Mr. Pardee, of the U. S. Geological Survey, in a recent bulletin on the Cracker Creek district of Baker county, says the mines have not closed down because of the exhaustion of the orebodies. This I take to be generally true of both Grant and Baker counties. The average grade of ore found in these counties would, in other places under competent management, be considered high-grade, for it is not uncommon to find veins 4 ft. wide assaying $15 per ton. The trouble lies not in the grade of the ore but in the means of treating it.

Refractory Ores to Be Treated

The oxidized ore extends to but a moderate depth and at times not deeper than under the subsoil, so that from the start the problem becomes one of treating unoxidized or partially oxidized ores which are refractory to plain amalgamation. The precious metals are as a rule evenly and finely disseminated in the quartz or slate matrix, and not easily discerned by panning. For example, a test made on a representative ore showed that the more easily crushed portions assayed the same as the more resisting or harder parts, and that the sulphurets assayed not more than twice the value of the average ore. The finely ground portion assayed $17.50; the hard portion the same, $17.50, and the one per cent. of sulphurets, $28 per ton. The finely ground portion contained mostly the argillaceous material while the hard portion was the quartz. The facts here stated—gold evenly distributed and very fine, not easily amalgamable, low value of concentrates and the argillaceous character of the ore—must be considered in connection with any process of treatment.

The natural inference is that a chemical process which would successfully treat these ores might be adopted, and one naturally turns to the cyanide process. This has been tried but with only partial success, not because it is not suited to the ores but because only one phase of it has been tried, treating the sands by percolation and the slimes by agitation and decantation. Anyone familiar with the working of clay slimes knows the difficulty of separating gold solutions from clay, and of dissolving gold from coarsely crushed quartz when the gold is in a finely divided state throughout the quartz particles. The general idea prevails that the ores are too base to treat by cyaniding, that the arsenic alone would prevent a good extraction. While it may be true that some of the mines produce extremely refractory ores, the cyanide process as known today has never had a trial.

All-Slime Process Suggested

I have tested ore of this character and found that it contained a great quantity of soluble sulphates requiring 10 pounds or more of lime per ton of ore for effective neutralization, that the amount of soluble sulphides was nil and that the finer the ore was ground the better the extraction. Using an 80-mesh screen with a 0.15 per cent. cyanide solution showed an extraction of 60 per cent. of the gold in 24 hours and 81 per cent. in 48 hours. My laboratory experiments showed the consumption of 12 lb. of cyanide in tests with 2 a.t., and 8 lb. of cyanide with 10 a.t. tests. This discrepancy led to the belief that the larger the sample the smaller the consumption of cyanide would be. In actual work this proved true, for in 20-ton lots the consumption fell to about 2.2 lb. per ton.

The laboratory tests showed the above abnormal consumption of cyanide to take place in the first six hours of treatment, after which the curve remained stationary at a nominal figure. This showed plainly that some cyanicide had to be fully satisfied at the start. In the mill the lime was ground in the rolls and tube mill with the ore, and had the best chance of becoming intimately mixed and so render the sulphates innocuous. When testing other ores I have found this same consistency, so I imagine it must be due in some part to the mass of material under treatment.

Owing to financial difficulties the slime filter for which the plant was designed was never put up, so this experiment on the ores of eastern Oregon never came to fruition, but the laboratory tests and the experiments made without the filter showed unmistakably that an all-slime process would solve the problem.

The Columbia mine has a cyanide plant treating the sands by percolation and the slimes by decantation; the In-

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*Mining engineer, Pasadena. Cal.

dependence mine has a small plant (now idle) treating the product from rolls by percolation; the Red Boy mine has a small plant agitating and decanting; the Cougar mine has tried percolating with poor success; none has thus far tried the sliming process, and to make a success, it remains for some one to introduce this process as carried out in Nevada or Mexico.

The orebodies of the dirstrict are of sufficient extent and have been developed to a depth to warrant the expenditure necessary to erect good mills. The failures have been due principally to insufficient capital or unskilful use of what money has been expended. Ores, no matter of what grade, must be studied; a process must be worked out for the ores, not the ores made to fit a fixed process. Because a cyanide process has been tried is no reason why a modification of the process suited to the physical and chemical character of the ore may not make a success.

Osceola Consolidated

The Osceola Consolidated Mining Company of Michigan reports the sale of 24,659,729 lb. of copper in the year ended Dec. 31, 1909, at an average price of 13.3c. per lb., and 636,928 lb. sold since Jan. 1 at 14c. The total income was $3,465,856, expenses $2,285,401 and new construction $109,810, leaving net profit $1,070,645. Dividends amounting to $10 per share were paid, leaving a total surplus of $1,851,220. The accompanying table gives some comparative figures of operations in 1908 and 1909.

RESULTS AT OSCEOLA.

	1908.	1909.
Tons of rock mined	1,353,406	1,632,076
Tons stamped	1,241,400	1,494,845
Mining, transportation, stamping and taxes per ton of rock	*$1.50	$1.36
Pounds of mineral obtained	26,912,944	33,107,579
Pounds of refined copper produced	21,250,794	25,296,657
Per cent. of refined copper in mineral	78.961	76.407
Pounds refined copper per ton of rock stamped	17.1	16.9
Cost per pound at mine, excluding construction	8.74c.	8.04c.
Cost per pound construction	0.69c.	0.41c.
Cost per pound of smelting, freight, commission, eastern office, etc.	1.10c.	0.99c.
Total cost per pound refined copper	10.53c. *0.28c. 10.25c.	9.47c.

*During the year 1908 there was charged against the costs of copper $60,000, as a replacement fund, amounting to 5 cents per ton of rock and 0.28 cents per pound of copper. For purposes of comparison these amounts should be deducted.

The Osceola branch was operated at a loss, the rock yielding only 14 lb. copper per ton of ore, and will be closed down. The openings at the north Kearsarge branch are of average quality. At the south Kearsarge branch the character of the rock opened is satisfactory, and the cost of production was the lowest of the three branches. The stamp mill is now running up to its full capacity.

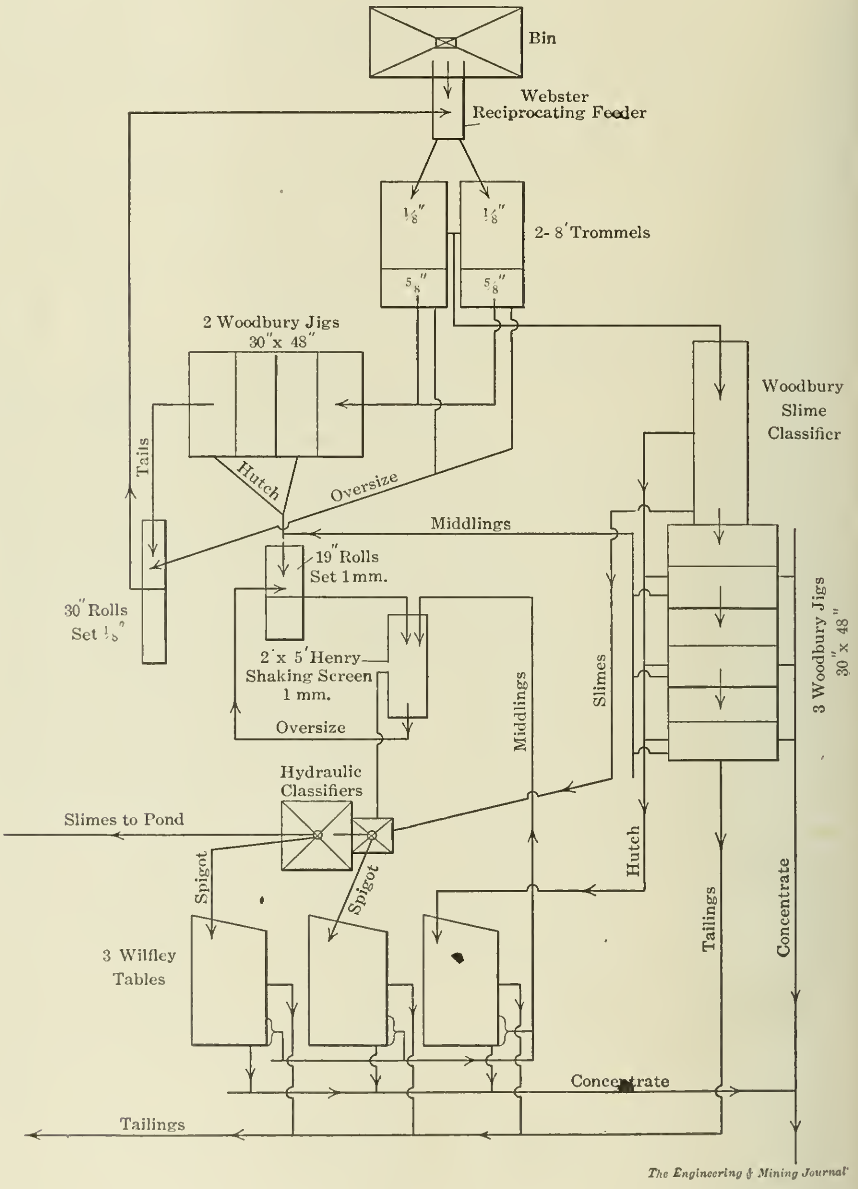
The Conqueror Tailings Plant

SPECIAL CORRESPONDENCE

There is a great deal of activity in the Joplin district in working over the tailings piles which are so plentiful and in many cases as rich as the sheet ground that is being mined at present. These tailings piles are from the mills that were operated in the early days of the camp, when less attention was paid to milling practice. However, there are still many tailings piles accumulating that are richer than they should be. A large number of the mills are still operating without the use of slime tables, though the majority of the newer mills are installing tables.

The National Ore Concentration Company of Milwaukee, Wis., has recently installed a mill at the Conqueror mine to treat 800,000 tons of tailings which this company has leased. These have been thoroughly sampled and contain from 2 to 2½ per cent. zinc. The plant, when completed, will have a capacity of 250 tons per day and is already producing 2 to 2½ tons of concentrate from 175 tons of tailings per day. The capacity of the mill is limited to this from the fact that not enough Wilfley tables are yet installed. There are three tables in operation now and the building is being enlarged to accommodate five or six more tables. At present the slimes from the hydraulic classifiers are being collected in a pond for subsequent treatment.

The accompanying flow sheet shows the equipment of the plant and the method of operation. When the plant was first started the ore was crushed to 3/16 in. From this the concentrate produced contained 49 per cent. zinc. The rolls are now set to crush to ⅛ in. and the zinc contents of the concentrate have been in-



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FLOW SHEET OF THE CONQUEROR TAILINGS PLANT, JOPLIN, MO.

creased to 53 per cent. The percentage of extraction will be greatly increased when the other tables are placed in operation. In fact, it is the hope of the management to recover 75 per cent., or more, of the zinc content.

The plant has been running only a few months and is an entirely new type of milling in this district. The feed is classified and all the slimes and fine sands taken out at the start and sent to tables. In this way the Woodbury jigs are operating on a product that is more uniform in size and character than in any other mill in the district. The entire plant seems to be a step in the right direction, that is, fine crushing, better classification and the use of tables.

The Barberton Goldfield in Swaziland

An interesting paper on the Barberton goldfield, a district about which little has been published, was read by A. Richardson at the meeting of the Chemical, Metallurgical and Mining Society of South Africa, at Johannesburg. Barberton is situated in the southeastern side of the Kaap valley at the foot of the Makongwa mountains, which form the northern boundary of Swaziland. It is 283 miles east of Pretoria and 136 miles west of Delagoa bay by rail.

The occurrence of alluvial gold in the Kaap valley was first reported in 1875, and in 1882 several hundred diggers were at work in the creeks in the vicinity. Owing to rich finds this number rapidly increased until in 1884 there were 2000 diggers scattered over the De Kaap district, finding gold everywhere and content to leave reef possibilities disregarded. However, some of the more enlightened began to prosecute a search for reefs, with the result that one of the Barber brothers discovered one at the back of what is now the town named after him. The Umvoti reef was found the next day, and later Edwin Bray discovered what was truly named the Golden Quarry, the outcrop of the Sheba reef.

The Sheba Mine

The Sheba may be said to have both made and unmade Barberton, because while it drew universal attention to the district, attracted capital and stimulated prospecting, it was the nucleus of a disastrous boom. The Sheba Gold Mining Company was floated in 1886 with a nominal capital of £15,000 in £1 shares, and the first crushings returned 8 oz. over the plates, the tailings carrying another 4 oz. On the strength of this the shares rose to £120, and anything in the shape of a reef in this district was readily floated by company promoters for capitals varying from £10,000 to £500,000. Shares in many of them, with the grass roots still undisturbed, ran up to twenty or thirty times their nominal value.

Disillusionment as complete as the uninformed optimism had been exaggerated quickly followed, and the population of the town, which had risen from 1000 in 1885 to 10,000 in 1886, rapidly dwindled again, many going to the then newly discovered Witwatersrand.

Although most of the properties on which development was done in the early days are now held or being worked by tributers and small syndicates, the district has by no means been adequately prospected, difficulties of transport standing much in the way. Being a mountainous district with extensive foothills and ravines, good sections and exposures can generally be found, and although plenty of chipping and scratching has been done everywhere there is still an opportunity for the man with a good nose for a reef.

This has been exemplified in all mining countries, so a few Barberton illustrations will suffice. In the Sheba section the rich portion of the outcrop of the Zwaartkopjes bar, which when found showed nuggety gold freely and stood out above the surrounding surface, and from which a lot of 100 tons returned 23 oz. to the ton, lay for 10 years with the Sheba battery crushing close to it just over the other side of the hill.

Another case was that of a reef discovered in 1896 on the Swaziland bridle path close to Barberton. This reef crosses the path at right angles and owing to its superior weathering qualities formed an awkward step for horses and a bit of a scramble for human beings; yet it was 10 years before anyone observed that where it crossed the path it carried "visible" freely. Of a similar nature was the finding within the last two years of a reef within a few hundred yards of two established mines and a hotel which from time to time had been the point of call of numerous prospectors. This was discovered by its present owner who, while in the course of a Sunday afternoon stroll, stopped to admire the scenery and kicked off a projecting piece of quartz, finding it to contain visible gold.

The mountainous nature of the country, furrowed by deep ravines, enables the reefs to be developed by means of adits driven on or to them at considerable depths below the outcrops (the lowest adit at the Mount Morgan is 900 ft. below the outcrop) which obviates hoisting and pumping expenses and enables the rock to be gravitated to the reduction works with practically no handling.

The small high-grade reefs of the district, with ore easily distinguishable from the country rock, lend themselves readily to sorting, which is done to the extent of 80 per cent. in extreme cases. The majority of the reefs are free-milling, such mines as the Consort, Mount Morgan, Rosetta, etc., being exceptions, but still it may be said that Barberton ores are refractory when those of the Rand are taken as a standard for comparison. The mills now running vary in style from the humble, one-stamp, glorified pestle and mortar driven by a homemade water wheel, to the 40-stamp turbine-driven equipment of the Worcester; the cyanide plants show corresponding differences.

Working Conditions

The widely varying conditions prevent an average working cost per ton crushed being struck. With a 5-stamp mill crushing from a large, soft reef and employing 2 whites and 25 natives, a return of 2 dwt. over the plates pays well; in the case of a high-grade, hard, narrow reef, sorting up to 65 per cent. of the rock mined, crushing 250 tons per month and employing 5 whites and 100 natives, costs will be quite 37s. ($9) or even higher.

Though the irregularity of auriferous deposition and the uncertainty of reef continuance render operations on a large scale generally undesirable, many chances offer for the small syndicate; but even with these latter considerable caution must be exercised if disaster is to be avoided. The chief reasons for the failure of small mines may be conveniently collected under the following headings: (1) Bad selection of ground, (2) inefficient methods, (3) lack of capital, (4) bad management.

In the selection of ground it is essential that the reef itself, as well as the related geographical conditions, should be studied with extreme care, and that nothing whatever be taken for granted; information given by interested parties, though often reliable, occasionally suffers from a low standard of authenticity, and the 10 oz. of the seller are apt to materialize as the 2 dwt. of the buyer. To pass a sound judgment requires special qualities in the man who does the investigating, a point sometimes overlooked by Rand syndicates who more often than not are averse to spending money in these preliminaries. It is much better to spend a hundred or two in a thorough examination, and then, if unsuitable, turn the project down and cut the loss, than to spend only a few pounds and risk losing thousands.

Permissible Explosives as Used in Coal Mines

The Increase in Amount of Fine Coal Produced by High Explosives Can Be Largely Overcome through the More Intelligent Use of Permissibles

BY J. J. RUTLEDGE*

Owing to the numerous disastrous ex-losions in the coal mines of the United tates, which are believed to have been aused, in many cases, by the use of lack blasting powder, the manufacture f permissible explosives has increased apidly in late years. As a result of uite recent mine explosions, and the ork of the Pittsburg Testing Station, he use of permissible explosives has een greatly extended, and they are now sed to some extent in the mines of estern Pennsylvania, in northern and outhern West Virginia, in southern Illiois, in eastern Oklahoma and in cenral Alabama. It is proposed, in the folowing paper, to give the results of some ield observations made in the mines in he various States where the permissible xplosives are being used.

There are three varieties of permissible xplosives, viz: the ammonium nitrate lass, the nitroglycerin class and the ydrated class. The manufacturers of hese permissible explosives make varius grades of each of these several lasses, with a view to adapting them to meet the varying conditions met with in he coal seams in different regions. It s possible, by trial, to secure a permisible explosive adapted for blasting any articular coal, just as it is possible to btain a grade of black blasting powder suitable for blasting the same coal. A very considerable sum of money has een spent by the various powder companies during the past two years in the ndeavor to perfect permissible exploives suited to the requirements of the arious coalfields, and it is quite probble that these manufacturers will ultimately be able to produce explosives of uch character as will be capable of perorming equally as well any work of lasting which is at present done by lack blasting powder.

These new explosives are entirely different in character from black blasting owder, being much quicker and much more powerful than black blasting powder, and should be used accordingly.

SHOTS FIRED BY SHOT FIRERS

In the chief districts where observaions were made, the method employed o fire shots with permissibles has been y the employment of a special shot firer, whose sole duty is the firing of shots for the miners. He carries a shot-firing lamp, a magneto-electric battery, or a dry-cell battery with safety contact button, and goes from one working place to another, tamping the shots and, as soon as they are ready, firing them. No shot is supposed to be fired until the working place is properly timbered and the shot firer is satisfied that the shot is a feasible one. As the shots are fired in turn, as far as possible, the miner knows when to expect the shot firer and usually has his shots ready for tamping as soon as he arrives. This practice yields better lump coal, regulates economically the amount of explosive used, results in more systematic work and produces better discipline than the plan of allowing miners to shoot shots indiscriminately. Moreover, by this plan, no one miner is allowed to load out all his coal before his neighbor, and the driver has a uniform tonnage for hauling during the entire shift.

During recent years, in mining districts where considerable gas is found in the mines, or the roof is poor or dangerous and considerable timber required, in the best disciplined mines it has been customary to employ entry or district bosses. These men, who are picked, practical miners patrol the working places, of which each has a certain number under his charge, noting that they are properly timbered and that the miner is, at all times, working under safe conditions. Many companies, especially those employing an inferior class of labor, have found such an arrangement necessary. If permissible explosives are employed to blast the coal, these entry or district bosses can also perform the duties of the shot firer, when the men are properly distributed. The tamping and firing consumes but a small amount of their time, and the entry boss is compelled to visit each working place whether he shoots the shot or not; hence he can easily perform this additional duty. One large coal-mining company in West Virginia has found such an arrangement very satisfactory.

In some mines in the Eastern districts, using permissible explosives, the miners fire their own shots, using fuse and detonators. The shots are generally fired either before the shift begins or in the early part of the shift. In so far as observations extended, this practice does not yield as good results as does the plan of using shot firers, for the reason that there is a tendency to use more powder than is absolutely necessary to bring down the coal, and in this way the per cent. of fine coal is increased. One serious objection to this practice in gaseous mines is the danger of igniting the gas when the fuse is lighted. In several instances the coal has been fired in this manner. Firing by miners has the additional disadvantage in the unsystematic manner in which the shots are fired, and in the carrying of explosives by those not familiar with the danger attending their use.

ELECTRIC FIRING

In the best practice, the permissible explosives are exploded by electric detonators. The shot firer carries a firing machine with him on his rounds, also a number of electric detonators. When he arrives at each working place, the miner has previously prepared the drill hole and is awaiting the shot firer's coming, the tamping and explosive being already placed at the face of the coal near the drill hole. The shot firer examines the shot, estimates the amount of explosive necessary, fits the electric detonator to the explosive and then tamps the hole, being assisted in the operation by the miner. As soon as the hole is tamped, the detonator wires are connected to one end of a piece of double leading wire, varying in length from 75 to 100 ft., the other end being carried back to a crosscut or other convenient place, out of danger from the shot, the wires connected to the firing machine and the shot fired.

There is no possible danger when this plan is carefully followed out. Generally there is a loss of a foot or two of leading wire every few days, owing to the breakage of the ends of the wires, but the loss is inconsiderable. The number of shot firers necessary by this plan averages, in mines where it is at present in use, one shot firer for each 200 to 300 gross tons of output, the coal being properly undercut in every case.

Since, in the system of firing by electricity, the companies usually furnish the electric detonators, the quality of the same is more apt to be of uniformly good grade than if they were purchased individually by the miners at the various stores. Moreover, in this way, the company has the assurance that the explosives will be given proper detonation, which is essential, and can fix responsibility in case poor detonators are supplied.

On account of the facility with which blasting fuse can be used, it is generally

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*United States Geological Survey.

employed to fire such shots as the miner himself fires. Fuse and detonator are also used in some mines in which shot firers are employed. But there is always the probability of improper detonation when blasting fuse is used, as well as the possibility of the naked flame or wire used to light the fuse igniting the gas at the working face. Quite recently, certain devices have been placed upon the market which are said to prevent spitting (and hence ignition of gas) of fuse. This device consists of a tube containing a sulphur match, which is ignited by turning a projecting wire. The tube fits closely over the projecting end of the fuse. In some mines there is the tendency to economize by shortening the length of the fuse, at the expense of safety. Fuse is subject to misfires, from kinked or cut fuse, or vacant spots in the fuse, and from the loosening of the detonator from the fuse to which it has been insecurely clamped. When fuse is employed, the common practice is to load and fire the holes shortly after they are drilled. The cost of the electric detonators is about the same as the blasting fuse of same length, and for this reason, if for no other, they should be used.

In using permissible explosives, the miner should exercise at least as much care as he would in using black powder. The new explosives, while much stronger, bulk for bulk, than black powder, still require the exercise of judgment in their use, in order to obtain the best results. All observations tend to show that they work to best advantage and yield the maximum amount of lump coal when the coal face is shot in several successive shots. It is much better to employ a number of small shots than to have a few large ones. All holes, in the best practice, are so drilled as to take every possible advantage of bands or partings in the coal bed, and each shot is fired and loaded out before the succeeding shot is fired.

METHOD OF CHARGING PERMISSIBLE EXPLOSIVES

Certain permissible explosives are furnished in cartridges of such large diameter that the cartridge cannot be inserted in the drill hole. In such cases, the explosive is removed from the paper covering and inclosed in a smaller, loosely rolled paper tube, of just large enough diameter to fit the drill hole. This delays the miner in preparing his cartridges. When the cartridges are considerably smaller in diameter than the diameter of the drill hole, some miners slit the cartridges into halves, lengthwise, and tamp the separate pieces tightly into the hole. This plan is necessary when the coal requires a quick explosive. When a slower action is required, loose tamping or the introduction of an air space will materially decrease the explosive action. Owing to the time consumed in rebuilding cartridges, or in slitting same lengthwise, the miner usually prefers the cartridges which fit the drill closely and require no alterations before being used. If the cartridge containing the permissible explosive fits the hole snugly there is no time lost in charging the hole, the shot firer merely inserts the electric detonator in the cartridge and pushes it back to the end of the drill hole, tamps the "dummies" in, and, after connecting the leading wires, is ready for firing. Given the same shots to fire, the permissible explosives will be much more quickly prepared and fired than black blasting powder.

In accordance with the fact that coal beds vary in character from point to point, so that the holes used to shoot down the coal vary in position in different fields, in some fields the permissible explosive must be placed as far as 2 ft. from the roof and ribs, in order to obtain best results, while in others they should be placed as close as 6 in. to the roof and ribs to get the same results. The angles the hole makes with the horizontal also vary in different fields. In some fields they are nearly horizontal, and in others make as great an angle with the horizontal as 30 deg. However, they never require as great a lift as do holes for black powder. Usually, all holes are driven parallel to the ribs, unless the face is not squared up, in which case, occasionally, one drill hole is driven at a slight angle with the ribs in order to displace the uneven face. As a rule, the greater the number of drill holes, within certain limits, the better the quality of coal resulting. In no instances are the holes drilled on the solid, but only as far as the mining extends. Level holes cut out horizontally and yield better results than those driven at an angle with the horizontal.

As the permissible explosives are always made of a certain standard diameter and length, the miner knows exactly how large the drill holes must be to insure good results from the charge, and the coal auger can be maintained at a certain definite gage.

Moist clay, made into "dummy" cartridges of slightly smaller diameter than the drill holes, is generally employed as tamping. This clay is either dug outside the mine and brought into it in mine cars and left at various points along the entry, within easy reach of the miner, or it is dug inside the mine, from the clay underlying the coal bed. In one or two instances, coal spalls have been used for tamping, but their use is not to be commended. Coal cuttings and even fine coal dust, made by the coal auger, have been used for tamping, but such practice is dangerous, as, even if they are wet, the heat of the explosive is apt to ignite them. Wooden rods, which fit the drill hole snugly, are employed as tamping bars. There is considerable variation in the degree to which the material is tamped. Some coal seems to shoot better when the explosive is tightly tamped, while other coals work better when it is loosely tamped near the explosive and tightly tamped the remainder of the hole, or when air spaces are permitted to exist between the different "dummies." When the explosive is too quick acting for the coal, a plug of soft, tough clay is often employed to produce an air space between sections of the tamping. The explosive expends a portion of its energy on the air space and the remainder on the coal, and in this manner the explosive force is reduced to such a degree as is best suited to the coal being blasted. In case this method is used, care must be exercised to tamp firmly.

An advantage connected with the use of permissible explosives is the facility with which they can be used in wet or damp holes. In shooting coal off the solid, in thick coal seams, the bottom holes are often found to be wet and incapable of being fired with black powder; in one mine, permissible explosives were being successfully employed to shoot the wet bottom holes.

USE OF PERMISSIBLE EXPLOSIVES IN GASEOUS MINES

In blasting high volatile coals, yielding considerable gas, the use of permissible explosives is absolutely necessary on account of the ignition of bodies of standing gas, in the advance working places, or of strong gas feeders at the face, by the flame yielded by the explosion of black powder. When properly prepared, the permissible explosives are practically flameless, and there is no ignition of gas or of the freshly mined coal.

In two important coalfields in southern Illinois and eastern Oklahoma, in widely separated parts of the Central Basin, permissible explosives are being used to some extent in driving entires in coal seams, which make fine coal dust and generate considerable inflammable gas. The new explosives are generally used in the entries alone, but in some cases also in the rooms. Previous to the introduction of the permissible explosives, the firing of the coal in the entries of some of the mines, had been of daily occurrence, while with the permissible explosives, there were practically no fires.

One of the most important results of the use of permissible explosives is the absence of smoke when these explosives are properly fired in suitably prepared drill holes. When there is just enough of the permissible explosive to blow down the coal, no smoke and little or no fumes are noticeable. The ventilating current is not fouled by large quantities of dense smoke, as is the case when black powder is employed, and the roof can be better inspected.

Complaint is frequently made of the

fumes rising from explosions of permissible explosives. Little or no difficulty, so far as observations of the writer extended, has been found to arise from such causes. In most cases investigated, the shortest time the miner was away from the face was 30 sec. after the shot was fired, and in no case was there any discomfort arising from the fumes resulting from the explosion. When the ventilating current is brought directly up to the working face there should be no discomfort due to fumes resulting from the explosion of permissible explosives, when such are used judiciously.

Ignitions after Permissible Explosives

It is extremely difficult to obtain authentic information as to the prevalence of occurrences of ignitions of gas after explosions of permissible explosives. Shot firers and miners are apt to fail to report the ignitions at the time they occur, and then refer to them at some subsequent time, when it is extremely difficult to obtain the facts surrounding the occurrence. From observations made while following the shot firers on their rounds, it seems extremely probable that by far most of the ignitions are due to the bringing of open lights up to the working face immediately after the explosion of the permissible explosives. The gaseous products of combustion from some of the permissible explosives yield no inflammable gases whatever, while others give out a small amount of such gases. As the new explosives do not scatter the coal, but merely cause it to drop down a few inches, opening up cracks and crevices at the roof and along the bedding planes of the coal, the gases liberated from the coal do not find as ready egress as they would if the coal were blown away from the face and scattered. For this reason, the gas released from the coal is not as quickly diffused as it is in cases where black powder is used, and it is easily fired when a naked lamp is brought into contact with it.

Exactly the same result would occur if a smaller charge than usual of black powder were used, and the coal was not blown off the bed, but merely dropped on the mining. In one large coalfield, in which open lights were used, and little or no gas was found, experiments made by bringing open lights into contact with coal freshly blasted by permissibles, showed that by holding a light to the cracks in the coal, an ignition resulted in nearly every case. This was true also when black powder was used sparingly and the coal was not scattered, but merely dropped down on to the mining. By allowing at least an interval of five minutes to elapse between the firing of the shot and the approach to the face, with a naked light, there should be no danger of ignition after permissible explosives have been exploded.

Effect on Quality of Coal Produced

When, in a given mine, the charge is made from black powder to permissible explosives, there is doubtless, in some cases, a slight increase in the amount of fine coal made; still, a considerable amount of this increase must justly be charged to the inexperience of the person using the permissible explosive. It is well known that miners must become accustomed to the use of a new grade of black powder, before they can secure good results with it; also that each miner must learn by experience how best to shoot any new coal seam with which he may come in contact; in like manner, he must become accustomed to the use of permissible explosives, before he can obtain the best results from them. These new explosives are entirely different in character from black powder, and must be used in a different manner.

From observations recently made, it has been found that in using permissible explosives, there is a tendency to try to blast thick coal beds, with one or two shots only, when several additional ones should be employed. If these thick coal beds were not undermined by puncher or electric chain machines, but were being blasted off the solid, either in whole or in part, the miner would never think of trying to blast the entire bed in one bench, but would break the coal down by several successive shots, each one depending for its success on the preceding one. The permissible explosives should be used with the same judgment, and if so used, results in quality of coal produced will compare favorably with black powder.

In some coalfields, black blasting powder, costing the operators from $1.10 to $1.15 per keg, is sold to the miner at an agreed price of $1.75 per 25-lb. keg. The profit on black powder in some mines, especially those in which coal is shot off the solid, and hence consuming large quantities of powder daily, is considerable, and some of the operators using such powder are unwilling to lose this profit. In such cases, when permissible explosives are introduced, the proper method of procedure is to ascertain the cost of powder per ton of coal produced, and charge the permissible explosive to the miner at the same rate.

The price paid per pound for permissible explosives furnished the miner by the companies, varies from 12 to 14c. Hitherto, as a rule, there has been no profit made by the company in the sale of the permissible explosives, the amount charged the miner only covering the wholesale cost of the explosive, with the expense of handling same, being added. The miner usually pays one-half cent per foot for fuse, and from one-half to three-quarters of a cent for detonators. When electric detonators are used, it has usually been the practice of the company to furnish them to the miner free of cost. These electric detonators cost from 3 to 5c. each, depending on their relative strength and length of wires. In one mine in which the coal averaged about 7 ft. in thickness, and in which the shots were fired by fuse, the cost of the fuse and detonator was 3½c. for each shot. The cost per ton for permissible explosives at this mine varied from 1¾ to 2c. per gross ton of coal produced. In this instance the company paid the shot firers, of whom four were employed, at $2.75 per shift, for an output of 800 gross tons.

Failures of Permissible Explosive Shots

Failures with permissible explosives may be due to four causes:

First. Frozen or deteriorated explosive.

Second. Improper detonation, that is due generally to the detonator used being too weak to detonate the charge.

Third. A displaced detonator.

Fourth. The wires of the electric detonator may have lost part of their insulation, or the same accident may have happened the leading wires extending from the detonator to the battery.

These failures can be avoided by using only the freshest, unfrozen powder; by employing only the strongest detonators, and taking care to see that they are properly placed in the cartridge, and by using new connecting wires and carefully examining them for worn spots before each shot is fired.

As it leaves the factory, the cartridge containing the permissible explosive, is covered with a heavy paper, made water and weather proof by a coating of paraffin or similar substance. If such cartridges are carelessly handled, the paraffin coating is broken and air and moisture are allowed access to the powder, resulting in a loss of strength, and eventually complete destruction of the explosive power. Loss of strength also results from long exposure to the moist air of the mines, or from contact with water.

The following instances of misuse of permissible explosives have been occasionally noted in the mines using these explosives. The most common abuse has been the use of an excessive amount of charge, especially when miners are shooting their own shots and no regular shot firer is employed. The miner desires to bring down the coal completely, without the necessity of his performing any pick work, and with this end in view, he generally employs an excessive amount of the explosive. The shot firer, on the other hand, generally endeavors to secure the maximum amount of lump coal, and consequently, only employs enough explosive to bring down the coal, and usually produces a better quality of coal.

Another reprehensible practice, occaonally observed, is the introduction of nall amounts of permissible explosive ito the back of the powder hole, before ie arrival of the shot firer and without is knowledge. This may be done to over up the fact that the hole has been rilled on to the solid, beyond the minig, or it may be a precaution taken to isure the use of what the miner coniders an adequate amount of charge. he practice is a very dangerous one, and annot be too strongly condemned. One istance is on record of the introduction f dynamite into a drill hole which was estined to contain permissible exploives. In this case a flame followed the ischarge of the blast.

Perhaps the most common abuse is ie bringing of naked lamps into contact ith the gases liberated or disengaged by ie explosion of permissible explosives.)wing to the fact that the latter make ttle or no smoke, when properly emloyed, the miner can return to the shot nmediately after it has been fired, and sually does so, especially when there re no offensive fumes. The naked lamp f the miner may ignite the gases geneated by the explosion, or those liberated rom the coal.

So far as observations extended, : was possible to produce a flame y bringing a naked lamp into contact vith the freshly blasted, but still standng coal, whether permissible explosives r black powder were used, but, result f analysis seems to prove that the inlammable gases come from the coal, in early every instance. In this manner a igh volatile coal may be readily fired, ind such fires, once well started, are exinguished only with great difficulty. A safety lamp should be used in gaseous mines when the miner approaches the shot after it is fired.

Comparative Amount of Coal Produced by Black Powder and Permissible Explosives

It is quite difficult to obtain accurate data as to the relative amounts of fine coal produced by the black powder and the permissible explosives, owing to the comparatively recent introduction of the latter. Estimates by mine superintendents as to the increased amount of fine coal, due to the use of permissible explosives. vary from 0 to 10 per cent., though some superintendents maintain that, while the lumps of coal resulting from use of permissible explosives may be smaller than those produced by black powder, yet the aggregate amount of coal passing through the same sized screen is not less than with black powder. Some observers maintain that the lumps of coal produced by use of the permissible explosives are not as easily broken up by transportation or exposure to atmospheric agencies, as are those resulting from the use of black powder, while others maintain that the reverse is true. In most cases, however, where care is used, the permissible explosives make as good coal, at approximately the same cost, as black powder, when the coal is properly undercut.

When permissible explosives are properly employed, ignitions are very rare, and no mine fires result. This fact is a very important one to all mine owners.

When blasting coal, previously undercut, by means of permissible explosives, it is not necessary to give the drill hole as great an inclination as when black powder is employed. In order to obtain good results from black powder, it is usually necessary to give considerable "lift" to the drill holes, and in doing this, the holes are frequently driven into the roof coal or slate, shattering the same and rendering the use of timber necessary. On the other hand, the new explosives appear to give more satisfactory results, both in blowing down the coal, and in the size and quality of lump produced, when the holes are drilled almost horizontally. In such cases, the permissible explosives appear to work out horizontally along the bedding planes of the coal, and consequently do not strike up into the roof coal or slate, when proper advantage is taken of the slate bands or partings in the coal bed. It is possible, when leaving up head coal as a roof, to preserve a smooth, firm layer of roof coal, unbroken by the force of the explosive, and therefore, requiring less timber to support it. The permissible explosives need not always be placed directly on the ribs, as must black powder, but can be placed as far as 2 ft. from them, and still bring down the coal. Moreover, in some coalfields, when the permissible explosive is thus placed, the ribs are cut much cleaner than when black powder is used. In one mine there was an increased yield of 1½ tons per cut over the use of black powder, due to this trimming effect of the permissible explosives. These explosives strike into the rib whenever placed within a reasonable distance of the same. On the other hand, when the hole containing the permissible explosive is drilled on the solid, to any distance whatever, the explosive merely expends its energy at the end of the hole, forming a crater at that point, without breaking down the solid coal. If black powder is thus placed, windy shots often result, while with permissible explosives this result rarely occurs. The ribs in rooms and entries cannot be robbed or stepped when using permissible explosives, as they often are when black powder is employed. The permissible explosives will not cut ahead on the solid, in advance of the mining, as will black powder. These explosives, when properly used, do not scatter the coal over the gobs, where it is lost, nor do they displace props, as is the usual condition when black powder is used. When the coal is properly undermined and blasted with permissible explosives, the coal is not thrown outward or displaced, but merely settles down in its bed, although it is generally sufficiently broken up to permit easy loading.

There is not nearly the concussion accompanying the use of these explosives as there is found resulting from the use of black powder. Brattices, doors and stoppings are not subjected to as injurious air blasts as with black powder. Owing to the absence of windy shots and dust explosions, the position of the shot firer is more easily filled and does not have to be filled so often, when permissible explosives are used, than when the shot firer is required to shoot black powder.

In some mines, working a high volatile coal, giving off considerable gas and making large quantities of fine coal dust, it is necessary to employ a fire runner with every pair of shot firers. His duty is to follow the shot firers and extinguish any fires resulting from their work. This expense is avoided when permissible explosives are employed. In one mine which was using permissible explosives and leaving up top coal, no regular timberman had to be employed, as was formerly the case when black powder was used. The permissible explosives are cleaner and vastly more convenient to use and handle than black powder, and they can, moreover, be prepared and fired much more quickly than black powder. Since coal is not scattered when they are employed and timbers are not dislodged, the miner's working place is made safer.

The shots fired with permissible explosives are vastly more safe than those with black powder. There is considerable saving of time, owing to the absence of smoke, and the miner can more readily examine the roof after firing, when permissible explosives are employed in blasting coal. Since they are very much stronger than black powder, the same effective charge of permissible explosives occupies only about one-half the space that a charge of black powder of the same strength would, hence there is much more tamping on the permissible explosive than on the black powder charge and relative increase in safety. Moreover, the miner does not require as many tools to prepare shots as he does for black powder.

Disadvantages of Permissible Explosives

Most prominent among the objections urged against the use of permissible explosives are the following: The fact that most of them freeze at a rather high temperature; they usually cost more per ton of coal produced than black powder; and, lastly, the fact that some of them deteriorate rapidly on exposure to the atmospheric agencies. There is often considerable difference in the sizes of the various permissible explosives, and this fact causes trouble when one size is substituted for another.

In using permissible explosives, three factors enter into a failure. These three factors, the failure of any one of which will prevent a blast, are: First, condition of the permissible explosive proper; second, the electric detonator; third, the contrivance employed to generate the electric spark or battery. In using black powder but two factors are concerned in the blasting; these are the powder itself, and the fuse or squibs used to explode the powder.

Pneumatic Transportation of Coal

A pneumatic method of transporting coal from the mines has been installed and is being tested at the mines of the United States Coal and Coke Company, Gary, W. Va. Superintendent Edward O'Toole says: "We have installed a 24-in. pipe for the purpose of thoroughly testing the practicability of transporting coal in large quantities by this method, and for the further purpose of getting some accurate data on same. There is no doubt, whatever, but that coal can be moved the same as grain, sawdust, ashes, etc., but the large amount of power required to move material by this method has been a stumbling block, and rendered many attempts impracticable.

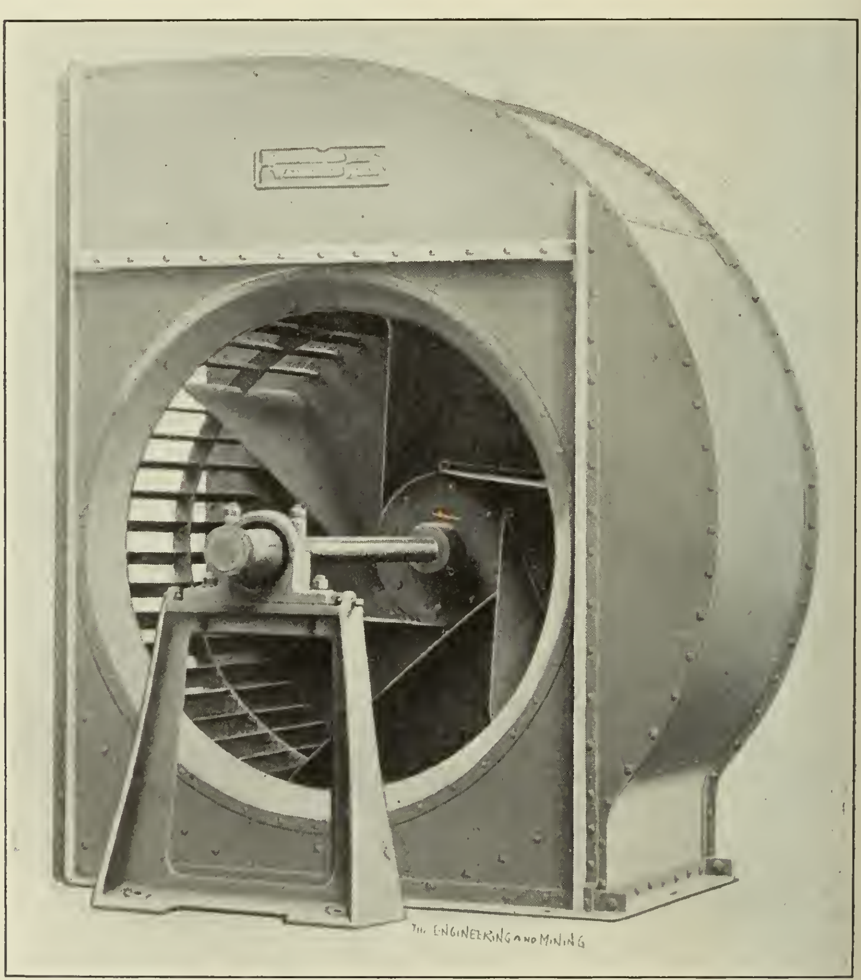
"We have discovered, however, that, by using a number of vacuum chambers, the power required can be largely reduced and the system made feasible. The distance from which coal can be transported in mines by the vacuum-chamber method may be increased indefinitely, and all machinery remain on the outside. Our estimates, which we believe are quite liberal, show that we can equip a mine with machines to mine the coal, and with the necessary machinery to transport same to the outside, with much less cost per hundred tons capacity than first-class mines are being equipped for by present methods."

Explosion in Anthracite Mine

Seven men were killed in a gas explosion at the No. 5 colliery of the Lehigh & Wilkes-Barre Coal company, on the evening of March 12. The men were hoisting an engine to a higher level when the explosion occurred. The bodies were found face down, faces covered by their hands, at three o'clock the following morning. Death was due to fire damp. Mine officials state that the place was safe a few hours before the explosion. It is believed the air was diverted through some manner yet unknown. An investigation is being made.

The Squirrel Cage Fan for Mine Ventilation

The squirrel-cage fan is the result of an extended seeking for higher efficiency and more capacity in a small space and is the latest form of the high-speed or many-blade type of fan. As in other makes of multi-blade fan, the wheel consists of a large number of shallow curved blades, each of which is secured at one extremity to a disk and at the other to an annular ring. The many shallow blades furnish the requisite blade area for the air delivered and permit a large inlet area, which reduces one of the greatest losses of power in the operation of the fan. With a small inlet the air must enter at high velocity, and this velocity is entirely destroyed before the air is delivered. With few blades, eddies and pulsations are formed in the so-called "paddle-wheel" fan because the outer ends of the blades are farther apart than the inner ends; yet the density of the air at the outer ends is greater.



Squirrel-cage Fan

In the early types of many-blade fans, the removal of all blades in the inlet was an attempt to reduce the eddying effect by restricting to the shortest period possible, the time the air is subjected to blade action. As a result a high velocity was imparted suddenly to the outer shell of air in the inlet the velocity being gradually reduced toward the center.

In the squirrel-cage fan this defect is overcome by using a few long blades extending toward the center of the wheel, but not radial. The scooping action of the blades starts the air in motion gradually, giving it a slowly whirling motion and then a rapid radial motion toward the small peripheral blades. A study of the action of the air shows that the direction of the long blades should be the same as the component of the two forces, the centrifugal motion and the whirling motion. Because the centrifugal force varies with a change in velocity, the position of the long blade must be changed for each peripheral speed, if maximum efficiency is to be secured.

The fan illustrated is made by the Massachusetts Fan Company, of Watertown, Mass. To provide for the many different conditions under which fans are used, and to make possible the most economical speed of motor, engine, or turbine three standard types *A*, *B* and *C*, are made in single and double widths.

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specification of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COAL AND COKE

COAL CUTTING—Improvements in Cutting Machines for Use in Mining Coal and Other Minerals. Mavor & Coulson, Ltd., Glasgow, and Robert C. Anderson, Alexandria, N. B. (Brit. No. 5617 of 1909.)

COKE—Apparatus for Watering Coke In Coke Ovens. William L. Affelder and Mark Gorton, Brownfield, Penn. (U. S. No. 949,290; Feb. 15, 1910.)

COKE—Process of Treating Fuel. August G. Maul, New York, N. Y., assignor to the Anthracoke Co., New York, N. Y. (U. S. No. 949,326; Feb. 15, 1910.)

COKE-OVEN DOOR. John J. Alley. Bristol City, Va. (U. S. No. 950,422; Feb. 22, 1910.)

COKE-OVEN DOOR—Door for Coke Ovens. William O. Abbott, Pittsburg, Penn., assignor to William Glyde Wilkins, Pittsburg, Penn. (U. S. No. 950,983; March 1, 1910.)

COKE-OVEN DOORS—Improvements in or Relating to Apparatus for Securing the Doors of Retort Coke Ovens or the Like. Paul Riecke, Dessau, Germany. (Brit. No. 15.276 of 1909.)

COKE OVENS—Improvements in Regenerative Coke Ovens. Louis B. Haine, Jolimont, Belgium. (Brit. No. 1866 of 1909.)

SAFETY DEVICES — Improvements In Safety Devices for Use in Connection with Explosives in Coal Mines and the Like. John G. Patterson, Darlington. (Brit. No. 4017 of 1909.)

SAFETY LAMPS—Igniting Miners' Safety Lamps in Mines. Percival Buckley, Batley, near Leeds, Eng. (Brit. No. 8112 of 1909.)

SAFETY LAMPS—Improvements in Miners' Safety Lamps. James H. Edmondson and Walter T. Garton, Wigan, England. (Brit. No. 11,514 of 1909.)

COPPER

EXTRACTION—Improved Process for the Extraction of Copper from Its Ores and Alloys. Société Francaise Electrolytique, Paris, France. (Brit. No. 4574 of 1909.)

MATTE TREATMENT—Improvements in and Relating to the Wet Treatment of Mattes. James Y. Carrick, and Basil S. Pattison, Johannesburg, Transvaal. (Brit. No. 21,164 of 1908.)

ORE TREATMENT—Improvements in the Treatment of Pyrite Copper and Copper-Nickel Ores. J. T. Carrick, and B. S. Pattison, Johannesburg, Transvaal. (Brit. No. 13,849 of 1909.)

REVERBERATORY FURNACES—Improvements in or in Connection with Reverberatory Furnaces Applicable for the Production of Blister Copper and Sulphuric Acid. Thomas Walker, Hough Green, England. (Brit. No. 9918 of 1909.)

SINTERING—Process for Sintering Ore. George G. Vivian. Tintic, Utah, assignor of one-half to Jesse Knight, Provo, Utah. (U. S. No. 950,798; March 1, 1910.)

GOLD AND SILVER

CYANIDATION—Treatment of Sands or the Like with Liquids. Charles E. D. Usher, Johannesburg, Transvaal, assignor to Adair-Usher Process, Limited, Johannesburg, Transvaal. (U. S. No. 949,455; Feb. 15, 1910.)

SLIME SEPARATOR and Classifier. Chas. Allen, El Paso, Tex. (U. S. No. 949,560; Feb. 15, 1910.)

IRON AND STEEL

BLAST-FURNACE-CHARGING APPARATUS. Rutherford H. Rogers, Youngstown, Ohio. (U. S. No. 949,403; Feb. 15, 1910.)

NODULIZING—Process of Nodulizing Fine Ores. Joseph Weatherby, Jr., New Cumberland, Penn., assignor to Andrew J. Dull, Harrisburg, Penn. (U. S. No. 949,387; Feb. 15, 1910.)

OPEN-HEARTH FURNACE. Samuel E. Meyers, St. Louis, Mo. (U. S. No. 949,192; Feb. 15, 1910.)

REFINING—Iron-Refining Furnace. Frederick W. Hawkins and George F. Key, Detroit, Mich., assignors to the Globe Steel Filtration Process Co., Detroit, Mich. (U. S. No. 949,475; Feb. 15, 1910.)

REFINING—Process of Refining Iron. Frederick W. Hawkins and George F. Key, Detroit, Mich., assignors to the Globe Steel Filtration Process Co., Detroit, Mich. (U. S. No. 949,474; Feb. 15, 1910.)

REGENERATIVE FURNACES — Change-Over Device for the Gas and Air Flues of Siemens-Martin or Other Regenerative Furnaces. Gustav von Bechen, Kalk, Germany. (Brit. No. 3609 of 1909.)

LEAD, ZINC AND OTHER METALS

ALUMINUM — Improved Manufacture of Alumimum Alloys. E. J. Seville de St. Laurent, E. W. Lancaster, H. T. McNeal and J. W. Collins, London, Eng. (Brit. No. 1339 of 1909.)

ALUMINUM ALLOYS. Société Anonyme, "Le Ferro Nickel," Paris, France. (Brit. No. 18,198 of 1909.)

NICKEL—Process for the Manufacture of Pure Nickel. Société Electro-Metallurgique Francaise of Froges, Isere, France. (Brit. No. 14,946 of 1909.)

TIN—Process for the Production of Pure Oxide of Tin. Gustav Spitz, Brunn, Austria. (Brit. No. 28,565 of 1908.)

TIN—Process of Removing Tin from Scrap. Charles J. Reed, Philadelphia, Penn. (U. S. No. 950,115; Feb. 22, 1910.)

TIN—Process of Separating Tin or Other Metals from Waste Metal, Metallic Ware, Alloys and the Like. Gustav Spitz, Brunn, Austria. (Brit. No. 28,551 of 1908.)

ZINC—Improved Means for Treating the Fumes from Zinc Retorts. Henry E. Howard and George Hadley, Halesowen, nr. Birmingham, England. (Brit. No. 4563 of 1909.

ZINC—Improvements in Means or Appliances for Charging the Retorts of Zinc or Other Analogous Furnaces. Emile Dor-Delattre, Dorplein-Budel, Holland. (Brit. No. 17,103 of 1909.)

NON-METALLIC MINERALS

ARSENIC—Improved Treatment of Arsenic Ores and Compounds. Frederic P. Dewey, Washington, D. C. (Brit. No. 11,073 of 1909.)

GILSONITE—Method of Mining Gilsonite. Thomas W. Blake, Dragon, Utah. (U. S. No. 950.363; Feb. 22, 1910.)

PETROLEUM — Method of Cleaning Oil Wells. Francis A. Flanegin, Chautauqua, N. Y. (U. S. No. 949,567; Feb. 15, 1910.)

MINING—GENERAL

BLASTING—Improvements in and Relating to Mine Exploders. Schaffler & Co., Vienna, Austria. (Brit. No. 24,469 of 1909.)

BLASTING—Improvements in Mining or Like Cartridges. Charles Stuart-Bailey, London, and Herbert L. Storey, Lancaster, Eng. (Brit. No. 7714 of 1909.)

BLASTING—Means for Preparing and Fixing Blasting Charges. Charles S. Bahney, Carthage, Mo. (U. S. No. 947.289; Jan. 25, 1910.)

DRILL SHARPENER. David G. Morgan, Jamestown, Cal. (U. S. No. 949,040; Feb. 15, 1910.)

MINE PROPS—Improvements in Appliances for Removing Mine Props. Amos Garbett, Hucknall Torkard, Nottinghamshire. (Brit. No. 6817 of 1909.)

MINER'S LAMP. Thomas Davis, Winburne, and Robert F. Monteith, Patton, Penn. (U. S. No. 949,318; Feb. 15, 1910.)

PICKS—Improvements in and Relating to Miners' Picks and Like Tools. William McDerment, Patna, Ayrshire, England. (Brit. No. 6334 of 1909.)

ROCK-DRILL CHUCK. Harold W. Schorlemmer, Rossland, British Columbia. (U. S. No. 950,030; Feb. 22, 1910.)

TRACTION ENGINE. Miladin Bunyetin, Bakersfield, Cal. (U. S. No. 949,350; Feb. 15, 1910.)

ORE DRESSING—GENERAL

CONCENTRATION—Improvements In and Connected with Concentrators or Apparatus for Separating or Grading Metals, Ores and Other Substances In Wet Recovery Processes. George L. Whitcombe, Johannesburg, Transvaal. (Brit. No. 1756 of 1909.)

CRUSHING—Improvements in Crushing Machines and in Appliances Connected Therewith. Samuel Osborn, and David Carnegie, Sheffield, England. (Brit. No. 9454 of 1909.)

FLOTATION PROCESS—Improvements in and Relating to the Separation of Zinc Blende and Other Metalliferous Constituents from Ore Concentrates and Slimes by Flotation or Granulation. Edward J. Horwood, Broken Hill, N. S. W., Aust. (Brit. No. 1789 of 1909.)

ORE MILL. Thaddeus C. Histed, Shawnee, Okla. (U. S. No. 949,982; Feb. 22, 1910.)

ORE-SAMPLING APPARATUS. Alexander J. McCone, Reno, Nev. (U. S. No. 949,284; Feb. 15. 1910.)

ORE TREATMENT—Improvements in and Relating to the Treatment of Metalliferous Ores or Compounds by Wet Processes. H. L. Sulman and H. T. Durant, London, England. (Brit. No. 1882 of 1909.)

PULVERIZING—Improvements in and Relating to Pulverizing Machines. H. A. Goetz, New Albany, Ind. (Brit. No. 8587 of 1909.)

SCREENING—Improvements in or Relating to Screening Apparatus. Henry J. Grace, Enderby, Leicester, Eng. (Brit. No. 9800 of 1909.)

SCREENING MECHANISM. Henry A. Goetz, New Albany, Ind., assignor to American Pulverizer Co., St. Louis, Mo. (U. S. No. 950,170; Feb. 22, 1910.)

SEPARATION—Apparatus for Separation of Particles from a Fluid Stream. Lawrence N. Morscher, Enterprise, Kan., assignor to William J. Ehrsam and Lawrence N. Morscher, co-trustees, Enterprise, Kan. (U. S. No. 949,041; Feb. 15, 1910.)

SEPARATION—Centrifugal Separator. William R. Macklind, Mineral Point, Mo. (U. S. No. 949,488; Feb. 15, 1910.)

SEPARATION—Ore Separator. George W. Kunkel, King City, Mo., assignor of one-half to Jesse A. Milligan, King City, Mo. (U. S. No. 949,709; Feb. 15, 1910.)

METALLURGY—GENERAL

COMBUSTION—Apparatus for Regulating Combustion. George W. Parker. New York, N. Y., assignor to the Parker-Russell Mining and Manufacturing Co., St. Louis, Mo. (U. S. No. 949,596; Feb. 15, 1910.)

DROSS FURNACE. George L. Walker, Pueblo, Colo., assignor to Paragon Metals Co., New York, N. Y., a Corporation of New York. (U. S. No. 949,311; Feb. 45, 1910.)

ELECTRIC FURNACE. Francis A. J. Fitz Gerald, Niagara Falls, N. Y., assignor to Imbert Process Co., New York, N. Y. (U. S. No. 950,904; March 1, 1910.)

ELECTRIC FURNACE. John Thompson, New York, and Francis A. J. Fitz Gerald, Niagara Falls, N. Y., assignors to Imbert Process Co., New York, N. Y. (U. S. Nos. 950,878 and 951,086; Mar. 1, 1910.)

ELECTRIC FURNACE. John Thomson, New York, N. Y., assignor to Imbert Process Co., New York, N. Y. (U. S. Nos. 950,877; 950,879; 950,880; 950,881; 950,882; Mar. 1, 1910.)

ELECTRIC FURNACES—Method of Protecting Resisters of Electric Furnaces. Francis A. J. Fitz Gerald, Niagara Falls, N. Y., assignor to Imbert Process Co., New York, N. Y. (U. S. No. 950,905; March 1, 1910.)

ELECTROLYTIC APPARATUS for Recovering Metals from Solutions. Wilbur A. Hendryx, Denver, Colo. (U. S. No. 949,016; Feb. 15, 1910.)

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. F. Shaw has returned to New York from Alabama.

Dr. George W. Maynard, New York, has gone to Georgia, to examine an iron property.

S. H. Brockunier, Wheeling, W. Va., has gone to Nevada county, Cal., on professional business.

E. M. Weston has been appointed mining lecturer in the Transvaal University College at Johannesburg.

R. B. Lamb has returned from professional work in Central America and is leaving for Mexico on examinations.

Willet G. Miller, provincial geologist of Ontario, has gone to Porcupine to make an official inspection of the gold area.

G. L. Fraser has been appointed manager of the Columbia Coal and Coke Company, of Granite Creek, Alberta, Canada.

C. W. Kempton, mining engineer of 42 Broadway, New York, has gone to Colombia, South America, on professional business.

R. S. Burdette has accepted the position of manager for the Utah Lead Mining Company, at Patterson Pass, Box Elder county, Utah.

Robert Baylor has been appointed superintendent of the Windber mines of the Berwind-White Coal Company, to succeed D. A. Thomas.

William Scallon, formerly counsel and managing director for the Amalgamated Copper Company, is removing from Butte, Mont., to New York.

W. D. McCausland has resigned his position as superintendent of the Hays Coal Company near Johnstown, Penn., and will go to West Virginia.

Frederick W. Jameson, of Leavenworth, Kan., has been appointed receiver of the Brighton Coal Company, of Kansas, on application of the bondholders.

It is reported that the position of president of the Pittsburg Coal Company has been offered to William K. Field, now president of the Sunday Creek Company.

Prof A. P. Coleman, of Toronto University, has been selected by the Council of the Royal Society of England, as one of the fellows to be formally elected in May.

Arthur H. Lowry has been oppointed chief engineer of the Montana-Tonopah mine at Tonopah, Nev., in place of E. D. North, who has gone to Velardeña, Mexico.

H. F. Bovard has been made general superintendent of the Keystone Coal and Coke Company, with office at Greensburg, Penn. He has been with the company for 18 years.

E. M. Mohrman, of Cleveland, Ohio, has returned from the island of Santo Domingo, where he spent a couple of months investigating and examining placer property.

Karl P. Swenson has been appointed professor of mining in the University of Nanking, China. He is a graduate of the University of Minnesota and has had experience in Arizona and Mexico.

Powell Stackhouse has retired from the position of president of the Cambria Steel Company. He has been connected with that company and its predecessor, the Cambria Iron Company, for 53 years.

C. C. Semple, New York, is confined to his bed with a severe attack of malarial fever, and has been obliged to postpone indefinitely the trip he contemplated making to the mines of the West and British Columbia.

Edward Soppitt has been appointed general superintendent of the Jamison Coal and Coke Company, with office at Greensburg, Penn. He was recently with the Ocean Coal Company, at Herminie, Penn. His successor there is Philip Emmons.

Harry King, of New York, who has been suing for possession of a tract of 500,000 acres of coal and timber lands in West Virginia, under a grant made to Robert Morris in 1795, has been finally defeated in the United States Supreme Court.

OBITUARY

Joseph Dunt, for a number of years district coal-mine inspector in Ohio, was killed March 11, in the Charter Oak mine at Pomeroy, Ohio, by a fall of slate. He was inspecting the mine at the time.

John L. Arts died suddenly in New York, March 14. He had been for many years connected with the Burden Iron Company, of Troy, N. Y., and for 30 years past had been manager of that company.

H. Julius Klinger died at Butler, Penn., March 1, aged 80 years. He was a prominent operator in the early days of the oil excitement in western Pennsylvania. It is said that a cargo of petroleum shipped by him in 1862 was the first oil sent from this country to Great Britain.

Alexander McDonald died at Long Beach, Cal., March 18, aged 82 years. He was born in Scotland and came to this country 59 years ago, settling at Cincinnati. He was a partner in the Rockefeller firm for some time, more recently president of the Standard Oil Company of Kentucky and a vice-president of the Standard Oil Company.

David Cummings McCormick died at Pittsburg, March 12, aged 78 years. He was born in Savannah, Ga., and was educated at the old Carlisle college. At an early age, he went to Pittsburg with his father, Pollard McCormick, who became identified with the Shoenberger steel interests. Later he went to Hollidaysburg, Penn., where he organized the Sarah Furnace Company, one of the early producers of pig iron for the Pittsburg district. He continued in this business for 15 years, when he retired and returned to Pittsburg.

George E. Woodbury died at San Francisco, March 17, aged 73 years. He was born in Massachusetts and removed to California in 1874, taking an active interest in mining. He soon made a place for himself and won recognition as an inventor and designer of mining machinery. Among his inventions was the well known Woodbury concentrator and the time stamp. He was widely known and highly respected on the Pacific Coast. In recent years he had been less active, and his personal eccentricities became more pronounced, but he did not give up his work, and his loss will be generally regretted.

Sir Alfred Hickman, a leading iron manufacturer and coal-mine operator in England, died March 11, aged 79 years. He was chairman of Alfred Hickman, Ltd., and was one of the largest employers of labor in the United Kingdom. For many years he was the leading manufacturer of pig iron and steel in the Midlands. His company has coal mines, blast furnaces and steel works in Staffordshire and iron mines in Oxfordshire and elsewhere. He had always taken an important part in the settlement of questions arising between railroads and shippers. One of the first to appreciate the value of the basic process of steel making, he was also among the first to adopt the eight-hour shift at blast furnaces, and his relations with his employees were generally free from friction or disagreement. He was a past president of the British Iron Trade Association, a member of the Council of the Iron and Steel Institute and had served for a time in Parliament.

SOCIETIES *and* TECHNICAL SCHOOLS

Canadian Mining Institute—The following officers for 1910 have been elected by the Cobalt branch: Chairman, T. R. Jones; secretary, A. A. Cole; executive committee, J. E. Leckie, C. O'Connell, H. Park, C. Campbell and John Macdonald.

American Institute of Electrical Engineers—The regular April meeting will be held in the auditorium of the Engineers' building 33 West Thirty-ninth street, New York City, Friday, April 15. The meeting is to be held under the auspices of the Educational Committee of the institute. Dr. Samuel Sheldon, professor in the Brooklyn Polytechnic Institute, will present a paper.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

March 16—The snow is disappearing from the low flanks of the mountains in the upper part of California earlier than usual, although the snowfall has been up to the average. Warm rains, however, have reduced the winter pack materially. Unless additional snow storms and rains occur, there is apt to be a shortage of water in the streams the coming year. As far as it appears at present the volume of water in the streams will be below the normal this summer. The snow continues to diminish on the Sierra Nevada, Siskiyou and Lassen ranges, and the streams are not quite to flood stage.

The Chamber of Mines of Los Angeles announces its intention of appointing a committee to look after "secret process" men and the legitimacy of their claims. Also it intends to regulate the issuance of assay certificates based on results obtained from the said secret processes. To accomplish the latter end "legislation is being prepared." It is to be hoped that these intentions of the Chamber of Mines will be carried out and not end with the mere announcement. The presence in that city of so many tourists and Eastern people unfamiliar with mines or mining operations has made it a favorite place in which to launch or promote all sorts of shady corporations intended to attract the unwary into investing in oil, gold mining, gold dredging, black sands and all sorts of things. These have brought discredit not only on the city itself, but on the industries represented by the companies. It is high time for the legitimate mining people of Los Angeles to step in and try and protect investors by showing up the falsity of the statements in the prospectuses of such fake companies.

A Los Angeles judge has awarded $1000 to Dr. Mary J. Helm in a suit by her against W. R. Price, of Long Beach, a psychologist and promoter. She asked for $1900 on the allegation that Dr. Price had sold her stock in the National Gold Dredging Company, operating on the Feather and American rivers, under fraudulent representations as to its value. A criminal charge against the same promoter arising from the same transaction is shortly to be heard.

Congressman Engelbright has brought suit against the New Eureka Gold Mining Company to determine ownership of the property in Grass Valley mining district claimed by the company.

Salt Lake City

March 17—Since acquiring the Boston Consolidated, the Utah Copper Company has increased its shovel operations, and will abandon underground work as soon as the overburden is stripped far enough in advance for the steam shovels to supply the company's three mills. Underground work on the company's original holdings was stopped Feb. 1. Four new steam shovels have been ordered, and with those already in use, will make a total of nineteen. The company's mills are known as the Copperton; Magna, formerly Utah Copper; and Arthur, formerly Boston Consolidated.

Taking of testimony in the case of the Silver King Consolidated vs. the Silver King Coalition is being continued. During the past week the examiner was occupied with testimony regarding the milling ore alleged to have been extracted from the Parsons' stope.

The Silver King Coalition stock has been listed on the Boston Exchange, and for the first time in years, a financial statement has been made public by the company. This shows cash on hand $87,370, and ores in transit valued at $34,321. The total assets are given as $6,436,510 which includes improvements and the value placed on mining property. No action has yet been announced regarding the quarterly dividend due in March, and it is probable that this will be passed on account of pending litigation.

Denver

March 20—Good headway is being made in the Cripple Creek deep-drainage tunnel, which is still being driven under contract by A. E. Carlton, and under the management of Charles M. Fuller. The total distance driven is given by T. R. Countryman, chief engineer, as 12,604 ft. to March 1. The breast is still in Pike's Peak, dry, hard granite.

The fight for control between Allen L. Burris, president and general manager of the El Paso Consolidated company, representing Eastern capital, and S. S. Bernard, former manager, representing the local faction, was won by the former, who retains his position, and by a big majority, as shown at the annual stockholders' meeting. The regular quarterly dividend of 1c. per share, amounting to $24,500, was delared, payable March 25.

The Vindicator company's report shows that for the last fiscal year the receipts from ore sales were $677,037, and the profits $132,000. Over 8000 ft. of development has been done, and large ore reserves created. An encouraging feature is that a steady production is being made from the 1400 level, and the ore is of as good grade as that in the levels above. Owing to the death of Frank J. Campbell, late manager, G. S. Wood, of Denver, the vice-president and treasurer, has had to take the management.

Adjoining the town of Cripple Creek is Gold hill, which has had a more or less chequered career in its production of gold. It now comes to the fore with a strike in the E. Porter Gold King, under lease to Irving & Dinkins. Reports just in state that the lessees have discovered a new vein, and that it has 2½ ft. of ore that will average $30 to the ton, and 3 in. of calaverite ore that will yield 7.5 oz. gold per ton as mined. The mine is near the top of Gold hill, and its early production was only about $50,000. It is entirely in the breccia area, but is traversed by a basalt dike having a north and south course. The property is managed by John Sharpe, and owned by the estate of the late E. Porter, of Joliet, Illinois.

The Golden Cycle mine is being examined with a view to purchase by the Consolidated Goldfields of South Africa. It was inspected and reported on by a first party of its engineers, but there appears to have occurred a hitch in the proceedings, and now it is being examined a second time. The price is said to be $3,000,000.

Goldfield

March 19—Two features in the statement of mine conditions in the February report of Manager J. R. Finlay, of the Goldfield Consolidated, are rather significant. An extension of the 750-ft. level from the Clermont has exposed ore in the main Mohawk ore channel at a point 150 ft. lower than any heretofore developed in the Mohawk workings. The ore is of a quality which easily places it in the shipping class, and while the development has not fully determined the extent of the body, it shows every indication of yielding a large tonnage. It is also announced that developments on the 1000-ft. level of the Clermont indicate the presence of even less copper than is found in some of the higher levels. The Clermont alone is now in condition to supply 600 tons of ore daily to the mill for an indefinite period and with three other shafts in operation, the mill can easily be kept in operation at its new capacity, 875 tons.

By a decision by Judge Averill last week, an injunction has been granted, prohibiting the Round Mountain Mining Company from working certain blocks on the Black Hawk claim, and also tieing up $10,000 in bullion recently shipped by the Round Mountain Company. It is alleged that the mining company has extracted a large amount of high-grade ore from the Black Hawk ground, and the defendant has been placed under $10,000 bonds, pending settlement.

James R. Clark is negotiating with the Tonopah & Tidewater Railroad for the transportation of a large tonnage of silica which he has located near the line of the railroad, seven miles north of Zabriskie. The silica is presumably a deposit from warm springs. It is an almost impalpable powder, and has been tested and proved valuable for a number of industrial purposes.

The definite announcement on the part of the officials of the Salt Lake route, that the old line down the Meadow Valley wash would be immediately rebuilt and that train service to Pioche would be resumed within a few months, has resulted in increased activity in the Lincoln county camp. Development work is going along steadily and a number of new producers will be added to the list of shippers when normal traffic conditions are resumed.

Scranton, Penn.

March 21—The officials of the Lehigh & Wilkes-Barre Coal Company declare that the explosion at mine No. 5, where seven men lost their lives some time ago, was the result of the carelessness of one or more of the men. They assert that the men all carried safety lamps and were all warned to use them in testing for gas. This warning was given because the mine previous to the accident had been idle for four days, and as it was known to be gaseous, it was necessary to take extra precautions.

In the report made by Mine Inspector Joseph Walsh, of the Tenth district, Luzerne county, the inspector says that in one colliery at least in his district there has been no fatal accident during the past three years. This is the Alden, near Ashley. In the opinion of the inspector, the admirable record of this mine is in a large measure due to precautions that are taken in firing blasts. The company employs shot-firers, who first find out that the blast is properly made ready. If not, a new blast must be made ready by the miner. The total production of the colliery last year was 337,000 tons. It employs over 600 men and boys.

A bill in equity was filed on March 15 in the United States court of the Middle District on behalf of the Alden Coal Company, which has mines at Ashley, Luzerne county, against the Central Railroad of New Jersey, in which the plantiffs sue for the sum of $24,677 on the ground of an overcharge for the carriage of coal. The plantiffs own and operate coal mines in the neighborhood of Ashley. For a considerable period, the Central Railroad of New Jersey has carried the produce of these mines over its track from Ashley to Nanticoke, the coal company supplying the trucks and the railroad the motive power; the coal being hauled a distance a little over three miles, and then transferred to the Pennsylvania railroad. The railroad company did not have to handle the coal at Ashley or at Nanticoke. The Alden company paid the Central at the rate of 15c. per gross ton. The coal company considered this too high, but could not obtain a rebate, as there was no competing line.

Some time before August 12, 1909, the Central railroad notified the Alden company that henceforth it would have to pay a rate of 25c. The Alden company protested, but has continued to pay this rate. The complaint charges that the rate is excessive, and demands a reduction.

Birmingham, Ala.

March 21—The Southern Iron and Steel Company has started up the blooming-mill department of its steel plant at Alabama City, near Gadsden. The final revised figures of the State mine inspector of Alabama show that 12 counties of the State produced coal in 1909, mining 13,790,268 tons of coal, with 316 openings and 20,163 employees. Jefferson county, in which Birmingham is, produced 7,355,571 tons of coal and gave employment to 10,614 men. The coke output in Alabama last year amounted to 3,047,510 tons from 9890 ovens, with 330 of them not working at all. Jefferson county produced 2,576,901 tons of the coke made.

Cobalt

March 19—At a meeting of the directors of the Peterson Lake Mining Company in Toronto, it was decided to extend the time of the various leasing companies for a further period of two years. There are 14 companies operating in territory leased from the Peterson Lake, and it is understood that this decision will affect all of them with the exception of the Nova Scotia lease. The original leases were for five years, but so many of the companies have made such a poor showing, and as all have been crippled by lack of power, it was decided to grant the extension. All of the companies have to pay a royalty of 25 per cent. of the gross proceeds of the ore to the Peterson Lake. So far only two of the leases have shipped, the Little Nip and the Nova Scotia.

H. L. Timmins, who purchased the Hollinger properties, Porcupine, has taken up an option on another group of claims in the vicinity. It is understood that a large cash payment had to be made before the option was given. On the Timmins property, free gold is visible in the bottom of the shaft. As a whole, the country looks promising, and the recent gold discoveries in Bryce and Holmes townships have given a decided impetus to prospecting. Much machinery is being sent into the district, and indications point toward a busy spring. The McArthur properties are now being developed, and the shaft which is down 30 ft. shows high gold at the bottom. Negotiations are under way for the purchase of the Higginson claims by New York men, and many other deals are reported. The government is being petitioned to build a summer road into the camp, and a company has been organized to run a line of motor boats on the lakes.

In connection with the trial of the ore thieves from Cobalt, it may be mentioned that true bills have been returned against several.

The first payment of $25,000 has been made on the Airgoid property, which was sold for $200,000 to Seattle men. This is practically the only remaining property in the center of the producing area that has not been developed. Work will be started this spring.

One of the most famous litigations in Cobalt's history, that between the Florence Mining Company and the Cobalt Lake Mining Company, was settled a few days ago, before the Privy Council, in favor of the latter company. The Florence company maintained that it had been sold the mining rights under 20 acres of Cobalt lake at the south end before the Ontario government put the lake up for auction. The case has been carried through the different courts in Canada, and was finally brought before the Privy Council. The appeal was dismissed and Cobalt Lake company now has a clear title.

Toronto

March 20—The Grand Trunk Pacific Railway officials at Montreal have received news that the engineers working on the construction of the line, 100 miles east of Prince Rupert, B. C., have discovered a large area of mineralized rock, carrying gold contents worth $1 to $40 per ton, and silver, lead and copper. The area, as far as can be at present ascertained, extends from Kitselas cañon far into the interior through the hills at Hazleton, and the Babines and Hudson Bay mountains. Many prospectors are now in the district.

Quebec

March 19—The Quebec government is planning an expedition to the Chibougamou district to start in June. This new mining field is 200 miles from the nearest railroad connection at Roberval, Quebec, but it is said that the Grand Trunk Pacific will pass in the near future at a distance of 75 miles. It can be reached in the summer months in an 18-days' trip, by following a canoe route from Roberval. Copper and gold ores and asbestos are said to occur in payable quantities round Lake Mistassini, but the difficult access of the region has had a rather retarding effect upon the proper development of these resources. The expedition, which is composed of a mining engineer and geologists with assistants, will make a survey of all mineral occurrences.

A new corporation, Graphite, Ltd., with a capital of $1,000,000 has been formed in Montreal to work extensive graphite deposits in the township of Amherst, 80 miles northeast of Montreal.

Extensive alterations are being made at present at the Standard Black Lake plant of the Amalgamated Asbestos Corporation. An additional mill unit is added to the one existing, bringing up the capacity of this mill to 400 tons of asbestos rock, or about 35 tons of asbestos fiber per day. Operations, which have been suspended for a short time, will be resumed April 1.

Mexico

March 19—The provisions and regulations of the new mining law are requiring considerable attention on the part of the operators and owners. The requirements as regards erection of monuments is entailing considerable work in the connection with resurveying and the erection of the proper monuments to conform to the new regulations. The government is enforcing strictly the provision against the shipment of any ore from properties on which the title has not yet been issued, but which are in process of denouncement.

The Chamber of Mines of Mexico City has prepared an authorized annotated edition of the new mining law and regulations, and will distribute the same to those interested, and will later supplement it with additional publications as more new regulations are forthcoming and the law is practically construed.

The Southern Pacific Company in Mexico is authorized under its charter to charge double first-class fare and freight over its new lines for a period of five years, and while the facilities afforded by the line, particularly into the western Jalisco country, are very important, the matter of double-freight rate is somewhat of a grievance. The road is now receiving and delivering a large amount of freight to the present terminus at Magdalena, which supplies a wide district in which there are important and active mining interests.

The rapidly increasing holdings in land which Americans are acquiring in all parts of Mexico, particularly in Sonora and Sinaloa, are looked upon with much favor by the mining interests. It is recognized that the transfer of the large haciendas to Americans means the better utilization of the land and the construction of roads and the inauguration of commercial facilities, which will directly and indirectly greatly benefit the mining. In the West Coast country and Sonora, the American land interests are particularly important, and they promise to become much more so in the next few years. Many of these projects involve more ore less extensive irrigation installations.

London

March 15—The report of the directors of the British South Africa Company for the financial year ended March 31, 1909, records steady progress in the development of the company's large estate. The financial position has improved and the accounts for Southern Rhodesia, that is, the country south of the Zambesi river, show a small balance in favor of the administrative revenue as compared with the expenditure. In the two northern provinces, Northeastern and Northwestern Rhodesia, the administrative expenditure exceeds the revenue by £50,000 in round figures. The dividend stage has not yet arrived, but the directors are hopeful that this stage will soon be reached, owing to the progress that is being made in the commercial operations of the company, such as in land settlement, mining, cotton and tobacco culture. As the country becomes settled, an increasing revenue from these sources is in sight and it is from this revenue, which is distinct from the administrative revenue, that the dividends will be derived.

The mineral industry has been making steady progress, the value during 1909 from all sources having been close to £3,000,000, of which £2,623,708 was in gold. The resident mining engineer reports increased activity in all mining centers, and says that the proving of good ores at depth, has undoubtedly established a feeling of confidence that has never existed in the past.

With regard to the rumors that negotiations were in progress for the sale of the company's rights and assets and the inclusion of Rhodesia into the union of South African colonies which is to be consummated this summer, the chairman said that there was not a word of truth in them. Nothing would be done without consulting the shareholders and the people of Rhodesia.

The balance sheet shows a total issued capital of £6,000,000 in one-pound shares, and a debenture debt of over £2,000,000. Premium on shares stands at £4,238,148. On the other side of the account cash and loans stand at £583,218, shares and debentures of companies at balance of cost £1,064,603, debtor balances (being principally advances to Rhodesian railway companies) £1,547,268, Rhodesia defense expenditure £2,587,410 and general expenditure of £4,748,525. There is one item in the accounts that one would have liked to have seen absent, namely, that of proceeds of sales of shares received by the company in commutation of rights in mining properties, figuring at £505,420. Whether the company should raise money by sharemongering or not is an open question. As owners of the minerals they are without doubt justified in drawing a revenue from the mineral production, but it surely ought to be in the form of a royalty or a tax on the profits of the mining companies. It is not pleasant to find a company of the standing of the British South Africa Company, which is practically a British colony, entering into the stock market and capitalizing its mining royalties or profits out of the money of the public. As a whole, mining in Rhodesia has not so far resulted in heavy dividends, and this being so, the question arises whether the company in selling shares has been giving value for money. Booms, an example of which is now in active eruption, enrich financiers and company promoters at the expense of the speculator. It is possible that the British South Africa Company has only sold shares of good value, but it is also possible that some of the shares sold are of little value or worthless. Anyhow, it is not fitting that this important company, which is not solely a commercial company, should be doing the same business as a financial house or company.

At the annual meeting of the Arizona Copper Company, the chairman of the company said, regarding the negotiations that have been going on for the sale of the mines to Americans, that they were interrupted by outside circumstances beyond the control of either party, and that he did not think he would be wrong in saying that a great drop in all stocks in America at that time accounted for the negotiations being left over for the present. It was possible that the negotiations would be reopened.

Jena, Germany

March 8—In the German mining Industry, the chief news of recent interest is the discovery by diamond drills of a new potash salt deposit of great magnitude, about 4-hours' journey southwest from Eisenach. It was struck at a depth of about 1300 ft. Other borings have been inaugurated to ascertain the lateral extent of the deposit. Thus it appears that what Germany is lacking in copper and other metals may be made up by potash salts.

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY· INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

Alaska-Mexican—The February returns show tons crushed, 39,030; estimated value of free gold $36,243; of "sulphurets," $30,013; operating expenses, $29,095; yield per ton, $3.48.

Alaska-United—February report shows tons crushed, Ready Bullion claim, 20,180; "700" claim, 15,599; total gross value, free gold, $39,534; "sulphurets," $30,107; total operating expenses, $58,098. The yield per ton on the Ready Bullion was $1.73, and in the "700," $2.15.

Alaska-Treadwell—Returns for month ended Feb. 15, show: tons ore crushed 32,732; tons "sulphurets" saved 705, estimated gross value of free gold, $64,550; of "sulphurets," $46,780; total production, $111,331; operating expenses, $82,857; net operating profit, $23,598; construction expenses, etc., $15,398; yield per ton of ore milled, $3.40. The 300-stamp mill was shut down, and no ore was sent to this mill.

Arizona

COCHISE COUNTY

At Courtland work has been discontinued at the Copper Queen property by the Calumet & Arizona company owing to unsatisfactory results. The Great Western is developing some ore.

Calumet & Arizona—The production for February from company ores was 2,024,000 lb. of blister copper; from Superior & Pittsburg ore, 1,864,000 pounds.

Arizona United—The work reached water level on the Republic at 820 ft. on main shaft in January. Sinking operations were suspended until pumping machinery was installed, which has now been completed. The pumps are in operation and sinking has been resumed. A body of sulphide ore was encountered just before the water level was reached. Plans are being made to increase the capacity of the smeltery to 300 tons per day. Operations on the Republic and Mammoth mines give an output in excess of the smelting capacity.

Superior & Pittsburg—No. 16 crosscut on the 1500 level of the Junction shaft has run into a body of high-grade sulphide ore. The drift has passed through 18 ft. of ore with a solid breast of ore in sight. This ore is probably the extension of the orebody on the 1300 and 1400 levels. In depth, however, it is richer. The Junction and the Briggs shafts have been connected on the 1500 level. A new electric pump has been installed at the 1500 level of the Hoatson. At the Lowell the 1400 drift paralleling the west side line of the Del Norte claim has encountered a full face of sulphide ore.

Heffern Mining and Development Company—At a meeting of the directors at Bisbee recently it was decided to install a mill and cyaniding plant in order to treat ore from the newly uncovered gold vein on Bonanza hill. A 4x10-ft. shaft is being sunk on this vein.

Peacock Copper Company—This company of Johnson has begun shipping its high-grade ore to El Paso.

MOHAVE COUNTY

Dandy—This mine in the Weaver District, 25 miles northwest from Chloride, has been sold by William Hall to J. P. Hutchinson, of Chicago.

Tom Reed—The strike at 250 ft. in shaft No. 2 is improving with development. Drifting has been started toward the main shaft, 1500 ft. away, and the face shows 5 ft. of high-grade milling ore.

Boundary Cone—This mine is installing a hoist and compressor.

California

Petroleum Investment Company—This company has been organized at San Francisco with John Baker, Jr., as president, and M. L. Requa and F. W. Bradley as vice-presidents. The primary object of the company is to engage in the oil business in California, which offers an attractive field for investment. The dividend returns are claimed to be larger than from any other industry on the Pacific coast. The position of the company will enable it to command expert investigations regarding developments and conditions affecting the value of oil property. It will be the policy of the company to own and operate oil properties; also manage concerns having oil-producing territory, and it will assist financially parties having proven oil land whose operations are retarded because of limited capital.

BUTTE COUNTY

Butte-Magalia Consolidated—This company at Magalia expects soon to get the capital to construct the 3500-ft. drainage and working tunnel from the Feather river to the Mammoth channel.

CALAVERAS COUNTY

Boston—Active operations will soon be resumed at this mine, Mokelumne hill.

Columbus—This mine at Mt. Ranch, owned by Damon & Tisher, will shortly be started. There is a 5-ft. vein of free milling quartz.

ELDORADO COUNTY

Pyramid—This mine, near Rescue, is now being worked by C. F. Croathers, of San Jose. The 15-stamp mill is being overhauled.

INYO COUNTY

Four Metals—This company working the Union mine, Cerro Gordo, is taking ore from the 1100 level, or 200 feet deeper than the works of the old mine. Ore is being shipped to Salt Lake.

NEVADA COUNTY

Montana—Work has been resumed at this mine near Nevada City under charge of W. G. Drown.

Canada Hill—This mine has been almost entirely unwatered. Meantime work is going on in the upper levels.

Colorado

CHAFFEE COUNTY

Madonna—This mine at Monarch is one of the early producers, and being owned by the Eilers interests, is noted as having been one of the causes for the building of the old Eilers smeltery at Pueblo, but the cost of hauling killed the profits, and operations ceased. Now a new tunnel has been driven 500 ft. lower than the old workings, and it is reported that under Kenneth Burton as manager a strike has been made of a vein of ore 15 feet in width.

LAKE COUNTY—LEADVILLE

Hibschle—About 30 tons of lead ore per diem are being produced from this property, under lease to Harris & Bennett.

Louisville—This mine, under lease to Hanifer & Reynolds, and operated through the Yak tunnel, is sending about 30 tons of silver-lead ore per day to the smeltery.

Wilson—This mine, originally known as the International, of Robinson, is sending 50 tons per diem to the Leadville district mill in Lower California gulch. Two products are obtained: a lead one, which is being treated at the local smeltery, and zinc, which comes to Denver.

Colonel Sellers—This property, in Calornia gulch, operated by the Empire nc Company, is sending about 50 tons r diem to that company's works at anon City.

Teller County

Rexall—This mine, in the center of the wn of Victor, and worked through the picer shaft, at the 900 level has now a -ft. vein of ore. A new hoisting plant nd compressor are to be installed by the exall company at once, and a mill is lso to be erected to treat the ore.

Idaho

Information has been received in Spo-ane that the Idaho and Swastika Rail-ay Company has been financed, and that ork on the construction of the line will egin in the spring. The road will be be-veen four and five miles in length, run-ing from Lakeview, at the upper end f Lake Pend d'Oreille to the Swastika, Vebber, Keep Cool and Venezuela mines n the divide between Lake Pend 'Oreille and the Murray mining district.

Custer County

White Knob—This property, the sub-ect of several promotions, and idle since 907, is again to be examined with the iew of resumption.

Coeur d'Alene District

Reports are revived of negotiations or a merger of the principal silver-lead roperties of this Idaho district with the ederal company as the nucleus.

Hecla—It is reported that the Federal Mining and Smelting Company has taken ver the holdings of J. R. Smith, deceased, of Chicago, in this lead-silver roperty. Mr. Smith was president of he company and with his associates con-rolled it. The deal is said to cover about 300,000 shares of stock, the market value of which is $4.50 per share.

Caledonia—The oreshoot in a drift on the 300-ft. level is from 18 in. to 7 ft. wide and there is 4 ft. of shipping ore. The ore in the other working is also high-grade. A four-drill electric-driving air compressor is being installed, and the shaft will be sunk to the 700-ft. level. Charles McKinnis is manager.

Liston—The drift has been run 180 ft. in low-grade lead-silver ore and the quality of the ore is improving with progress. The drift has a depth of over 1000 ft. The property is at Wardner.

Alice—During the last month 400 tons of lead-silver ore were shipped by this new producer. Richard Wilson, of Portland, is the principal owner.

Western Development — Greenough Brothers, owners of the Snowstorm mine, are reported to be at the head of the company which represents the proposed merger of the Boulder Creek, Bitter Root and Idaho Giant mining companies owning properties near the Snowstorm.

Cricket—Charles E. Miller, of South Bend, Wash., who worked this property years ago, has relocated the claims and backed by Washington capitalists will proceed with further work. Twenty thousand dollars is on hand now for development purposes.

Snowstorm—The company has declared its March dividend of $22,500, making $67,500 in all disbursed in 1910 by this Mullan copper mine.

Illinois

Governor Deneen has signed the bill passed by the legislature, which provides for three mine rescue stations in Illinois, one of which will be located in Springfield. The object of these rescue stations is to furnish prompt aid and serviceable apparatus at mine accidents, where outside help is needed. The two other stations are to be at LaSalle and Marion. The law also creates a commission of seven members to have charge of mine rescue work in the State. The sum of $75,000 is appropriated to purchase equipment and maintain the commission until July 1, 1911.

Kentucky

The court has confirmed the sale of the Kentucky Coal and Mining Company property, near Owensboro, including mines at Waverley and Bakersville. The buyers will consolidate mines with those of the River and Rail Coal and Coke Company.

Michigan

Copper

Hancock—The opening on the No. 3 lode continues yielding good results. The winze, or secondary shaft tributary to No. 1 shaft is down to the 19th level, and drifts extending from the various levels above. The permanent equipment at No. 2 shaft is going forward satisfactorily and in all probability the erection of a stamp mill will be started during the coming summer. An assessment of $3 per share on the outstanding stock has been levied.

Adventure—The new vertical shaft is down 470 ft., and is sinking 70 ft. per month. The first of these lodes will be encountered at 900 ft. This lode has recently been disclosed at the North Lake property, some distance away, and was well mineralized.

Lake—The crosscut from the fifth level has cut the foot-wall lode that was first revealed by the shaft at the sixth level. The face of the crosscut shows the formation well mineralized. Drifting on this lode at the sixth level is showing good results. This shaft is bottomed at a point about half way between the sixth and seventh level and sinking will soon be resumed. An order has been placed for a 50-drill compressor, and when this goes into service, additional drills will be added. Nine drills are now in service and rock shipment of about 120 tons daily are being made to the Franklin mill, the rock coming from the development work preparatory to stoping.

Copper Range—Repairs have been made to the boiler house damaged by fire recently, and one battery of boilers has gone into commission, which enables two heads of the Baltic stamp mill to operate. The other heads will go into commission shortly, and in the meantime a portion of the rock will be stamped by the Champion and Trimountain mills.

Houghton Copper Company—The company has let a contract for a large amount of diamond drilling, operations to start at once on section 14, adjoining the Superior property to locate the extension of the Superior lode.

Twin Lakes—This development company has been organized to explore and develop a tract in sections 22, 23 and 27, of township 52, range 36, near the Wyandotte. J. P. Edwards will be in charge.

Oneco—No. 7 drill hole, going down 2000 ft. from the No. 5 hole, in which the very encouraging amygdaloid formation was cut, is down 640 ft. and is nearing the lode.

Atlantic—President John R. Stanton denies there is any foundation for the statement that the company has found a lode that it has been long looking for. No new developments have occurred.

Montana

Butte District

Davis-Daly—The company has filed its acceptance of the permit given by the city council to run a tramway from the Colorado mine to the Great Northern Railway tracks.

Butte-Alex Scott—On the 1400-ft. level the west drift, which has been run 100 ft., has opened up an 18-ft. orebody. All work has been confined to development.

Broadwater County

Keating—By April 1 it is planned to have the electrically operated surface plant in operation and the output increased to about 30 cars of ore weekly. Operations have been temporarily suspended on account of labor troubles.

Jefferson County

Boston & Alta—The shaft is now down 605 ft., several feet below the lowest of the old workings. When a depth of 660 ft. has been reached, a crosscut will be driven to the veins.

Hattie Ferguson—The shaft is down 135 ft. The management states that a 1500-ft. tunnel will be run.

Montana-Corbin—On the 400-ft. level 2 ft. of chalcopyrite ore has been found.

London-Corbin Exploration Company—The company has been incorporated with a capital of $1,000,000. The claims being operated are the Sun, Bohemia, London, Truro, Moon, Manchester, Glasgow and Starlight quartz claims in the Corbin district. On the Sun claim a tunnel has been run which has opened up the main vein 180 ft. Peter Ward, Corbin, is in charge.

Amazon-Montana—The last of the electrically operated surface equipment has been installed. The hoist is good for 600 ft. The two-compartment shaft is now down 130 ft., where a station has been cut from which will be run a crosscut to the old tunnel on the property which will be used to drain the shaft. W. H. Graham, Amazon, is in charge.

Madison County

Golden West—The officers state that an underwriting agreement has been entered into, whereby the sale of 100,000 shares of the stock will bring funds with which to equip the property with a modern surface plant. Construction work will be begun in the summer.

Nevada

Esmeralda County

Booth—Work on the Lind and the Weber-McLaughlin leases at Goldfield is steadily progressing in dacite. A change in formation, accompanied by ore, is expected at any time.

Black Butte—Shipping ore is being taken from the original adit on the north side of the Butte, on company account.

C. O. D. Consolidated—W. F. Gray and B. E. Thomas are planning a 50-ton mill to treat the low-grade, free-milling ore from a block of ground on which they have a five-year lease.

Goldfield Annex—Under the direction of E. C. Watson a new vein apparently independent of either Mohawk or Jumbo veins, is being developed with satisfactory results.

Pittsburg-Silver Peak—The 20 additional stamps in the mill at Blair are in operation. This makes 120 stamps, the largest number dropping in any mill in Nevada. The ore is crushed to 35-mesh, and for this reason the capacity is only 540 tons daily.

Western Ore Purchasing—The company's 800-ton sampling mill at Millers is reopened, and continuous operation is promised.

Humboldt County

Preparations are under way for extensive drilling in the new oilfield at Sulphur.

Lincoln County

Gold Chief—The vein has been followed for 200 ft. on the 250-ft. level. A cyanide plant on lines similar to that at Mercur, Utah, is under consideration.

Pioche Metals—Lateral work on the 200-ft level is revealing good ore.

Eldorado-Occidental—The new mill built by the Eddy Engineering Company, of Los Angeles, is now in commission. C. G. Austin is president of the company.

Nye County

The ore shipments for the week are: Tonopah, 3250 tons; Belmont 780; Montana-Tonopah, 896; Mac Namara, 250; West End, 120; Tonopah Extension, 840; Midway, 80; and Jim Butler leases, 20, making a total of 6236 tons.

Tonopah—About 40,000 ft. of lumber has been unloaded for the construction of ore bins of 400 tons capacity at the Red Plume shaft. This will eliminate tramming to the Mizpah bins before loading to railway cars. The mill report for the week shows 3250 tons crushed, average value $10.50 per ton.

Belmont—The immensity of the new orebody recently discovered seems to grow more remarkable as the development proceeds. Reports show it to be unique in the history of the camp. The vein shows 12 ft. of high-grade milling ore exposed for nearly 300 feet.

Tonopah Extension—The mill is crushing 120 tons daily, about ¾ of this coming from the mine, and the balance from the old dump.

Pioneer Lease—Manager Wilson McManaman is shipping 15 to 20 tons of high-grade, and a similar amount of milling ore daily from this Bullfrog property.

Keane Wonder—Bullion to the amount of $20,000 represents the output of the mill during 20 days operation in February.

White Pine County

Cumberland-Ely—Net earnings from Dec. 1, 1908, to Nov. 30, 1909, were $742,558; interest on loans amounting to $25,678 reduced net to $716,880. December earnings were $28,216. Balance, Dec. 1, 1908, was $312,424, making total surplus Dec. 1, 1909, $1,057,520.

Steptoe Valley Smelting and Mining Company—Earnings from Oct. 1 to Dec. 31, 1909, were $194,661. After charging off $36,987, net earnings amounted to $157,674, which amount was paid in dividends to the proprietary companies.

Nevada Northern Railway—From July 1 to Dec. 31, 1909, net earnings from operations and interest collected amounted to $447,643. Appropriations were $129,375, leaving $318,268 as surplus. Previous surplus was $238,823, making total $557,091, from which was deducted dividends of $400,000, leaving balance at the end of the year of $157,091.

Nevada Consolidated—This company has acquired 1,257,776 shares of Cumberland-Ely, leaving but 42,224 outstanding. Of the $10,000,000 capital of the Steptoe Valley Smelting and Mining Company, Nevada Consolidated owns $420,000 and Cumberland-Ely, $320,000, there being but $740,000 outstanding.

New Mexico

Sunset—This Terre Haute, Ind., company will install an engine and compressor, and is planning during the summer to erect a smelting plant at the mines at Hell's cañon, 25 miles from Albuquerque. W. L. Staley is president.

Pennsylvania

Anthracite Coal

Nay Aug Coal Company—No. 1 breaker of this company, near Scranton, was destroyed March 6, entailing a loss estimated at $60,000. The destruction of the breaker will throw about 200 men and bos out of employment.

Bituminous Coal

Monongahela River Consolidated Coal and Coke Company—For the three months of its fiscal year from Nov. 1 to Jan. 31 this company reports its net earnings at $365,992. Charges included royalty, depreciation, taxes and interest, amounting to $438,863, leaving a deficit for the quarter of $72,871, which is $115,350 less than in the corresponding quarter last year.

Utah

Juab County

Tintic ore shipments in carload lots for the week ended March 11, were as follows: Centennial Eureka, 40; Grand Central, 2; Oponhongo, 2; East Tintic Development, 1; Mammoth, 1; Gold Chain, 2; Beck Tunnel, 9; Sioux Consolidated, 18; Colorado, 17; Iron Blossom, 23; Dragon Iron, 17; Ridge & Valley, 3; Gemini, 3; Eureka Mill, 5; Chief Consolidated, 9; Scranton, 4; Yankee, 1; Bullion Beck, 1; Eagle & Blue Bell, 2; total, 160.

Eagle & Blue Bell—At a special meeting of the stockholders held March 12 in Salt Lake City, it was decided to increase the capital stock from 250,000 to 1,000,000 shares, par value $1. The directors were authorized to dispose of as much of the increased stock as they deemed for the best interests of the company. During February, the company shipped 16 carloads of ore on which the returns were in the neighborhood of $12,500. Ore has been opened at several new places in the mine.

Yankee Consolidated—The annual report shows that the receipts in 1909 were $38,505, and the disbursements $67,148, of which $58,135 was on mine account. On Jan. 1, 1910, company had an overdraft of $23,433. The orebody which was recently encountered has been opened for 35 ft. or more along the strike. The ore is of shipping quality. A new electric hoist has been ordered.

Sioux Consolidated—At the monthly meeting of the directors, held in Provo, March 10, it was decided not to post the initial quarterly dividend. Conditions at the mine are unchanged, though a new strike is reported east of the shaft on the 450-ft. level. About half the working force is being kept on development. The ore now being mined is not of high enough grade to justify the company's making a distribution at the present time. The last payment was in December, 1909.

SALT LAKE COUNTY

Columbus Consolidated—At a meeting of the directors held March 10, it was decided to levy an assessment of 25c. a share. This is said to have been necessary on account of the falling due of one of the company's notes, and on account of the inability to make ore shipments at the present time, caused by the disabling of the tramway by snowslides, and poor condition of the roads. The date of delinquency for the assessment is April 11. No effort will be made to extract ore at the present time, the management intending to devote its entire attention to development.

SUMMIT COUNTY

Park City ore shipments for the week ended March 11, were as follows: Silver King Coalition, 1,518,820 lb.; Daly West, 1,124,000; Daly-Judge, 450,000; Daly-Judge (zinc), 721,480; Little Bell, 126,000; total, 3,940,300 pounds.

Daly-West—At the annual meeting the old board of directors was reëlected. New orebodies are being developed on the 1700- and 1800-ft. levels. Drifting is in progress on the 1900 and 2100 levels, and ore is expected here any time. Since the shaft was connected with the tunnel level the production has been largely increased. During January and Februay the company earned in excess of $1000 per day. In February 13,574 cars of ore were hoisted. The company is producing zinc concentrates at the present time which do not appear in the Park City ore shipments but are shipped direct to the east.

West Virginia

Four States Coal Company—It has been announced that the various interests of John H. Jones, of Pittsburg, and associates will be merged into the Four States Coal Company. This merger will include the Big Hill Coal Company and the Monarch Coal Company, both with offices in Cincinnati, and the new corporation will develop properties in Ohio, Pennsylvania, West Virginia and Kentucky. These properties include mines at Elkins, W. Va.; Richmond, Ky.; on the Wheeling & Lake Erie Railroad in Ohio, and lands, plants, etc., in Pennsylvania. The Pittsburg-Buffalo Coal Company will continue to operate as a separate corporation, with John H. Jones as president, all the companies having their offices in the Frick building at Pittsburg. Harry P. Jones will be in charge at Cincinnati. The Four States Coal Company was incorporated in January with a capital stock of $5,000,000, and is now developing 6100 acres of land in Marion county, West Virginia. It plans an expenditure of $1,500,000 on this property to provide for an annual output of 1,000,000 tons of coal.

Washington

By the reopening of the Northport smeltery all the mines in the northern part of the State will be greatly benefitted, and with the proposed extension of the Idaho & Washington Northern railroad, much of the ore which is now being shipped to Trail, B. C., will be sent to Northport.

The winter has been disastrous to many of the mines, in the mountainous districts, where much loss has been caused by snowslides.

FERRY COUNTY

Laurier—A contract has been let for the continuation of the tunnel.

OKANOGAN COUNTY

Jim Hill—This company will equip and develop its claims. Charles Cain, Chesaw, is manager.

STEVENS COUNTY

Monumental—The property is being worked by W. H. Jackson, of Northport, who will install a compressor and concentrator.

Canada

ONTARIO

The shipments from Cobalt for the weeking ended March 11, are as follows: Nipissing, 311,893; LaRose, 375,615; McKinley-Darragh, 166,000; Kerr Lake, 119,360; Right of Way, 67,000; City of Cobalt, 42,000; Millerette (Gowganda), 112,000; total, 1,193,868 pounds.

Haileybury Silver—This company has paid another 50 per cent dividend. The money came from the sale of the south half of the property to the Haileybury Frontier Company.

Gifford—High-grade ore has been struck in the drift on the 200-ft. level. The ore is pockety and is not consistent.

Nipissing—The drift on the Meyer vein at the 185-ft. level, is producing excellent ore.

Boyd-Gordon—A shipment of 35 tons of high-grade ore has been made to Perth Amboy, N. J., from this Gowganda property. Ore is now being sacked at the 40- and 75-ft. levels at the rate of 10 bags per day.

Hollinger—Fifty men are working double shifts. One shaft is down 60 ft. and another nearly as far, visible gold being found at this level. A rock drill and compressor will shortly be installed on this property in the Porcupine district.

Cobalt Commercial—Silver has been found at the bottom of a 30-ft. shaft in this south Lorraine property.

Scottish Ontario—The shaft is down 18 ft., at which depth the vein has narrowed from 5 to 3 ft. About 20 tons of quartz have been taken out. Some new discoveries have been made on this Porcupine property.

Ophir—The main vein has been cut at 200 ft., and shows high silver content.

Chambers-Ferland—A new high-grade vein has been opened up. This company will ship as soon as final matters, in connection with the reduction of royalty, have been adjusted between the government and the company.

Mexico

CHIHUAHUA

Parral Output—The production of the Parral camp for February was 33,650 tons, of which about 25,000 tons were locally milled.

Alemania—This company is developing in the El Oro section west of Terrazas and machinery will be installed. The company has offices in El Paso and Chihuahua. D. M. Evans is manager.

Republica—The report for February contains these items—Ore milled, 1246 tons of average silver contents of 50 oz.; concentrates produced, $5500, bullion from cyanide plant, $18,365.

San Francisco del Oro—Reports from the London office are that an economical process for treatment of the refractory ores has been evolved as a result of the experimental work carried on at Swansea, and that a profit of about $5 per ton may be made. It is the plan to erect a 300-ton milling plant at the Parral property.

Bien Venido—An English company is developing this property at Santa Barbara and it is probable that a sale will follow.

Tres Amigos—This company will resume operations in the Guaynopa district which is being made more accessible by the building of the Terrazas-Madera branch of the Mexico Northwestern railway.

Santa Elena—Shipments of high-grade lead-silver ore are being sent to the El Paso smeltery. J. D. McKenzie and J. R. Harbottle are operating this Terrazas mine.

Santo Domingo—Regular shipments of lead-silver ore have been started from this mine in the Sabinal camp. Machinery is to be installed.

Kansas-Mexico—This parral company is to resume work at its properties in the Los Trenes section, and heavier sinking machinery will be installed.

Palmarejo-Mexican—A recent report shows the ore reserves in this company's mines, near Chinipas, to be about 200,000 tons of about $20 ore in addition to 60,000 tons of somewhat lower grade in the old stopes.

Rio Plata—The February statement shows net returns on shipments, $59,412.

Stamp mill operated in part all the month, equal to 24.16 days at full capacity. Crushed, 1523 tons of dry ore, containing 78,452 oz. of silver, gross. Produced, 28.33 tons concentrates. Cyanide plant operated to about three-fifths of its capacity, treated 1295 tons of tailings containing, 41,134 oz. of silver, gross. Value of silver recorded, $33,029; operating expenses, $12,285; operating profit, (exclusive of stored tailings), $20,743.

Durango

Lustre—At a meeting, at Pittsburg, of the stockholders, a new company was formed, and money subscribed to pay the debts and make the proposed improvements of the property; an effort will be made to have a railroad built to the camp, a distance of 61 miles. The property has been in the hands of a creditor's committee for some time.

Guanajuato

Oro Grande Mines Company—This concern, organized last year with a capital of $9,750,000 to work the old producers of La Luz camp, has ordered drill plants and hoists preparatory to commencing operations. The equipment is to be installed at once.

Pinguico—Much of the ore now being shipped by the Pinguico Mines Company runs 15 kg. silver and high in gold.

Hidalgo

Santa Gertrudis—The designs for the new mill have practically been completed, and its construction will be pushed ahead with all possible speed. It will consist of 60 stamps with appurtenances, and have a capacity of about 15,000 tons a month. In the meantime, earnings will accrue from treatment of low-grade ore in the small mill erected by the old company. Hugh Rose in in charge.

Jalisco

Cinco Minas—The Marcus Daly intertests have organized the Cinco Minas Company, capital $500,000, to handle the property, purchased recently for 570,000 pesos. Thirty feet of high-grade milling ore was recently opened in the San Juan vein. The winze started from the old tunnel level last year will be put down 1000 feet.

Amparo—From Jan. 2 to 31 the Amparo mill crushed 5350 dry metric tons, the ore averaging 340 grams silver and 10.4 grams gold. The value of the concentrates and bullion was 122,557 pesos. From Jan. 31 to Feb. 27 mill handled 5304 tons, averaging 375 grams silver 10.2 grams gold. Value of products was 121,759 pesos.

Lupita—An accumulation of 600 tons of slimes will be treated in the cyanide annex, recently installed. Mill is now handling 20 tons daily.

San Jose de las Agujas—A small stamp mill has been purchased, and a plant for direct cyaniding will be built. There is a dump of 12,000 tons of high-grade milling ore.

San Pedro Analco—Money received by Jose Landero y Cos and others from the sale of the Santa Gertrudis mines at Pachuca will be used to equip the San Pedro Analco mines in the Hostotipaquillo district with a modern cyanide plant. The company recently increased its holdings by denouncing 79 pertenencias under the name Santa Gertrudis.

Casados—A recent smelter settlement on a shipment by the Consolidated Mining Company shows from 20 to 22 kg. silver and 150 to 152 grams gold to the ton. The Casados shipments from development work are more than covering development expenses.

Morelos

Santa Rosa Quicksilver—Robert Scott, of San Jose, Cal., has erected a Scott fine-ore furnace at this property, about 10 miles southwest of Cuernavaca.

Sonora

Greene-Cananea—A motor line is in process of construction through the Elisa tunnel, an adit 3000 ft. long driven to do away with a 4-mile narrow-gage railway haul around the mountain.

Juanita—This company has been organized by Martin Pattison and associates to take over and develop the Fortuna and adjoining claims near Cananea that have been but partially explored.

La Dura Mining—An option on the properties held by this company, near Rio Chico, has been taken by Chicago people.

La Republica—This mine, near the Chihuahua line in the Sahuaripa district, is being unwatered.

Veta Grande—A sale of this property has been made to Bisbee men.

Pedrazzini—Owing to the development of large quantities of second-grade ores, this company will double its milling capacity during the year, the placing of five additional stamps being under way at the present time. The normal production of 500,000 oz. silver and 5000 oz. gold per annum will be maintained until the proposed units are working, when it will be increased. A wagon road has been graded to Nacozari. The shaft following the Chispa vein has been sunk 300 ft. below the level of the adit tunnel and a new strike has been made.

Tepic

Certuchena y Anexas—The first cleanup has been made at the 20-ton Lane mill and concentrating plant at these gold properties in the Ahuacatlan district. The plant will soon be increased and a cyanide annex installed.

Veracruz

Oil Development—In the Potrero de Llano, not far from Tampico, the Pearson-Aguila company has brought in a well reported to have a capacity of several hundred barrels daily. At Tanguijo, near the Tamiahua lagoon, is also a 200-bbl. well, and oil has been struck in a new well in the San Cristobal field, where the Pearsons have been operating for several years. Deliveries of oil from the Furbero field of the Oil Fields of Mexico Company to the Pearson refinery at Minatitlan will be started as soon as the pipe line to the Gulf port of Tuxpan can be extended under water 2 miles to a point outside the Tuxpan bar, where steamers will be loaded. The Huasteca Petroleum Company, a Doheny concern, has made an initial shipment of 3000 bbl. from the Huasteca field to the Mexican National Gas Company in Mexico City. A pipe line is being built from the Huasteca field to Tampico.

Africa

Transvaal

The labor returns for February show a total of 189,156 negroes employed in the mines, an increase of 9762 during the month. With this month the Chinese have finally disappeared from the mines.

West Africa

Gold production in January was 22,817 oz. bullion in 1909, and 17,357 oz. in 1910; a decrease of 5460 oz. The bullion reported this year was equal to $343,602, or 16,618 oz. fine gold.

Australia

Queensland

Gold production in January was 24,486 oz.; in February, 34,300 oz., making a total of 58,786 oz., or $1,215,106 for the two months.

Central America

Costa Rica

Montezuma—A petition in bankruptcy has been filed for this company. The liabilities are given as $74,952. The main office of the company is at 45 Broadway, New York.

South America

Chile

Braden—A cable from Pope Yeatman, who has just completed an examination of the mine, states that it is looking better than expected, especially in respect to depth. He estimates that in the upper workings alone of the Fortuna mine of the company, viz., tunnels No. 2 and No. 3, there are 7,000,000 tons of ore developed. Ore of excellent grade has been encountered at the No. 3 Teniente tunnel, which is at about the same depth as the No. 4 Fortuna. The construction of the ditch, steam railroad and concentrator is progressing rapidly. Mr. Yeatman is expected in New York on April 1.

Colombia

Peru-American Investment Company—This company is taking estimates for coal-mining machinery and oil-drilling outfits for Colombia. The company owns 24,000 square miles of coal and oil lands 200 or 300 miles from Colon, active operations will begin in October.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, March 23—The seaboard bituminous trade continues quiet. The principal point in the market at present is the discussion of the yearly contracts and there is the usual dickering between producers and buyers. Car supply is better. The anthracite trade shows nothing new except that everyone is anticipating the April discounts, which will be made as usual.

In the West, of course, everything is waiting for the wage settlement. The mineworkers in session at Cincinnati received the report of the scale committee to the effect that there had been no agreement. A resolution was passed authorizing the representatives of the miners on the committee to effect, if possible, a compromise with the operators' representatives; on condition, however, that an advance in wages should be insisted upon. On this basis negotiations were resumed. At this writing the joint committee is still in session but no agreement has been reached.

The Hocking Valley Settlement—An important arrangement has just been concluded which affects several coal-carrying railroads in Ohio. It is announced that the holdings of Hocking Valley stock have been transferred to the Chesapeake & Ohio company. This carries with it control of the Kanawha & Michigan railroad, but that line will continue to be operated independently. The Toledo & Ohio Central and the Zanesville & Western roads are transferred to the Lake Shore & Michigan Southern. This arrangement will give the Chesapeake & Ohio an outlet to Lake Erie and an important local coal trade, while the Lake Shore gains a direct connection with the coalfields of central and southeastern Ohio.

COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, two months ended Feb. 28, short tons:

	1909.	1910.	Changes.
Anthracite	1,784,526	1,945,404	I. 160,878
Bituminous	5,795,144	7,256,090	I. 1,460,946
Coke...............	1,657,004	2,654,301	I. 997,297
Total	9,236,674	11,855,795	I. 2,619,121

The total increase this year over 1909 was 28.4 per cent.

Coal tonnage originating on Southern railway, year ended Dec. 31, 1909: Tennessee district, 1,248,926; Alabama district, 2,473,215; total, 3,722,141 short tons, an increase of 727,235 tons over the previous year.

Coal tonnage of Monongahela River Consolidated Company, three months of fiscal year from Nov. 1 to Jan. 31, short tons:

	1908-9.	1909-10.	Changes.
River coal..........	910,929	1,156,635	I. 245,706
Rail coal...........	198,124	650,707	I. 452,583
Total...............	1,109,053	1,807,342	I. 698,289

The total increase reported this year was 63 per cent.

Coal receipts at Boston, two months ended Feb. 28, long tons:

	1909.	1910.	Changes
Anthracite...........	192,860	248,981	I. 56,121
Bituminous	449,332	557,551	I. 108,219
Total domestic....	642,192	806,532	I. 164,340
Foreign.......... ..	48,923	43,364	D. 5,559
Total.........	691,115	849,896	I. 158,781

The foreign coal mines chiefly from the Nova Scotia mines.

New York

ANTHRACITE

March 23—Business is quiet, pending the approach of April 1, when the usual discount of 50c. per ton from list prices of domestic sizes will be made.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Business on current lines is fair only. Some orders are coming in from the far East, but the Sound is taking things quietly. Discussion of contracts continues, and is on the same lines as noted last week; that is, the lower grades of coal are most in demand. The prices are about as given last. Georges Creek is bringing about $1.50@1.60 at mines; good Miller vein steam is closed for at $1.40@1.50 at mines, and some of the poorer grades of steam coal can be had down to $1.10 at mines. Gas coal has been quoted at $1@1.10 at mines for ¾-in. and $1 for run-of-mine, while the lower grades have sold at 95c. for ¾-in. at mine.

Car supply is improving, and transportation is fair. The coastwise vessel market is still irregular, but is gradually settling down.

Birmingham

March 21—Coal operations in Alabama are active, and reports are to the effect that there will be a steady operation at mines for some time to come. The coal is being either consumed right in the district, or shipped out into adjoining States, as quickly as it is mined. The railroads are giving better service, equipment being added to from time to time. One great help in this regard has been the adding of locomotives to the present supply. The coke demand is good and the production is strong. No time is to be lost in the construction of the large batteries of by-product ovens being put in, in the Ensley district by the Tennessee Company. More labor is being sought for the coal mines.

Chicago

March 21—An abundance of coal characterizes the market, with prices practically unchanged from last week and the demand for all but strictly steam coals lessening. Screenings continue to be high in Illinois and Indiana coals, and all other sizes are softening gradually in price without any perceptible effect on this. Eastern coals are in large supply and shipments of them should be made cautiously, for the tendency is toward smaller buying until after April 1, when tax schedules of property on hand are dated in this State. Only the prospect of a serious and general labor strike at the mines would bring about large buying soon, and the public is apparently of the mind that no serious trouble in this respect will occur. The steam needs of the Chicago district continue to be large.

Illinois and Indiana are quoted at $2.20@2.40 for lump, $2@2.15 for run-of-mine and $2@2.15 for screenings. Eastern coals do not hold up well to circular prices under the large supply, much coal being sold to escape demurrage charges. Smokeless brings $3.55@3.65 for lump and $2.15@2.30 for run-of-mine. Hocking is steady at $3.15. Other coals show steadiness.

Cleveland

March 21—Domestic trade has fallen off, as was to be expected. For steam coal, the market is easier, as car supply is better, and arrivals of coal in the city have been heavier. Prices are slightly lower, except for slack.

Indianapolis

March 22—There was a revival in coal mining in Indiana during the past week which is puzzling. The orders increased steadily and the output was large. The demands were chiefly from large manufacturing concerns that concluded to store an additional supply. Big consumers will not worry about a strike after another week, because thousands of tons of additional storage will be secured. The railroad companies report an unusual traffic in coal for March but do not anticipate that it will continue long. Every mine in southern Indiana is working full time.

Pittsburg

March 22—As April 1 approaches, more definite opinions are expressed in various quarters as to whether or not there will be a suspension of mining, but unfortunately these opinions differ. The preponderance, apparently, is that there will be a suspension. In some quarters it is admitted, on the part of Pittsburg operators, that a 5c. advance would be conceded by Pennsylvania operators, but that it is a question whether the Ohio operators would do it. The market is quieter than would be expected in the circumstances, consumers having evidently done about as much stocking as they desire. Sellers are asking $1.25 on both mine-run and slack, but will not let business get away from them if $1.15 will take it. The demand for slack, putting it on the mine-run basis, is unusual. The market stands quotable at $1.15@1.25 for mine-run, nut and slack, $1.25@1.35 for ¾-in., and $1.40 for 1¼-in. domestic.

Connellsville Coke—The market has continued extremely dull, and it is practically impossible to sell even small lots which operators have above their shipping requirements, such coke going regularly into stock. Output continues heavy and clearly beyond consumptive requirements. Prompt furnace coke is quotable at $1.90@2, there being coke available at the figures, which might possibly be shaded. On contract for second half, there are no negotiations and nominally operators are asking $2.35@2.40, while some furnaces would possibly pay $2.10@2.15. Foundry coke is quotable nominally at $2.75@2.85 for first-class grades.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended March 12 at 464,897 tons, and shipments at 4927 cars to Pittsburg, 9048 cars to points west of Pittsburg and 822 cars to points east of Connellsville, a total of 14,797 cars.

St. Louis

March 21—The market has remained unchanged for the past week. The domestic sizes of high-grade coal, however, have declined in price until they are practically on the same basis with the steam coals. This is, of course, due to the fact that the domestic season is about over. It was generally thought the market would be stronger and advance, but it has remained stationary. The reason for this seems to be that consumers in general started to store coal earlier than usual this year, consequently there has been no rush toward the end of this month.

Railways are the heaviest buyers and are taking an enormous quantity of coal, in fact, one-half of the tonnage. Car supply is about the same, though the Louisville & Nashville has had an unusually good run for the past 10 days. All embargoes on equipment are now off.

Current prices are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	$2.00	$2.52
2-in. lump	1.75	2.27
Mine-run	1.50	2.02
2-in. nut	1.40	1.92
2-in. screenings	1.10	1.62
Pea and slack	0.90	1.42
Staunton, Mt. Olive & Springfield:		
6-in. lump	2.10	2.62
3-in. lump	2.00	2.52
Mine-run	1.60	2.12
2-in. nut	2.00	2.52
2-in. screenings	1.10	1.62
Carterville:		
6-in. lump or egg	1.80	2.47
3-in. nut	1.75	2.42
Mine-run	1.50	2.17
1½-in. screenings	1.25	1.92
Franklin County:		
6-in. lump or egg	2.20	2.87
3-in. nut	2.00	2.67
2-in. nut	1.50	2.17
1½-in. screenings	1.25	1.92

The prospects are that the market will possibly remain unchanged for several days, and that there will be a little spurt the last few days of the month, with a tendency toward high prices.

FOREIGN·COAL·TRADE

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, two months ended Feb. 28, long tons:

	1909.	1910.	Changes.
Coal	8,688,934	8,353,703	D. 335,231
Coke	166,055	166,971	I. 916
Briquets	234,938	239,155	I. 4,217
Total exports	9,089,927	8,759,829	D. 330,098
Steamer coal	2,921,409	2,843,921	D. 77,488
Total	12,011,336	11,603,750	D. 407,586

Imports of coal for the two months were only 200 tons in 1909, and 1405 in 1910; entirely negligible quantities.

German Coal Production—Coal production of German empire, month of January, metric tons:

	1909.	1910.	Changes.
Coal	12,010,715	12,425,893	I. 415,178
Brown coal	5,596,415	5,628,361	I. 31,946
Total mined	17,607,130	18,054,254	I. 447,124
Coke made	1,776,373	1,902,710	I. 126,337
Briquets made	1,483,328	1,550,810	I. 67,482

Of the briquets reported this year, 1,208,434 tons were made from brown coal or lignite.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices as follows on March 12: Best Welsh steam, $4.14; seconds, $4.02; thirds, $3.90; dry coals, $3.96; best Monmouthshire, $3.66; seconds, $3.48; best steam smalls, $2.46; seconds, $2.22. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, March 23—While the iron and steel trades continue to hold some of their waiting attitude, activity is beginning to manifest itself in several lines and upon the whole conditions may be said to be improving.

In finished material rail orders continue to come in and there is an active demand for plates and shapes from the car-building companies. The manufacturers of agricultural implements are taking bars and similar material on a scale almost unprecedented, and the mills have hard work to meet the demand. In addition to standard rails there is a considerable demand for light rails and material for trolley roads. Structural-steel orders amount to a considerable total, but it is noted that in the East the fabricating companies are taking contracts on a basis which implies some cutting in prices for material.

Pig iron is the weakest part of the market and prices are being made on a basis which implies considerable concessions by furnaces. These concessions seem to be bringing a number of buyers into the market for their third-quarter supplies. Southern iron has been disturbing the market and is said to have been rather freely offered on a basis of $13 Birmingham for No. 2 foundry.

Baltimore

March 21—Imports for the week included 1086 tons ferromanganese from Liverpool; 144 casks manganese ore from Hamburg; 11,200 tons iron ore from Cuba. Exports included 170,800 lb. steel rails and 1,404,636 lb. bars, plates, etc., to Panama.

Birmingham

March 21—Pig iron buying in the Southern territory is a little slow. There is no change in the production, and so far, there has not been much iron going to the yards. The quotations are weak, $13.50 per ton, No. 2 foundry, being about the present figure. The manufacturers are hopeful, however, and expect a turn for the better. Some large deals are under consideration, or have been made recently, of which but little mention is made.

Consumption in the Southern territory shows no abatement, the cast-iron pipe plants, foundries, machine shops and other industries using iron being active and melting a large quantity. Basic and charcoal irons still have a little call.

Chicago

March 21—The iron market shows little change from last week, but sales are increasing slowly. Foundry iron, the great staple of this market, is being bought cautiously, as heretofore, with the average melter still taking a carload to 300 tons, and only an occasional larger lot. The needs of the next three months are always before the foundrymen to the exclusion of longer-time contracts, but there are some—and an increasing number—of third-quarter and last-half requirements that are being contracted for. Southern iron sells at $13@13.50, Birmingham, or $17.35@17.85, Chicago; Northern at $18@18.50. The stiffness with which Northern has been held seems to be disappearing; this iron is selling in larger amounts than heretofore. Inquiries indicate a large prospective need of the melters for the last half. For iron and steel products in general the demand is large. Coke is steady at $5.75 for the best Connellsville.

Cleveland

March 20—No sales of iron ore reported. Prices as fixed for the season are: $5 for Old Range bessemer ores; $4.75 for Mesabi bessemers; $4.20 for Old Range and $4 for Mesabi nonbessemers; all f.o.b. Lake Erie port.

Pig Iron—Some large sales are reported made, and others are under negotiation. Notwithstanding this, the market has a weaker tendency. Quotations, Cleveland delivery, are: $18.50@18.75 for bessemer; $16.75@17 for No. 2 foundry; $16.25@16.50 for forge; $19.50 for Lake Superior charcoal.

Finished Material—Not much new business, except in bars. Concessions on structural steel are reported.

Philadelphia

March 23—The fact that the production of pig iron throughout the country is steadily increasing is given by some makers as the reason why there is less anxiety to purchase for forward delivery than was shown a few months ago. The transactions for the past week were limited to the closing of negotiations for several lots for which inquiries were made from two to four weeks ago. A few large makers admit that just at this time there are fewer inquiries on the market than are usual at this period of the year. Pennsylvania makers are in a frame of mind that would make it easy for consumers to arrange for supplies for the second and third quarters of the year. Users of No. 2 X foundry might, if they were so inclined, make favorable terms at this time. Several grades of forge are offered at $17. Basic is quoted $18@18.50. Additional inquiries for malleable iron are on the market.

Scrap—The market has relapsed into temporary dullness after a number of large purchases.

Pittsburg

March 22—The iron and steel market as a whole is clearly less active than a week or two weeks ago, and the reversal, after two or three weeks of improvement, is a decided disappointment.

Production of both pig iron and steel is practically at the highest rate on record, and all but a very small percentage of the current make is being shipped, yet the actual market is inexpressibly dull.

Prices of steel products are fairly well maintained, but show signs of wavering at certain points. Line pipe, for instance, is being shaded rather severely. Wire products, however, show an improvement, doubtless due to the advance in the season. Iron bars are quiet, and in some Western districts are distinctly lower, particularly in the St. Louis district, where as low as 1.40c. at mill has been done. Chicago is down to 1.50c., while at Pittsburg the market remains 1.70c. nominally.

Pig Iron—It is claimed the low prices done on the Westinghouse business for second half, reported a week ago, could not be duplicated, but this remains to be seen, for there has been no important buying meanwhile. The Standard Sanitary Manufacturing Company is today sending out inquiries for a moderate tonnage for second-quarter delivery. Basic and bessemer are extremely quiet, with practically no inquiry. Prices are quotable as follows, but are largely nominal: No. 2 foundry, $16@16.25; forge, $15.25@15.50; basic, $16@16.25; bessemer, $17.75, all f.o.b. Valley furnaces.

Steel—The market has been quiet on semi-finished steel. Open-hearth billets appear to be still scarce, but the demand is limited. Occasional inquiries for sheet-bars appear. Prices remain quotable at $27@27.50 for bessemer billets, $27.50@28 for open-hearth billets, $28.50@29 for sheet-bars and $33 for rods, all f.o.b. maker's mill, Pittsburg or Youngstown districts.

Ferromanganese—The market has been extremely quiet. Prices are nominally unchanged at $43 for prompt and $43.50@44 for delivery over the next few months, at Baltimore, freight to Pittsburg being $2.30 per ton.

Sheets—Demand is not heavy, but most mills are well fixed with contracts and are able to maintain production. The Follansbee Brothers Company is about to add two sheet mills to its plant at Follansbee, W. Va., where it now has an open-hearth steel plant, six tin mills and two sheet mills. Regular prices remain at 2.40c. for black, 3.50c. for galvanized, $1.70 for painted corrugated roofing and $3 for galvanized corrugated roofing. Corrugated material continues to be shaded $1 a ton. Blue annealed sheets command 1.90c. for prompt delivery, 10 gage.

St. Louis

March 21—The iron market has been a little livelier this week, though it is far from active. The tonnage actually closed has been small. Inquiries are numerous, but prices remain unchanged at $14@14.50 per ton Birmingham or $17.75@18.25 per ton St. Louis for No. 2 foundry. However, some interests have been eager for business during the past 30 days, and these prices have been shaded quite a bit in some instances.

METAL · MARKETS

New York, March 23—The metal markets have been rather heavy, and there are lower prices recorded in some lines.

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin, lead, zinc and aluminum, was 144 for the month of January; 129 for February.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Feb. 1910..	$ 2,937,134	$ 3,063,116	Imp. $ 125,982
" 1909..	8,860,814	3,576,444	Exp. 5,284,370
Year 1910..	9,100,266	6,194,473	" 2,905,793
" 1909..	16,696,170	6,966,627	" 9,699,543
Silver:			
Feb. 1910..	4,588,619	3,155,329	Exp. 1,433,290
" 1909..	4,852,549	3,508,935	" 1,343,614
Year 1910..	9,086,923	7,403,683	" 1,683,240
" 1909..	9,394,643	7,173,687	" 2,220,956

Exports from the port of New York, week ended aMrch 19: Gold, $98,200; silver, $822,739, chiefly to London. Imports: Gold, $409,513 chiefly from France in transit; silver, $68 970, from Mexico and South America.

Gold—The price of gold on the open market in London continued unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin.

Platinum—The market continues firm and business is fair, while reports from abroad point to higher prices. Dealers ask $29@29.50 per oz. for refined platinum, and $35 per oz. for hard metal.

Our Russian correspondent writes from St Petersburg, under date of March 10, that the market has a strong tendency. At Ekaterinburg, small lots are sold at 6.05 rubles per zolotnik—$22.75 per oz.—for crude metal, 83 per cent. platinum. At St. Petersburg, the same grade has sold from 23,750 up to 24,200 rubles per pood; the higher price being equal to $23.72 per ounce.

Exports of silver from London to the East from Jan. 1 to March 10, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£ 888,000	£1,235,400	I. £ 347,400
China........	240,000	507,000	I. 267,000
Straits.......	82,800	......	D. 82,800
Total......	£1,210,800	£1,742,400	I. £ 531,600

India Council bills in London sold for the week at an average of 16.09d. per rupee.

SILVER AND STERLING EXCHANGE

Mar.	17	18	19	21	22	23
New York....	51⅜	51⅜	51½	52	52⅛	51⅞
London.....	23 11/16	23 11/16	23¾	23 13/16	24	23⅞
Sterling Ex..	4.8725	4.8710	4.8715	4.8715	4.8725	4.8715

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—Silver has been firm with advancing tendency on resumption of buying by the Bombay bazaars.

The China banks have also been buyers, with the result that silver has advanced to 24d. and closes strong at 23⅞d. in London.

Foreign trade of the United States, two months ended Feb. 28, as valued by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1909.	1910.
Exports..................	$ 282,764,576	$ 269,979,650
Imports..................	222,230,027	263,556,878
Excess, exports......	$ 60,534,549	$ 6,422,772
Add excess of exports, silver..........		1 433,290
Add excess of exports, gold...........		5,284,370
Total export balance.................		$ 13,140,432

The gold and silver movement in detal is given in the table at the head of this column.

Copper, Tin, Lead and Zinc

Mar.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
17	13½ @13⅝	13⅛ @13¼	58 13/16	31⅝	4.40 @4.45	4.25 @4.27½	5.45 @5.47½
18	13½ @13⅝	13⅛ @13¼	58⅞	32	4.37½ @4.42½	4.22½ @4.25	5.42½ @5.45
19	13½ @13⅝	13⅛ @13¼	....	32	4.35 @4.40	4.20 @4.25	5.40 @5.42½
21	13½ @13⅝	13⅛ @13¼	58⅞	31⅞	4.35 @4.40	4.20 @4.25	5.35 @5.40
22	13½ @13⅝	13⅛ @13¼	58¾	32⅛	4.35 @4.40	4.20 @4.25	5 35 @5.40
23	13½ @13⅝	13⅛ @13¼	58⅞	32⅜	4.35 @4.40	4.20 @4.25	5.35 @5.40

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market is dull and without special feature. Consumers are busy, but being well covered for the immediate future, are holding off. The market closes somewhat easier at 13½@13⅝c. for Lake copper, and 13⅛@13¼c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13@13⅛ cents.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¾c. base, carload lots at mill.

The London standard market has fluctuated within narrow limits, and is somewhat firmer at the close at £58 17s. 6d. for spot, and £60 for three months.

Refined and manufactured sorts we quote: English tough, £62; best selected, £62@£62 10s.; strong sheets, £71@£72 per ton.

Copper exports from New York and Philadelphia for the week were 3820 long tons. Our special correspondent gives the exports from Baltimore at 2172 tons copper.

Tin—The market has recovered from its recent decline. Orders from this side, where consumers took hold more freely than for a long time past, helped to strengthen the London market. Liquidation in London seems to be at an end for the time being and quotations at the close are cabled as firm at £146 12s. 6d. for spot and £148 15s. for three months.

Spot material, which has been more plentiful in this market, was bought up to a large extent by consumers and is therefore again becoming scarce. At the close it can be obtained at about 32⅜ cents.

Tin output of Federated Malay States, two months ended Feb. 28, was 7,138 long tons in 1909, and 7222 in 1910; increase, 84 tons.

Messrs. Robertson & Bense report receipts of Bolivian tin ore (concentrates) at Hamburg, Germany, in February at 473 tons.

Lead—There has been little demand for this article. As Missouri lead continues to be pressed for sale, prices have declined and the market closes weak at 4.35@4.40c. New York and 4.20@4.25c. St. Louis.

The weakness in the lead market is due primarily to the heavy offerings of Missouri lead, the production of which is constantly increasing. The pressure of this lead is felt severely, although among the silver-lead smelters there are many idle furnaces at Denver, Pueblo, Leadville, Salida and Salt Lake City.

However, this seems to be due primarily to shortage of silicious ore, inasmuch as the lead output of the Cœur d'Alene appears to be maintained, wherefore the silver-lead smelters are probably running higher lead charges than usual. At the moment the demand for lead from the corroders is rather slack.

The London market is slightly lower, Spanish lead being quoted at £12 18s. 9d., and English lead at £13 1s. 3d. per ton.

Spelter—There is little business doing. The market has eased off and closes at 5.50@5.55c. New York and 5.35@5.40c. St. Louis.

New York quotations for spelter, March 17, were 5.60@5.62½c.; March 18, 5.57½@5.60c.; March 19, 5.55@5.57½c.; March 21-23, inclusive, 5.50@5.55 cents.

The London market is unchanged at £23 for good ordinaries and £23 5s. for specials.

Base price of zinc sheets is $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—The market is strong with good sales and large inquiries for future delivery. Prices are very firm, 23¼@23¾c. being quoted for No. 1 ingots. Sellers are unwilling to quote far ahead, expecting further advances, in view of the increasing demand.

Antimony—The market is still dull, and prices are unchanged. Cookson's is selling at 8¼@8½c., and U. S. at 7⅞@8c.; while 7¼@7⅜c. is asked for outside brands.

Quicksilver—Sales have been larger, but prices are unchanged. New York quotation is $49 per flask of 75 lb.; jobbers ask 73@74c. per lb. for small lots. San Francisco, $48@49 for domestic orders and $2 less for export. The London price is £9 5s. per flask, with £9 2s. 6d. asked by jobbers.

Imports and Exports of Metals

Exports and imports of metals in the United States, month of January, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.	
Copper, long tons	30,099	13,999	Exp.	16,100
Copper, 1909....	21,012	9,661	Exp.	11,351
Tin, long tons....	19	4,976	Imp.	4,957
Tin, 1909........	33	4,196	Imp.	4,163
Lead, short tons.	6,589	11,409	Imp.	4,820
Lead, 1909......	7,465	10,406	Imp.	2,941
Spelter, sh. tons	154	563	Imp.	409
Spelter, 1909....	364	283	Exp.	81
Nickel, lb........	1,122,445	2,464,941	Imp.	1,342,496
Nickel, 1909....	635,576	853,630	Imp.	218,054
Antimony, lb..	....	730,328	Imp.	730,328
Antimony, 1909.	....	506,614	Imp.	506,614
Platinum, oz.....	... .	7,039	Imp.	7,039
Platinum, 1909.	....	12,466	Imp.	12,466
Quicksilver, lb ..	6,845	....	Exp.	6,845
Quicksilver, '09	7,553	....	Exp.	7,553
Aluminum, value	$27,131	.. ....	Exp.	$27,131
Aluminum, 1909	3,583	....	Exp.	3,583
Ores, etc.:				
Zinc oxide, lb. ..	1,677,320	....	Exp.	1,677,320
Zinc oxide, '09..	1,639,270	....	Exp.	1,639,270
Zinc dross, lb....	161,501	....	Exp.	161,501
Zinc dross, '09..	1,698,663	....	Exp.	1,698,663
Zinc ores, lg. tons	2,020	5,139	Imp.	3,119
Zinc ores, 1909.	....	9,096	Imp.	9,096
Antim'y ores, lb.	....	....	....	....
Ant. ores, 1909	....	1,468,661	Imp.	1,468,661
Chrome ore, tons	....	3,740	Imp.	3,740
Chrome ore, '09	....	6,437	Imp.	6,437

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in January, 1910, were 3,917,114 lb.; not reported prior to date of new tariff.

Zinc and Lead Ore Markets

Platteville, Wis., March 19—The base price of 60 per cent. zinc ore opened at $45 per ton, but weakened to $43 for top grades, while bids on low grades were made Saturday night upon a $40 base. For 80 per cent. lead ore $50@51 per ton was paid. The condition of the wagon roads has materially improved, but a number of outlying mines, with large accumulations of concentrates on hand, are still unable to ship.

SHIPMENTS, WEEK ENDED MAR. 19.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Plattoville	477,590	....	341,400
Mineral Point	443,200	....	....
Benton	327,500	....	....
Galena	153,000	....	....
Highland	121,000	76,950	....
Cuba City	82,965	....	....
Total	1,605,255	76,950	341,400
Year to date	16,555,640	1,176,049	2,887,350

In addition to the above there was shipped during the week to the separating plants 1,713,830 lb. zinc concentrates.

Joplin, Mo., March 19—The highest price paid for zinc sulphide ore was $48 per ton, the base being $43@45 per ton of 60 per cent. zinc. Zinc silicate remained in fair demand on a base of $21@24 per ton of 40 per cent. zinc, with the high price at $28. The average price, all grades, was $41. The highest price offering for lead ore this week was $51 per ton, deductions being made for ores under 80 per cent. lead. While this figure was the high offering for the week, much of the ore shipped was on past week's price, which brought the average price, all grades, to $49.99 per ton.

SHIPMENTS, WEEK ENDED MAR. 19.

	Zinc, lb.	Lead, lb.	Value.
Webb City–Carterville	5,549,250	1,350,570	$153,747
Joplin	2,084,530	104,930	48,536
Duenweg	973,860	125,450	24,137
Oronogo	1,006,300	......	22,718
Galena	885,000	64,860	20,239
Alba-Neck	713,110	38,580	16,671
Granby	818,000	3,500	12,245
Aurora	605,640	......	10,611
Miami	364,810	212,890	9,623
Carthage	273,960	......	6,026
Sarcoxie	411,480	......	5,666
Spurgeon	258,450	54,330	5,184
Badger	215,290	10,280	4,885
Quapaw	183,040	43,240	4,924
Carl Junction	64,620	......	1,389
Totals	14,407,340	2,008,730	$346,601
12 weeks	128,103,080	20,035,340	$3,229,915

Zinc value, the week, $295,435; 12 weeks, $2,678,053
Lead value, the week, 51,166; 12 weeks, 551,862

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	......	34.71	......	50.82	......
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

The zinc ore market weakened at the week end, ore being sold today, for next week's delivery, on a $42 base. Weather conditions are favorable and the mines are generally producing to the full capacity of the employees possible to secure.

CHEMICALS

New York, March 23—The general market continues steady with no changes of importance, but rather a strong tendency.

Copper Sulphate—Business is good and the market steady. Prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller orders.

Nitrate of Soda—Sales continue large and spot nitrate has again advanced, being quoted at 2.15c. per lb. Futures remain at 2.07½c. per lb. in view of the large imports, present and prospective.

Arsenic—The market is better, and sales amounting to about 200 tons were made during the week. Quotations continue at $2.50@2.62½ per 100 lb. for white arsenic.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, month of January:

	Imports.	Exports.		Excess.
Copper sulph. lb.	....	897,290	E.	897,290
Copper sul., '09	....	969,404	E.	969,404
Bleach, lb.	8,060,347	....	I.	8,060,347
Bleach, 1909	7,510,746	....	I.	7,510,746
Potash salts, lb.	50,776,160	60,178	I.	50,715,982
Potash salts, '09	36,785,255	458,819	I.	36,326,436
Soda salts, lb.	1,538,810	59,274	I.	1,479,536
Soda salts, 1909	834,952	29,600	I.	805,352
Acetate lime, lb.	....	4,215,046	E.	4,215,046
Acetate, 1909	....	6,690,022	E.	6,690,022
Nit. of soda, tons	44,483	1,051	I.	43,432
Nitrate, 1909	13,180	743	I.	12,437
Phosphates, tons	1,319	31,587	E.	30,268
Phosphates, '09	150	44,185	E.	44,035
Sulphur, tons	4,011	11,414	E.	7,303
Sulphur, 1909	3,036	5,817	E.	2,781
Pyrites, tons	70,415	....	I.	70,415
Pyrites, 1909	42,687	....	I.	42,687
Magnesite, lb.	18,596,048	237,590	I.	18,358,458
Magnesite, 1909	....	....		....

Exports include reëxports of foreign material. Figures for magnesite not reported separately prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 32,177 tons.

Petroleum

Petroleum production and shipments of Gulf Coast and Midcontinent fields in February, as reported by *Oil Investors' Journal*, in barrels of 42 gal. each:

	Production.	Shipments.
Oklahoma	3,282,895	3,469,697
Southeast Texas	596,361	983,544
Louisiana	288,283	200,083

New wells completed in February in Louisiana, 4 oil and 1 gas; Southeast Texas, 22 oil and 2 gas; Oklahoma, 188 oil and 12 gas wells. Stocks of Oklahoma oil were 54,738,275 bbl., at close of month.

MINING·STOCKS $

New York, March 23—The general stock market has been, during the week, almost entirely a professional market and has shown no definite tendency. Brokers profess to be waiting for news, and do not seem to be disposed to any particular activity in the interval. Prices have moved rather irregularly and fluctuations have not been large.

The Curb market has been also rather confused and irregular. There was some movement in coppers, but only very moderate changes in price, while other mining stocks were rather neglected.

The Standard Consolidated Mining Company, of Bodie, Cal., has made application to have its stock taken from the unlisted department on the New York Exchange and put upon the regular list. Standard Con. was at one time one of the most active mining stocks in New York, but of recent years the dealings in it have been very small, and it is seldom quoted.

March 22—There has been very little to the copper-share market during the week, although a firm tone prevails in the main. Stocks are well held as witnessed in the fact that few are offering, while the demand is exceedingly light. A drop of $25 in the price of Calumet & Hecla shares to a low of $600 has been gradual and on small lots. No significance is attached to the decline, as apparently somebody is trying to make as low a quotation for the stock as possible.

The selling pressure has ceased in Arizona Commercial. Although the price of North Butte is slightly off for the week there is a lack of offerings of the stock. There is quite a busy time soliciting proxies to put a Boston representative on the board at the forthcoming annual election.

The distribution of the Franklin mining stock taken in payment by the St. Mary's Mineral Land Company for mineral land sold to the Franklin has caused a somewhat uneven market for Franklin stock. It comes as a dividend to St. Mary's stockholders, they receiving one share of Franklin stock for five owned. A $1.50 rise in Superior & Boston to $16.50 accompanied reports that the company had struck a rich ore-shoot, although it was on limited transactions. Hancock had

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.	Mar. 12	Apr. 7	$0.05
Bader, Cal	Feb. 24	Mar. 14	0.10
Belcher, Nev	Mar. 9	Mar. 29	0.10
Cardiff, Utah	Mar. 10	Mar. 28	0.00½
Central Eureka, Nev	Mar. 13	Apr. 23	0.02½
Chollar, Nev	Mar. 8	Mar. 31	0.10
Columbus Con., Utah	....	Apr. 11	0.25
Confidence, Nev	Mar. 25	Apr. 15	0.20
Crown Point, Nev	Mar. 8	Mar. 28	0.10
Gould & Curry, Nev	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev	Mar. 9	Mar. 31	0.10
Hancock, Mich	May 2	....	3.00
New Arcadian, Mich	Mar. 10	....	1.00
Ojibway, Mich	Mr.Oct.	....	2.00
Oneco, Mich	Feb. 15	....	1.00
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Seg. Belcher, Nev	Mar. 8	Mar. 28	0.10
Seven Troughs Mon., Utah.	Mar. 12	Apr. 2	0 00½
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Union, Nev	Mar. 7	Mar. 31	0.10
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

a good spurt after a $2.50 drop to $20.50 on the $3 assessment. It subsequently rose to $25.50 per share.

Shattuck & Arizona had a rise of over $19 on the Curb, touching $39. Dividends at the rate of $4 per year are shortly expected.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
III, 1909	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1909	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	......	23.227	......
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52..38	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	......	12.826	......	56.231	......
April	12.56	......	12.93	......	57.363	......
May	12.893	......	13.238	......	59.338	......
June	13.211	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	......	15.84	......	15.62	......
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Mar. 22	
Name of Comp.	Bid.
Listed:	
Acacia	‡.06
Cripple Cr'k Con.	‡.02⅞
C. K. & N.	‡.10
Doctor Jack Pot.	.06
Elkton Con.	.70
El Paso	‡.66
Fannie Rawlins	‡.05
Findlay	‡.09¾
Gold Dollar	‡.10
Gold Sovereign	‡.04
Isabella	‡.17½
Mary McKinney	‡.46½
Pharmacist	‡.03
Portland	‡1.06¼
Vindicator	‡.79¾
Work	‡.05¾
Unlisted	
Golden Cycle	1.40
United Gold Mines	.08

SALT LAKE Mar. 22	
Name of Comp.	Clg.
Carisa	.60
Colorado Mining	.76
Columbus Con.	.44½
Daly Judge	4.00
Grand Central	1.60
Iron Blossom	.94
Little Bell	1.65
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	1.80
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.53
New York	.13
Prince Con	.87
Red Warrior	‡6.00
Silver King Coal'n	2.00
Sioux Con.	.44
Uncle Sam	.38
Victoria	1.25

SAN FRANCISCO. Mar. 22

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.16	Belmont	2.65
Belcher	1.12	Daisy	.09
Best & Belcher	.25	Jim Butler	.18
Caledonia	.59	MacNamara	.35
Challenge Con.	.35	Midway	.37
Chollar	.30	North Star	.02
Confidence	1.45	West End Con.	.46
Con. Cal. & Va.	1.37	Atlanta	.16
Crown Point	1.05	Booth	.15
Exchequer	.25	C.O.D. Con.	.08
Gould & Curry	.32	Columbia Mt.	.08
Hale & Norcross	.50	Comb. Frac.	.51
Mexican	1.82	Great Bend	.03
Ophir	1.52	Jumbo Extension	.42
Overman	1.15	Oro	.06
Potosi	.30	Red Hill	.04
Savage	.47	Sandstorm	.04
Sierra Nevada	.57	Silver Pick	.10
Union	.88	St. Ives	.18
Yellow Jacket	.98	Tramps Con.	.08

N. Y. EXCH. Mar. 22	
Name of Comp.	Clg.
Amalgamated	78⅜
Am. Agri. Chem.	47¾
Am.Sm.&Ref.,com	86
Am. Sm. & Ref., pf.	107⅞
Anaconda	49¼
Bethlehem Steel	31½
Col. & Hock. C. & I.	‡15
Colo. Fuel & Iron.	41½
Du Pont P'd'r, pf.	85
Federal M. & S.	40
Great Nor., ore ctf.	68½
Nat'nal Lead, com.	84
National Lead, pf.	109½
Pittsburg Coal	21½
Republic I&S, com.	39
Republic I & S, pf.	‡103
Sloss Sheffi'd, com.	‡78
Sloss Sheffield, pf.	‡117½
Tennessee Copper	‡33
Utah Copper	48½
U. S. Steel, com.	85¼
U. S. Steel, pf.	121
Va. Car. Chem.	59⅞

N. Y. CURB Mar. 22	
Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19⅜
Braden Copper	5⅛
B. C. Copper	6⅞
Buffalo Mines	3½
Butte Coalition	26
Chino Copper	15⅛
Cobalt Central	.16½
Combination Fra.	.48
Con. Ariz. Sm.	2 3/16
Cumberland Ely.	9
Davis-Daly	3⅛
Dominion Cop.	7
Ely Con.	.75
El Rayo	2⅞
Florence	3⅛
Gila Copper	7¾
Giroux	9¼
Gold Hill	1½
Goldfield Con.	8⅜
Greene Cananea	.10¼
Guanajuato	1⅝
Guggen. Exp.	215
Kerr Lake	.08½
La Rose	4½
McKinley-Dar-Sa.	.95
Miami Copper	23
Mines Co. of Am.	49
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1¼
Newhouse M. & S.	3½
Nipissing Mines	10⅜
Ohio Copper	4⅜
Pacific Sm. & M.	⅝
Silver Queen	.20
Standard Oil	640
Stewart	½
Tonopah	7⅜
Tonopah Ex.	1.11
Tri-Bullion	15/16
Utah Apex	‡5⅛
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4⅜

LONDON Mar. 23	
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 8 0
Esperanza	2 16 3
Tomboy	0 10 1½
El Oro	1 8 0
Oroville	0 10 3

BOSTON EXCH. Mar. 22	
Name of Comp.	Clg.
Adventure	8
Allouez	50½
Am. Zinc	30
Arcadian	6½
Arizona Com.	33
Atlantic	9½
Boston Con.	19¼
Butte & Balak	9¾
Calumet & Ariz.	74
Calumet & Hecla	602
Centennial	20
Con. Mercur	.13
Copper Range	76
Daly-West	8¾
East Butte	10¼
Franklin	18¾
Granby	83
Greene–Can.	10¼
Hancock	24
Helvetia	3⅝
Indiana	39⅝
Isle Royale	20½
Keweenaw	5¼
Lake	76¼
La Salle	16⅝
Mass	6
Michigan	6½
Mohawk	62
Nevada	23⅞
North Butte	40¾
North Lake	23¼
Ojibway	10⅛
Old Dominion	42
Osceola	153
Parrot	16⅛
Quincy	89
Shannon	14¾
Superior	55½
Superior & Bost.	15
Superior & Pitts.	13¾
Tamarack	66
Trinity	8½
U. S. Smg. & Ref.	46½
U.S.Sm. & Re., pd.	51½
Utah Apex	4
Utah Con.	32
Victoria	4
Winona	10¼
Wolverine	135
Wyandotte	2½

BOSTON CURB Mar. 22	
Name of Comp.	Clg.
Ahmeek	195
Bingham Mines	3½
Boston Ely	3 13/16
Calaveras	5⅝
Champion	.10
Chemung	10
Chief Cons.	2 15/16
Chino	14⅞
Cons. Ariz.	2 11/16
Corbin	.09¾
Cactus	4 11/16
Crown Reserve	3¾
First Nat. Cop.	3⅝
Gila Copper	7¾
Indiana	‡34½
Inspiration	8½
Majestic	.91
Nevada-Douglas	2¾
New Baltic	8½
Oneco	6¼
Ray Central	3 7/16
Ray Con.	21½
Rawhide Coal.	.23
Rhode Island Coal	10¼
San Antonio	10½
Shattuck-Ariz.	30
South Lake	12⅝
Superior & Globe	80
Trethewey	1⅜
Tuolumne Copper	3½
Vulture	9⅞
Yuma	1 3/16

‡Last quotation.

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The Senseless Scare

The markets of the East are submerged by a wave of pessimism. Bankers, brokers, and especially investors, seem to be scared out of their wits. What excites their fear is unknown even to them. They are terrified by spooks that they think may exist, but whereof they do not know the nature or the manifestation. One specter at least has been laid, namely the prospect of labor troubles anticipated on April 1, the day of the proletariat. Of this there was never much danger. The times are not propitious for strikes.

The most dreadful specter is doubtless the coming decision in the monopoly cases. If adverse, the "big fellows" are going to precipitate a panic, and out of revenge depreciate the value of their own property, etc., *ad nauseam,* and also bosh. The Supreme Court of the United States is composed of conservative jurists, who are also patriots. It is senseless to believe that they will destroy the foundations of our industrial structure and relegate our business to barbarism and chaos. James J. Hill talked sanely upon this subject.

Another spook is recession in business. With wise shakings of the head, it is said that the clock has struck 12. This is the evil effect of the blowing of bubbles in the latter part of 1909, and is the aftermath of the "sunshine movement," which persuaded folks in 1909 that a boom had come once more. There was none.

We had two years of industrial depression. During that time but little new work was inaugurated; maintenance was neglected. But the population and its needs kept on increasing, and must be supplied. Railway facilities are notoriously inadequate and must be increased. The wear of existing plants must be made good. The improvement in business in 1909 did not become noteworthy until after mid-summer. It is inconceivable that in the brief period of the remainder of that year the deferred development of two years was consummated. It is yet to be done, and this means industrial activity. In fact, the consumption of raw material is increasing steadily. The pessimists ought to go West and witness the population there buying and selling and making money without thought of calamities.

The world is never free from evils. There are some now. One of them is extravagance. Another is the greed that accompanies prosperity and manifests itself in the financing of accumulations to extract from consumers the last penny they will pay. The status of our foreign trade, resulting from these factors, is detrimental to welfare, but this will be corrected. Producers all want to sell freely, but conditions must be adjusted so that consumers will buy freely. The present tendency to readjust prices is wholesome.

In the metal industries this readjustment has already made good headway. Our index number for February was 124 against 127 for January and 101 as the average for 1909. In copper there was no large decline, but that metal has not lately had any rise worth mentioning. Copper is now the center of pessimism. The "talent" regards it as hopeless; can't see anything that will lift it out of the slough of despair. About a year ago the same prophets were talking about the speedy coming of a 15c. market. The fact that the accumulation was then increasing cut no figure in their estimation. Now that it is decreasing, the prophets are hopeless.

The present wave of pessimism is not likely to last long. Such senseless fright may end in a day.

The Collapse of Granby

As a bolt from a clear sky came last week a decline in Granby shares from $80 to $65, and later in the day an official statement that a report upon the property is soon to be issued, but in advance of that "it may be said that it will be disappointing as to the tonnage of ore available for stoping, which will probably not exceed 6,000,000 tons." This was received by the stockholders of the company with consternation. Not only they, but also the industry in general, had become imbued with the belief that in quantity of ore Granby was of the order of a Rio Tinto, that exhaustion of ore reserves was not a subject for serious consideration inside of a generation, that the only problem of Granby was to enlarge sufficiently its means of mining and smelting and treat an immense tonnage of low-grade ore. Even in the week of the collapse fell due the last payment upon the subscription of a new issue of stock to pay in part for increasing the company's plant and working capital.

Granby stock has never been a speculative shuttlecock. Its board of directors comprises names as honorable as the best in American industry. The directors themselves are the largest stockholders. Outside of them the stock is distributed among the best class of investors. An unusually large percentage of them seem to have been men well versed in mining. Most of them have held the stock for its dividends, rather than with any idea of reaping a profit from manipulated rises and falls. They have felt sure of their principal. There has been nothing in the recent reports of the company to excite fear; certainly nothing to arouse suspicion of the nature of the news that was abruptly told last week.

Reading between the lines of the official statement it is evident that in connection with a change in the superintendency of the property, announced a few weeks ago, the president, with a consulting mining engineer, was led to visit British Columbia and while there learned of facts which previously they did not know. Upon their return to New York a report was in preparation for communication to the stockholders. However, the bad news apparently leaked out prematurely, which does not necessarily imply that it escaped from the office of the company. In the alarm naturally caused by the violent break in the stock and the circulation of wild rumors, the management seems to have thought it best to tell the truth promptly.

In this, at least, its action stands in a favorable light when compared with that of some other managements which have maintained mystery respecting the real condition of their mines when adversity has come. The truth may be unpalatable but it is better to know it than to be buffeted and worried by uncertainty.

Harsh things are naturally being said about the slump in Granby. In the company's report for fiscal year ending June 30, 1909, A. B. W. Hodges, the superintendent, said: "Our ore reserves are largely increased and we have ore in sight for many years to come." In its statement to the Stock Exchange, March 16, 1910, the company said that "approximately 8 to 10 million tons of ore are now developed ready for extraction in the company's territory." The discrepancy between these statements and that of March 23 clearly demands the explanation which has been promised.

There are some officers and directors of the company whose names have particularly inspired confidence. No one will believe, we think, that such men as Higginson, James, Langeloth and Nichols, besides others of this board, have intentionally lent themselves to any deception. We feel sure that they will make a frank declaration respecting the whole matter, which is, indeed, one that cannot be dismissed lightly. No event in years has done so much to destroy public confidence in mining investments, and the Granby stockholders have reason for their indignation, wherever be the responsibility. If there has been treachery by anyone in any manner, the guilty should be branded, but until all the facts are known, judgment must be deferred.

Production of Spelter in 1909

Our final statistics of the production of spelter in 1909 do not differ materially from the preliminary figures that we reported Jan. 8, the difference being less than 0.25 per cent. The revised figures are given in the following table:

PRODUCTION OF SPELTER.
(IN TONS OF 2000 LB.)

State.	1908.	1909.
Colorado	3,079	6,115
Illinois	50,244	75.229
Kansas	99,136	103,390
Missouri	10,196	8,418
Oklahoma	14,867	28,840
South and East	32,989	44,470
Total	210,511	266,462

The above statistics represent the production of what is called virgin spelter, i.e., metal derived directly from ore, but an insignificant part came from galvanizers' dross treated by concerns whose business is chiefly the smelting of ore.

The deliveries for consumption are computed in the following table:

DELIVERIES INTO CONSUMPTION.
(IN TONS OF 2000 LB.)

	1908.	1909.
Stock January 1	32,883	25,000
Production	210.511	266,462
Imports	881	9,670
Total supply	244,275	301,132
Exports	2,640	2,566
Stocks, December 31	25,000	11,500
Deliveries	216,635	287,066

It is well known that the actual consumption was materially less than the deliveries, the surplus having been accumulated in the yards of manufacturers and possibly to some extent in storage warehouses. The reports of stocks by the smelters included not only their own metal, but also all that they were holding for other accounts.

What Is the Matter with the Metal Markets?

Since Jan. 1 there has been a decline in the prices for all of the metals except tin and aluminum. Bessemer pig iron averaged $19.90 in January and $18.96 in February. For the other metals the averages were, respectively, as follows: Copper, 13.62 and 13.33; lead, 4.70 and 4.61; spelter, 5.95 and 5.42; silver, 52.38 and 51.53. In March, copper fell to 13⅛, and lead to 4.37½. Producers have expressed discouragement because of this downward trend, and have asked what is the matter with the metal markets?

The answer is simple. The producers are able to output abundantly and profitably at present prices. In iron, copper and spelter, the pace was set too fast in the latter half of 1909, and the prices for iron and spelter in particular were carried too high. Copper was unable to rise because of the accumulation that is being financed and lead escaped any serious inflation because of the conditions under which it is chiefly marketed.

However, much as producers would like to have 15c. copper, 6c. spelter and 5c. lead, they ought not to complain grievously over the present prices, which after all are not greatly below the averages or what ought reasonably to be expected. No one is justified in basing calculations on copper at higher than 13½c., spelter at 5.50, and lead at 4.50, and it is best to make up the mind to those figures, taking joyfully whatever in excess may be realized from time to time.

As to silver, the Cinderella of metals, will any fairy prince of commerce appear to take it away from its position of neglect? Of no great use in the arts, or esteem as an ornament, its chief purpose is to fill the demand of Asia, and produced so largely as an inevitable product, the development of a new Cobalt may at any time demoralize the market. Anyway, the course of silver is something that no one ventures to forecast.

Australasian Gold Production

We have now the full returns for 1909 of the six States of Australia and he Dominion of New Zealand. These re given in the accompanying table in ine ounces; the Northern Territory being ncluded in South Australia. Comparison is made with the complete returns or the preceding year:

	1908.	1909.	Changes.
Vest'n Australia	1,647,911	1,595,263	D. 52,648
'ictoria..........	670,910	654,222	D. 16,688
ueensland......	465,085	450,937	D. 14,148
ew South Wales	224,792	204,709	D. 20,083
asmania.... ...	57,085	44,669	D. 12,416
outh Australia..	9,162	8,187	D. 975
Commonwe'lth	3,074,945	2,957,987	D. 116,958
ew Zealand....	471,967	472,476	I. 509
Total, oz.......	3,546,912	3,430,463	D. 116,449
Total value....	$73,314,671	$70,907,670	D.$2,407,001

The decline in Australian gold output as now been continuous since 1904. It s due to a variety of causes, among vhich is the fact that no new districts of ny importance have been discovered or pened. There has been for several years omparatively little prospecting or openng of new mines. The energies of mine operators have been diverted to other metals, notably copper; and gold mining has attracted less attention than formerly.

Western Australia remains the chief gold producer in the Commonwealth, and its output has fallen off mainly because of the lower grade of the ores found in some of its larger mines. New Zealand shows a small increase, which is the result of the working of the Waihi and two or three other important mines; its dredging industry is decreasing.

Utah Copper Company

The Utah Copper Company in 1909 produced 51,749,233 lb. of copper at a profit of 4.173c. per lb. The average price received for the copper having been 12.915c., the cost of production was 8.742c. per lb., the copper being credited with the receipts from gold and silver and all miscellaneous receipts. In its recent statement to the New York Stock Exchange the company reports that it is now producing at the rate of approximately 60,000,000 lb. per annum at a cost of 8.5c. per lb.

The report of the company does not state the tonnage of ore mined and milled, but we shall not be far wrong if we take it at 2,600,000 tons. Upon that assumption the cost of mining, mine development and stripping was 97c. per ton. The charge for stripping—$133,713.55—is evidently about 5c. per ton of entire output, but, of course, is properly debited only to the ore extracted by open work. The proportion of ore thus extracted is not stated, which, of course, is in no way a reflection upon the company in a purely financial report of this character. It is of interest, however, to note that among its assets, Dec. 31, 1909, the company carries the item $1,513,946.73 for advance stripping, which it states will be gradually extinguished as the ore stripped is mined in the future.

Freight on ore—$762,080.59—appears to have been about 29.3c. per ton. There is the large item of $1,779,866 for "treatment and refining." If we reckon that smelting, transportation of blister copper and refining cost 1.5c. per lb. of copper, there would remain $1,003,648, or about 38.5c. per ton, for milling. These deductions are probably not far out of the way.

The Chinese in the Transvaal

The mine-labor return for the Transvaal mines in February is notable because for the first time in nearly six years no Chinese are included. The introduction of the Chinaman into South Africa began early in 1904, when the mine operators found themselves prevented from further expansion by the scarcity of unskilled labor, and obtained permission to import men from China, which seemed the only available source of supply. In July, 1904, there were 1388 Chinamen at work, and thereafter the number grew rapidly; in July, 1905, there were 43,191; in July, 1906, there were 52,234, and in January, 1907, it was 53,856, the maximum reached.

While the Chinese served the purpose of the mining companies for the time and proved fair mine laborers, their presence was resented by the white members of the community. Many believed the presence of so large an alien element to be undesirable; moreover, among so large a number of coolies there were naturally some bad men who escaped from the mine compounds and made themselves a danger which had to be dealt with by summary methods. This increased the feeling against them, and when the Transvaal became a self-governing colony, almost the first act of its parliament was to pass a law prohibiting further importations and providing that those in the country should be sent back to China as fast as their contract terms of service should expire. At first this repatriation was slow; in the first six months the number at work was reduced only to 51,472. Thereafter the movement proceeded rapidly, the total falling by successive half-yearly periods to 33,849, to 19,071, to 11,534, to 5360. On Jan. 1, 1909, only 1094 were left, and on Feb. 1 even these were gone.

Fortunately for the mine operators, conditions in South Africa have been such that it has been possible to increase the black laborers from 103,000 to over 190,000 in February of this year.

There is no place here to discuss the economic or sociological sides of the Chinese question. It is enough to note that the orderly introduction of nearly 55,000 alien laborers, and their removal without friction or disturbance, constitute a remarkable industrial episode.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Why Prospecting Is on the Wane in Colorado

There can be no denial of the present ore shortage in Colorado compared with former years, and the consequent dismantling of some furnaces, and running at half capacity of the others. What is the reason? One of them is apparent enough.

Looking back over 30 years of mining in Colorado, the behavior of each of the mines in the great camps of the State—Leadville, Cripple Creek, Creede, Central City and Black Hawk, Aspen, Georgetown, Red Mountain, Rico, Summitville and others—reminds one of a pan of fresh milk, where the richest is on the top, and now the cream having all been taken off, i.e., the oxidized ores and ores of secondary enrichment, we are down to the humdrum, though more regular and steady, production of the skim milk, i.e., the lower grade, but more evenly distributed baser sulphide ores.

I can remember in Red Mountain, in the San Juan region, where a carload of ore from the Yankee Girl brought $80,000; when two carloads from the Isabella, in Cripple creek, brought $315,000; and when in the Independence mine, at one time, they had 10 ft. wide of $90 gold ore; when the Wheel of Fortune, in the Sneffels district near Ouray, was shipping 24-oz. gold ore, besides rich silver contents, to Green's smeltery at Silverton at a cost of $35 for packing and $45 for treatment; one year, when Leadville produced $18,000,000 worth of ore.

But why are not new pans, with their cream on top, being discovered? Does anyone suppose that all have been discovered and that in Colorado the prospector has no new worlds to conquer, no more rich mines to discover? If so, it is a grand mistake; not one one-thousandth part of the State has been so prospected and exploited as to enable it to be said that all the mines have been discovered. I remember the time when every city, town and village in the State had its little groups of business men who clubbed together, or its individuals who grubstaked and outfitted their prospector to look for mines in various parts of Colorado, and when any successful miner who had made a stake forthwith invested some of his winnings in the same manner; and the result was the discovery of great mines and the resultant phenomenally rich camps above mentioned. This has all ceased. Prospectors are still being grubstaked, and going out on their own hook, but to Mexico, Nevada, Utah, Alaska, and even to South Africa, the Philippines and other foreign countries—and why?

I will give the answer of the mining fraternity of this State as they look at it, and as they believe it, and as voiced by Hon. Edward T. Taylor, of Colorado, in his speech on "Federal Encroachments upon the Rights of the West" in the House of Representatives on Feb. 1, 1910. His words were:

"We want the impracticable restrictions removed from prospecting, and the inauguration of such regulations as will allow the development of our mining resources. Prospecting has practically ceased within the State of Colorado; there have been no more new Creedes or Cripple Creeks, or other important mining camps developed since the public domain was taken possession of by the Forest Service.

"We will heartily welcome such laws as will prevent land grabbers of every kind. We are more opposed than anyone else can be to the spoilation or monopoly of any of our immensely valuable resources. We want our timber conserved, not monopolized, and a government monopoly is not much better than any other.

"If the bills are prepared by men who know the conditions of our country, and are drafted in the interest of the growth and development of the West instead of its exploitation, I care not how strict the requirements may be for guarding against frauds of every kind. But we insist upon what we believe to be our rights, that this property shall lawfully and orderly, and as speedily as may be reasonably possible, all go into private ownership, and become the property of the residents of the States within which it is situated, and subject to taxation for the benefit of the States and counties therein. We believe that to be an inviolable right, and in every respect in accordance with the policy that has made this nation what it is. We ask for nothing more and we expect nothing less. Even though it were not a violation of our rights, we do not believe it either practical or good policy for this Government to embark in the coal business, or the oil business, or the gas, or water-power, or mining, or any other such business within our borders."

There can be no new ore production from these mountains without the discovery of new mines and new camps, and there will be none of these until the prospector, with his burro, carrying his pick and his frying pan and grub and blankets, begins to climb the trails again. When this will be, who shall say? But I have given one of the chief reasons of the ore shortage in Colorado.

William Weston.

Denver, Colo., March 17, 1910.

Spurious Potassium Cyanide

The sale of the Daly Reduction Company's properties soon after the completion of the cyanide tests reported under the above heading in the Journal, Oct. 23, 1909, prevented further investigation at the time and renders me unable at present to answer some of the points raised by W. J. Sharwood in his excellent article in the Journal, March 19, 1910, under the heading, "Commercial Sodium and Potassium Cyanide."

Both he and E. M. Hamilton, Journal, Feb. 12, 1910, are justified in criticizing the manner of reporting percentages of sodium and potassium present. Determinations were made for sodium, potassium and soluble sulphides only; percentages of the oxides of both bases were reported in terms of their cyanide equivalents, with a favorable chance of accuracy in the case of potassium.

But, as was stated at the time, the reason for writing the original article of Oct. 23, 1909, was a desire to place before metallurgists without delay this apparently fraudulent practice of manufacturers in selling highly adulterated potassium cyanide as the commercially pure article. Some chemists might know of this, but it was likely that the majority did not. All chemical questions as to ultimate composition, solvent power or precipitation efficiency were left in abeyance and certain queries were propounded in forms that were thought best calculated to start a valuable discussion of the metallurgical and commercial factors involved.

In a private communication of recent date, Abbot A. Hanks, the San Francisco analyst to whom our controls were submitted, says: "I have no present doubt but that the potassium was all combined as potassium cyanide; that enough sodium cyanide had been added to bring the salt up to the requirements, 98 to 99 per cent. (apparent) KCN, and that the remainder is some cheaper sodium salt, very probably caustic soda, added by the manufacturers as an adulterant."

From this it would appear that Messrs. Hanks, Hamilton and Sharwood are of one mind upon the subject of wholesale adulteration; but before drawing definite conclusions as to the effect of these adulterants in metallurgical work, or before attempting an explanation of the diametrically opposite results produced by apparently identical salts upon practically identical ores, we must necessarily await the result of a much more extended research.

F. A. Ross.
Spokane, Wash., March 25, 1910.

Gold in the Adirondacks

Supplementing the article under the above heading in the Journal of March 19, 1910, the following may be of interest: About four or five years ago I was asked to investigate certain statements concerning the so-called gold-bearing sands of the Adirondack region. These statements were similar to those made in the letters of Mr. Hatmaker, published in the article above referred to, to the effect that the gold was lost in the fire assay, but that it could be recovered by amalgamation, or possibly by some wet (chemical) process. The lands in question were, if I recall rightly, in St. Lawrence county, and I do not think either Mr. Hatmaker, Professor Locke or Doctor Keith were connected with the project. The promotors were quite uncertain as to the possibility of recovering the gold by any wet (chemical) process, but were positive about the results obtained by amalgamation.

Method of Testing

Upon asking for proof, I was introduced to some of the promoters and owners, and was assured that fullest opportunity would be given for investigation and verification of their claims and of the results of tests. Preferring first to investigate the claims as to the character of the sand and its gold contents, I visited the offices where demonstrations were made. It was explained that no satisfactory recovery could be made without fine grinding, and this consisted in grinding the sand in a mortar to 80 or 100 mesh. The samples contained much sand that was of 40- and 20-mesh size. After being ground and screened through an 80- or 100-mesh sieve, one pound of the sand was taken, and sufficient water added to make it of the consistency of mortar. A "small quantity of alkali," sodium or potassium carbonate, was added "to correct or neutralize acidity."

The mass was then thoroughly stirred for 10 or 12 minutes in a large Wedgewood mortar or porcelain evaporating dish. Four ounces of mercury were added, and the mass kneaded for one hour or more, or until the mercury was so thoroughly floured that no globules were readily visible to the naked eye. Sometimes two hours were consumed in this work. Water was added in quantity, and the sand panned; the mercury was collected, and the tailings caught and repanned to collect any mercury lost in the first panning. The mercury was then carefully cleaned, washed and dried by absorbing the water with blotting paper applied to the dish adjacent to the mercury, but not in contact with the mercury.

The mercury was then transferred to a porcelain evaporating dish, about 2 or 2½ in. in diameter. The dish was placed in the center of a hot plate about 10 in. in diameter. The plate was heated by an alcohol lamp (with small flame) placed exactly below the center. A glass funnel about 7 in. in diameter was inverted over the evaporating dish. As the lower edge of the funnel, being in contact with the hot plate, was relatively hot and the upper part of the funnel relatively cool, the mercury vapor condensed mainly in the upper part of the funnel. Whenever the coating of mercury became thick enough to form globules, the funnel was removed, and the condensed mercury wiped off. About four hours were required to volatilize the 4 oz. of mercury. It was stated that more rapid distilling of the mercury would invariably result in a loss of all, or nearly all of the gold.

After the volatilization was complete, there remained in the evaporating dish a cake of finely divided gold, gold powder, practically impalpable, sufficiently coherent to permit of its transfer, unbroken, to a small bone-ash cupel, upon which it was reduced to a bead by fusing with a blow pipe. The head showed, when weighed, a value of about $8 to $10 per ton. All this work was performed in my presence. No attempt was made at secrecy, and I was offered any quantity of the same sand (taken from a sack containing about 80 or 100 lb. of sand) to test by this or any other method; the statement being made that if I would faithfully use the same process I would assuredly get similar results. I was shown scores of beads, which I was told were obtained in this way. These represented the sand as worth from $5 to $30 per ton.

I accordingly took about 6 or 8 lb. of the sand to my own laboratory, where I carefully treated 1-pound samples in exactly the way described, but with absolutely negative results, although I made three trials of the process. I then made a cyanide test of the sand and extracted a very small quantity of gold. I do not recall the exact amount, but it was about 10c. per ton. I also made two or more fire assays, and obtained mere traces of gold. As I did not consider an examination of the deposit was justified, the investigation was then dropped.

Gold in Commercial Mercury

About one or two years after this, I had a rather similar experience. The scene was in Nevada, where I was stopping for a few days. There had drifted into this settlement, an old prospector, a Californian, a man of large experience in prospecting, and a really fine old fellow. Day after day he rode out in the morning, returning at night loaded with samples, which he carefully panned. A few days after I made his acquaintance, he told me of a discovery which he described as "mineralized porphyry, exactly like Goldfield ore, but it won't pan." He had been trying amalgamation, and said he judged he was getting $20 to $30 results. He needed help to stake the claims necessary to cover the ground, and asked me to join him.

We went to his tent, and he showed me the beads he had obtained by amalgamation. He had a small blowpipe outfit, with which he could fuse the beads. I repeated his tests on 4 or 5 samples, which he said were taken from outcroppings several hundred feet apart, and in every case obtained a bead similar to those he showed me. I then proposed to him to "try a blank," but he did not understand what I meant, and I explained to him I meant to test his mercury. He agreed at once, but said it was bought as "chemically pure" from . . . . . (naming a prominent Pacific Coast house), and that it must be all right, because he had never used it before. I accordingly placed a bead about the size of a pea on a bone-ash (blowpipe) cupel, and upon volatilizing the mercury, obtained a gold bead of about the same size we had obtained from all of the tests.

Mercury loaded with extremely fine gold is doubtless responsible for many similar errors. If the gold be very fine, ordinary distillation apparently does not purify the mercury, as considerable quantities of gold are mechanically carried over with the vapor.

H. M. Chance.
Philadelphia, Penn., March 23, 1910.

Automatic Zinc Dust Feeder

I read with interest an article in the Journal of Feb. 26, 1910, by James S. Colbath on an "Automatic Zinc Dust Feeder." He states that he is unable to give credit to the inventor. I am not sure whether I am right as to the originator, but during 1905, when I was chief assayer at the Tyee smeltery, Ladysmith, B. C., William Kiddie, who had charge of the sampling mill at that time, worked out a sampler of this kind. In addition he had a horizontal arm with a sliding weight that enabled him to vary the size of the sample taken.

This made an efficient sampler as no matter how fast or unevenly the ore was fed, the percentage taken out for a sample was exact. At that time it was used only on material passing, say, a ten-mesh sieve.

Charles S. Hurter.
Hancock, Mich., March 18, 1910.

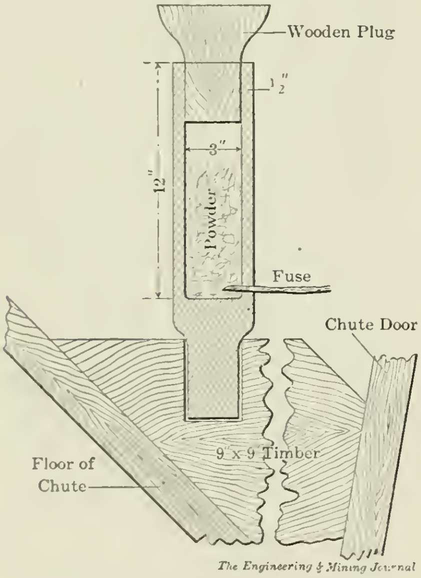
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Device for Clearing a Hung-up Chute

By J. Bowie Wilson*

All underground managers have at some time been worried by ore chutes choking and hanging up out of reach of the trammer's bar. When the material consists of fine clayey stuff the only remedy is practically to dig it out. If the material consists of rock, even if it contains a proportion of clay, and the block is due to the large pieces keying together and arching over in the chute, the following method of clearing the chute will be found better and certainly safer than attempting to shoot down the pass by tying pieces of dynamite to a tamping stick.



Cannon for Opening Chutes

This scheme is used at the Mount Morgan mine in Queensland, and consists in firing a wooden plug from a small cannon placed in the bottom of the chute. The cannon is made from a length of steel shafting, the center being bored out in a lathe and a touch-hole drilled large enough to take the ordinary fuse in use at the mine. The end of the shafting is turned down to fit into a hole in the top of a short length of 9x9-in. hardwood timber of such shape that when the device is laid on the floor of the chute and resting against the chute door, the cannon will point up the center of the raise. The cannon is charged with ordinary black blasting powder and a plug of hardwood timber is tapped home in its mouth. A fuse is then inserted into the touch-hole to explode the powder.

In action the cannon is a big popgun, and on the powder exploding the wooden plug hits the keyed material with a good, sudden blow. If the shot is successful the material falls upon the gun and its carriage, but these, being of a simple design, are in no way hurt and can be recovered. A knock against the side of the truck suffices to clear the cannon of any material and it is thrown down in the tunnel beside the chute until required again. If the chute is not freed by the first shot it will generally be found to open after several. A great advantage of this method is that the men are in no danger when using it.

Making Bricks from Slag at the Great Fitzroy Mine

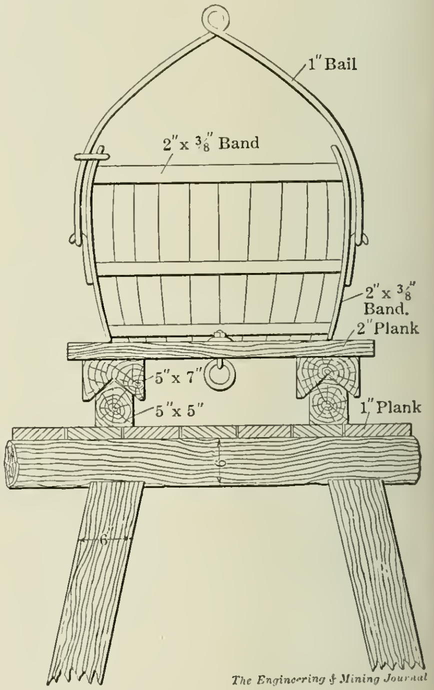
A prominent feature in connection with the extensive building operations now in progress at the Great Fitzroy copper mines, Mount Chalmers, Queensland, is the utilization of slag bricks for various constructions. The bricks have been used in the erection of offices and in the construction of water tanks, retaining walls, piers for ore bins, and bases for chimney stacks.

The mold used consists of two L-shaped cast-iron plates, and mention may be made of the following features, which have proved important: (1) The thickness of the metal, sufficient to chill the slag without becoming overheated. (2) The reëmbossing of the angles to minimize warping. (3) The adaptation of these reëmbossments to form distance pieces, by which means channels for air circulation are maintained between adjoining molds. These molds set upon edge and arranged to form rows of 20 molds are banked with about 1½ in. of dry sand or ashes. The slag is poured into the mold from the ordinary slag pots. As soon as the bricks have solidified, the molds may be removed and set up elsewhere. After 10 to 14 hours, the bricks are cool enough for handling. Their average weight is 80 lb. and they have withstood a crushing stress of 13 tons per square foot without showing any sign of failure.

Tram Car for the Prospector

By Guy C. Stoltz*

In the new Gowganda district, Ontario, Canada, where a real tram car is a luxury to the prospector, he has evolved the substitute shown in an accompanying sketch. The half barrel, strengthened by iron strips, is bailed and used as a bucket. It is hoisted by windlass from the prospect shaft, and at the surface it is swung out on a movable platform and detached from the winding rope.



Bucket and Tram Platform

The platform, 3 ft. square, is made of 2-in. plank, fitted with notched runners, and rests on the inverted V guide rails, which are spiked to a floor, covering the trestle bents. The windlass men draw the bucket of waste rock to the dump at end of trestle by a rope attached to ring shown on platform. In summer axle grease is applied to the runners and guide rails, and in a freezing temperature water is applied.

A 10-unit vacuum plant, furnished by the Ore Concentration Company, Ltd., of London, has been contracted for by the Broken Hill Proprietary Company.

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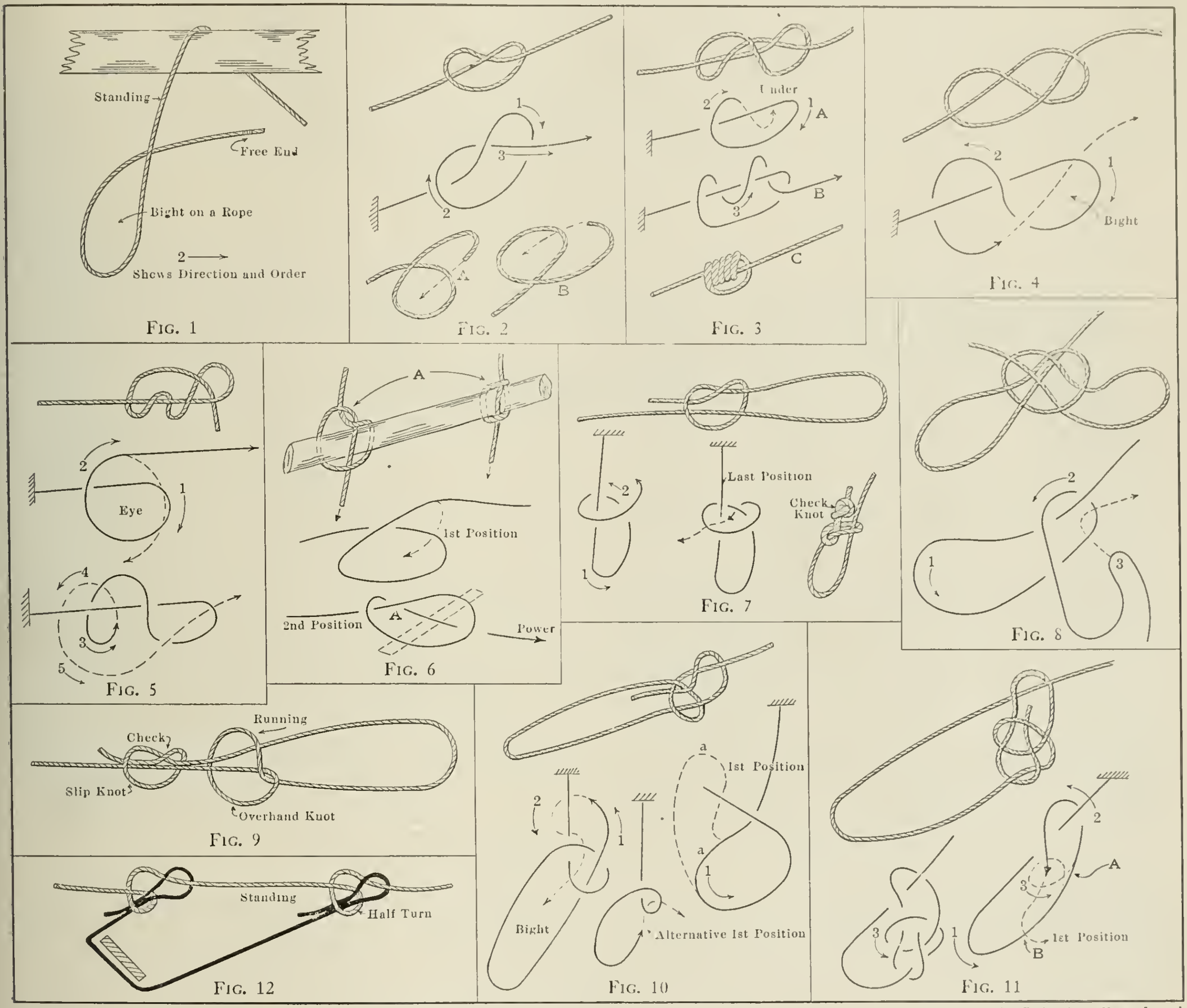
*Consulting mining engineer, Sydney, N. S. W.

*Mining engineer, Mineville, N. Y.

Some Useful Knots for Engineers

By A. Livingstone Oke*

The knots described in this series of articles have been useful to me in my work in out-of-the-way places. Fig. 1 indicates the meaning of the terms employed.



Simple, Stop and Slip Knots, Ladder Hitch and Bowlines

Fig. 2, Simple or Overhand Knot—This is the simplest of all knots to tie, and may be used as a stop on a rope. A free end is necessary to make it. If strained, it injures the fiber of the rope more than a figure-8 knot, and it is difficult to unmake and liable to jam.

Fig. 3, Double Overhand Knot—This knot is used for the end of a rope when it is required to prevent its going through an eye, as in a pulley block, or for the end of a halter rope. It is also useful for shortening a rope. It may be made with any number of turns: *A* in the illustration shows the first position; *B*, the knot finished with two turns; and *C*, one with four full turns of rope.

Fig. 4, Figure-8 Knot (Flemish)—This knot may be employed as a stop on a rope; is less injurious to the fiber of the rope, and more easily undone than either the single or double overhand knot. If made with the rope doubled and the bight left long, it becomes a figure-8 hoop knot.

Fig. 5, Stevedore Knot—The end of the rope is wrapped twice around the standing and then passed through the eye. It is useful as a stop on a rope to prevent the end going through an eye, as in a pulley block (see double overhand knot). It is also employed instead of sewing the rope end with twine.

Fig. 6, Boat Knot (Marline-spike Hitch)—Suitable for quickly making a rope ladder, or getting a temporary pull on a rope with a marline-spike. No free ends are required to form this knot. The point marked *A* must always be at the back of the spike or rung of the ladder, away from the direction of the weight or pull.

Fig. 7, Slip Knot (Simple Running Knot)—The simplest kind of slip knot. It may be used similarly to the packer's knot (which will be described in the next series) but is not so good, as it is liable to pull through and does not bind on the rope.

Fig. 8, Tomfool Knot (Double Running Knot)—When the loops are drawn taut and the ends tied, this makes a pair of handcuffs which it is almost impossible for the person so secured to undo. It may be used as a barrel sling, half-hitches being put on the ends, and the hook put under the knot itself. The bight marked 3 is passed through the overhand loop as shown by the dotted line.

Fig. 9, Flemish Loop—This knot makes a simple loop for light work and may be used in the same way as a bowline, but is not so quickly made; neither is it so secure nor so easily undone. The security depends almost entirely upon the check knot.

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*Mining engineer, Argentine and General Exploration Company, Ltd., Rodeo, San Juan, Argentina.

Fig. 10. *Bowline*—A generally useful knot when a loop of any sort that will not slip is required, as in a sling for lowering a man, or fastening a bucket to a rope.

Fig. 11. *Running Bowline*—As shown in the first position a half turn is made at *A* (shown dotted) and the end passed through and to the back of the part marked *B*. This is a good slip knot and does not tighten on the standing, always remaining open.

Fig. 12. *Bowline II*—A method of attaching the end of one rope to the standing of another. A half turn is put in the standing and the end of the other rope taken through as in tying an ordinary bowline. This knot is practically a sheet bend.

(*To be continued.*)

Pipe Lines as a Factor in Rescue Work

The introduction of compressed-air pipe lines into all the workings of a mine might be utilized to provide fresh air and even food to men imprisoned after explosions or through falls. This does not involve much expense, as mines are usually equipped with compressed-air apparatus, and the piping leading into the mine is of such a nature as to withstand considerable damage from the exterior. Telephone wires inserted within the air pipe might also serve a useful purpose in saving life.

False Set for Spiling Ground

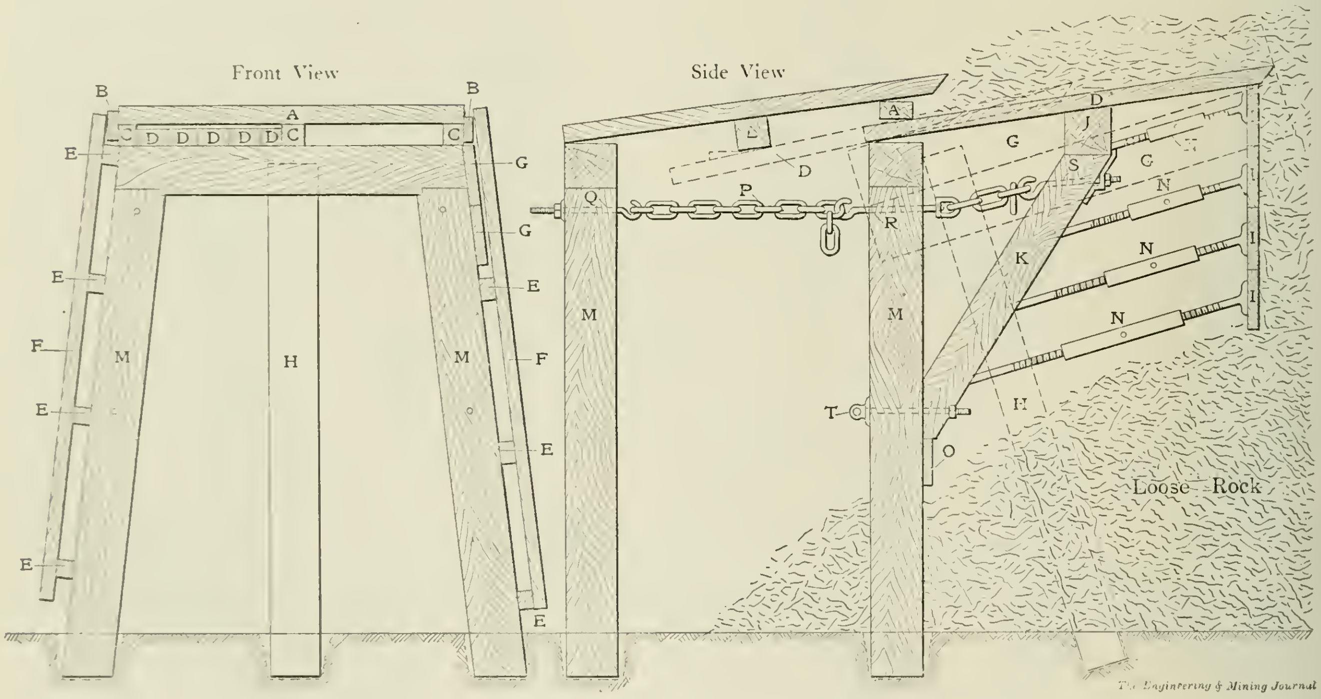
By James Humes *

The tunnel being driven by the Austin-Manhattan Consolidated Mining Company, at Austin, Nev., is 7 ft. wide at the bottom, 6 ft. at the top and 8 ft. in hight. The timber used is mostly 10x10-in. Oregon pine. The posts are cut 8 ft. long and placed in hitches. The caps are 4½ ft. in the clear.

When the writer assumed charge of the underground operations of this company the old style of false setting for spiling ground, which was sure though slow, was in use. This method was to stand the false set 2½ or 3 ft. ahead of the last main set and in order to do this it was sometimes necessary to blast out the bottom for the hitches, a dangerous practice at times on account of the position of the braces that held the breast boards in place. It required breast boarding for every 2½ ft. of lineal advance and was, in consequence, slow work.

The cost was high on account of the large amount of timber consumed (which costs here $40 per M.), for the same braces that would answer for one set of breast boarding would not do for the next and the tunnel was always littered with discarded breast-board braces. It was only rarely that we could get in one set of timbers in 24 hours, and as all costs were charged up against this work of retimbering they amounted to more than $40 per ft. for the spiling ground.

This excessive cost set us thinking, and the result was the production of a false set that increased the footage driven in the worst ground about 10 ft. per week over our previous work. When we are sure we have reached ground that is to be spiled we stand the last set loosely, holding the posts in an upright position by spiking a 2x6-in. plank from the last set of timbers in place to each of the posts of the set about to be erected (*M* in the accompanying drawing). These pieces, and a temporary block placed on the center of the cap and against the ground, hold the timbers in position until the side bridging *F* is put in place and blocked.



A False Set for Driving Through Loose and Heavy Ground

We are now ready to place the top bridging *A*, which consists of a 3x6-in. piece supported on 4x4x6-in. blocks *C*, one on each end and one in the center of the cap. These blocks are generally removed as the spiling is placed in position. After the spiling is driven home the space between the bridging and the spiling is filled with wedges which are taken out when the further end of the spiling is let down on the bridging of the next set.

While driving the spiling ahead, a 6x6-in. tailing block *L* is used. This tailing block should be sufficiently long to engage at least half of the spiling; oftener it should be long enough to reach across all of them and should be moved up as the spiling is advanced. When driving the back spiling there should also be at least two side spiling advancing on each side; these should be kept as far up as the back spiling. While driving the back and side spiling, one man uses a light, sharp-pointed bar with which he removes the rock from before the spiling while his partner is forcing them up with a 12-lb. hammer.

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*Superintendent, Austin-Manhattan Consolidated Mining Company, Austin, Nev.

When the spiling has reached a distance of 3 or 3½ ft. ahead of the last main set, the loose rock is pulled down to make room for the swing posts *K*, but none of it is shoveled out of the way into the cars until the swing set is pulled up tight against the spiling. Leaving this loose rock as shown in the drawing helps to sustain the mass hangng overhead. When the false cap is placed on the swing posts, the posts and cap are drawn up tight against the spilng by screwing up on bolt *Q*, the foot of the posts in the meantime being held n position by the bolt *T* and also supported by the block *O*. The fact that his set can be pulled up tight in this way is one of its advantages, for it obviates the necessity of driving wedges over the cap and against the spiling, the arring of which sometimes results disstrously.

Everything is now ready to force the piling in to its full length, and when this s done we are ready to go on with the reast boarding. The bonds are held in lace by the iron braces *N* which have right nd left screws or threads. The center ieces or nuts are made of 2-in. pipes lugged at the ends and tapped for the xtension pieces, and have holes drilled n them to admit a small bar.

The end or foot piece of the brace ext to the breast board is just a part of he rod bent at the angle shown. Each nd of this foot piece is turned over into slight point so that when it is backed p tight it presses into the plank and revents slipping. The other end of the race is rounded and fits into a hole bout an inch deep bored in the swing osts.

These braces have not failed in a ngle instance, neither has any part of his swing set. It has often happened, in he old method of timbering, that downard pressure on the breast boards ould push the braces below a horizontal osition, and then, of course, they would ll out and leave the breast boards unupported; but these iron braces can be laced at such an angle above the horiontal that the downward pressure on the reast boards cannot drive them out of ace.

If the ground should project inwardly n either side, the swing posts can be wung to the opposite side; or if the round projects on both sides, as somemes happens, both posts can be swung ward the center of the tunnel and a horter cap used.

The leaning post *H* shown in the cenr of the tunnel is used for bracing the enter of the breast boards when the exnsion braces are taken out to admit of e main posts being placed in position.

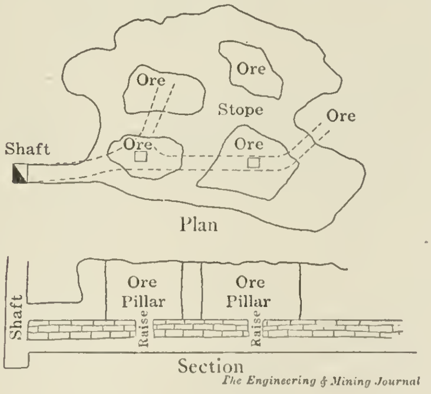
It is also customary to place a plank upright against the breast boards and overlapping all of them, and it is against this plank that the braces are placed. The hole in the swing posts for the eyebolt *T* is made large enough to admit of the above adjustment. When everything is in proper position and the chains are pulled up tight, this eyebolt is also tightened.

The miners like this method, for when they reach a point where there is a cave of considerable hight, they can put this swing set in position under the protection of the last main set. They can then place plank or heavier material from the last set over the false set and thus protect their heads until they have the next main set in position.

The side spiling is worked forward as fast as the breast boards are put in place and overlapping them; this and the support the side spilling receives from the swing posts is sufficient to keep them in place until the main set is put up. There are only two side spiling shown in place in the drawing, but it is frequently necessary to spile the sides to the bottom of the tunnel.

Recovering Ore from Pillars

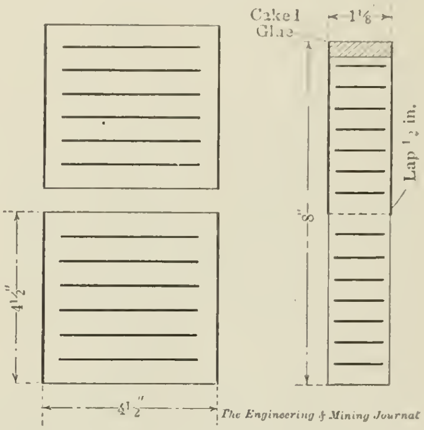
The accompanying sketch illustrates in plan and section a method of robbing pillars at a mine in the Joplin district. The ore occurred in a pocket, where the roof was heavy and a large amount of timber had to be used to enable even half the ore to be extracted. The pillars themselves contained a high percentage of ore. Beneath the body was a solid, compact limestone stratum. The shaft was sunk a few feet into this, and a subdrift extended beneath the ore pillars with a 7- or 8-ft. roof. A raise was put up in the center of each pillar and the ore shot down into the drift below, and trammed to the shaft. This method gave a safe place in which to work and at the same time allowed nearly all the ore to be recovered.



ROBBING ORE PILLARS

Economic Tampers

"Economic Tampers" are being placed on the Joplin market for the use of mine operators by the Economic Explosive Company, Webb City, Mo. They have been experimented with for more than a year, and a number of companies are now using them in all their work. The tamper consists of a cardboard tube covered with paper and then filled with sand. It is the size of an ordinary 1⅛-in. stick of dynamite. The tube is made of two pieces of cardboard, each 4½ in. square. Each piece of cardboard is slotted, and when bent to form a tube the slots extend entirely around the tube. Two pieces of cardboard are used in order to make a weak place in the center of the stick, so that when pressure of the tamping rod is applied the cartridge will bulge and fill the hole. The two pieces of cardboard are held in place by a piece of wrapping paper, the edges of which are glued together. The paper is crimped over the end of the tube to keep the sand in place.



ECONOMIC TAMPER SHOWING ARRANGEMENT OF SLOTS

The sand used is the fine material from the tailings mills, and is screened with a 10-mesh screen to take out any large pieces of rock and gravel. After the dry sand is put in and thoroughly packed, the top is covered with thin glue, which makes a hard cake ¼ to ½ in. thick. The tamper is placed in the hole so that the tamping bar strikes the caked top. This cake prevents the bar from breaking the paper and entering the sand, which in the case of an up hole would allow the tamping to run out.

The advantages claimed for this device are: a saving in the amount of powder used; more efficient use of the powder; safety in tamping as the sand does not come in direct contact with the fuse; and it is as easy to tamp uppers as down holes. The American Zinc, Lead and Smelting Mining Company, Cartersville, Mo., has been using this patent apparatus for 12 months with excellent results. The Little Princess mine has used it 10 months.

Granby Consolidated

Following the primary break on March 23, Granby stock continued to slump and on March 28, sold at $37. The executive committee met on March 28, and after a long session issued the following statement:

"The tonnage reported by Dr. Sussman indicates that Granby has ore in sight which will require four to five years to mine and smelt at the highest rate of consumption in the past and this is independent of any custom ores.

"The report is highly favorable in all respects except for his opinion as to the probable results of further exploration of the company's properties. Upon this point, of course, opinions may differ.

"Exploration will continue as usual, and in the meantime the directors are not selling their stock. A further expert examination may be ordered by the board."

The directors of the company who are in New York, have declared that they have not disposed of their holdings in the company and have pointed out that during the recent examination of the property there were practically no sales of the stock. It has been reiterated that the developments following President Langeloth's visit to the mine came without warning, the inspection being purely incidental to the resignation of Mr. Hodges, the superintendent. Mr. Hodges, who has been in New York preparing to sail for Cerro de Pasco, has refused to explain publicly the discrepancy between his own and Dr. Sussman's statements about the mine, saying that as an engineer and former employee of the company he has no right to discuss its affairs. Mr. Hodges was present at the meeting of the executive committee on March 28. Among stockholders of the company, outside of the board of directors, there is great indignation and talk of calling the directors to account.

Statement to Stock Exchange

The essential part of the statement recently filed by the company with the New York Stock Exchange is as follows:

"The board of directors, Jan. 4, 1910, authorized the issuance and sale of 13,500 shares of the unissued capital stock of the company, and resolved that the stockholders should be entitled to subscribe therefor at the rate of $85 per share to the extent of 10 per cent. of their respective holdings, as shown upon the books of the company on Jan. 20, 1910. Stock not subscribed for by the stockholders will be taken by the underwriters of the issue at the same rate, i. e., $85 per share.

"The purposes for which the proceeds of the sale of this stock are to be used are not limited by the terms of issue except to corporate purposes. It is proposed, however, to use such proceeds principally to meet outstanding obligations of the company, including a balance of $875,000 still unpaid upon obligations in excess of $3,625,000 incurred during the last 5 years for acquisition of mining properties, new plant and an interest in the Crow's Nest Pass Coal Company, and for other items properly chargeable to capital account. So much of the proceeds as are not used for these purposes will be reserved for working capital.

GRANBY INCOME ACCOUNT, SIX MONTHS ENDED DEC. 31, 1909

Produced:	
11,167,644 lb. copper	$1,167,309
172,054 oz. silver	88,315
24,997 oz. gold	499,940
Total realized	$2,055,564
Costs:	
Working expenses	$1,669,512
Foreign ores purchased	81,406
Total costs	$1,750,918
Net profit for six months	304,646
Surplus from June 30, 1909	2,698,687
Gross surplus	$3,003,333
Less dividends	$270,000
Less interest paid	17,365
Net surplus Dec. 31, 1909	$2,715,968

GRANBY BALANCE SHEET, DEC. 31, 1909.

Assets.

Mineral lands of consolidated companies	$12,740,423
Mineral lands purchased	532,955
Plant and equipment	2,105,673
Lands, real estate and dwellings	126,366
Stocks and bonds:	
Crow's Nest Pass Coal Co. shares at first cost	$858,814
Giant-California Mining Co. shares 50% of cost	45,000
B. C. Copper Co. shares	9,395
Shares with transfer agents, at cost	936
Kettle Falls Power, at cost	80,677
Total stocks and bonds	$994,822
Supply department	$257,553
Cash and copper:	
Foreign ore on hand, at cost	$29,005
Granby ore on hand, at cost	17,375
Furnace bottoms and flue dust	50,000
Copper sold awaiting due dates	71,223
1,845 tons blister unsold at 13½c.	609,729
New York office fund	1,909
Cash in bank	22,043
Total cash and copper	$801,284
Total	$17,559,076

Liabilities.

Capital issued	$13,500,000
Expenses accrued	$27,542
Dec., 1909, wages	91,985
Dividends held for liquidator	1,129
Cash loan	875,000
Current accounts payable	97,152
Advances on copper in transit	250,000
Surplus Dec. 31, 1909	2,715,968
Total	$17,559,076

"Approximately 8 to 10 million tons of ore are now developed ready for extraction in the company's territory."

During the six months ended Dec. 31, 1909, mine development amounted to 6874 ft., and diamond drilling, 3496 ft. The smeltery treated 572,371 tons of Granby ore and 9368 tons of custom ore. The total cost per ton of ore was $2.868, and the cost per pound of copper was 10.1c., after deducting the value of the gold and silver.

Anaconda's Capital Increased

At a special meeting of the stockholders of the Anaconda Copper Mining Company held at Anaconda, March 23, it was decided to increase the capitalization of the company from its authorized issue of 1,200,000 shares, having a par value of $25 each, to 6,000,000 shares of the same par value, also to extend the business of the corporation so as to permit the company to acquire, own and possess stock and securities of other corporations.

APPORTIONMENT OF NEW ANACONDA STOCK.

Name of Corporation.	Number of Anaconda shares.
Boston & Montana	1,200,000
Red Metal (Butte Coalition)	500,000
Washoe	380,000
Butte & Boston	300,000
Big Blackfoot (Lumber)	300,000
Trenton	120,000
Diamond Coal	100 000
Parrot	90,000
Alice Gold and Silver	30,000
	3,020,000
Already outstanding	1,200,000
Total	4,220,000

The stockholders authorized the directors to offer stock as shown in the accompanying table in exchange for the entire assets and properties owned by the companies specified.

Alexander Agassiz

Alexander Agassiz died, March 28, on the steamship "Adriatic," while on his way home from Europe, his death being reported by wireless telegraph. He was 75 years old, and was a son of Professor Agassiz, the famous naturalist. He was born in Switzerland and came to this country when 15 years old. He graduated from Harvard and the Lawrence Scientific School; in 1859 he went to California as assistant on the Coast Survey. After leaving the Coast Survey he went to the Lake Superior country in 1866, at first as treasurer and a little later as superintendent of the Calumet & Hecla mines. About 1870 he was made president of the company, and had ever since been the chief executive of the company, directing its management and policy. Besides this work, he devoted much time to his researches in natural history.

We hope to publish an extended obituary in our next issue.

Edward N. Van Cortlandt

Edward N. Van Cortlandt died at the Engineers' Club, New York, March 29, aged 46 years. He was born in New York, and graduated from the Columbia School of Mines. For 20 years past he had practised actively as a mining engineer, dividing his time between New York and Denver, and was well known in both cities.

Statement of Utah Copper Company

In connection with its application for the listing of 1,198,889 additional shares on the New York Stock Exchange, the Utah Copper Company submitted the following data regarding some of its subsidiary companies. These shares make a total of 1,933,639 shares to be listed on the exchange.

The mining properties of the Boston Consolidated Mining Company, recently absorbed, consist of 380 acres adjacent to the mining ground of the Utah Copper Company in Bingham cañon, Utah. There have been already developed in the territory of the Boston Consolidated approximately 40,000,000 tons of ore yielding an average of 1.5 per cent. copper, which the company claims can be worked at a total cost of approximately 8½c. per lb. of copper produced. The Boston Consolidated concentrating mill has a daily capacity of approximately 3000 tons of ore, and the company is producing copper at the rate of about 25,000,000 lb. per year.

NEVADA CONSOLIDATED

The Nevada Consolidated Copper company is a corporation of Maine, with an authorized capital stock of $10,000,000, divided into 2,000,000 shares of the par value of $5 each, of which there are issued and outstanding 1,982,908 shares. Of the unissued shares, 4100 are held for the conversion of $41,000, par value, first-mortgage convertible bonds still outstanding, out of a total issue of $3,000,000, and 12,992 shares are held for the purpose of exchanging the same for the stock of the Cumberland Ely Copper Company under the terms of an offer to the stockholders of the latter company, dated Nov. 3, 1909, whereby the Nevada company agrees to exchange one share of its stock for each three and one-quarter shares of the stock of the Cumberland Ely company.

Under the terms of this offer, the Nevada company has acquired 1,257,776 shares of the stock of the Cumberland Ely Copper Company, being all the issued share capital of that company excepting 42,224 shares.

The Nevada company owns in fee 63 lode mining claims in the Robinson mining district, White Pine county, Nevada, aggregating approximately 850 acres. Two mines have been developed, one by a shaft of about 450 ft., where ore has been developed to the extent of at least 8,000,000 tons of an average copper content of about 2.4 per cent. The mine is fully equipped and ready for operation.

The company also has developed an immense body of ore lying near the surface on what is called the "Copper Flat" mine, with an average copper content of 1.84 per cent. Mining is here conducted entirely by steam shovels, and there are already developed in this orebody at least 29,000,000 tons. The company is producing copper at the rate of approximately 70,000,000 lb. per annum.

The Nevada company, together with the Cumberland Ely company, owns the entire capital stock of the Steptoe Valley Smelting and Mining Company, of the Nevada Northern Railway Company, and the entire first-mortgage bond issue of the railway company.

BOSTON CONSOLIDATED BALANCE SHEET, DEC. 31, 1909.

Assets.	
Investment:	
Acquisition of properties	$1,000,000
Purchasing claims, development, equipment, etc., to Oct. 1, 1909.	3,522,028
Bingham equipment, etc. (purchases this year)	1,120
Garfield equipment	6,288
Pelican Point millsite	159
Office furniture and fixtures	1,078
Total	$4,530,673
Current:	
Cash on hand, New York and Boston	$8,285
Accounts receivable, New York	5,427
Accounts receivable, Salt Lake	16,046
Total	29,758
Inventory:	
Warehouse at Bingham	$52,052
Warehouse at Garfield	47,189
Porphyry ore at mill	13,055
Concentrates at mill	15,041
Concentrates at smeltery, not settled	64,997
Concentrates at smeltery, settled	309,905
Sulphide ore at smeltery, not settled	11,693
Sulphide ore at smeltery, settled	42,586
Copper metal	238,207
Auxiliary operations, work in process, Bingham	1,101
Auxiliary operations, work in process, Garfield	3,347
Taxes at Salt Lake	10,554
Total	809,727
Suspense:	
Bingham development in ore	$207,243
Bingham prepaid ore cost	6,840
Garfield suspense	13,669
Salt Lake miscellaneous	1,949
Total	$229,701
Grand total	$5,599,859
Liabilities.	
Capital stock and surplus:	
Capital stock—authorized and issued	$1,000,000
Surplus as at Oct. 1, 1909	373,216
Add profit for three months to Dec. 31, 1909	34,340
Total	$1,407,556
Current:	
Cash—overdraft at Salt Lake	$16,873
Accounts payable—sundry creditors	2,334
Accounts payable—A. S. and R. Co.	
United Metals Selling Company	561,561
Notes payable	107,000
*Boston Consolidated Copper and Gold Mining Company, Ltd	3,346,907
Accounts payable—Salt Lake payroll	3,641
Accounts payable—Salt Lake miscellaneous	118,139
Total	$4,186,455
Deferred:	
Accrued interest	734
Reserves:	
Freight at Salt Lake	$1,678
Unclaimed checks and time checks	1,952
Miscellaneous	1,481
Total	$5,111
Grand total	$5,599,859

*The item "liabilities to the Boston Consolidated Copper and Gold Mining Company, Limited," amounting to $3,346,907, will be extinguished by the delivery of 40,000 shares of Utah Copper Company stock.

CUMBERLAND-ELY

The Cumberland-Ely Copper Company is a corporation of Maine, with an authorized share capital of $6,500,000, divided into 1,300,000 shares of the par value of $5 each, all of which has been issued.

The company owns 48 mining claims, aggregating 523 acres, in White Pine county, Nevada, lying near and adjoining the properties of the Nevada Consolidated. This mine is developed by a shaft fully equipped to produce 1500 tons of ore per day, the average copper content of which is about 3.4 per cent.

The Nevada Northern Railway Company is a corporation of Maine, with an authorized and outstanding capital stock of $2,000,000 divided into 20,000 shares of the par value of $100 each, and also has an outstanding mortgage indebtedness of $1,000,000. Its property consists of about 165 miles of single-track railroad, running from the connection of the Southern Pacific at Cobre, Nevada, to Ely, Nevada, and to the mines of the Nevada Consolidated and Cumberland-Ely companies, and connecting with the concentrator and smeltery of the Steptoe Valley company. The railway is fully equipped and in profitable operation.

UTAH COPPER COMPANY.

INCOME ACCOUNT, DEC. 31, 1909.

51,749,233 net lb. copper, at 12.96c	$6,706,752	
Debit difference in copper settlements for period 0.045c	23,431	
Net price applying for for the year's sales, at 12.915c		$6,683,321
20,862,345 oz. gold, at $20	$417,247	
198,943.15 oz. silver, at 51.528c	102,511	
Shipments of ore other than concentrating	4,311	
Rents received	13,050	
Interest, freight refunds, etc	6,604	
		543,723
		$7,227,041
Operation	$2,274,356	
Mine development	113,128	
Prepaid expense—ore stripping	133,714	
Freight on ore	762,081	
Treatment and refining	1,779,866	
State of New Jersey, annual license tax	4,113	
		5,067,258
Net profits for period		$2,159,786
Interest on bonds	$5,348	
Dividends paid	1,461,387	
		1,469,735
Net surplus for 12 months ended Dec. 31, 1909		$690,051

The Steptoe Valley Smelting and Mining Company is a corporation of Maine, with an authorized capital stock of $10,000,000, divided into 100,000 shares of the par value of $100 each. There have been issued and outstanding 74,000 shares, of which 42,000 shares are owned by the Nevada Consolidated Copper Company and 32,000 shares by the Cumberland-Ely Copper Company.

The property is situated at McGill, White Pine county, Nevada, about 25 miles from the mines of the Nevada Consolidated and Cumberland-Ely, and consists of a concentrator, smelting and converting plant, and the necessary buildings and equipment connected therewith, having a capacity of upward of 6000 tons of ore per day, with provision for further enlargement when necessary.

The Utah Copper Company has continued the development and operation of its properties largely by steam-shovel mining and, as reported in the annual and quarterly reports issued by the company, is producing copper at the rate of approximately 60,000,000 lb. per annum at a cost of about 8½c. per pound.

The Alaska Coal Land Inquiry

Representatives of the Morgan-Guggenheim syndicate appeared before the Ballinger-Pinchot investigating committee in Washington on March 25 and 26 for the purpose of testifying with reference to the interests of that syndicate in Alaska, its relation to the Cunningham coal-land claims under consideration before the committee, and various related subjects. The representatives who spoke before the committee were Messrs. Birch and Steele, most of the testimony, however, being given by Mr. Birch who stated that he was the managing director of the Morgan-Guggenheim syndicate in Alaska and was permanently stationed at Kennicott, Alaska. Some of the testimony offered by Mr. Birch had been developed at a former hearing before the Senate Committee on Territories but very much more was brought out by the questions of the counsel and by members of the investigating committee itself.

Morgan-Guggenheim Operations

Mr. Birch said that the Morgan-Guggenheim syndicate consisted of J. P. Morgan & Co., and some of the members of M. Guggenheim Sons. The syndicate was usually known as the Alaska syndicate and it was interested in the Northwestern Commercial Company as well as in other concerns—the Northwest Fisheries Company, the Alaska Steamship Company, the Kennicott Mine Company, the Copper River & Northwestern Railway Company and the Katalla Company. Some of these were controlled by the syndicate and the stock of some was held in the treasury of the Northwestern Commercial Company, of which latter the syndicate owned 46.2 per cent. Mr. Birch described the operations of the various concerns and their relation to the railroads and mining operations of the territory. He further reviewed the status of the Cunningham claims and the relation between the Cunningham claimants and the Morgan-Guggenheim syndicate but without bringing out anything of special novelty in this latter connection.

Of more interest was his discussion of the value of the coal underlying the Cunningham claims. On this point he developed a number of details that had not been considered before the Senate Committee on the Territories. When confronted with a statement made before the Committee on Territories concerning the value of the coal he said that the statements then made were accurate, "assuming that the coal could be mined for $1.75 and sold for $2.25" and that there were 500,000,000 tons of coal there. Mr. Birch further said that his testimony before the Committee on Territories was not under oath, whereas his testimony before the Ballinger-Pinchot committee was under oath. Moreover, when speaking on the former occasion (he added), "had I realized at the time that I was talking to a press gallery I might have been a little more careful in what I said."

Investment in Alaska

When Mr. Birch was asked how much the Alaska syndicate had invested in Alaska he said he thought about $15,000,000, including the railroad it owns, $10,000,000 of that amount being represented by the railroad itself while the syndicate is under contract to spend about $5,000,000 more or $20,000,000 in all. Questioned by members of the committee, he conceded that the Alaska syndicate was engaged in practically all industries and businesses in Alaska, but that the getting of returns from the investment in copper mines and the other investments depends in large measure upon the opening up of the coalfield of which the Cunningham claims form a part. As to the possibility of using the coal the following colloquy between Mr. Birch and Mr. Vertrees, attorney for Secretary Ballinger, occurred.

Mr. Vertrees. Where do the Pacific Coast people get their coal?

Mr. Birch. They get their coal from the local coal mines, from British Columbia, and from Australia, and even from Japan. The vessels come over from Australia empty to take back wheat and bring over the coal as ballast, and bring it in very cheaply.

Mr. Vertrees. So, in the matter of establishing the market of which you speak, even if the coalfields and areas of Alaska were developed, they would have to compete with the coal from these foreign countries you have mentioned, much of it coming in as ballast, as I understand you.

Mr. Birch. Yes, sir; and the coal that we are now using in the construction of our railroad, we import from British Columbia, because of its superior quality.

Mr. Vertrees. Do you know anything of the cost of mining coal in the United States?

Mr. Birch. Yes; I have some memorandums.

Mr. Vertrees. I wish you would state to the committee what may be considered as the range of prices of the cost of mining coal in the States; that is, in the coal areas of the States, that we may get some approximate idea or data to figure upon.

Mr. Birch (after referring to paper). The cost of coal mining, as reported by the Philadelphia & Reading Coal and Iron people, in their annual report of 1902, was $2.25; in the State of Washington it runs from $1.60 to $2.40; the cost of mining at Vancouver island averages about $1.75, and the cost of mining coal in British Columbia, because of the cheap Asiatic labor, is about $1.40 per ton.

Mr. Vertrees. Do you know what is considered as the return realized per ton upon coal mined in the States—I mean bituminous coal and also anthracite coal—what experience has shown is the net return?

Mr. Birch. I know of one instance, of the New River Collieries Company, where the profit was only about 0.4c. per ton.

Mr. Vertrees. What is considered the average return, do you know, in the United States—I speak now of bituminous coal?

Mr. Birch. Well, it runs from 1c. or from a fraction of a cent up as high as 15c. per ton.

Mr. Vertrees. What about anthracite coal—can you give an estimate as to that?

Mr. Birch. I can only give you the report, which shows in the neighborhood of 20c. a ton.

Mr. Vertrees. Stated in other terms, that means, then, that is about the value of coal in the ground, is it, per ton?

Mr. Birch. No, sir; that is after it is mined there is that profit.

Mr. Vertrees. That profit?

Mr. Birch. Now, the value of coal in the ground itself is very much under that. There are coal lands in Virginia and Kentucky that do not earn more than a cent and even under a cent a ton in the ground.

The Cobalt District in 1909

BY REGINALD E. HORE*

The silver production of the Cobalt district for the years 1904-1909 was about 62,415,395 oz. valued at $33,000,000. The cost of production was about $16,000,000 including about $4,000,000 for smeltery charges and freight deductions. The net profit to shareholders was therefore about $17,000,000. There was no large original investment of capital. The plants grew with the progress of mining, and were built by the profits on sales, and are charged to cost of production.

PANORAMIC VIEW AT SOUTH END OF COBALT LAKE; NIPISSING PROPERTY AT LEFT; MCKINLEY-DARRAGH AT RIGHT

BUFFALO MINE AND MILL

LA ROSE MINE, COBALT

In 1909 the production was about 25,000,000 oz. valued at $12,500,000. The year's profit was about $6,500,000. As in previous years some rich veins were worked out and others proved disappointingly low grade at depth. On the other hand, rich shoots were found in other veins, and several more rich veins discovered. The net result is that there is to-day more ore in sight than at any previous time, though the amount is still small in comparison with the market value of shares.

There is good reason to believe that the production for 1910 will exceed that of 1909. It is also likely that thorough prospecting will result in the discovery of many more veins. As in all bonanza camps, however, there is a delightful uncertainty concerning the future, though it appears that Cobalt will be a large producer for five years at least. The finding of new veins is the mine manager's most serious problem, in comparison with which he finds the extraction of the ore an easy one.

POWER PLANTS

An important advance during 1909 was the progress made in the construction of plants on the Montreal and Matabitchouan rivers, which will supply the camp with cheap power. For mining purposes Cobalt has many natural advantages: A good class of miners who can work to best advantage in the splendid though rigorous climate; convenient supplies of timber and water for mining purposes; splendid facilities for shipping by rail; hard compact country rock which requires but little timbering; only a few feet of glacial débris covering the ore-bearing rocks, and the ore concentrated by nature to an unusually high degree. The mine operators are, however, paying high prices for fuel, due to the long haul by rail, and they are pleased to see rival companies racing to supply them with power from the rivers.

THE RAGGED CHUTE PLANT

The Cobalt Hydraulic Power Company is installing, at Ragged chute, a 5500 h.p. air-compressing plant which is the largest in the district. The air is compressed by the Taylor hydraulic system and collected over water in a rock chamber under a pressure of 125 lb. The air is conducted to Cobalt, about eight miles, through a 20-in. steel pipe and will be distributed to the mines by loop lines of 12-in. pipe. The same company is already supplying electric power to the mines.

MINES POWER, LIMITED

The Mines Power, Limited, is putting in a plant on the Matabitchouan river, 25 miles from Cobalt, to develop electric power. The water will drive four turbines, direct connected with generators. The power will be transmitted by aluminum wire to three substations at Cobalt,

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*Houghton, Mich.

Kerr Lake and South Lorrain. At the first two stations there will be electrically driven compressor plants, and air will be delivered by pipe lines to the surrounding mines.

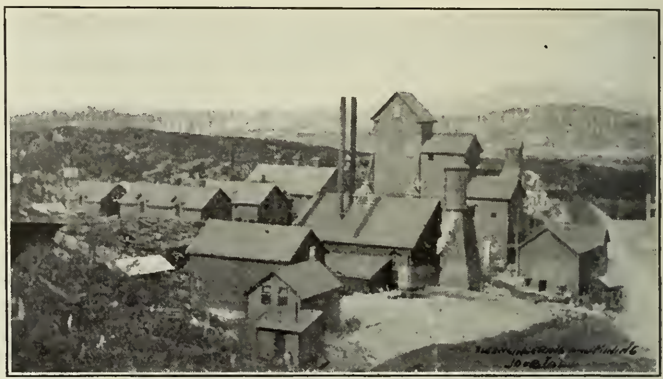
Beach Brothers have installed a plant at Hound chute. The head is 35 ft. and the power available is utilized to drive four water wheels connected with as many generators. Power is transmitted by copper wire to Cobalt from which the plant is six miles distant.

Mills and Cyanide Plants

In 1909 concentration became for the first time an important factor in the district. Early in 1908 there were three mills in successful operation and at the beginning of 1909 three others had begun to treat ore. During the summer two more were added and others are now nearly completed. In the three plants, first in operation, treatment was uniform in reducing with crushers and rolls and sizing in trommels. In the later plants stamps are used with more satisfactory results. In treating the pulp from the stamps, Wilfley and James tables and Callow tanks are used.

During the year two plants were installed to treat slimes by the cyanide process without amalgamation, and are said to be working satisfactorily. The two mines, Buffalo and O'Brien, recently made shipments of bullion representing the results of this treatment.

Foster and University Mines. Giroux Lake at Right



Crown Reserve Mine, Cobalt

Peterson Lake, Nova Scotia Mine in Distance

Right of Way Mine in Center; La Rose at Right

Iron Ore Mining in Eastern United States

The conditions of the iron trade in 1909 worked to the advantage of mining interests in the eastern district and 1909 witnessed record operations by many established producers, while a number of important deposits were opened up.

Lake Champlain District

In the Port Henry district, shipments during November were the largest in its long history and contracts closed for 1910 delivery indicate an output of fully 1,000,000 tons. An additional concentrating mill is under construction by Witherbee, Sherman & Co., Inc., at Mineville, and the Port Henry Iron Ore Company has made large expenditures on its property during the year.

Late in the year, the Bethlehem Steel Corporation acquired the Presbrey interests, slightly over 50 per cent., in the historic Cheever mine, north of Port Henry, and its output will be increased materially. There is also increased interest in the large deposits of titaniferous ores in the Lake Sanford district, situated in the Adirondacks some 40 miles west of Port Henry, and a connecting railroad line is projected.

Other New York State developments of 1909 included the beginning of shipments from the Herkimer district, where the Salisbury Steel and Iron Company has expended a large amount in developing mines and installing a concentrating plant, though as yet the movement of ore has been rather light. In Dutchess county two recently organized companies are preparing to resume the development of the Kelly and Dover Furnace deposits of brown hematite, one of them guaranteeing minimum shipments of 100,000 tons per year. At Benson Mines a nodulizing plant was recently placed in operation; shipments of crude ore and concentrates were begun several months ago, going as far west as Ohio and south to central Pennsyvlania. The Forest of Dean mine, in the Hudson River district, now well along in its second century of operation, is producing at an increased ate.

Other Eastern Workings

New Jersey mines yielded large tonnages during 1909, though the loss of the Hibernia mine, through a remarkable earth movement peculiar to that district, was serious. The same condition resulted in a serious accident at the Oxford mine during the autumn. The Richards mine continued to produce heavily and still shows a large tonnage available. The output of the Cornwall district in Pennsylvania was also large. Interesting improvements were made by the Cornwall Ore Banks Company during the year.

Note. Abstract of article in the Cleveland *Iron Trade Review*, Jan. 27, 1910.

Extraction Percentages in Metallurgical Plants

BY H. A. MEGRAW *

At first glance it might seem that the calculation of the per cent. of metal recovered in a metallurgical plant is a matter of simple arithmetic, about which there could be no two opinions. In some cases this is true, but in others there is wide latitude for argument. Some of the systems used at different plants are truly wonderful and the number of methods or systems seems to be limited only by the number of plants in operation.

Where the process of extraction is in one operation, as for example in concenrating plants, the comparison of the content of the ore delivered to the mill, with that of the produced concentrate, shows at once the proportion saved. In plants, however, where the treatment requires considerable length of time, or where two or more processes are used n connection, the problem is not so simple. Of course it goes without sayng that any report of per cent. extracted should have for its basic figures the actual content of the ore delivered to he plant and the actual content of the bullion, concentrate or finished product.

In estimating the content of ore deivered, consideration must be given to he methods of weighing and also to the proper deductions which have to be made for losses which may occur beween the point of weighing and the point where extraction begins. These osses include tare, moisture, etc. Few mills have accurate methods of weighng the ore delivered, and this is a point which in some cases may explain bnormal extraction results which seem ifficult to account for. Tare is another item to which attention should be given. The weight of a car or other means of onveying ore will change and for acurate results the weight should be hecked from time to time in order to e sure that the proper figure is being sed. A small error in the weight of a ar may amount to enough to vitiate reults, due to constant repetition and herefore accumulation of the error.

Moisture samples should be carefully nd frequently taken in order to approxmate as closely as possible the actual onditions. The average percentage of moisture in the ore sent to a large mill s not by any means a simple matter to etermine, and it seems that great freuency is about the only way of getting fair average. In wet ore the greatest are should be taken, having in view the act that a difference of 1 per cent. in the weight of the gross amount of ore delivered may make a serious difference with the metallurgical end of the business.

To use a concrete case as a basis for calculation, take for instance a plant where concentration is followed by cyanide treatment. When the milled ore is classified and each grade concentrated separately, it would be a good plan to ascertain just what proportion of the whole constitutes each class. The efficiency of the process for each class may then be derived. The total value of the tailings can be found by combination of the tailings for each class in the proportion which constitutes it. The figures showing the content of the concentrate will show the actual extraction when compared with the total content of the ore. Extractions by assay should check closely with the actual production, but in any case the actual production must be taken for accurate reports of extraction. The closeness of the results derived in the two ways show the efficiency and care with which the work has been done.

Cyanide Plant Methods

After concentration there are two general methods which are followed in cyaniding: (1) The separation of the product into two classes, sand and slime, and treating them separately; (2) the treatment of the whole product as slime, and regrinding the necessary portion. In the first case it is important to know just what proportions are treated in either class, and their respective values. The quantity of material in each tank or charge should be carefully computed, and its content in metal, together with an assay of the heads and tailings, recorded. It is well to observe that the usual methods of assaying tailings from cyanide treatment are more or less faulty. The general error is in taking too small a quantity of pulp for assay and not having sufficient checks. It would be a good idea for one considering this matter to figure out what would be the actual weight of a gold or silver button resulting from the amount of pulp used for the tailings assay. In a good many cases it will be found that it would be too small to be weighed on any balance, and that tailings assays are largely a matter of guess work. I have seen assays made on 50 c.c. of cyanide solutions. Of course accurate results are impossible in such a way.

Tonnage calculations of sand and slime charges should be carefully made, using as a basis data secured from repeated and careful calculation. This is simple enough on sand and slime charges where the specific gravity of the dry pulp has been ascertained, and means provided for determining that of each charge treated. In this way percentage extractions from each charge handled should be determined and recorded. Assay results and bullion production really should agree within certain limits, depending upon the condition of the plant and the kind of work done. If the figures do not check, steps ought to be taken to find out the reason, which will usually be found as due to inaccurate work in some part of the plant. Sometimes leaks in the plant itself or other mechanical faults may be found accountable, but these cases are in the minority, and faulty data or calculations will be found to be the reason.

In those rare and fortunate cases where the ore delivered to the mill is practically constant as to value and character, it may be sufficient to calculate the monthly production against the content of ore delivered to the mill during that month and call it per cent. extracted. In cases where the ore varies in character or amount milled, it is quite a different matter.

Difficulty of Monthly Cutoff

It is evident that the concentrate produced in any given month should be considered as derived from the ore milled during that same month. It is also evident that the bullion produced during any given month does not correspond to the ore milled during the same time. The cyanide treatment occupies a length of time depending on the class of ore and the method of treatment: Sands from 6 to 20 days, and slimes from 2 to 8 days. Ore upon which treatment is started at any given time will begin to give up its values a few hours later and continue to do so during the entire time of treatment, and the rate of extraction will vary largely at different times. It is quite evident that it is not an easy matter to cut off treatment at the end of any given period and say what production belongs to the previous and what should be attributed to the future time. Of course, if the ore is always of the same grade and the same amount is milled each month, it is sufficient to assume that the overlap from a previous month will about balance the amount carried forward. Where the ore varies no such assumption can be made.

As a matter of fact the only really accurate method would be to carry the

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*San Luis de la Paz, Guanajuato, Mexico.

treatment for a long period, say six months at least, and include in the calculations for production the amount in solution in the mill and the amount in combination with the zinc in the precipitation boxes. The amount present in solution or in process of treatment can be approximated closely enough to serve as a fairly accurate basis but the amount in combination with zinc is a point upon which there are very few data to guide, and which would be too expensive to ascertain. It is, in all probability, less than general opinion assigns it. I had an opportunity to gage this amount in cleaning up a plant which had been in long operation. The metal in combination with the zinc proved to be about 10 per cent. of the average monthly production of the plant. This was in a plant treating low grade silver-gold ore. This one instance, however, cannot be safely taken as a basis for calculation. It is possible that a higher-grade ore may leave a greater proportion of its values in the zinc. This, it seems, is quite likely to be the case with gold ores.

The first month or two of operation of a plant of this kind will not give results up to the general standard for the reasons previously mentioned and also on account of mechanical imperfections which have to be discovered and remedied. After that time results should be nearly standard, unless there is some special reason for other deductions. The amount of metals in solution or in suspension in a mill, contrary to some opinions, does not increase except with the grade of the ore, and then only proportionally. With the same ore and the same process, the amount in a mill at the end of 10 years' work should be the same as at the end of the first year.

Monthly Extraction Statements

Although it is impossible to show in a monthly report the real percentage of extraction secured during that time, it is advisable for purposes of monthly reports that some system should be followed for approximating it, and some plan of calculation could be devised and systematically followed, which will give a fair idea of the work being done. The following may be considered a suggestion along these lines:

Take the actual content of the ore delivered to the mill as 100 per cent. The concentrate produced will show a certain per cent. of this total. Say, for example, the content of the concentrate shows 20 per cent. of the total. This leaves 80 per cent. of the total to be treated in the cyanide plant. Then calculate the total head content of all the tanks discharged during that month. Use this as 100 per cent. in the cyanide plant and against that calculate the bullion product for that month. Presuming that the cyanide extraction is 80 per cent., then the percentage of the total ore milled, represented by the bullion product, would be 80 per cent. of the 80 per cent. which the cyanide plant has to treat, or 64 per cent. of the total ore treated. Adding to this the percentage derived from concentration we have, 64 + 20 = 84 per cent., representing the total month's work.

This may not be the only solution of the problem, and other methods may be as good or better, but it is reasonable and does not depend altogether on either ore milled or bullion produced during any stated time, and it will afford a good idea of what is being done at the plant. By following this system for a term of months it would show a final accuracy and a greater evenness than if gross production were charged every month against the gross value or content of ore milled.

Lake Superior Iron Ore Shipments

The completed statement of iron-ore shipments from the Lake Superior district in 1909 shows a total of 42,586,869 tons, of which 41,683,599 tons were forwarded by Lake and 903,270 tons by rail. The total compares with 26,014,987 tons in 1908, and 42,266,668 in 1907. The records of the district have been carefully kept from the beginning, and are compiled and published yearly by the Cleveland *Iron Trade Review*, so that statistics of the past production of each mine can be ascertained.

The following table shows the production of each range in 1909, the total production from the first shipments to the end of 1909, and the date of the first shipments from each range; the figures being in long tons:

Range.	Year 1909.	Total to End of 1909.	Year Opened.
Marquette	4,256,172	91,903,991	1854
Menominee .	4,875,385	71,313,115	1877
Gogebic	4,088,057	60,820,503	1884
Vermillion	1,108,215	29,125,385	1884
Mesabi	28,176,281	195,703,121	1892
Total	42,504,110	448,866,118	....
Baraboo	82,759	880,627	1893
Total	42,586,869	449,747,015	...

The Baraboo range in Wisconsin is included, although it is outside of the immediate Lake Superior district. Some geologists, however, hold that it is really an extension of the Gogebic range. The Helen mine on the Michipicoten range in Canada, which is not included above, shipped 170,065 tons in 1909, all to the furnaces at Sault Ste. Marie.

The Vermillion range showed the smallest gain in 1909, not because the mines are exhausted, but because the Steel Corporation found it more advantageous to push shipments from the Mesabi. All the Vermillion mines are Steel Corporation mines, except the old Section 30, which is still under development. For similar reasons no shipments were made from the Great Northern leases, on the northern side of the Mesabi. The Steel Corporation shipments from the whole district were 50.4 per cent. of the total, against 56 in the preceding year.

In 1908, only three mines shipped more than 1,000,000 tons, but in 1909, nine mines are found in this circle of big producers. They are the Adams, Burt, Fayal, Hull-Rust, Mahoning, Morris, Stevenson and the Virginia or Oliver group on the Mesabi, and the Newport on the Gogebic. Of these mines, the Hull-Rust is the leader, with 3,039,911 tons, being more than a million tons ahead of its closest rival, and eclipsing all previous records for any iron mine on the Lake Superior ranges, and doubtless for any mine in the world.

The Fayal mine took the leadership of the Mesabi range in point of total shipments, having sent down at the end of the season a total of 18,132,550 tons, passing the record of the Mountain Iron mine, which was 17,198,871 tons. This change in the relative positions of the mines is made possible by the shut-down of the Mountain Iron, from which no shipments were made during 1909, and only a very small shipment in 1908. The Mountain Iron is by no means worked out, but active work there has been discontinued for business reasons.

New Properties

A number of new properties appear on the list this year. Among the new mines are the Syracuse, Pearson, Euclid, Perkins and Bray on the Mesabi range; McDonald on the Menominee, and the Stegmiller on the Marquette. This latter mine is a property of the Steel Corporation, which for some unaccountable reason, has been spoken of in recent publications as the Brotherton, but it has no connection with the well known Brotherton mine on the Gogebic range.

The largest shipper on the Marquette range in 1909, was the Cleveland-Cliffs with 877,433 tons; on the Menominee, the Chapin, with 587,647 tons; on the Vermilion, the Pioneer, with 477,226 tons.

Method of Square Set Stoping at Bisbee

Adapted to Mining Soft or Hard Ore. Reduces to Minimum the Amount of Waste Sent to Furnace. Details of Framing Timbers

BY MORRIS J. ELSING*

The square-set method of stoping is used almost exclusively in Bisbee, Ariz. A few orebodies have been worked by other methods but they are small in comparison. There is probably no other camp where square setting has been worked out with such accuracy and detail as here, especially in the Copper Queen mines.

OREBODIES

The orebodies vary from soft to hard irregular masses of high-grade ore in altered limestone and porphyry, often intimately mixed with bunches of low-grade ore and waste with usually no definite foot- or hanging-wall. The ore varies from soft aluminous and ferruginous clays to firm pyrite with ½ per cent. copper, to almost solid chalcocite containing 65 per cent. copper. The oxidized ores are represented by malachite, azurite and cuprite in altered limestone. A small amount of native copper and some of the less common oxides complete the list. Usually the ground is quite heavy and the ore can be removed in small sections only. For the conditions, square setting although expensive is by far the best method of mining.

RAISING

Preliminary to stoping, a two-compartment raise, consisting of a chute and manway, is run to the level above which is usually 100 ft. If the orebody extends only a short distance above the level, the raise is run only to the limit of the ore. Connection is made with the level above for three reasons, all of which contribute to cheaper mining:

(1) A quick and economical system of getting waste filling.

(2) A means of securing better ventilation.

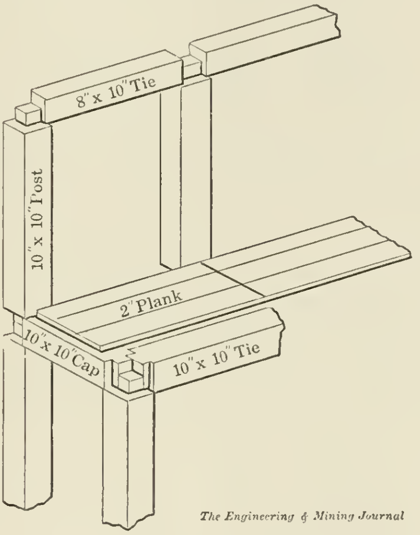
(3) An easier method of getting timbers into the stope as they may be lowered rather than hoisted.

The raise is usually placed at the corner of a section so that it may serve two or more sections.

After the raise has been run, some idea of the weight of the ground can be formed, when the size of the section to be carried up and the timbers to be used are decided upon. The size of the section will vary from 3x5 sets, when two or three floors only are worked simultaneously, up to sections 5x7 sets in ground that is easily supported, when more than four floors are worked at one time. The size of timbers varies from 10x10, 10x12 to 12x12. Recently quite a number of round timbers have been used.

STOPING

The actual method of breaking the ore varies with the formation. For example in a soft material, room for timbers can be made with a pick and shovel. The ground may be slightly harder when an auger is used and a stick of powder breaks and loosens the ground, making it possible to use a pick to advantage. Again, where the ground is still harder drills of the Shaw type are used to put in a round of holes. It sometimes happens that a 2¼-in. column drill is used. In such a case considerable ore can be mined ahead of the timbers, while in the first case timbers are put in as soon as room is made for them. In stopes where the soft ground runs and is quite heavy a majority of the sets are top- and side-spiled and sometimes even breast boarding becomes necessary. In such cases a jack screw is used to put in the spiling in order to prevent any unnecessary jar from causing additional caving.



The Engineering & Mining Journal

SQUARE SET USED AT BISBEE, ARIZ.

The timberman takes the order for the set and the order is immediately sent to the sawmill where the timbers are framed and delivered within two hours. In rush orders, timbers are sometimes delivered in 15 min. after the receipt of the order.

FRAMING

The framing is done by a Denver Engineering Works double-end timber framer, run by a 40-h.p. motor. The regular posts are framed both ends alike. The timber used in stopes ranges from 10x10 to 12x12 in. Posts are either 10x10, 10x12 or 12x12 in. The horn on a 10x10-in. post is 5x5x5 in. long and placed at the center of the post; that on a 10x12 is 5x5x6 in. long. The tenon on a 10x10 cap is 1½ in. long, 5 in. wide, 10 in. high. On a 10x12 these dimensions are the same except that the tenon is 12 in. high. On a 12x12 cap the tenon is 2 in. long, 6 in. wide, 12 in. high.

Formerly a 10x10 tie was used with 10x10 timbers, but now an 8x10 tie is used. The tie is unframed and for all practical purposes the 8x10 tie has proved just as efficient as the 10x10. The reason for this is that a cap or tie rarely fails at any place other than the point where the cap or tie rests on the shoulder of the post. A cap or tie broken in the middle is a rare sight. Failure is due almost entirely to the crushing of the bearing surface against the post. The bearing surface of an 8x10 and a 10x10 are the same, consequently except where the lateral pressure is great, an 8x10 tie is used because of a saving of 7½ bd.ft. in addition to the cost of framing. A 10x10 tie, when used, has a tenon 2⅛x8x10 in. high.

SILL FLOOR SETS

The sill floor set depends upon the nature of the ground on which the floor is started. If the floor is waste, a flat-bottom post is used resting on a small block with 4x6-in. spreaders between the posts. If the ground is ore subsequently to be mined from below, either a cap sill and tie or a mud sill is used. A cap sill and tie, being the more substantial, is used around a raise which it is desired to keep open whether the ground be ore or waste. In the second set from the raise if the floor is waste, a flat-bottom post is used if the ground is sufficiently hard to support it; if the floor is ore a cap sill and tie or a mud sill is used. The object in using a cap sill and tie or a mud sill is to work up from the level below and mine out the ore under the first stope without causing the waste filling to cave into the stope below. In very soft ground even though the floor is waste, a cap sill and tie is used in order to give a good foundation for the sets above.

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*Mining engineer, P. O. Box 825, Bisbee, Ariz.

The cap sill and tie supporting a floor with waste filling can easily be caught up with stulls and posts. In general where the floor is on ore, if the ground is heavy, the cap sill and tie is preferred to the mud sill.

The sill set consists of posts 8 ft. 8 in. to 9 ft. to the shoulder, posts being placed 5 ft. center to center with caps and ties completing the set. The 10x10 caps and ties are 4 ft 7 in. long; the 12x12 caps 4 ft. 6 in. long. Roof planks rest on the caps. When 10x12 posts are used the 12-in. dimension is tieway.

The floors above the sill are similar except in the length of posts. For a long time 6 ft. 2 in. posts with 10x10 timbers and 6-ft. posts with 12x12 timbers have been used. Recently 7-ft. posts have been used entirely, which not only reduces the cost of timbering by saving 11 bd.ft. per set, but still further reduces the cost of mining.

Vertical Pressure

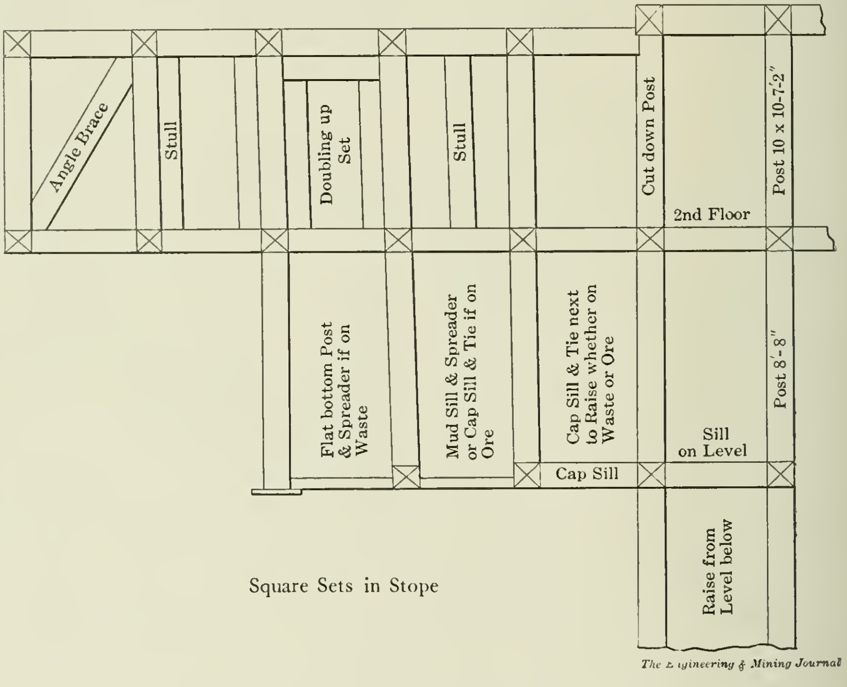
The object of framing posts so that the horns abut is to obtain the maximum resistance to vertical pressure. The end-grain resistance of the timber is the greatest and, therefore, best adapted to withstand the vertical weight of the ground above.

A stope is worked out much upon the same principles upon which timbers are relieved, that is, when a floor begins to take weight it is time for the floor above to be started in order to relieve the one below. The ground is worked out about 8 in. above the set, thus giving some time before the actual weight of the ground comes down upon the timbers. If the floor has many broken caps and ties it is an indication that the stope has not been worked sufficiently fast.

By following this principle of stoping it is possible, in the same kind of ground, to mine the ore with smaller timbers and a less amount of reinforcing timber. In some ground that it has been almost impossible to mine because of the tremendous crushing weight, the size of the section has been reduced and smaller timbers used; by simply working the section fast enough the same ground has been mined with comparative ease.

Gobbing

Gobbing keeps pace with stoping. A monthly open-set report shows just how many sets remain ungobbed at the end of each month. The number of open sets in easily supported ground rarely exceeds 75 to 100, while in heavy ground this number is not over 30 to 40. The gob is usually obtained from the prospect drifts and raises on the level above. Often two sets on the side of a section next to ore are lagged and not gobbed, with the idea of using them as a raise when the next section alongside is mined.


Angle Brace
Stull
Doubling up Set
Stull
Cut down Post
Post 10 x 10-7-2"
2nd Floor
Flat bottom Post & Spreader if on Waste
Mud Sill & Spreader or Cap Sill & Tie if on Ore
Cap Sill & Tie next to Raise whether on Waste or Ore
Post 8'-8"
Sill on Level
Cap Sill
Raise from Level below
Square Sets in Stope
The Engineering & Mining Journal

Different Timbers Used in Square-set System

Flirting, Beveling and Cut Down Posts

When the roof pressure becomes great and the timbers are forced out of alinement, flirting is resorted to in order to square up the sets. Flirting is changing the position of the horn on the bottom of the post so as to bring the posts in alinement. For instance, if the posts on the floor have swung to the left then the post above is cut with its bottom horn on the left side of the post, thus throwing the post to the right. In this way the post is thrown in or out, right or left, from 2 to 3 in., keeping the stope square. With all the posts in line it makes it possible to resist the pressure of the ground much more effectively.

Where the sets in a stope have swung so far to one side that the maximum flirt will not line the post up with the rest of the posts a beveled cap and tie are used. The object in doing this is to make the cap or tie fit squarely against the horn of the post in order to make use of the total bearing surface on the shoulder and against the horn of the post.

In order to keep the caps and ties level when a stope has settled, the cut-down post is used. The shoulder is cut the required distance below the regular shoulder and flat with the horn.

In heavy ground where the lateral pressure is great, posts are battered out at the top against the ground so that by the time the stope begins to take weight it usually has gained an upright position. This batter often amounts to ½ in. per foot.

Ordering Timbers

The accompanying order illustrates the method of ordering timber at these mines. Order No. 1 is for a flirted post and is read as follows: One post 10x10, 7 ft. long, flirted 2½ in. capway and 2 in. tieway, right. In writing the order for a flirted post the timberman always imagines himself standing under the cap and flirts the post toward himself and the tie either to the right or left as the case may be. The second order is for a beveled cap, one end to have a bevel of 1½ in., the other end 1 in. The bevel in this case is known as a straight bevel, both bevels being in the same direction. The third order is for a cap with a reverse bevel, that is, the bevels are in the opposite direction. The fourth order is for a cap with one end only beveled. The fifth order is for a cap with what is known as a drop bevel. The drop-bevel cap is used when connection is made with two posts of different elevation, especially in connecting with an old stope. These orders apply to ties as well as caps. The above orders are merely a few examples of the accuracy and detail with which square setting has been worked out at Bisbee, the object in view being to obtain the maximum strength with the minimum number of board feet.

ORDER.

(1) P. 10x10 7 ft. F. 2½C. 2 T. R.
(2) C. 10x10 4 ft. 6 in. 1½x1 B.
(3) C. 10x10 4 ft. 6 in. 1½x1 Rev. B.
(4) C. 10x10 4 ft. 6 in. ½ B. 1 E.
(5) C. 10x10 4 ft. 6 in. ½ D. B. 3 sides B.

It may be said that too much refinement and accuracy in measuring and cutting timber is not warranted. The latest practice has been to put in regular sets, allowing a stope to get considerably out of plumb and level before it is squared up. Perhaps every three or four floors a stope will be properly squared up by ordering, perhaps every set a special. Both time and money are saved by not attempting to keep the stope in perfect alinement.

CONCLUSION

Thus far, although square setting is recognized as an expensive method of mining, no other has been found applicable. It readily adapts itself to the irregularities of those orebodies where on one floor the ore may widen out and on the next pinch, while on the third it may be high grade but include considerable waste. No caving or slicing method can fulfil these requirements because with their application there is bound to be considerable mixing of high-grade ore with waste. This loss in itself would more than make up for the increased cost of mining by the square-set system. Besides it has other advantages of preserving the surface where it is valuable, and of permitting prospect work by means of intermediate drifts. One important feature of the square-set system which is often overlooked when considering its merits and demerits, is its adaptability to prospecting. If an irregular orebody or stringer of ore is encountered in prospecting soft ground it can be most easily and thoroughly prospected by actual stoping. The ore can be followed wherever it goes and at the same time it is being mined.

Therefore arrayed against the one disadvantage of higher cost there are the advantages as follows:

(1) The adaptability to mining soft or hard irregular bodies in caving ground.

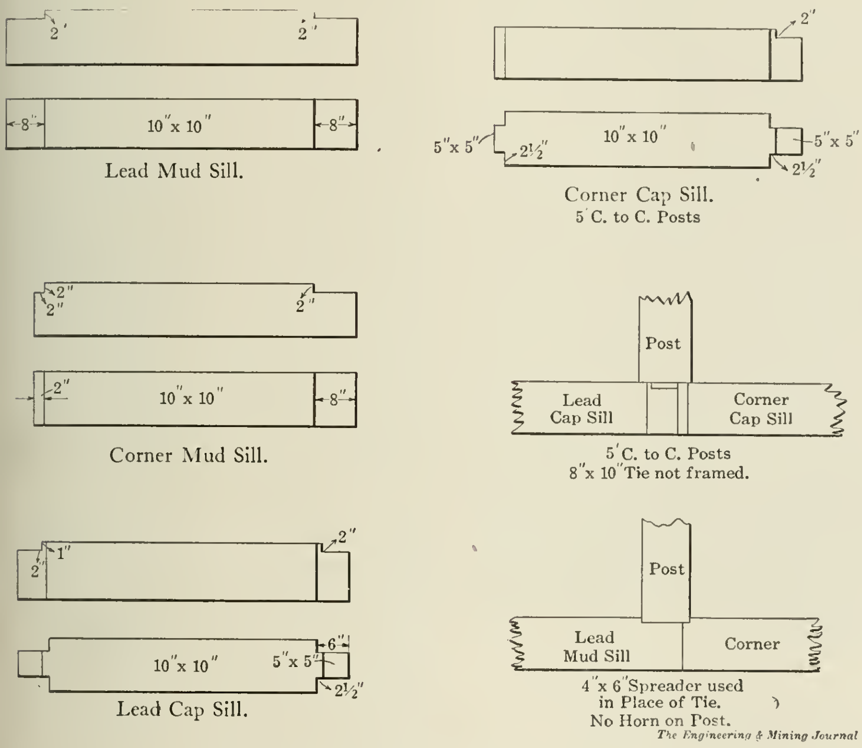
(2) The reduction to a minimum of waste to be smelted with the ore.

(3) The preservation of the surface.

(4) The facility with which it lends itself to prospecting by intermediate drifts.

(5) Its great value as a prospect agent at the same time the ore is being mined.

In conclusion it may be said that for the majority of the orebodies in Bisbee the square-set system is by all odds the best. If there is any improvement in the method of mining here it will probably be some modification of this system by which the cost of timbering and stoping will be reduced.



DETAILS OF FRAMING SQUARE-SET TIMBERS

Montgomery Shoshone Consolidated

During the fiscal year ended Dec. 31, 1909, the Montgomery Shoshone Consolidated Mines Company, at Bullfrog, Nev., earned a net profit of $86,703. There was treated at the mill of the Bullfrog Reduction and Water Company, a subsidiary concern, 68,632 tons of dry ore, the average value of which was $7.51 per ton, or a total value of $515,513. The total milling cost was $156,049, equivalent to $2.27 per ton. The average extraction for the year was 85.97 per cent.

Of the above tonnage, the Montgomery Shoshone Mines Company produced 65,106 tons and the Shoshone Polaris Mining Company 3526 tons. The total mining cost, including all development work done during the year, was $140,756, equivalent to $2.05 per ton. A total of 6982 ft. of development work was done.

John G. Kirchen, manager, states that it is impossible to estimate the probable ore in sight on account of irregularity of the deposits. He estimates 9500 tons of $6.50 ore broken and stored in the stopes. Development is being done at the lower, or 700-ft. level.

In the mill the average value of the concentrates treated during the year was $357.20 per ton, with an average extraction of 97.76 per cent. A tube mill, five agitating tanks for concentrate treatment, one clarifying tank, one 6-ft. chilean mill, a large agitating tank for slimes and a 40-leaf vacuum filter were added to the mill.

The Radium Business

The sale of radium by the Austrian State department, which controls its production, has now been placed on a more or less permanent footing, says the London correspondent of the *Sun*. The chief difficulty encountered by the department has been to find a suitable way of packing the precious mineral, but the experts of the Vienna Physical Institute have at last devised a satisfactory way of handling it.

Pure radium, of course, cannot be obtained; but what is sold as radium is really a chemical compound known as radium-barium chloride. Of this there are three different grades in the market. The preparation is inclosed in a so-called radium cell, a round capsule 1⅞ in. in diameter and ¾ in. long. This capsule is inclosed in a screw tube made of nickelled brass, with a lead bottom in which there is a little sunken square which serves to hold the speck of radium.

The cell or capsule itself is sealed by a mica plate, which obviates the necessity of opening it when in actual use. All tubes are carefully numbered and each bears an official stamp. Prospective buyers may note that it is not money alone that buys radium. It is only scientific institutes and savants of repute who are eligible as purchasers.

Postal-guide books are searched in vain for rules governing the despatch of radium. No postoffice has ever been called upon to handle a single milligram. In every case so far the sales have been made to buyers personally or their direct representatives sent expressly to Vienna for the purpose. It is not surprising that in the case of a product worth $2,375,000 an ounce, the strict rule is "shipment at buyers' risk."

Selenium is a rare element having peculiar properties. In the dark it is a poor conductor of electricity but in the light it becomes a good conductor, and on account of this peculiarity it is used in a number of electrical devices. It has been used in telephoning along a ray of light and also in transmitting pictures by telegraph.

Mount Morgan Mine Records and Assay Plans

Rock Drill Cuttings Used as Samples. Recording Diamond Drill Holes. Assay Plans Assist in Producing Ore of Uniform Grade for Mill or Smeltery

BY J. BOWIE WILSON*

The advisability of every mine, whether developing a deposit or after it has reached the production stage, keeping a set of assay plans, on which are recorded the value of the ore exposed or mined, should be too well appreciated to require any championing. I think it will be admitted by all mining engineers, who have managed a mine of any size, that assay plans are an absolute necessity if it is desired that the ore sent to the works for treatment should keep at a fairly even grade, and not vary over wide limits from month to month. Without a complete set of assay plans of the mine, it is impossible for a manager to determine what grade of ore the mine is capable of supplying and, to so regulate the output of the various stopes that the month's output will fairly represent the mine's capacity as a producer. These remarks apply more to a developed and producing property. If assay plans are a necessity for a producing mine, they are no less to be desired in a mine that is being prospected and developed. If all the assays obtained during the prospecting stage of a mine's career are placed upon a plan, in their proper position, it is infinitely easier to understand their relation to each other and, by studying the assay plan carefully, to determine the possibilities of the property.

Value of Assay Plans

Assay plans of a mine that is being developed will also be found of great assistance when the property is offered for sale, or capital is required for its further equipment. However roughly these plans are kept, they will be of use to the engineer who will have to inspect and report upon the property. It gives him something tangible to start with and, if on checking some of the work he finds it reliable, will greatly reduce his labor.

No one method of keeping assay records and plans can be laid down as being the best, as each field and district has its own peculiarities and any system used must be adapted to the requirements of the deposit. As progress in all things is greatly assisted by the free exchange of ideas and criticisms thereon, the following account of the system introduced at Mount Morgan, Queensland, may be of interest and use.

The subject naturally divides itself into the main headings: (1) Sampling; (2) assay records, and (3) assay plans.

Sampling

Three different methods of procuring samples were employed: (1) Sampling by hand in the open cut; (2) from the rock drills when mining underground; (3) by diamond drill cores. In sampling in the open cut, where the oxidized ore was quarried from the faces of benches or milled down chutes, two classes of samples were taken. One set was taken to act as a check upon the ore sent to the works, and was procured by the men working in each face throwing two handfuls of material from each truck into a heap from which, at the end of the day, a sample was taken. Samples were procured in the same way of any mullock (waste) trucked away from a face.

As much hand picking was done in the open cut a set of samples was taken each day, under the direct supervision of the overseer. These could not be taken as representing the value of any particuler face in bulk but were used by the overseer in assisting him to decide what class of material in a face had to be discarded, as being below pay value. Neither of these sets of assays would stand the criticism of men accustomed to accurate and careful sampling but, when combined with frequent "dish samples" washed by the overseer, who had been in charge of the open cut at this mine for many years, they gave results quite accurate enough for the conditions.

Sampling By Borings from Rock Drills

All the underground mining is done by rock drills and all the samples from this class of work are procured by collecting some of the fine borings or dust from all the holes bored in a face. This method of obtaining samples entails no extra expense. All the shift boss has to do is to write an assay ticket for each face that will bore out on his shift, and either collect the sample himself, or send a drill boy to the miner in charge of the face with a ticket and a sample cloth to hold the sample. As the collecting of the sample entails no hand work there is no tendency to shirk it, which must often occur when chip sampling in hard rock is delegated to subordinates. This method of sampling by the borings of rock drills has often been checked at Mount Morgan and has always been found satisfactory.

Of course, it must be remembered that the ore is uniform in appearance and that the gold occurs in such a fine state that it is almost an unknown thing for any gold to be visible in the stone, even when the rock carries several ounces to the ton, so that it is impossible for anyone to manipulate the samples by taking more from a hole that is known to be in good stone or *vice versa*. Miners who have worked in the mine for years are unable to give even a rough estimate of the value of the rock before it has been assayed. This method would be inaccurate in ore of varying degrees of hardness, where the men select the position of their holes largely by the hardness of the rock. Chip sampling has to be very conscientously done under these circumstances to be more accurate, especially in the presence of coarse gold.

In prospecting with the diamond drill the whole of the core was taken as the sample, the procedure being as follows: Wooden boxes were made 4 ft. 6 in. long, with slots arranged in such a way that when the lid of the box was shut no core could possibly get out of its slot. As the core was withdrawn from the hole it was placed in one of these boxes in its proper sequence, and every morning the officer in charge of the sampling went round and inspected the cores in the boxes. After making any notes about the geological nature of the core, the occurrence of dikes, etc., he wrote out labels showing the depth represented by the core in each slot, and any remarks he wished entered in the assay book. The labels were placed in the boxes among the cores; the boxes were locked and sent to the assay office. Here the whole of the core in one slot, after any dike that was present had been discarded, was crushed and sampled in the usual way.

Assay Records

Too much stress cannot be laid upon the necessity of keeping all assay books with sufficient clearness to leave no doubt about the exact locality from which each sample came. When entering the assay, it may appear a waste of time to put in much detail as, the work being fresh in mind, there is a tendency to think that you will always remember where the sample came from. The great necessity for clearness was forcibly impressed upon me when in 1901 I started to make assay plans of the Mount Morgan mine from the old assay records. The mine had been worked many years, but no assay plans had been kept. The hours spent in attempting to plot the assays in their correct position from the old assay books, assisted by the former mine manager's monthly reports, left an impression that will not be easily obliterated.

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*Consulting mining engineer, Vickery's Chambers, [illegible] N. S. W.

Making clear assay records and plans is, of course, open to the objection that by placing all your information and knowledge of a deposit clearly on paper, it is easier for another man to reap the benefit of your labor and that your services are not so indispensable to your employers. A man who thinks that he can only hold his position by preventing other men from learning, and not by showing that he is the best man for the job, had better retire early as he is doomed to failure. A manager should always remember that all his knowledge about the mine is not really his property but that of his directors and, therefore, should have his work in such a condition that in the event of his leaving the mine, his successor will be able to carry on the work as well as possible.

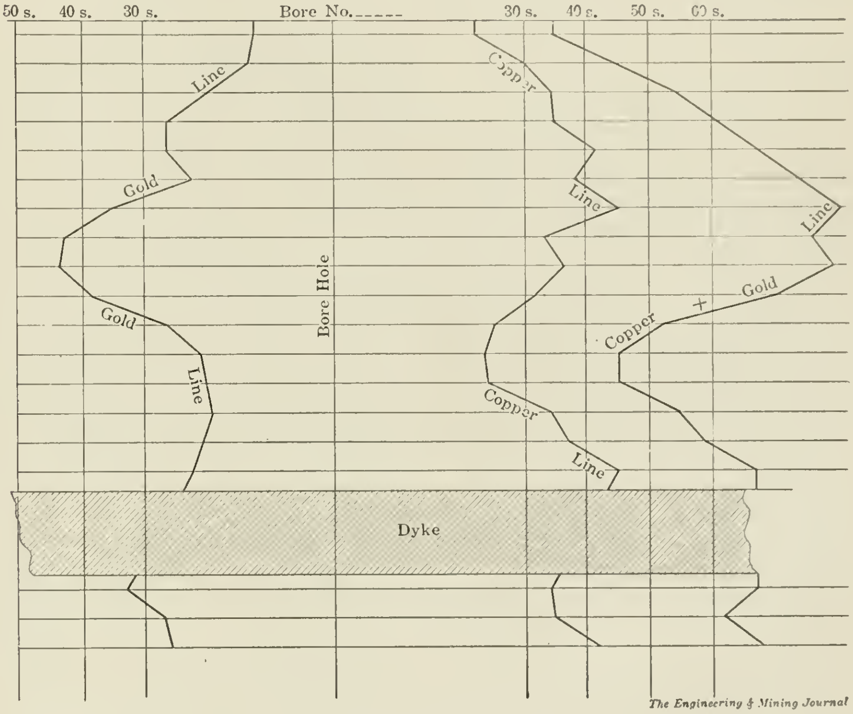
To follow the Mount Morgan method, it must be remembered that all the gold ore is mined by the square-set system with sets 6x5 ft., and 7 ft. 9 in. in hight. This divides the mine into a series of floors which are numbered from the top downward. If a new level is opened, it is easy to calculate how many floors there will be up to the next level and start it off with its proper number. The various stopes upon a floor or level, which are either by dikes or blocks of unpayable stone, are given names such as south, southeast, north, etc. The first set taken out upon a floor is numbered 1, and the rest in the sequence of their extraction.

The Stope Book

A stope book is kept in the mine office. This book is ruled in squares and each set is put in its position by marking around a square, and at the same time its proper number is written in the square. This gives a rough plan of each stope as the work progresses. At short intervals the stopes are checked by the mine surveyor, who, when making the mine-working plans, enters upon each set its proper number from the mine stope book. In sending samples from the stopes to the assay office they are labeled to show the floor, number of set and stope. In sending samples from drives, winzes, etc., their name or number and the distance from some marked plug or from some definite level is given so that from the assay book the exact position of the sample can be easily noted upon the plan.

Assay Record Book

An assay book is kept in the mine office, in which the daily assays are entered from the assay-office slip. All the assays for a 4-week period are kept together, and the book, being ruled into columns, a separate column is kept for each stope or drive worked during the period. At the end of each 4-week period, the book is closed and a fresh set of pages started. This method of opening up fresh headings each 4 weeks, although it may appear cumbersome, has the advantage that it keeps all assays of work done during one period together, and fits in with a 4-week statement drawn up to show the tonnage and value of all ore sent from each stope and floor to the works, the total of which should tally with the average of the daily samples taken on the works during the same period. It also shows approximately the date of the work as the only dates entered in the assay book are those to identify the periods. In this assay book are kept notes of any dikes encountered and also the disposal of the rock mined. For example, if a set is mined, that the assay shows is too low grade to be sent the works, its assay is entered with the rest, but an *M* is put against it to show that it has been mullocked.



Record Used at Mount Morgan Mine for Diamond-drill Holes

When a start was made to mine the copper-gold orebody, which was found to the northwest of the old gold stopes, the square-set method of timbering was abandoned and a chamber and filling system introduced. This necessitated an alteration in the method of keeping the records of where the assay samples came from. As all the shift bosses were accustomed to the method just described, the following modification was adopted. The survey department supplied the mine with plans of the copper stopes ruled in 5-ft. squares, to a scale 20 ft. to one inch. Upon these plans were marked all fixed points such as winzes, chutes and known dikes, to help the shift bosses identify their position on the plan. When a machine was rigged up the shift boss wrote a number in the square, which he assumed would represent its position on the plan. Periodically the survey party surveyed the stope, plotted the ground that was actually out, and then corrected the shift-bosses' plan. At first a fair amount of manipulation was required to make the two plans check, but after the chambers were properly started, little alteration had to be made on the shift-bosses' stope plans to make them agree with the ground actually mined. A separate plan was made for each cut or floor as the chambers were mined upward.

Assay Plans

A complete set of working plans, consisting of a plan for each floor in the mine to a 20 scale, was kept in the survey office, and upon these every set that had been mined was shown, and numbered. All the sets mined in the one-half year were colored with a distinctive tint. Of course only the plans of the main levels show any drives, but all plans showed the shafts and winzes. The assay plans were duplicates of these, but instead of the sets having numbers printed on them they contained the assay value of the ore mined, a sample being taken for each set. The gold contents are put in pennyweights and decimals of a pennyweight. On the main floors the contents were plotted along the drives, and where a horizontal diamond-drill hole existed they were surveyed and plotted and the assays for each 4 ft. 6 in. of length written on. Vertical bores could, of course, only be shown by circles. The position of all dikes and other geological features were shown. Of course in a body such as mined at Mount Morgan, where the pay ore occurs in masses which merge into unpayable ore, it was necessary to enter up any widths. The work entailed in starting these assay plans in 1901, after the mine had been operated nearly 20 years, was naturally enormous, but their usefulness amply repaid the time thus spent and without them it would be almost impossible to now work the mine to a fairly even grade. When the plans are once uptodate, it requires comparatively little labor to keep them going, and I should strongly recommend a mine manager to keep his own assay plans personally, and not delegate this work to an assistant. In no other way can he keep in such an accurate and personal touch with the progress and contents of his stopes. The very action of writing on the assays impresses one much more than reading over a plan that someone else has made. Gold assays are put on in black ink, copper is red and the silica contents of the copper-gold ore in blue.

Diamond Drill Records

When the existence of a body of copper-gold ore to the northwest of the old gold stopes was discovered, it was decided to carefully prospect it by diamond drilling before any expense was incurred in the erection of a plant to treat this new class of ore. With this object in view 20,000 ft. were drilled and careful assay plans kept of all the work. In making the estimates of the ore developed by this work a graphic method of showing the assays of the bores was utilized in conjunction with the assay plans, is shown in the accompanying diagram.

In calculating the content of the ore reserves, copper was taken at £50 per ton and gold 4s. per pennyweight.

If the percentage of copper is plotted on a 20 scale then a 20 scale will also read its value in shillings. If pennyweights are plotted on a 50 scale, then a 20 scale will also read the value in shillings. A line is drawn to represent the bore; this is divided with a 20 scale into sections of core represented by one assay (generally 4 ft. 6 in.), and lines are drawn through the centers of each of these sections upon which to plot the assays. These are plotted, the copper to the right, and the gold to the left, of the bore line, which is taken as zero in each case. By joining these plotted points a diagram is obtained of the copper contents to the right, and gold to the left, each reading shillings by a 20 scale.

To obtain the total value of the ore, the gold assays are also plotted upon the copper line, using this line as zero. This gives a figure showing the copper plus gold in shillings per ton. Where dikes occur they are of course plotted in their proper place. By drawing lines parallel to the bore line at 30, 40, 50 and 60 from it, a glance will show what lengths of this bore exceed these values. Of course, the average of any section of the bore can also be obtained from these diagrams by obtaining the area of the section, with a planimeter, and dividing by the length. These graphic representations were useful and by them it was easier to estimate quantities than with the list of values upon the assay plan or in the assay book.

Stope Production Card

As previously mentioned at the end of each four weeks, a card is prepared, showing the production and value of each floor and stope worked during period. As it was impracticable to weigh separately the ore coming from each floor and stope, the information required to fill in the card was procured as follows:

All ore sent from the mine to the works passes over a weighbridge so the actual tonnage delivered by the mine is accurately known. On the last day of each period, the tonnage in the mine hoppers and lying unbroken in the mine (very little ore is kept broken underground) is estimated. By deducting from or adding to the tonnage actually delivered by the mine, the difference between this stock and that carried from the previous month, the total tonnage broken is obtained. The ore obtained from development work (winzes, drives, etc.) is estimated by its cubic content and subtracted from the tonnage broken, and then the number of sets mined during the period is divided into the remainder, which gives a tonnage per set for the period. As each set is assayed, the average of the assays in each stope of each floor gives the value per ton, and the number of sets the tonnage.

It is evident that errors can occur in this method, as the stock may be under or over estimated, but over a period of, say six months, as the stock is carried forward each four weeks, these errors should balance each other. They cannot be cumulative. Also the contents are obtained on the assumption that each set supplies the same tonnage which, although not individually correct, must be accurate over a period as all the timber is cut in a sawmill to a uniform size. After this card had been completed, but not before, the value of the mine product for the four weeks was compared with the average of the works' daily samples taken after the ore had been crushed. It was the way in which these two estimates of the mine product, obtained from a completely different set of assays, checked that makes me speak so confidently about the accuracy of sampling a deposit like Mount Morgan by borings from machine drills.

Vincent forge was built by William Branson, on French creek in Chester county, Pennsylvania, in 1750. Two or three years later Branson began to make crusible steel, and this is said to have been the first steel made in America.

State Mining Areas of the Transvaal

Special Correspondence

The full text of the mineral lease entered into between the government and Gustav Imroth under the provisions of the Precious and Base Metal Act of 1908 is now published. The lessee, Mr. Imroth, representing Barnato Brothers, has been granted the exclusive right to mine the two government gold-bearing areas of 2633 claims, on the Modderfontein farm on the eastern extension of the Rand.

The lease provides that the lessee shall, on or before Feb. 28, 1910, register a company whose principal object shall be to supply the capital necessary to work the claims. It is provided that the initial capital of the company shall be £1,400,000, £1 shares, of which (1) 175,000 shares shall be offered for subscription to the Transvaal public; (2) 450,000 shares to be paid up in full by the guarantors, Barnato Brothers, prior to registration, and (3) 775,000 shares to be subscribed at par by the guarantors, 2s. per share to be paid prior to registration and the balance as required. The guarantors are also required to take up at par and pay for in full all of the shares offered to the public as may not be applied for. It is, however, unlikely that any of these will be left.

Upon the registration of the company the lessee must assign and transfer to such company free of all consideration all his right, title and interest in and to this lease. The lessee, or the company, must not create nor issue any vendor's, guarantor's or promoter's shares, nor shall he or it pay any underwriting or other commission in the acquisition of the lease or of the provision of the initial capital of the company, and none of the shares of the company are to be issued below par. Operations must be commenced not later than June 1, 1910, unless the Minister of Mines consents to a postponement.

In consideration of granting the above rights the government receives, (1) a tax on the net produce of the mine that shall bear the same ratio to the net produce as the latter bears to the value of the precious metals produced, subject to a minimum of 10 per cent. and a maximum of 50 per cent.; and (2) a further amount computed as follows: when the prime tax does not exceed 20 per cent. of the net produce, 7½ per cent.; exceeding 20 per cent. but not 33⅓ per cent., 10 per cent.; exceeding 33⅓ per cent., but not 49 per cent., 17½ per cent.; exceeding 49 per cent., 22½ per cent. The lease endures until the profitably treatable mineral has been exhausted. The scheme is one of the most interesting yet brought forward in gold mining.

Notes on the Zeehan Mining Field, Tasmania

Tin-Silver-Lead Deposits of Cambrian Age. Montana Mine Has Paid $750,000 in Dividends. Large Percentage of Ore Mined by Tributers

BY GERARD W. WILLIAMS*

The metal-mining fields of Tasmania are all within a comparatively small area in the northwest portion of the island. The tin-lead-silver deposits are due to the presence and influence of the Heemskirk granite *massif*. The genesis of the metalliferous lodes of this area has been clearly shown in the numerous bulletins issued by the government geologists. Few districts in Australia have been more carefully studied and the work of the government geologists has been of great importance from an economic and scientific standpoint.

The entire metalliferous area is rugged and the hills are clothed with heavy timber, interlacing vines and shrubs. The rainfall varies from 120 to 200 in. per annum. The flats are mostly peat bogs covered with tufts of button grass. For many years the middle west and northwest of the island was regarded as an utter waste, and at the beginning of the last century the great penal settlement of Port Macquarie, on the west coast, was chosen for that reason. The penal settlement was abandoned in 1833 and the whole district remained practically unknown for 40 years. In 1871 the Mount Bischoff tin mine was discovered, and pushing out from this center the prospectors opened up the Heemskirk tin fields in 1877 and entered the Zeehan district in 1882. The Mount Lyell field first attracted attention in 1881 as an alluvial goldfield, not as a copper-mining district. Since then many new fields have been opened around Zeehan.

Cambrian and Silurian Rocks

Without exception all the important ore-bearing rocks of Tasmania are of Cambrian and Silurian age. It appears quite certain that the mineralization of these rocks, for the most part sedimentary in origin, took place during the period of great earth movement that characterized the Devonian age in Tasmania and the adjoining mainland. No sedimentary rocks have been found which can with certainty be referred to this period, as the faulted, shattered and metamorphosed Paleozoic strata are overlain by Permian-Carboniferous or younger rocks. The greater portion of the island is overlain by coal-measures. The central portion is covered by post-Devonian flows of diabase and basalt. Consequently the mineral areas are limited to that portion where denudation has exposed the underlying rocks, or which have remained above water since the commencement of Mesozoic time. The small mineralized area is still far from being thoroughly prospected. The natural difficulties are so great, the covering of trees and scrub so dense that it will be many years before the country even in the immediate vicinity of the existing camps is fully examined.

Anticlinal Fold

The rocks of the Zeehan silver-lead field are composed of a basal series of conglomerates overlain conformably by slates, sandstones and interbedded tuffs and melaphyres. The slates are referred to the upper Silurian. A vast anticlinal fold traverses the country north 45 deg. west. The Zeehan mines lie to the north of Mount Zeehan, which represents the eroded crest of the anticline. The lodes are situated in the slates and melaphyres which, subsequent to their first folding, have undergone considerable faulting. The richest lodes are in the most disturbed country.

The entire area has undergone extensive denudation since mineralization of the fissures took place. The present lodes are but the roots of the original fissures. Seven miles to the westward the big Heemskirk granite *massif* outcrops, and as the ore deposits are traced towards the contact, the change both in vein formation and mineral contents is marked. Although most of the Zeehan lodes are true fissure veins, they are frequently subdivided and broken as they approach the series of cross faults that run diagonally across the usual north and south line of the mineral-bearing lodes and exhibit a general "drag" along the lines' of earth movement. In many cases there appears to have been a period of secondary enrichment of the fissures along the line of the cross faults.

Types of Deposits

There are several types of deposits, the most important being:

(1) The magnetite type: These lodes are found in the contact country around Mount Heemskirk and do not properly belong to this district. Cassiterite, galena and blende occur in these veins, but so far they have not proved of any great commercial importance.

(2) The pyrite-cassiterite type: A small lode occurs on one of the most westerly of the Zeehan mines, but several similar lodes have been worked in the district. At present several mines in the Dundas district, a few miles northeast of Zeehan, are opening up on similar lode formation.

(3) The preceding types pass into the magnetite-blende-chalcopyrite-galena-pyrite type. Several of these lodes occur in the Comstock district, four miles west of Zeehan.

(4) The pyrite-galena-blende type which is strongly represented on the western portion of the field. The Oonah mine furnishes a good example of this variety of lode.

(5) The siderite-galena type: This is the most important type on the Zeehan field. The lodes on the Montana mine, which will be described, are perfect examples of the type.

(6) The pyrite-stannite-chalcopyrite type: This interesting type occurs on the Oonah mine and in a neighboring mine similar ore occurs in association with blende and galena.

As the country is traced away from the central granite mass these types overlap and pass gradually from one type to another. The general order of the lodes in relation to the granite contact is well shown in the accompanying diagram compiled by G. A. Waller, assistant government geologist. Varied as these lode formations are they yet seem to possess one common basis of similarity, for so far ore from below 550 ft. in depth has not repaid the cost of development. Few veins extend deeper than 250 ft. The majority have not paid to work below water level. Unfortunately the country rock yields much water, and this fact has certainly militated against exploration in depth.

At present only two mines of importance are working: The Montana and the Oonah, and as each of these mines represents a different type of vein matter a description of the two mines furnishes in effect a description of the leading features of the field. The other mines are given over to tributers; indeed, the bulk of the ore from this field has been mined either by tributers or by small parties of working miners.

The Montana Mine

There are about eight lodes on the property, all of which have been worked more or less. The chief producer is the No. 2 lode, and for the present all development work is confined to this orebody. The lodes are true fissure veins running in a general north and south direction and dip east at an average angle of 65 deg. The lode fissures traverse slates and melaphyres alike without being in any way affected by the nature of the country rock. The most important feature in the mine is the Big Slide, which runs diagonally across the country striking 60 deg. west of north.

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*Mining engineer, Stock Exchange Club, Melbourne, Australia.

THE BIG SLIDE

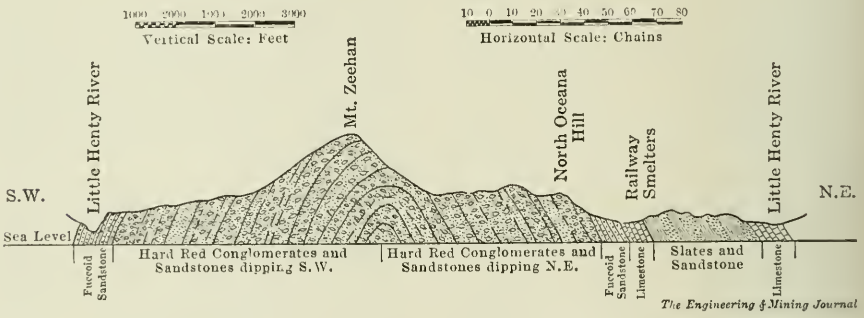
The Big Slide may be described as a zone of crushed and rolled country 150 ft. wide, at the junction of black slates and grayish melaphyre rock. Throughout the mine there are several parallel normal faults, but none of them attain large dimensions. As the lodes approach the Big Slide they becoome broken up and exhibit a marked drag to the westward along the line of earth movement. The crushed country in the fault itself has yielded small patches of ore, but nothing payable has been found in the disturbed country. The lodes, on the other hand, are all enriched in the vicinity of the faults, and particularly in the neighborhood of the Big Slide. Recent development has shown that the No. 2 lode exists north of the fault and important orebodies are now being opened up. Two distinct types of galena can be distinguished in the vicinity of the faults, a cubic form and a dense, finely crystalline variety. In places where the lode expands to a few feet in thickness, the face of the orebody exhibits a concretionary structure, with concentric rings of galena and siderite alternating. The surface ores exhibit none of the ordinary characteristics of secondary enrichment by oxidiation, the galena extending to the grass roots. In lodes occurring in the hills there is usually a capping of argentiferous gossan. The zone of lead carbonates is usually absent. It has been suggested that the peaty waters, which carry humic acid, have effected some concentration of the lodes on the low-lying portions of the field. It is difficult to find direct evidence of this. Pyrite is entirely absent in lodes of the Montana type. I am inclined to the view that the obviously secondary appearance of the richer portion of the lodes was due to a second phase of subterranean enrichment proceeding along the line of the later series of faults and crushed zones.

On the south side of the Big Slide the eight lodes have been carefully explored and 32 miles of development work testifies to the thoroughness with which prospecting was carried out In the 800-ft. workings, and 1000 ft. in the adjoining Spray mine, the vein formation of siderite persists unchanged, but the metal contents are either wanting altogether, or scattered. On the north side of the Big Slide there are indications that the metal contents will extend to a greater depth on the footwall of the slide than was the case when the lodes were followed down under the hanging wall.

The lodes on this mine and of the district in general are similar in nature and occurrence to the older series of lodes in the Freiberg district (Saxony). There are four main types on the latter field: The Noble quartz; the pyritic lead and copper; the tin, and the siderite or Noble lead formation. The first type does not occur in Zeehan, but examples of this type may be found at Mount Farrell, 20 miles distant. The other types occur. The tin deposit is being represented only by a small pyrite-cassiterite vein recently found on the surface of the Oonah lease. The presence of blende in the pyrite deposit and the absence of it in the sideritic veins is common to both fields, as is also a fact that the silver-lead ratio is higher in the sideritic than in the pyritic galena. The pyrite-stannite lodes of the Oonah have no analogue in the Freiberg series.

MINING METHODS

The vein varies in width from a few inches up to two feet, the siderite filling being constant throughout. The galena occurs in the form of irregular masses lying within areas which exhibit a definite relation to the cross faults. In view of the irregular deposit it is necessary to stope the entire vein. Frequently a level will show no trace of metal and a stope may be carried half way up to the next level before ore comes in. The ore is hand-picked in the mine into "firsts" and milling ore; the residual siderite and country rock are used for filling. The stopes are worked on the flat-back system, and owing to the flaky nature of the slate hanging-wall they are carried 6 ft. wide. Little timber is needed, as the filling is kept well up to the face. The mine yields 28,000 gallons of water per hour.



GEOLOGICAL SECTION THROUGH MOUNT ZEEHAN, TASMANIA

WAGES

Miners receive $2 per shift; truckers on contract average $1.92; timbermen $2.10, and engine drivers $2.30 to $2.40. The standard of mine labor on this field is high and compares more than favorably with the best Australian labor. Although there is no official preference for union labor, few non-union men are employed.

The mine produces 150 tons of picked "firsts" per month. The picked ore averages 70 per cent. lead, and 65 to 80 oz. of silver per ton (2240 lb). In addition 1800 tons are sent to the mill, yielding 250 tons of concentrates, containing 65 per cent. lead and 70 oz. silver per ton. The men employed in the mine average 250 in number, of whom 40 are on development work. Starting with an actual capital of $15,000, the mine has about 40 miles of development work on the main and subsidiary leases, a modern mill, and has paid $750,000 in dividends.

METALLURGICAL WORK

The ore from the mine is dumped on a ⅞-in. grizzly, the oversize passing to a jaw breaker which delivers to a ⅞-in. trommel. The undersize from this, together with the undersize from the grizzly, passes to a ½-in. trommel. The oversize from the latter, together with the oversize from the ⅞-in. trommel is sent over a picking table, where it is hand picked by boys. About 2 per cent. of the total ore is removed in the form of 60 per cent. "firsts," and 12.5 per cent. is cast aside for waste. The balance goes to the coarse rolls, where it is joined by the undersize from the ½-in. trommel, which has previously passed over a two-hutch jig for the removal of a coarse concentrates.

The rolls are 14x24 in., set ½ in. apart. They run at 40 r.p.m. From the coarse rolls the ore passes through a series of trommels with circular holes, 13, 9, 5, 3, and 1.6 mm. in diameter. The ore is therefore graduated into six sizes: (1) Over 13 mm.; (2) between 9 and 13; (3) between 5 and 9; (4) between 3 and 5; (5) between 1.5 and 3, and (6) less than 1.5 mm. in diameter.

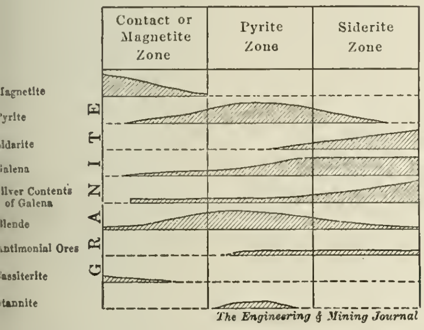
For these products 1 returns to the coarse rolls; 2 passes to a two-compartment jig, the tails returning to the fine rolls; products 3, 4 and 5 pass each to a three-compartment jig; the tails go to waste, but the product from the second and third compartments is elevated to the fine rolls; and 6 goes direct to a hydraulic classifier.

The fine rolls are of the same size as the coarse rolls and run at the same speed, but are set close for friction drive. The product from the rolls passes a 4-mm. trommel, the oversize returning to the fine rolls. The undersize passes a 3-mm. trommel, the oversize being sent to a three-compartment jig. The tails are ejected and the product from the second nd third compartment returned to the olls. The undersize from the 3-mm. rommel passes to a 1.5-mm. screen and s classified as in the case of the 3-mm. roduct. The final undersize is sent to he hydraulic classifier. The latter distributes the fine sands over three Wilfley ables and a Cornish buddle. The middlings from the tables are returned to the lassifier.

THE OONAH MINES

The leases held by this company are ituated on the northwestern portion of he Zeehan field and the characteristics f the lodes are intermediate between the ontana siderite-galena type and the ontact lodes of the Comstock-Heemskirk istricts. There are three distinct types n the property—the pyrite-galena-lende, the copper-pyrite-stannite type nd the pyrite-cassiterite type.

The galena lodes have been worked out everal years. The main galena lode has strike a few degrees west of north and ips at a steep angle to the east. In the orth the lode terminates against what is ither a continuation of the Big Slide in he Montana mine or a parallel movement f a similar nature. As in the latter mine, he lode drags to the west when it comes p against the zone of faulted country. o the west of the main lode a smaller nd similar lode was worked. Neither of hese lodes were profitably worked below 00 ft. in depth.



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IAGRAM OF MINERAL DISTRIBUTION OF ZEEHAN LODES

The Stannite lode is at present the ost important ore deposit in the mine. n addition to stannite, the pyritic gangue f the vein carries appreciable quantities f wolfram, bismuthenite and silver. A icked parcel of 70 tons taken from the pper workings gave 10.7 per cent. coper, 9.2 per cent. tin and 65 oz. of silver. he Stannite lode has been opened 425 ft. n depth and is found to maintain its average ore and width. In width the vein aries from a few inches to 3 ft. and ince the present company started work he ore has average 6.5 per cent. of coper, 3.5 per cent. tin and 30 oz. of silver er ton. It is interesting to note that lthough wolfram is coming into the ore n depth, cassiterite has not yet been dentified in the Stannite lode.

The company is vigorously opening up the Stannite lode and is erecting reduction works capable of treating 80 to 100 tons per day. Another lode, now abandoned, was worked for the rich kaolin cap which carried much silver. In another of the many small lodes in this mine, which have mostly been worked by tributers, the pyrite gangue carried payable quantities of argentite and pyrargyrite.

Another lode, at present mined and concentrated for pyrites, carries about 0.5 per cent. of copper. This lode is worked by tributers. They concentrate the ore, which averages 35 per cent. FeS_2 and ship the concentrates to Melbourne for use in the sulphuric-acid plant. Recently the outcrop of a small pyrite lode was discovered; the vein carries cassiterite and a little chalcopyrite.

METALLURGICAL TREATMENT

The plant consists of a 70-ton, water-jacket blast furnace built with a 30-ft. ore column; a reverberatory furnace; two Leggo roasters and the usual crushing plant. The metallurgists engaged upon the work have had many difficulties to contend with, but it seems almost certain that they have at last evolved a satisfactory treatment. It has been found that by sintering the ore and reducing the sulphur from 27 to about 8 per cent. and then smelting in a high-column furnace the losses due to the volatilization of tin are reduced to a minimum, and that a 2.5: 1 concentration of the tin, copper and silver may be effected without undue slag losses. The matte, after crushing, is roasted in the Leggo furnace and treated in the reverberatory together with picked ore from the mine. The latter will average 8 to 10 per cent. copper and 6 to 7 per cent. tin, as against the smelting ore of 6.5 per cent. copper and 3.5 per cent. tin. By bottoming the major portion of the copper, the bulk of the silver is removed and the slag carrying all the tin and some of the copper can be profitably re-treated in the blast furnace. As a result of this cycle of treatments the management expects to market argentiferous black-copper and tin-copper bullion, small amounts of bismuth-tin-copper alloys which form in the blast furnace.

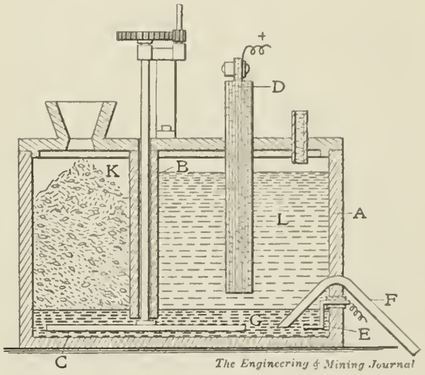
New Mining Law in Spain

The new mining law provides that every proprietor of mines shall submit to the treasury at the end of each three months a detailed report on the output of his property. This report is to particularize as to quantity and quality of the output, and its value, based on the average selling prices quoted during the quarter. A tax of 3 per cent. on the value of the output is then calculated. The mine owner has to sign the declarations required.

Metallic Lead from Galena by an Electrolytic Process

A process for the electrolytic separation of metals from their ores, but especially in connection with the production of metallic lead from galena was patented (U. S. pat. 941,904, Nov. 30, 1909) by Herbert S. Auerbach.

In the accompanying illustration is shown an apparatus suitable for carrying out the process. The vessel *A*, made of, or lined with, fire clay is provided with a cover having a funnel, and extending through it is a tube for the escape of sulphur fumes and gaseous compounds. A partition *B*, reaches almost to the bottom of the vessel, and in this partition is a shaft with a pinion and gear at the upper end for revolving it. At the lower end is a spider *C*. *D* is the carbon electrode and *E* is the other. *F* is a siphon, to draw off the molten lead.



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APPARATUS FOR PRODUCING ELECTROLYTIC LEAD

Metallic lead *G*, is placed in the bottom of the furnace, the ore in the compartment *K*, and heat applied to melt the lead. The ore partially dissolves in the molten lead which acts as a collector. An electrolyte, *L* (which may consist of almost any haloid salt of the alkali or alkaline earth metals) is now added and fused by heat. An electric current is passed through the molten liquid from the carbon *D*, to the electrode *E*; the halogen gases are freed, while aluminum, sodium, calcium or potassium (depending on the bath employed) is liberated from the electrolyte and forms an alloy with or is dissolved in the molten lead. The liberated metal or metals combine with the lead sulphide in solution or alloyed with the metallic lead, forming sulphides of the attacking metals and reducing lead sulphide. The new sulphides formed are decomposed by the electric current, the sulphur going off as a gas, while the liberated metals or metals of the alkali or alkaline earths again attack the lead sulphide and the process as described is repeated. Metallic lead is thus continuously produced and sulphur is distilled off at the surface of the electrolyte.

Growth of American and Australian Mining Law

American Law Evolved from Experience in California after Rush of '49; Leasehold System Proved Superior to Freehold in Australia

BY A. C. VEATCH*

The discovery of workable alluvial gold in California in 1848 marks the beginning of American mining law, and in like manner a similar discovery in Victoria and New South Wales in 1851 marks the beginning of Australian mining law. To link these countries even more closely, it may be noted that the opening of the Australian goldfields was due to the return of persons who had been attracted by the California rush and their application to the Australian fields of the knowledge gained in California. Victoria, furthermore, with only three-fifths of the area of California, has today nearly the same population, and between 1851 and 1905 produced gold to the value of $1,365,000,000, while California produced between 1848 and 1905, $1,400,000,000. The Victoria gold production in 1905 was about $16,000,000, while almost $19,000,000 was produced in California.

Inauguration of Freehold System

Previous to these discoveries, in both America and Australia, several more or less abortive attempts had been made at mining legislation. In each case some of the early grants contained reservations of certain minerals, others did not. In America an attempt had been made at leasing lead- and copper-bearing lands, and in 1845 President Polk recommended the abolition of this system and the selling of the lands outright. This recommendation was followed by the acts of July 11, 1846, as regards the lead of the Mississippi valley; of March 1, 1847, as regards the mineral lands of the Lake Superior land district in Michigan; and of March 3, 1847, as regards the mineral lands in the Chippewa district of Wisconsin. The minimum price fixed for these lands was $5 per acre.

In 1840, in like manner, the British Secretary of State, Lord Russell, announced his opinion in a letter to the Governor-in-chief of New South Wales, Van Diemen's Land and their dependencies, as follows: "All deeds of grant throughout the whole of the colony should henceforth convey to the purchaser everything below and everything above the surface. Neither would I reserve lands merely because supposed, or even certainly known, to contain useful mineral substances. The small amount of profit derived from mines throughout the great extent of the British colonial empire would appear to us sufficient reason why such reservations would, as a general rule, be as unnecessary as they would be inconvenient to the progress of the settlement."

And the Land Regulations of the colony, dated March 1, 1843, contains the statement that "all deeds of grant from the Crown will be issued . . . conveying all that is above and all that is beneath the surface," except that in certain areas coal will be reserved until 1862, and that "precious minerals or metals may also be reserved if it be known that they greatly abound, but not otherwise." In 1846 an attempt was made in South Australia and Western Australia to reserve to the government one-fifteenth of all metals and ores containing metals, and to issue mining leases at this royalty of 6⅔ per cent. This was of particular importance in South Australia because of the copper mines which were then being developed there, and here again a close parallel is found in American history in the copper leases issued in the Superior district between 1843 and 1846 at a royalty of 6 per cent.

In 1849 this plan was abolished and an act was passed in South Australia waiving the reservation contained in all grants previous to that date. In February, 1850, the governor of New South Wales issued a proclamation declaring that the reservations of coal contained in certain grants before that date were forever abandoned. Mineral lands were sold throughout Australia in much the same way as other lands, and at a minimum price of £1 per acre.

It thus happened that in both the United States and Australia at the time of the discovery of gold the governments had abandoned both the plan of reserving minerals in deeds of grant and of such mineral areas as were found under much the same conditions as other lands. In America the abolition of any system of mineral leasing or reservation was recommended by President Polk because of the difficulty of collecting rents, the cost of administering the system and the irritation of the people. In Australia the matter was placed on the rather broader grounds that the development of the country would be promoted by such a change.

No Law in California in '49

Had only small amounts of gold been found there is little doubt that such auriferous lands would have been sold in the same way as other lands, as had been done in South Australia some years before, and that in time a system of mineral-land law would have been gradually evolved which would have had little in common with the present American law, and which might or might not have resembled the Australian law. But in both America and Australia the discoveries were not small; they were of such enormous magnitude that they made the whole world pause, and resulted in two of the most stupendous gold rushes ever know. Both California and that portion of southeastern Australia where gold was found, including portions of New South Wales and Victoria, were thinly settled regions, and the influx of an enormous population, gold-mad, at once produced a crisis. The new population many times exceeded the old, and, as many of the older residents holding positions under the Government resigned their offices and joined the gold-seekers, the preservation of law and order became a serious matter.

In California the discovery of gold followed on the heels of the Mexican war. The district where the gold was found was under military government, and it continued to be so governed until the admission of California into the Union in September, 1850. The region was far from the seat of Government, communication was slow and uncertain and the whole future course of the mineral law for many years, as it has proved, depended upon the action of the man on the spot. This man, Colonel Mason, proclaimed on Feb. 12, 1848, that, "From and after this date the Mexican laws and customs now prevailing in California relative to the denouncement of mines are hereby abolished." This proclamation, so far as this region was concerned, did away with whatever vestiges of mining law then existed and left Colonel Mason free either to promulgate and enforce adequate provisions, having for their object the safeguarding of the future interests of the community, or to allow the miners to "fight it out among themselves." Colonel Mason visited the fields and was so appalled by the magnitude of the task before him that he announced:

"It was a matter of serious reflection with me how I could secure to the Government certain rents or fees for the privilege of procuring this gold; but upon considering the large extent of country, the character of the people engaged and the small scattered force at my command, I resolved not to interfere, but permit all to work freely."

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*Geologist, U. S. Geological Survey, Washington, D. C.

Thus did Colonel Mason fail utterly to meet the great emergency with which he was confronted, and there followed a period of excess, crime and lawlessness which forms a disgraceful episode in our national history. Left to themselves, the miners were forced to form local organizations and vigilance committees for the administration of a rude justice and for the partial preservation of order. Each locality promulgated certain evident regulations regarding the right of a discoverer to a claim, and the essential condition of development as the necessary requisite for the retention of title. These primitive and fundamental mining-law conceptions, which spontaneously assert themselves in all regions when the demand arises, were soon followed by other regulations of a more local or special application.

Origin of Extralateral Rights

The most important of these special regulations, and the one which has exerted the most far-reaching effect on the mining industry of the United States, is that relating to extralateral rights, whereby the holder of the apex of a reef is considered to be entitled to all the underlay of the reef within the extension of his end lines. This is a distortion of the right of the discoverer, and originated under much the same conditions as that other impossibility of American mining law, the assertion that only a discovery can initiate the right to a mining holding.

Both these doctrines naturally found expression in the Australian mining law, but Australia, after giving both a careful test, abandoned them and herein is illustrated the basic difference between American and Australian in the matter of mining legislation. Starting from the same point and based on the same fundamental principles, developing along the same lines and under much the same conditions, the American law is essentially where it was over 50 years ago while the Australian laws have been progressively improved. After fair trial, the Australians have rejected what was bad and have produced enactments which much more fully protect the rights of all concerned than those which are today found on American statute books.

Whatever may have been the original utility of the discovery and extralateral-right provisions, the need of such provisions has long since passed. The discovery doctrine has been responsible for more essentially false declarations than probably any other enactment on the American statute books. The extralateral-right doctrine has resulted in an endless amount of litigation, involving the absolutely unproductive expenditure of millions, and, unless firm and decided action is taken at this late day, the end is not yet. Fully realizing the difficulties which beset any endeavor to undo the harm which has been done, it is confidently believed that an entirely equitable solution of this difficulty can be propounded. All the leading mining men in Australia with whom the matter has been discussed regard the matter susceptible of such a solution.

The Federal Government followed the policy of Colonel Mason, and did nothing. The matters which led up to the Civil War were then of overshadowing importance, and the affairs of the distant State of California seemed of small moment in comparison. The war followed, and it was thus almost twenty years before any action was taken by the National Government relative to mineral-land laws. The enactment of 1866 did little more than legalize whatever customs or regulations might be found locally agreeable after that date, provided they did not change the more fundamental of those which had been already established and incorporated in the law. The majority of the western Congressmen were at this time, as now, strong, able men, interested in and benefitted by the existing state of affairs, and unwilling or unable to look at the matter in any way than from the standpoint of their own selfish ends. Such is the origin and essentially the present condition of the mining law in the United States, for the Act of 1872 did not materially affect the underlying principles enunciated in the Act of 1866.

Common Law Right of the Government

At the time of the discovery of gold, New South Wales and Victoria were, measured in the time required for the journey, but little further from the seat of government in London than California was from Washington. In New South Wales and Victoria there were partially elective legislatures but the Governor was all-powerful, and the conditions of autocratic administration found in California was paralleled by those in these colonies. In New South Wales the existing order of affairs had been established for over half a century, and there was in existence machinery for the administration of justice based on the English law. In the Victorian portion of the colony this had been true for only 15 years, but, while this gave an advantage not found in the Californian situation, the presence on the goldfields of large numbers of convicts who had been transported to Tasmania and New South Wales gave rise to a state of affairs which, so far as the preservation of order was concerned, certainly equalled, if it did not exceed in lawlessness that in California.

The matter here, as in California, resolved itself into a question of the power of the man on the spot, and in Australia the man for the task was not wanting. While recognizing that the existing force was entirely inadequate to cope with the emergency, Governor Fitzroy, of New South Wales, which then included Victoria, did not follow Colonel Mason's example and let the men fight it out among themselves, but said in effect: "Order must be preserved, and if the preservation of order requires a larger force and a greatly increased expenditure, it is but right that those who will be most protected and benefited (the miners) should pay for it." This reasoning led to the first two acts of goldfield law in Australia—the issuing by Governor Fitzroy of a proclamation on May 22, 1851, and of regulations covering gold-digging licenses on the following day.

This proclamation asserted the common law right of the Crown or Government to "all mines of gold and all gold in its natural place of deposit . . . whether on the lands of Her Majesty or Her Majesty's subjects," and warned all persons that anyone removing any gold, or digging for or disturbing the soil in search of such gold, without being duly authorized, would be prosecuted both criminally and civilly, and notified all persons that "such regulations . . . as may be found expedient will be speedily prepared and published, setting forth the terms on which licenses will be issued for this purpose."

This assertion of the common law right of the Government to all precious metals, while correct in law, was clearly an emergency proceeding, as it was in direct violation of the principles which had been announced in Lord Russell's despatch of 1840 and in the Land Regulations of New South Wales of 1840 and 1843. It might be pointed out that a similar proclamation was possible in California without evoking the common law right of the Government if Colonel Mason had desired to avoid it, because practically all the gold was obtained from public lands, and the remainder was entirely from Spanish grants in which the precious metals had not passed to the freeholder. The matter thus lay even more fully in the hands of Colonel Mason than it did in the hands of the Governor of New South Wales. There was in the United States at that time no law providing for free search on public lands, and the "diggers" were, as in Australia, legally trespassers.

High Mining Fees Exacted

On July 1, 1851, Victoria was formally separated from New South Wales, and on Aug. 15 and 18 Lieutenant-governor Latrobe repeated the proclamations and regulations issued by Governor Fitzroy the preceding May. Those in New South Wales seemed to have been rather better suited to the needs of the case than those of Victoria, and were received with much more general satisfaction by the "diggers." In April, 1852, Governor Fitzroy visited the diggings, and everywhere he was thanked by the miners for the tranquil and prosperous state of the extensive gold-bearing districts, which was due, in their opinion, to the wise goldfield regulations, to the police force established and to the care evidenced by the Government in maintaining order. New South Wales was at this time producing several million dollars more gold per year than is now being obtained from Alaska, and the situation offers a striking contrast to the early days in California and one which does not redound to the credit of the United States.

In Victoria, which was the center of the excitement, the early period was not passed so successfully. While this may have been due in part to the greater magnitude of the operations (Victoria was then producing over £200,000 of gold per week), it seems to have been due more to certain ill-advised regulations, to opportunities which these regulations opened up for blackmailing and grafting on the part of some of the petty officials, and to the misconduct and misjudgment of some of these officers. The regulations of Aug. 18, 1851, which became effective on Sept. 1, and which fixed the license fee at the considerable figure of 30s. per month, were followed on Dec. 1 by new regulations increasing this fee to £3 per month, and requiring that every person on the goldfields, including cooks and teamsters, should pay the fee.

This raised a storm of protest and seems to have marked the beginning of the feeling of discontent, which, fed by one official act or another, culminated in the Ballarat riot of 1854. Following the proclamations of the regulations of Dec. 1, 1851, thousands of men assembled, and with decency and order passed resolutions which led to the immediate revocation of the objectionable regulations.

Fines for Unauthorized Mining

During the following summer the partially elective legislative council passed an act to restrain by summary proceedings unauthorized mining on the waste lands of the Crown. In this act there is the first evidence of special tribunals for the decision of mining disputes; provision is made for the appointment of certain officers called gold commissioners, who were empowered to inquire into disputes between miners and determine them in a summary way. This act provided that any person found mining or digging for ore should be liable to a fine, but expressly stated that nothing in the act should be construed to extend to any preliminary search or inquiry for the purpose merely of discovering ore or minerals. This provision was undoubtedly intended to relieve the unsuccessful prospector from the payment of the license fee, but the police did not so interpret it and demanded that every person found on the goldfields should have a license.

As the police received half the fines, they commenced the practice of "digger hunting," which was carried to such an extent and with so many evidences of rank injustice and of collusion between police officers and magistrates, that the matter became one of very serious import to the miners. Another fertile source of discontent lay in the fact that the gold commissioners appointed were mere youngsters of good families, with entirely erroneous ideas of their duties and prerogatives, and, while some of them afterward made good wardens because of the experience gained, their conduct during this critical period was often far from commendable.

The license fee not yielding the protection of their rights for which it was in theory assessed, was regarded by the miners as an odious tax. This feeling of discontent was intensified in the autumn of 1853 by the reduction of the license fee to 10s. in New South Wales, when it was found that the receipts more than met the expenses; and judging from the fact that the fees from gold-diggers' licenses are reported to have amounted to as much as £700,000 per year at this time, it would seem that Victoria might have done likewise. Public opinion was crystallized in the autumn of 1854 by the discharge by a local magistrate of a notorious personage, who had been guilty of many crimes and who had boasted that the magistrate would not convict him, and by the imprisonment of three innocent miners in connection with the case on the perjured evidence of the police officers. A mass meeting was held, at which resolutions were passed demanding the release of the miners. Governor Hotham, who had succeeded Lieutenant-governor Latrobe, was a high-strung navy officer, accustomed to implicit obedience, and not only refused the "demand" but sent soldiers to the spot to enforce order. This led to the inevitable conflict and resulted in the death of 25 miners and 5 soldiers.

The "Miners' Right" Established

This Eureka stockade affair led to the immediate appointment of a Royal Commission to investigate the matters at issue. The report of this commission on March 29, 1855, resulted in the passage, the following June, of a new Goldfields Act, which marks the beginning "of practical legislation, having for its object the advancement of mining, the improvement of the position of the men and the collection, by methods least likely to be burdensome, of reasonable fees for the privilege of mining on Crown lands." This Act of 1855 abolished the license fee of 20s. per month, and substituted for it a document happily called a "Miners' Right," which was issued on payment of 20s. per year.

The act also provided for local courts, composed of a chairman appointed by the Governor, and nine holders of miners' rights elected by the miners of the district. These local courts were empowered to frame regulations in the nature of by-laws to regulate the taking up and working of claims and the settlement of disputes between miners. Five mining districts were created in this year, each of which had its own local court. The gold commissioners were replaced by officers called "wardens," who, with the abolition of the judicial feature of the local courts in 1865 and the reorganization under the name of "mining boards," became very important officials in the administration of the mining law.

This act marks the end of the disturbance on the goldfields. These troubles were primarily conflicts between the miners and the officers of the law, not through the lawlessness of the miners, but through the indiscretions and injustices of the officers of the law, and are to be viewed in a different light from the disturbances in California. One is quite ready to agree with the statements contained in the despatches of Governor Latrobe to the Colonial office in London, that the conduct of the greater number of miners was deserving of all praise, and that life on the goldfields was far more orderly than the precedent of California might have led him to expect, and to indorse the following summary of the matter made in 1869 by a leading Victorian mining man:

"But for the prompt action of the Governor . . . it is certain that a repetition of the atrocities which disgraced California would have been seen in our colony." Changes were made from time to time as new needs arose, and with the passing of the shallow alluvial gold period, the need of a further fundamental change in the law became evident. Another royal commission made an extensive study of the matter, and the Mining Statute of 1865 resulted. This is by many regarded as the mother mining act of Australia.

The enormous developments in Victoria between 1851 and 1865 were certainly, under wise supervision, calculated to develop and fully test a practical mining law, and the Victorian Mining Act of 1865 has therefore taken a foremost place among Australian mining enactments, because it was based on the most experience. Victoria continued its premier position as the principal mineral-producing district in Australia for many years, and during these years the chief judge of the Court of Mines, Robert Molesworth, a man of strong and forceful character, laid in his decisions the broad foundations of Australian mining law and practice as it exists today. Speaking in 1897, Sir Samuel Griffith, then chief justice of the Supreme Court of Queensland and now chief judge of the High Court of the Australian Commonwealth, said: "It is a well known fact that the mining law of Australia was practically made by the decisions of Justice Molesorth and the Supreme Court of Vic- oria."

American Law Repudiates First Principles

One of the first-recognized and funda- ental principles of both the American nd Australian mining laws was that no laim could be held without development. t was considered but fair that if one an did not work the ground another hould be permitted to do so. This was ot due to any abstract theorizing in the ealms of political economy; it was a doc- rine which appealed to all men as fair, nd one which was not more firmly held n Australia than in America. In Amer- ca, however, this fundamental idea was oon lost sight of, and became obscured y other considerations.

The conclusion so evident in the early ays of the gold rushes, that a man ould constantly work only one claim, as obscured by the introduction of cap- al, whereby the labor condition on many laims could be fulfilled by hired work- en. This led to the provision that any erson could hold any number of claims, nd when, after the subsidence of the irst excitement, the remaining holders greed among themselves regarding a odification of the condition of continu- us development, and there resulted an xpression of the development condition n money per year which made it possible or a speculator to hold any number of laims, the result was but little short of he absolute abandonment of the original dea. The final step in the absolute nega- ion of this fundamental principle was aken when it was provided that at the xpiration of five years a holder could urchase the fee simple.

A freehold, as applied to mining, means he waiving of the fundamental condi- ion of development for all time. Start- ng from a common-sense basis which pontaneously appeals to all men, the merican mining law developed amid cenes of the wildest description, and was o distorted to meet entirely selfish ends hat when the Government finally con- luded to do nothing more than recognize his product, it had practically repudiated he principles from which it had sprung.

Australia, on the other hand, has logic- lly followed out the principle thus orced upon it by the necessities of the old rush of the 50's. It has continued o hold *bona-fide* development, i.e., the easonably continuous labor of one man or each one man's ground contained in claim, as the essential condition for he retention of title. It has not reduced his condition, as has been done in Amer- ca, to such a point that a man can even ully comply with the letter of the law nd yet hold a claim without real devel- pment.

When the growth of the mining indus- ry showed the necessity of some form of enure other than a claim, the lease followed as a logical result. Only under leasehold tenure is it possible to enforce the condition that "if one man will not work the ground, another should be permitted to do so." This is not Government ownership in the abstract sense, it is only the Government guaranteeing the exercise of a right which miners have asserted in all free countries. Starting at the same point, and from the same basic conception as the American law, the Australian law developed under conditions of order, and the result represents the combined efforts of miners, business men and statesmen to frame a law which to the greatest possible degree would conserve the rights of the miners, the prospector and the developer, and yet would fully protect the interests of the country at large.

Minerals Not Owned by Australian Freeholder

As has been shown, at the time of the discovery of gold in Australia, the Government had abandoned any idea of reserving either mineral lands or the minerals contained in such lands. In 1840 and again in 1843 the Government announced that every grant would convey all minerals. Had deposits of only small consequence been found, and requests been pushed for the waivure of all government rights, such requests, under the conditions existing before the discovery of gold, would doubtless have been granted.

In South Australia, the only colony then known to contain metalliferous deposits of consequence, and where a gold mine had been worked as early as 1846, such a request was indeed made and granted by the House government in 1849, and the Legislative Council promptly passed an act waiving all reservations in previous grants. In New South Wales, of which Victoria then formed a part, coal was the only mineral which had proved of commercial importance, and reservations of coal had from time to time been inserted in grants. In 1850, Governor Fitzroy, evidently in reply to a general request, proclaimed that: "Her present Majesty, being desirous of promoting the welfare of her subjects, has been graciously pleased to direct that all such reservations and the rights incident thereto shall be abandoned." But no definite legislative action was taken in any part of the Australian states confirming the ownership of the gold to the freeholder who held land under a deed of grant without reservations.

This lack of action was apparently due to the fact that outside of South Australia the question of mineral reservations was of little importance, and because the freeholders with deeds of grant without reservations very naturally thought they owned the gold. The feeling in this respect found ample support in the statements in the despatches from the Colonial Land Board to the Secretary of State, Lord Russell, in 1840,[1] in Lord Russell's despatch to the Governor of New South Wales in 1840,[2] in the provisions in the Land Regulations of South Australia and New South Wales of 1840,[3] in the New South Wales Land Regulations of 1843,[4] and in the despatch from the Secretary of State to the Governor of South Australia in 1845[5]; in all of which the opinion is expressed that grants without reservations convey everything.

Under the circumstances the assertion of the common-law right of the Government to the precious metals "whether in the lands of Her Majesty or Her Majesty's subjects," which was made in New South Wales in May, 1851, and repeated in Victoria in August, 1851, following the separation of the latter from the former, did not pass unchallenged. There were bitter denunciations of this "invasion of vested rights" and the battle was largely fought out in Victoria. In this state the point was of more importance than in any other states, because of the great value of the gold finds and the fact that here none of the early grants contained reservations of the precious metals; indeed no such reservation was inserted until after May, 1873.

In the first case involving this point (Land vs. Hannah) it was decided in February, 1861, that "gold in land alienated from the Crown still belongs to the Crown and does not pass to the grantee." In 1863 (Miller vs. Wildish) it was again held "all gold mines belong to the Crown, and though the Crown may have granted the lands containing them to a subject without reservation, the gold under the grantee's land is not his, and neither he nor anyone else has a right as against the Crown to take it." This matter repeatedly presented itself in the courts for the next few years and was always decided by the Victorian courts in the same way, though the New South Wales courts rendered decisions adverse to the Government.

In 1876 an appeal (Woolley vs. Attorney General of Victoria) was taken to the court of last resort under the English law, the Privy Council, where the decisions of the Victorian courts were sustained in 1877: "A Crown grant does not pass to the grantee royal mines (that is, gold and silver) that may be found under the land included in the grant, unless the intention that such minerals should pass is expressly stated in the grant in apt and precise words"; and the matter was finally settled.[1] The court here held, in substance, that the expression of opinion in the several despatches of the British secretaries of state, and their instructions to the colonial governors were, in the absence of any specific granting clause in the conveyance, not conclusive, neither were the provisions in this respect in the Land Regulations of 1840 and 1843.

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[1] *English Parliamentary Papers*, Sess. 1840, Vol. 33, No. 613, p. 11.

[2] *English Parliamentary Papers*, Sess. 1840, Vol. 33, p. 395.

[3] *South Australian Government Gazette*, Nov. 11, 1840. *New South Wales Gazette*, Dec. 9, 1840 p. 1327.

[4] *New South Wales Government Gazette*, March 1, 1843, p. 312.

[5] *English Parliamentary Paper*, Sess. 1846, Vol. 24, No. 706, p. 50.

ENGLISH COMMON LAW BINDING IN AMERICA

In this connection it may be pointed out that no conclusive action has ever been taken in the United States conveying the precious metals to the freeholder. Chief Justice Field, in 1861, in the case of Moore vs. Smaw (17 California 199), in which this doctrine was not directly involved for the issue could be clearly defined only by the Government becoming a party to the suit, expressed the opinion that the doctrine was inapplicable to American institutions because the right to the precious metals was "the personal prerogative of the British ruler and not an incident of sovereignty." This conclusion, however, was questioned in 1873 (Gold Hill Quartz Mining Company vs. Ish, 5 Oregon 194), where the court referred to the principle as conceded that "mines of precious metals belong to the eminent domain of the political sovereign."

Some time before the American War of Independence the English royal family definitely relinquished to the State all public lands and royal mines, and any question which may have remained regarding the exercise by the State (the *de facto* sovereign under constitutional government) of those functions which before the existence of constitutional government were vested solely in the king, were forever settled. The right to the precious metals is in Australia to-day clearly exercised as an incident of sovereignty.

One should bear in mind in reading Australian law that the term "Crown" is here but a synonym for "Government," and that the phrases "Crown Lands." "Crown Land Acts" and "Crown Grants" mean exactly the same in every way as the American expressions "Public Lands," "Public Land Laws" and "Government Patents." The disposal of the Crown or public lands and the revenues derived therefrom are absolutely under the control of the elective legislature or parliament of the country or colony in question. The ownership of all the "Crown Lands" in Australia is as much a personal prerogative of the English king as the ownership of the minerals, and it is quite as logical to deny the sovereign right of the United States to its public lands on the basis that such lands are in the English colonies called "Crown Lands" as it is to deny its sovereign right to the precious metals.

Furthermore, the doctrine has long been accepted by the American courts that the English common law is, in the absence of any specific legislative modification, binding in the United States. On this principle as well as on the one that the United States singly and collectively is and are the successors in interest to the rights and privileges of the British government, the precious metals are in the United States the property of the Government. This means that in all States where the Federal Government has never owned the land, and there are 19 such States, the ownership of the precious metals lies with the State Government (in several of the older States this has long been recognized), and that in States where the ownership of the land has been vested in the Federal Government the ownership of the precious metals in like manner lies with the nation, and that as against the Government no person has a right to gold and silver in any lands in the United States unless this right has been specifically granted to him in the deed of conveyance.

The enforcement of this right in the United States, if ever undertaken, will doubtless be carried out in much the same way as in Australia, where it is utilized, not as a means of hoarding these minerals and mines for the exclusive use of the government, but as a means of promoting and permitting development. This prerogative enables the Government to insist on the doctrine, as regards all precious metals, that if the owner of the freehold will not work them or permit someone else to do so, the Government will excercise its right and promote the welfare of the country by permitting the development of these deposits, always, however, providing for the indemnification of the freeholders for loss or damage caused by mining operations.

AUSTRALIAN POLICY TO ENCOURAGE MINING

The assertion of the right of the Government to all precious metals, made on the discovery of gold in Victoria, was not intended to open freehold land to reckless prospecting. Although the Government owned the minerals, it did not have a right to the land, and it could not, without specific legislation, authorize anyone to enter upon such freehold property without the consent of the owner. The first regulations issued in New South Wales on May 23, and in Victoria on Aug. 18, 1851, clearly define the attitude of the Government on this point in the following words:

"With reference to lands alienated in fee simple, the commissioners will not be authorized for the present to issue licenses under these regulations to any persons but the proprietors or persons authorized by them in writing."

The intention of the Crown to insist on license fees for all gold digging on private property suggested in these early regulations was not carried out in Victoria as it was in New South Wales, and the practice speedily grew of tacitly allowing the freeholder to make such arrangements as he chose and to protect those arrangements, the Government making no claim to any of the profits.

In Ballarat and other of the goldfields much difficulty was caused by private holdings. The law previous to the discovery of gold gave to the holders of pastoral leases a preëmptive right to select 640 acres anywhere on their leases, and these lessees at once proceeded to select and purchase aurifierous ground. Although this practice was prohibited after a short time, it was not till extensive areas of mineral lands had passed into private hands. Large tracts were thus locked up and unworked as mines, and often not even prospected, and while miners could generally obtain licenses from the freeholders to enter, it was only on payment of unduly heavy compensation. Attempts were made at once to have these lands opened up to development, but, although one or more bills were introduced at almost every session of Parliament from its first meeting under responsible government in 1856-7, no Mining on Private Property Act was passed until 1884.

Under the present law either leases or claims can be acquired on private lands on payment of compensation for damages, the compensation to be fixed by agreement or, failing agreement, to be assessed by the local mines-department office, the warden. For gold leases a rental of 6d. per acre per year is collected by the Government in the case of lands alienated prior to 1884, and 2s. 6d. for lands alienated since that date. In leases for minerals other than gold which can be granted only to lands alienated since the reservation of all minerals on March 1, 1892, the rental is not to exceed 1d. per acre. The reason for the difference in the rental on gold leases as to lands alienated prior to 1884 and subsequent to that date is apparently to be found in the lesser amount of compensation which can be assessed in the latter case.

AN ANOMALY IN ROYALTIES

In private arrangements between miner and owner the compensation for surface damages frequently takes the form of royalty, and there has thus developed in the administration of this law the anomaly of the miner paying an acreage rental to the Government which has no surface rights, and a royalty to the freeholder who has no claim to the minerals on which the royalty is paid. This unique royalty system in connection with mining on private property was severely criticized by many witnesses before the last Victorian Royal Commission on Gold Mining. In New South Wales the logical course has been followed in the new ines Act of 1906 of abolishing the old ause which permitted the freeholder collect royalty on that which it did not wn, and making such an agreement legal. The New South Wales act now rovides for a rental to the surface owner nd a royalty to the Government.

Areas of private lands on the goldelds proved such a hindrance to deelopment that a demand was at once ade that tracts supposed to be mineral earing should not be alienated. This emand found expression under similar onditions in the United States, but prouced much less tangible and effective esults. In Victoria the first lands act 24 Victoria No. 117, 1860) passed after e discovery of gold, contained theproibitive statement: "No lands known to auriferous or mineral shall be aliented." In the lands act passed two ears later this was changed to the statement: "The Governor in Council may ithdraw from sale as being auriferous mineral . . . any lands about to selected, rented, or purchased," and 1865 this was changed to the rather ore effective provision, under efficient dministration: "The Governor in Counl, if he shall think fit, may withhold may withdraw from sale, selection, or asing any land or allotment." Under ese provisions the practice began of eferring all land papers to the officers dministrating the mines side of the land ffairs for indorsement as to whether or ot the lands might be needed for ming purposes, the Government refusing part with lands which the mines ofcers thought it advisable to hold. This lan has proved successful in Victoria nd other Australian states to a degree stonishing to one familiar with the adinistration of the American land office.

Recognizing that, however efficient a orps might be, it could not be omniscent, e Lands Act of 1869, while continuing ese provisions, added another provideg for the resumption by the Government for mining purposes of any lands, ther than auriferous, on payment of alue. This appears to have been degned not only as a means of remedying e injurious effect of any alienation of ineral land which might have inadertently occurred since the passage of e first land law, but also, and this was e main object, to remedy that which ad been done under regulations passed efore such a need was appreciated.

As the practical difficulty of entering rivate property for the purpose of earching or mining for precious metals ecame more evident, the Government ook the step, in 1872, of reserving in rants of lands sold at the mining town f Buningyong the right to mine at a epth of not less than 180 ft., and to ccupy the surface on payment of amages. On May 8, 1873, a new form f grant was approved which contained e reservation of the right to search and mine for gold on payment of damages. Such a reservation has in one form or another continued to this day. The provisions of this new grant form were included in the next lands act, which was approved Dec. 12, 1884. During this period areas covered by leases and licenses for pastoral purposes were considered as essentially private lands, and in order to obviate the delays and difficulties which were encountered under the provisions of the Mining on Private Property Acts, it was provided in the 1890 Lands Act that there should be "inserted in every lease of a pastoral allotment, and in every lease of a grazing area, the covenant that the lands are demised . . . under the condition that the holder of a miner's right or of a mining lease shall have the right to enter on such areas and search and mine for gold without payment of compensation for surface or other damages."

Mining Lands Should Not Be Sold

The question of the advisability of selling lands containing minerals was gone into at length by the last Royal Commission on Gold Mining, and they reported in 1891 as follows: "The great bulk of the evidence throughout the whole course of the inquiry bears out the opinion that no greater mistake can be made by the State than that of alienating mining lands. There is no necessity whatever for disposing of such areas in fee simple. No use to which the land can be applied requires that it should be sold. On the other hand, experience proves that when land is once alienated it is extremely difficult to enter in and mine upon it. The Mining on Private Property Law does not adequately meet the case. Its operation is cumbersome, expensive and slow; and the only safe course, as it seems to us, is to reserve all mining areas from sale."

As a means to this end, the commission recommended that the "geological survey of the colony be completed with all possible expedition, and the survey of the lands yet remaining in the hands of the Crown should be proceeded with first." One of the immediate results of the recommendations of this commission was the redoubling of the administrative efforts to prevent the alienation of lands supposed to contain minerals, and the incorporation in the Lands Act of 1891 and the Mines Act of the same year, of a provision that grants of land would, after March 1, 1892, convey only surface values, that all minerals would be reserved to the government.

Discretionary Powers of Victorian Officers

The practice is still continued of referring all land applications to the mines department for indorsement of recommendations.

One of the most impressive features of the Victorian mining enactments is the large number of things left to the good judgment of the officers administering them. The mining law as originally enacted rested largely on executive discretion, and in the half century during which it has been in operation there has been no essential change in this respect, although mines acts and mines amendment acts have been numerous. Among mining men there is a general feeling of satisfaction with the administration of the department. In one or two instances there is a suggestion of a weak minister of mines yielding to the importunities of workmen during a strike, and there is some complaint that certain mineral lands were alienated when they should not have been, but the net result is wonderfully good. One American, who had been engaged in mining in Australia for several years, complained that he had not found "palm oil" effective in Australia, a result which his experience in America had not led him to expect. The Australian mining man's comment on this statement was emphatic: "'Palm salve' will not work here. There may be occasionally an official who is slightly off color, but he and the persons treating with him will always take a cropper in short order."

Perhaps it might be suggested from this that a law which leaves things to executive discretion appeals strongly and potently to the Anglo-Saxon's honor. Such a law clearly says, "It's up to you," and may have points of efficiency, from a human standpoint, which a law lacks that is framed on the supposition that, as no man sufficiently honest can be found to administer it, nothing can be left to executive discretion.

Provisions were first made for leasing auriferous lands in October, 1852. The rather excessive demands of the Government of that date, which had been exemplified in the attempt to increase the license fee, were again shown here in the offer of annual leases at a rental of £720 per acre. This rate was determined in this way: At this time one man's ground was fixed at the absurdly small area of 12x12 ft., and 20 men might take up half an acre. Each of these men paid 30s. per month; therefore it was argued that the correct lease fee for an acre was 2 times 12 times 20 times 30s. It is needless to say that no leases were applied for under such conditions. Subsequent regulations provided for leases at a royalty of 5 per cent., but none were applied for until after the passage of the Act of 1857 and the proclamation of regulations fixing the rent at £5 per acre per year. Mining leases were at once applied for from all over the goldfields, and the first of these was issued in 1859.

As to minerals other than gold, the first definite legislative authorization of leases is found in the Lands Act of 1860. The first lease issued under the provisions of this act was for antimony, and bears the date Nov. 13, 1861. A coal lease was issued in 1862, but was antedated May 22, 1861. Several coal leases were issued at this time in widely separated parts of the country.

The mines department has not published since 1891 any data regarding the total areas covered by leases in force at any given time. Up to Dec. 31, 1891, the last date on which the mines department published these data, there had been issued 17,639 gold leases covering 345,473 acres. In 1906 mining leases for 84,546 acres were issued.

Government Leasehold Better than Freehold

Government leasehold, as a method of dealing with minerals, has thus been tried in Victoria for over 50 years, and mining men are a unit in indorsing it as a better method of promoting mining development than freehold. This assertion is based on the statements of the following men: Ager Wynne, member of the House of Representatives, a mining lawyer and capitalist of Melbourne and member of the Victorian Chamber of Mines; F. G. Hughes, vice-president of the Chamber of Mines, a man intimately associated with many large mining concerns; A. H. Merrin, former president of the Chamber of Mines, consulting mining engineer, and now chief mining inspector of Victoria; Henry Gore, a mining engineer and a member of the Victorian Chamber of Mines; and on the statements of the following leaders of the different political factions of Australia: Hon. Alfred Deakin, present prime minister of the Commonwealth; Hon. Joseph Cooke, leader of the Opposition (conservatives and anti-labor) in the House of Representatives; Hon. John Christian Watson, Labor leader of the House of Representatives and premier of the Commonwealth from April to August 1904; Hon. William Hill Irvine, former premier of Victoria, and leader of a section in the House of Representatives, which, while anti-labor, does not entirely agree with the Opposition. Many of these gentlemen are intimately connected with mining, and all are closely in touch with the sentiment of the country in this matter, and they affirm that the mining interests of Australia unanimously indorse leasehold as a better method of promoting mining development than freehold. Clearly, the matter of government leasehold is not a party question; indeed, in Australia it is apparently not a "question" at all.

The Royal Commission on Gold Mining, appointed in 1899 to inquire, among other things, into the best methods of promoting mining developments in Victoria, examined about 500 witnesses and found no man who recommended freehold. This commission, including prominent mining men, capitalists and members of Parliament, instead of recommending freehold as a means to this end, state: "The great bulk of evidence throughout the whole course of the inquiry bears out the opinion that no greater mistake can be made by the State than that of alienating mining lands. There is no necessity whatever for disposing of such areas in fee simple. No use to which the land can be applied requires that it should be sold."

This recommendation is made in a country which has entirely repudiated the doctrine of the nationalization of the land in an agricultural sense, and by some of the very men who have been prominent in this repudiation. The attempt has been made in several of the Australian states to initiate a system of not alienating agricultural lands. In some states this has assumed the form of a perpetual lease, but in all the states, including New Zealand, this doctrine, after trial, has been abandoned. The policy of the nonalienation of mineral lands, the practice of reserving to the Government all minerals and of working minerals on State leasehold, which is now binding on all Australian states and is heartily indorsed, is thus not a socialistic dogma or abstract doctrine of political economy, but an institution founded on actual trial.

Mining in German Southwest Africa

SPECIAL CORRESPONDENCE

A fever of prospecting and promotion has spread over the Luderitz Bay district in German Southwest Africa, resulting in stock operations in Germany which might be criticized. There are now over 80 diamond companies in the district, 25 of which are being made the basis of speculation at the new stock exchange of Luderitz Bay.

Principal Mines

The two main enterprises are the Diamant-Pachtgesellschaft, formed in Berlin to work the diamond properties kept in reserve by the Government, and the Deutsche Diamanters-Gesellschaft m. b H., which works the properties of the Kolonial-Gesellschaft für Südwestafrica.

The former company started its operations in March, 1909, and had produced at the beginning of October 273,701 carats sold at 7,981,312 marks, upon which the state laid a tax of 3,670,000 marks. The expenses represent about [illegible] per cent. of the diamonds saved, the cost price per carat varying from 2 to 10 marks according to the conditions. The selling price of the carat has progressively increased from 22.42 to 33.69 marks. The monthly production is about 45,000 carats.

The diamonds are found on the shore of Luderitz bay, and it is a question whether they come from a submarine deposit or were brought by the Orange river and carried by the sea from the river mouth to the bay. Against the latter hypothesis it is pointed out that the stones do not show any sign of so long a transport. The discovery of two diamonds in andesite in the valley of the Molopo river (British Bechuanaland) aroused interest.

Outside the diamond-bearing sands of Luderitz bay, the mining activity is mostly concentrated in the Otavi copper mines. During the last year the output of the Otavi Minen und Eisenbahn Gesellschaft was 44,200 tons as against 25,700 tons in the previous year. The main mine of Tsumeb is worked to a depth of 70 m. with 230,000 tons of ore in sight. Between April and September, 1909, the company shipped 9700 tons of ore, 1290 tons of lead and 870 tons of matte; besides, 2000 tons of ore and 800 tons of matte are ready to be shipped. It is expected that the daily output will soon reach 300 tons.

In the newly opened mines of Osis and Gushab, rich ores are found yielding 27 to 29 per cent copper. The Otavi Exploration Company, Ltd., will prospect some discoveries made in the dolomitic limestones of the Otavi mountains. Expeditions were sent out by the Anglo-German Copper Company, Ltd., the Hanseatische Land und Minen Exploration Company, the Kaoko Land und Minen Gesellschaft and the Kharas, Exploration Company to look for copper deposits as well as for diamonds and coal.

Mining in Manchuria

The State department has received official assurance that the agreement between China and Japan, relating to mining in Manchuria, affects only the operations of Chinese and Japanese in the district along the South Manchurian and the Antung-Mukden railroads. If minerals are found within the designated territories by Americans or others, no objection will be made to their working mines under concessions granted by China.

Report of Mysore Operations in Kolar Goldfield

During 1909 the battery of 210 stamps of the Mysore Gold Mining Company, Kolar district, India, crushed 234,500 long tons of quartz from which gold to the value of £894,834 was recovered, equal to an extraction of 76.3s. per long ton or 67.9s. ($16.52) per short ton. The most of the gold is won by amalgamation, 83.4 per cent of the total value of the ore being recovered by this process. The ore averaged last year 19dwt., 8 grains of fine gold per ton. The balance of the recovery is obtained by cyanide. The report does not make it clear what amount of gold is won from current tailings and what from stored tailings, of which there are still about 125,000 tons to be treated. The actual tonnage dealt with by the cyanide department was 190,388 tons of tailings. The cyanide and zinc consumption per long ton of tailings was 0.57 and 0.07 lb. respectively.

As regards information about expenditure, the report of the directors, as in former years, is sadly deficient. Except for one short paragraph, which refers to a saving to be effected in the cost of carriage owing to the construction of a new railway siding, no allusion to working costs is made either by the directors or the manager. It is true that a statement of revenue and expenditure is given with a fair amount of detail, but as the figures are not calculated on a tonnage basis, a comparison with previous years is not possible without a good deal of laborious computation. Two tables are given from which the grand totals from the commencement in 1884 to date may be computed, without great loss of time, and these show the following results:

TOTALS AT MYSORE.

Total tons crushed, 1884-1909	2,452,959
Total tons tailings treated	2,105,245
Amount realized	£11,680,522
Total dividends paid	£ 5,935,094
Yield per ton of 2240 lb	91.5 s.
Yield per ton of 2000 lb	81.4 s.
Dividends per ton of 2240 lb	48.4 s.
Dividends per ton of 2000 lb	43.1 s.

The average costs, therefore, including the unknown amount that has been put back as capital for extensions, have been about 43s. per long ton or 38s. ($9.24) per short ton. During the year under review (1909) the costs according to the revenue and expenditure account, which includes London expenditure, amounted to 33.2s. per long ton milled, or, including depreciation and amounts written off machinery and plant, buildings, etc., 36.6s. per ton.

Large Profits Made

These costs will appear high when compared with those of the Rand where, calculated on a similar basis, they were 20s. ($4.86) per ton in 1909, but, as pointed out by Doctor Hatch in his work on the Kolar Goldfield, published as a memoir of the Geological Survey of India 10 years ago, there are special reasons why costs are high. Among these are the occurrence of the ore in pay shoots, necessitating a heavy expenditure in development, the stoping only of high-grade ore, and the heaviness or instability of the ground calling for much timber.

While there is some doubt whether the mine is being worked as economically as it might be, there is no question about the profitable nature of the operations. After putting a large sum to reserve and writing off liberally for depreciation, the company paid last year dividends aggregating 115 per cent. on the nominal capital.

The development of the mine continues to be of a satisfactory character. In the Ribblesdale section the lode is exposed at a depth of over 4000 ft., maintaining its width and richness. In Tennant's section the depth is not far short of 3000 ft At the deepest level the lode is 6 ft. wide and averages over an ounce of gold to the ton. The southern section, McTaggart's, has been less productive during the year than formerly, but it is hoped that the bottom levels will soon pass out of the poor zone that they are now in. The reserves of ore are stated to be over one million tons, which is a four-year's supply for the mill at the present rate of crushing, but the information loses a good deal of its importance owing to the absence of a statement as to the value of the ore.

Premier Diamond Production in the Transvaal

In their annual report, the directors of the Premier (Transvaal) Diamond Mining Company announce that the operations during the year ended Oct. 31, 1909, showed a profit of £438,811, as against £789,963 in 1908 and £875,729 in 1907. Profit in suspense, being diamonds on hand at the end of the year, figured at £355,297.

Production and Quality

The production for the year amounted to 1,872,136 carats, a decrease of 206,688 carats on that of the preceding year. It might be concluded from the difference in the average per carat for the last two years that there has been a further fall in the quality of the diamonds produced. The directors, however, state that this is not so, and give the following reasons: Last year's average of 14s. 9d. was arrived at by including over £500,000 worth of diamonds sold to the diamond syndicate at the full preliminary contract prices. As, however, there was a serious loss sustained on realization of these goods by the syndicate which could not be shown in last year's accounts, it will at once be seen that the average stated was not ultimately realized.

Revaluation of Low Grade Stock Reduces Assets

Further, the stock of about £600,000 brought forward at the end of October, 1908, was realized for the greater part during 1908-9 and, despite all precautions in estimating its value, this has shown a loss on revaluation, chiefly in the lower qualities which it necessarily contained. These lowest qualities have not been reduced in quantity during the year under review, but have to some extent been increased, and the board has written the whole of the stock of that class down to a low level, and has made this year's average carry the whole of the depreciation.

The complete shipments included in the stock on hand at Oct. 31, 1909, have shown marked appreciations against stock prices, the benefit of which will only be reflected in next year's average. The directors claim that when allowance is made for the points above enumerated, there has been no difference in the average quality between the last two years.

Revenue

The realized profits up to Oct. 31 have enabled the company to meet all capital expenditure, liquidate the balance of loss in connection with the diamond syndicate and provide for the two preference dividends for the year. Since its inception, the revenue of the company has amounted to £4,441,918. Against this the company has spent £1,516,696 in equipment, the Government has been paid £1,085,915, dividends amounting to £980,000 have been distributed to stockholders, and trading and emergency funds of £300,000 and £100,000 respectively have been created.

Two Important Iron Ore Deposits of Australia

Iron Island Deposit Consists of Hematite and Magnetite. Koolan Island Contains Larger Bodies in Unexplored Country. Both Low in Phosphorus

BY J. BOWIE WILSON*

Australia is richly endowed with mineral wealth and has greatly benefited by the exploitation of its gold, silver, copper, lead and coal mines. Iron ore has been known for many years, yet this reserve of mineral wealth remains practically untouched. It must surely, in the near future, attract attention and be the means of creating employment for many men and make available new channels for the profitable investment of capital.

Of the Australian States, New South Wales alone possesses iron smelting works. They are at Lithgow, about 100 miles from Sydney, upon the western railway and on the western side of the coastal range of mountains. The supply of ore is from a deposit in the neighborhood. This plant is still in its infancy, and it remains to be seen if it will become the nucleus of a big iron and steel producing industry, or if it will be killed by the competition of already well established works in other parts of the world.

Attention has lately been turned to some of the big deposits of iron ore that occur upon the seaboard of Australia, and on at least two of these leases have been taken up with the idea of developing an exporting trade in iron ore. Although one of these deposits occurs upon the northeastern coast of Australia and the other upon the northwestern coast, both are largely in the same hands; they both occur on small islands close to the mainland and in general position, although separated by the width of the continent, have somewhat similar features. They are known as Iron island and Koolan island.

IRON ISLAND

This island is one of the smallest of the Duke group, which is about midway between Rockhampton and Mackay, on the coast of Queensland, and about 10 miles from the mainland, but outside the Great Barrier key which protects the northern half of Queensland's coast line. The accompanying maps, showing its position and geological structure, are taken from the report of Lionel C. Ball, assistant Government geologist, issued in 1904 as publication No. 194. As will be seen, the island is of small extent, having a maximum length of 20 chains by a width of 8 chains, with the highest point 120 ft. above high-water mark. Mr. Ball describes the geology as follows: "The rock on the western side of the island is a greenish, highly altered trachyte in which there has been a great development of east and west quartz veins, probably formed before the iron was introduced into the adjacent country. On the south side of the island are three outcrops of pure white statuary marble from 10 to 20 ft. across and a chain in length. The ore consists in greater part of cryptocrystalline magnetite, with massive hematite, having a visible trace of impurity."

ANALYSIS OF ORE

A rough surface sample taken from over the whole of the iron-ore area was analyzed at Mount Morgan, as follows:

Water, 0.13 per cent.; silica, 2.51 per cent.; aluminum, 2.95 per cent.; iron, 64.72 per cent.; equivalent magnetite, 89.73 per cent.; equivalent hematite, 91.34 per cent.; manganese, none; lime, 2.85 per cent.; magnesia, 1.07 per cent.; phosphorus, 0.065 per cent.; titanium, none.

IRON ISLAND WHICH NOW FURNISHES THE MOUNT MORGAN COMPANY ITS IRON FLUX FOR SMELTING OPERATIONS

This island was taken up as a mineral lease several years ago by Percy Kean, a Charters Towers prospector, who believed that a deposit of high-grade iron ore situated so favorably for transport must eventually be of value. He formed a small company (The Marble Island Iron and Limestone Company, Ltd.), consisting largely of Charters Towers speculators, to finance the property and do a little prospecting work. In 1907 the Mount Morgan Gold Mining Company was looking for a supply of ironstone to flux the silicious copper ores, and approached the owners of Iron island. After some negotiations an arrangement was made that upon the payment of a fixed royalty per ton and the construction of a jetty and bins from which steamers could load, the Mount Morgan Company could mine 125,000 tons of ironstone. Under this agreement the Mount Morgan Company has already removed 90,000 tons of ironstone, the stone being shipped to Rockhampton and then by rail to Mount Morgan.

MOUNT MORGAN TO ABANDON IRON ISLAND WHEN MANY PEAKS MINE IS IN OPERATION

Upon the completion of the Boyne Valley Railway, which will connect Mount Morgan with the Many Peaks pyrite mine, it is expected that the Mount Morgan Company will stop taking the barren ironstone flux from Iron island, when the property will revert completely to the Marble Island Company with all the improvements put in by the Mount Morgan Company. The Marble Island Company will then have to look for other customers for its ore, but being in the fortunate position of having a quarry opened, equipped with bins, a loading jetty at which the coastal steamers can load, and being on the main route of shipping along the northeastern coast of Australia, the property must remain a valuable one. Although the Mount Morgan Company will have removed over 100,000 tons there will still remain a large quantity of ore. Mr. Ball roughly estimated that there would be over a million tons available above water level.

This contract with the Mount Morgan Company having placed the Marble

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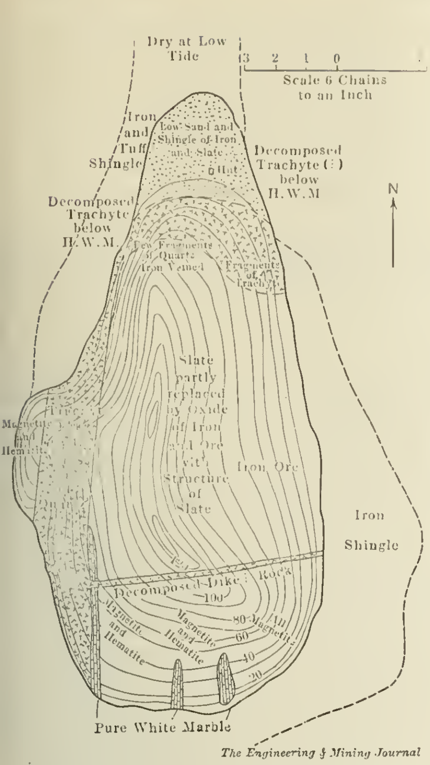
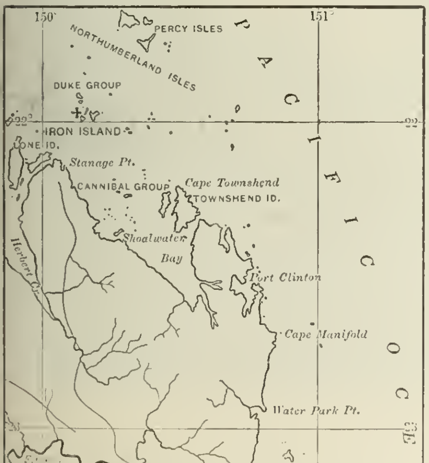
*Consulting mining engineer, Vickery's Chambers, Sydney, N. S. W.


Dry at Low Tide
3 2 1 0
Scale 6 Chains to an Inch
Iron and Tuff Shingle
Low Sand and Shingle of Iron and Slate
Decomposed Trachyte (?) below H.W.M
N
Decomposed Trachyte below H.W.M.
Magnetite
Hematite
Slate partly replaced by Oxide of Iron
Structure of Slate
Iron Ore
Iron Shingle
Rock
Decomposed Dike
Magnetite and Hematite
100
80
60
40
20
Pure White Marble
The Engineering & Mining Journal

Geological Sketch of Iron Island

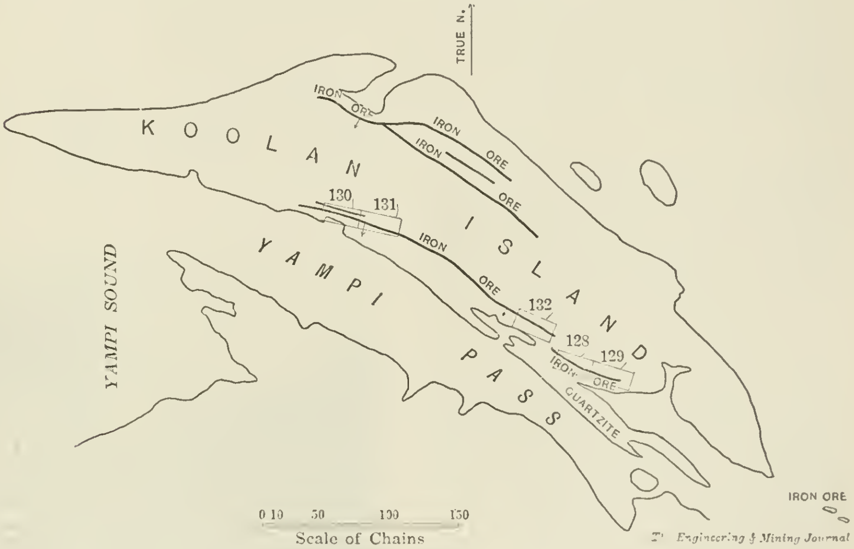
Island company in a satisfactory position, Mr. Kean was encouraged to locate similar ironstone properties. Having heard, when prospecting in Western Australia, of an island upon the northwest coast which seemed somewhat similar to Iron island, Mr. Kean formed, in 1907, the Australian Prospecting Association, Ltd., to investigate the district in West Australia. After a trip up the coast from Derby, Mr. Kean found the deposit and pegged five leases.



Portion of Queensland, Showing Iron Island and Mount Morgan

Koolan Island

This discovery was considered of sufficient importance to induce the West Australian government to send W. D. Campbell, geologist, to Koolan island in June, 1908. The accompanying sketch from his report shows the position of the deposit and also the leases pegged thereon. The island is about eight miles long by one mile wide, and parallel to its greatest length is a series of ridges. Mr. Campbell reports that these ridges consist of sandstones, quartzites and schists, having a strike of S. 62 deg. E and dipping 50 deg. to the south. The iron ore is interbedded in these strata, the outcrops being prominent on the south side of the island. The ore is anhydrous, retains a black metallic luster but is not uniformly magnetic. At the western end of lease No. 130 the iron ore forms the south slope of the ridge, from its summit (350 ft.) to its base at water level. This lode outcrops more or less continuously through the 1½ miles easterly between this point and lease 132, where the general character of the ore is similar.



Koolan Island, Western Australia

The Various Outcrops

In the three western leases the lode appears to vary from four to 50 ft. in width, while in places another smaller lode appears about 50 ft. distant on the northern side. In the orebody there are occasional bars and patches of vissicular iron ore, while sheets of this material appear to accompany the ore in other places. Toward the foot of the cliff in the western leases there are gray micaceous slates and on the opposite side of the shallow bay there are silicious and ocherous beds.

About three-quarters of a mile north of lease No. 131 there is a small steep-sided bay near which iron ore outcrops. The outcrop is about 40 ft. wide, and toward the east it splits into two beds which follow a nearly parallel course, about 20 chains apart; the northern one continues for about a mile, but the southern one a further distance. Both dip to the south and range from five to 25 ft. in width.

It appears that the southern lode will average 20 ft. in width, and as its outcrop has been traced three miles with an average hight of 250 ft. above sea level, and dips at a flat angle an enormous quantity of ore should be available above sea level. Outcropping as it does along a steep ridge, it should be cheaply mined by quarrying, or by tunnels into the lode and then "milling" the ore down chutes.

Analyses of a typical sample gave: Iron, 66.48 per cent.; silica, 4.16 per cent.; sulphur, 0.072 per cent.; phosphorus, 0.064 per cent.; moisture, 0.08 per cent.; combined water, 0.12 per cent.

Economic Conditions

Koolan island has ideal shipping facilities, as the outcrop runs parallel to Yampi passage, an inlet off Yampi sound, with sufficient depth of water to carry steamers. The only difficulty to be incurred will be the big rise and fall of the tides. Yampi sound is about 100 miles north of Derby, a shipping port situated at the head of King sound, on the northwest coast of Australia, and is on the direct route of boats going to Singapore or to the North Australian cattle ports. As a considerable trade in cattle is developing along this coast, cheap freight rates should be available, as ballast is desired for these boats and also by tramps from Singapore.

The island is uninhabited. The mainland opposite, and from which the island is only separated by a narrow channel, is uninhabited, containing only a few wandering aborigines. The district is practically unexplored. The blacks not being trustworthy, and water scarce, it is not a good prospecting country. In opening up the deposit it will be necessary to make Derby the base and communicate with the island by means of small coasting boats, as the large steamers would only call if ample freights were offered. Derby is a settled town, where supplies may be obtained. It has a good jetty and water supply and about 70 steamers call there annually.

The Blackwater Mines at Waiuta, New Zealand

BY SIDNEY FRY *

The Blackwater mines are situated at Waiuta, about 12 miles south of Reefton, the most important mining camp in South island, New Zealand. The orebody, known as the "Birthday Reef," is an auriferous vein lying in the same great gold-bearing belt as the Reefton deposits which it resembles in many ways. The vein, which varies from a few inches to 12 ft. in thickness, is of the "bedded" type and is situated between a greywacke 50 to 100 ft. thick, which forms the hanging wall, and argillites which form the footwall. The ore is white quartz seamed with fine crenulated lines of dark-colored mineral consisting of mispickel, pyrite and stibnite, and containing free gold. Of the sulphides contained by the ore, the arsenopyrite forms by far the major portion. The stibnite occurs in extremely small quantity.

Discovery and Development

The deposit was discovered early in 1906 by a party of prospectors, and was first located by the method known as "spearing." The prospecting spear most generally used in New Zealand, is made of a round rod of wrought iron ⅝ in. in diameter, and having a piece of steel welded into one end which is pointed for driving into the ground. The other end of the rod has a length of round iron 1½ in. in diameter and about 9 in. long, welded to it, and the end of this is faced with steel and worked into a pestle head so that it may be used for crushing quartz in a dolly-pot. In prospecting the procedure is to follow along the backs of the ridges or along the beds of streams, in a direction at right angles to the strike of the bedding planes of the country rock, and where no bedrock is visible, to pierce the layers of surface soil and sound the rock with the end of the spear. This is done at intervals of a few feet, and to a practised ear and hand the sharp clink and hard "feel" of quartz are almost unmistakable.

Shortly after the discovery of the vein the prospectors sold out to a local investor for $10,000, and he, after opening it out to some extent, sold to the Consolidated Goldfields Company for $150,000. This company proceeded to develop the ground vigorously, and at the beginning of 1909 commenced to crush ore. A main shaft was sunk to a depth of 500 ft. and three levels driven on the vein, of which No. 2, called the "Joker" level, comes out at the surface and forms the main road for the ore going to the battery. The ore cars carry about a ton, and are run in trains of six or eight, the full set being run out by gravity and the empties drawn in by a horse.

At the end of the tramway the ore is dumped into a bin, and from this is filled into cars on a self-acting incline or "jig," by which it is lowered into the tipping shed on the battery bin. The "jig" cars, which hold two tons, dump their loads on a grizzly from which the oversize is fed by a shaking trough into a Marsden rock breaker. The undersize is passed along two side chutes, having bottoms of punched plate, with holes ½ in. diameter.

Blackwater Mines at Waiuta, New Zealand

Crushing and Amalgamation

The undersize from these chutes falls into a bin, from which it is fed directly to the tube mill without passing through the batteries. The stamps are thus relieved of much unnecessary work. This divergence from the usual tube-milling practice is the outcome of the ideas of Andrew Watson, the mill superintendent, and has resulted in a considerably increased output, although as yet only one tube mill has been installed. The method is eminently suitable in this case as the ore is often much crushed in the mine and as taken out contains a large proportion of fines. The tube mill is a 16x4-ft. "Burt" mill, with feed and delivery through hollow trunnions. Brown's steel liners are used. The pulp is ground to pass a 25-mesh screen and is then passed over amalgamated copper plates.

The ore is fed to the stamps by automatic suspended "Nelson" feeders which are actuated by tappet rods. There are six 5-stamp batteries, three Prices and three Hendys. The stamps weigh 850 lb., have an 8-in. drop and make 100 drops per minute. The pulp passes through 25-mesh, woven steel-wire screens, thence through a launder to a distributing box, which delivers it to five 12-ft. amalgamated copper plates set at a slope of 1⅜ in. to the foot. The plates are some distance from the front of the mortars. The advantages claimed for this arrangement are (1) absence of vibration and (2) ease of accessibility. Seven plates are laid down, six for constant use and one reserve plate. The latter is used while one of the other plates is being

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*Mining engineer, [illegible] N. Z.

ressed in order that the distribution of ulp may be kept uniform.

CYANIDING

From the plates the pulp passes rough amalgam traps and thence to pitzkasten, the sands from which go on the cyanide leaching vats. The plant or the treatment of the sands consists of even circular steel tanks 20 ft. in diameter and seven feet deep, together with dissolving tank and three sumps; four -compartment zinc extractors, with ompartments 19x26x17 in.; and three -in. centrifugal pumps for handling the yanide solution which is used at 0.3 er cent. strength. The extraction from ne sands is so high that it is not considered necessary to grind them finer than 5-mesh.

The plant for the treatment of the limes from the spitzkasten, although onstructed, has not as yet been placed in operation. It is intended that the dewatered slimes be treated with a 0.3 per cent. cyanide solution in Brown agitation tanks. There are four of these tanks, 10 ft. in diameter and 40 ft. high, built upon substantial foundations cut out of the solid rock. After agitation the slimes will be discharged into three filter tanks where a basket filter will remove the gold solution. The filter when fully charged with slime cake will be washed, and will then discharge its worthless residue into a waste launder which will discharge them into the river.

A Price 6-in. slime pump, with double plungers and a 15-in. stroke, has been installed for raising the slimes into the Brown agitation tanks. For creating the suction for the filter a Burt 6-in. vacuum pump with a 12-in. stroke will be used. An 8-in. single stage, double cylinder compressor of the vertical type will supply compressed air.

GENERAL DATA

Power for the mill is provided by a high-pressure Pelton wheel with a double nozzle 3½ and 2½ in. in diameter and operating under a head of 120 ft., and by a low-pressure Pelton wheel operated by a 6-in. nozzle under a 19-ft. head. The stamps and tube mill are driven by the high-pressure wheel through the medium of a rope drive. The mill is lighted by electricity supplied by a small Westinghouse dynamo yielding 5¼ kw. at 100 volts.

The average cost of mining and milling the ore during the first four months of 1909 was $3.83 per ton. During that period 7039 tons were mined and treated, the total value of gold won being $77,529.60, an average recovery of $11.01 per ton. In May and June, 1909, 4821 tons of ore were mined and treated, yielding $54,024.62, or an average recovery of $11.20 per ton.

Silver-Lead Smelting in Tasmania

BY THEODORE KAPP*

Two fruitless attempts were made to stablish the silver-lead smelting indus-y on the west coast of Tasmania. One meltery was built at Argenton, about our miles from Zeehan on the Zeehan-trahan railway, and another one about a nile from Zeehan beside the Zeehan-Dundas railway. Both of those works vere in blast only a short time, and had stop on account of financially unsatisactory results. In 1898 a third smelery was erected by the Tasmanian Smeltng Company, Ltd. (London), about two niles from Zeehan on the Zeehan-Straan railway. This company, after a long truggle against great difficulties, finally ntroduced silver-lead smelting into this ield.

LOW GRADE REFRACTORY ORES

The problem which had to be solved vas to treat economically the low-grade efractory ores. It was found to be impossible for smelting works to exist on high-grade lead ores only, as European vorks, on account of their cheap wages and supplies, were able to reduce smeltng charges on that class of ore to such an extent that the difference in freight which could be saved by shipping home he silver-lead bullion instead of the ore tself was not big enough to counterbalance the higher costs of treatment.

The larger bodies of low-grade ores in his field are of such a refractory naure that their treatment offered great difiiculties and long remained a financial failure. The most objectionable component of this ore is zinc, which prevents the metallurgist smelting the ores in the usual manner, i.e., for a silver-lead bullion and a heavy matte containing some lead and silver for retreatment. The sulphur which is left in the ore after roasting is for the most part combined with the zinc, and consequently the matte which results from the blast-furnace smelting contains a high percentage of that metal, making it light and preventing its separation from the slag.

It became a necessity to prevent the absorption of precious metals by this matte, and only since experiments in this direction became a success could these ores be treated without financial losses. The business is carried on in the usual manner of custom smelters. The principal supplies of ore are received from the silver-lead mines around Zeehan, and from the low-grade ore deposits of Rosebury, about 17 miles from Zeehan on the Emu Bay railway.

Government reports, as well as the Tasmanian Smelting Company's books, show that the establishment of smelteries not only reduced the export of ores to a minimum, but also increased the total ore output of the district to more than three times its quantity. The quantity of ore which is still being exported (2400 tons per year) is exceptionally high-grade and pure lead ore, which for special reasons is sold to European smelters.

The smelteries were built originally for treating low-grade ores, and during the first years only low-grade ores were bought. On account of the above-mentioned reasons the treatment of those low-grade ores proved a failure, and in 1900 a start was made to treat higher grade lead ores. This was continued during 1901, when the average lead contents of the ore purchased was above 45 per cent. As pointed out, the treatment of high-grade lead ores cannot be profitable on this coast, and the smelting company had to fall back on experimenting with ores of lower grade. At the same time, a then newly discovered process—the Huntington-Heberlein process—was brought into use, and with its assistance the difficulties of treating the lower-grade ores were gradually overcome, with the result that 39,863 tons, with an average lead content of only 22.6 per cent were treated during 1905.

ARRANGEMENT OF PLANT

The Tasmanian Smelting Company's original plant, erected for silver-lead smelting, contained 3 main departments; the crushing and sampling plant connected with an assay office, the roasting plant, and the blast-furnace smelting plant; the whole being supplied with motive power by a central station, and connected by a branch line with the government line of railways from Zeehan to Strahan.

The general arrangement of the present works is still the same as originally, although some additions and alterations became necessary as an outcome of the various experiments which were carried on during the time the works existed. The parallel siding connecting the smeltery with the main railway line gives it an elevation of 90 ft. above the line. On this siding a Howe weighbridge receives the trucks of ore delivered to the company. The scales are self registering and facilitate weighing to the greatest extent.

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*Frankfurt a. M., Germany.

Automatic Weighing and Sampling of Ore

After passing the weighbridge the track forks, one line carrying ores, etc., to the crushing and roasting department, while the other and lower one leads straight to the blast-furnace bins.

The materials passing over the top line are delivered at the sampling mill. The operation of automatic sampling is here applied to the ore after it is crushed into a suitable size. It is first fed into a 9x15-in. Blake crusher, then into two sets of Reliance rolls, and after being lifted it passes through a Bridgman sampler, which cuts out an adequate proportion of the ore stream as a sample. The bulk of the ore after having passed the sampling machine, runs through chutes into trucks which carry it into the respective bins, according to its composition.

These bins are constructed all along the roaster building and have a capacity of about 5000 tons. In addition to the sampling mill, which is able to treat about 100 tons of material per shift of 8 hours, there is a crushing and drying plant of equal capacity. This plant is used mainly for flux and for ores which are delivered in a finely crushed state, both of which contain a considerable amount of moisture. The material which is discharged from the drying plant is carried by a belt conveyor into whatever bins may be chosen for it. All the roaster bins, which are, of course, charged from overhead, have doors on their bottom level, leading to the charge floor of the roasting plant.

Fairbanks scales are fixed at suitable distances to weigh the roasting charges in the most efficient and economical manner. The charges ready for roasting are fed into Huntington-Heberlein roasters, of which 12 are available to perform the process of desulphurization. There is a general flue along the back of the roasters which connects with a roomy dust and condensing chamber, and then with a stack 125 ft. 10 in. high, and 8 ft. inside diameter. This hight insures a good draft and carries off the noxious fumes above the summits of the surrounding hills.

Smelting Department

The ores, after leaving this plant, are ready for smelting, and they are delivered on the same level on which oxidized ores and fluxes for the blast furnace are received direct from the railway trucks. A second system of large bins provides storage room above the blast-furnace charge floor for materials required for the blast-furnace process. The bins are capable of accommodating 4000 tons of ore, 2000 tons of flux, and 1000 tons of coke.

Three lead blast furnaces are available for smelting the mixtures which are made up on two Howe charge scales. The furnaces are of American type, 42x120 in. at the tuyeres. They are 25 ft. high, with a charge column up to 21 ft., and can treat 80 tons of ore per day each. Two are regularly in blast. The fumes from the blast furnaces are discharged above the charge floors by a downtake into the main blast-furnace flue. The latter is large enough to act as a condensing chamber for collecting volatilization products. It is 200 ft. long and is connected with a stack 125 ft. high. The furnace product, silver-lead bullion, is carried on a 2-ft. tramway to the Austral siding for consignment to the shipping port, Strahan. It is exported to England, where it is desilverized and refined.

The slag is tipped over a high dump, the bottom of which is 60 ft. below the blast-furnace tapping floor. It has been tried to granulate the slag and wash it away by running it into a stream of cold water, but as all the water for this purpose had to be artificially lifted, the process did not work economically. Horses are now engaged to pull the big slag cars from the furnaces to the edge of the dump.

Power Plant

The power plant supplying the works with motive power consists of 4 large multitubular boilers of 125 h.p. each, working at a pressure of 100 lb. Three of them are in constant use and provide steam for two Reynolds-Corliss engines of 125 h.p. each, a 75-h.p. Reynolds-Corliss engine, and a smaller steam engine, of 50 h.p. The two first-mentioned engines drive two No. 7½ Roots blowers. They supply 87 cu.ft. of air at each revolution and are guaranteed to work up to 5-lb. pressure. They further provide motive power to the various machines of the fitting shop. The 75-h.p. engine drives the sampling mill, and the smaller engine, the crushing and drying plant.

Until Jan. 1, 1906, this company had disbursed £1,181,900. In 1907 an Edwards furnace was installed to experiment with the treatment of ores carrying higher percentages of sulphur. Debentures to the amount of about £30,000 were issued at this time. In spite of this, the company has not been a financial success, as it has not been able to pay a dividend to its shareholders, and the benefit of its enterprise has been reaped solely by the miners and the State of Tasmania in general.

The Proposed Trans-continental Railway in Western Australia

By Charles G. Gibson*

The preliminary survey for this line begins at Kanowna and passes easterly to Majestic via Bulong and then almost due east across Western Australia to the South Australian border. With reference to the geological features of the country traversed, it may be said that the first 60 miles is a greenstone formation, the next 100 miles is granite and the last 300 miles will extend over a limestone of Tertiary age. The greater part of this belt is covered with extensive recent deposits of sand and loam, and the western portion is fairly well timbered with salmon gum. Immediately along the proposed route, the only rock outcrops of any note are toward Cowarna Rocks, where there are a few low greenstone ridges of small extent and which appear to be almost free from quartz reefs. These outcrops show the country rock to be a fine-grained greenstone, more or less foliated, and similar to that usually found on the Western Australian goldfield.

The greenstones are intersected by occasional granite dikes and masses, one of the most conspicuous of these being Cowarna Rocks. The western boundary of this main auriferous greenstone belt lies about 10 miles west of Cardinia and as shown on the acompanying geological map, runs roughly north and south. East of this line the granite rock is non-auriferous with the exception of a small belt lying immediately west and north of Cardinia, which has a width of about three miles and a length of possibly twenty. The whole country is more or less hilly and broken and in addition to the granite hills there is a series of low greenstone ridges to the west and north. The granite is undoubtedly intrusive and newer than the greenstone. Several small fragmentary areas of the latter can be seen entirely caught up in it.

The Granite Country

From Cardinia eastward for about 100 miles the country is composed entirely of granite. Vegetation is more or less stunted and the drifting sand hills of the interior are gradually encroaching on the old bed of the Ponton river; it is only a matter of a few years until it will be completely obliterated. From the highest point from which a general view can be obtained the country as far as can be seen with field glasses consists of alternating low ridges and valleys all covered with dense growth of mallee and spinifex.

East of the 167th mile the mallee and spinifex give place to oaks and blue bush with scattered salt bush, while the sand planes are replaced by light-colored loam flats. This change marks the approximate junction between the granite country and the Tertiary limestone, which from this point is continuous easterly across the South Australian border and south to the coast. No rock outcrops are visible for a number of miles both east and west of this point. The whole of this limestone area is practically level or at most slightly undulating and is covered with a varying depth of loam beneath which limestone flags can be seen here and there. The elevation of the limestone plateau is 500 to 600 feet.

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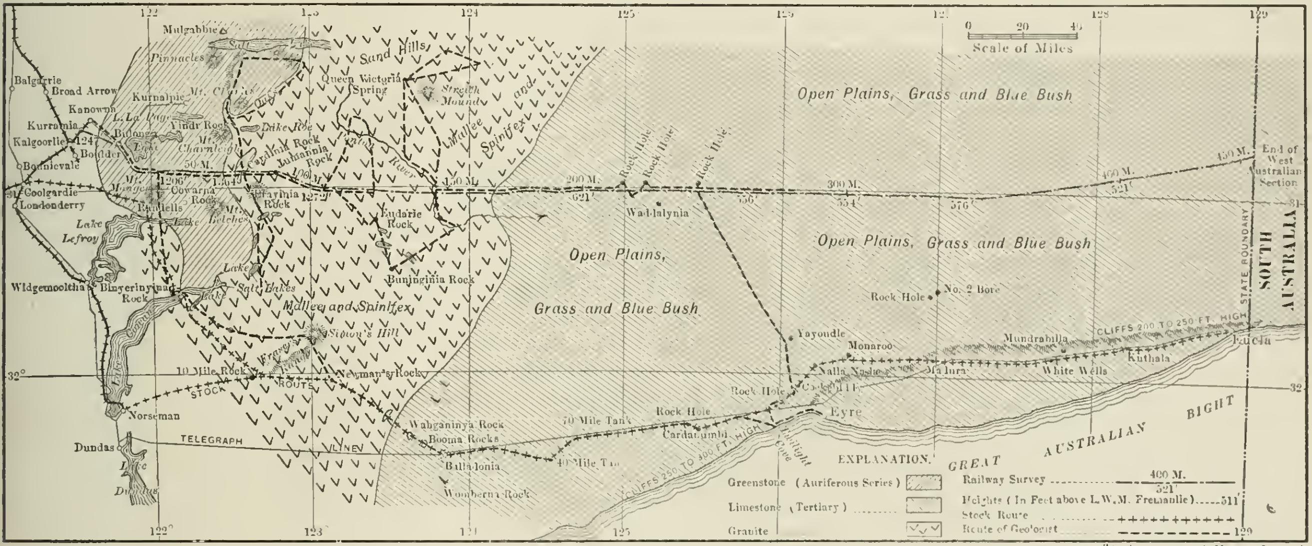
*Assistant government geologist, Perth, West Australia.

Note—Abstract of *Bull.* 37, Western Australia Geological Survey.

The southern edge of the limestone tableland is marked by a fairly regular line of cliffs from Twilight cove rising vertically out of the sea to a hight of 250 to 300 feet.



The Engineering & Mining Journal

SKETCH MAP OF WESTERN AUSTRALIA ALONG THE ROUTE OF THE PROPOSED TRANSCONTINENTAL RAILWAY

MINERAL POSSIBILITIES

As regards the mineral possibilities of the country lying within a distance of 70 miles from the proposed railway, it can be stated that both the granitic and limestone formations occupying most of the country passed over are nonauriferous. With the exception of the one district at the west it holds out no possibility of mineral wealth of any description. Neither can it be said that the construction of the proposed railway will to any great extent open up mineral deposits already discovered, as they are now accessible from other centers.

WATER SUPPLY

The first 180 miles of the proposed line is practically a waterless stretch. Drilling operations have failed to prove the existence of an underground supply of fresh water. Salt water is obtainable at a shallow depth along any of the systems of salt lakes. Along the section of the line over the limestone table-land water will always be procurable by deep boring, but the quality judging by previous results, will be none too good, and in addition it will in all probability have to be pumped from a depth of several hundred feet. The strata which form this table land consist of porous limestone, with underlying soft sandstone and clay shales; these beds appear to be horizontal, although a slight prevailing dip to the south has been ascribed to them. On the north the water-bearing beds do not outcrop, but presumably impinge directly on the granite, and receive a large portion of their water along this junction.

On the South Australian side of the border, water bearing beds exist at a depth of 300 to 500 ft. A second main water bearing series appears to exist at a depth of 1000 to 2000 ft. below the upper one, the intervening porous rocks also being more or less saturated with water. Over the limestone table land the only surface water procurable is found in small rock holes which are more or less circular in the upper crust of the limestone and hold up to 20,000 gal. of water. The usual capacity, however, is 500 to 1000 gal. After a rain they hold water for a comparatively short time only and are not to be relied upon for supply during summer months.

Production of Fuller's Earth

According to statistics collected for "The Mineral Industry," the production of fuller's earth in the United States in 1909 was 29,561 short tons, valued at $289,000. Of the total quantity, Florida produced 24,148 tons; the remainder being contributed by Georgia, Arkansas, California and Texas, in the order named. In 1908 the production was 30,517 short tons.

Bessemer & Lake Erie Railroad

The Bessemer & Lake Erie Railroad, the ore road of the Carnegie Steel Company, hauled 6,745,802 gross tons of ore in 1909, against its previous record of 5,843,186 tons, made in 1907. This was for the Edgar Thomson, Carrie and Duquesne blast furnaces. To Dec. 31 last the road had purchased 366,355 steel ties of the I-beam pattern from the Carnegie Steel Company, having now in service steel ties equivalent to 116.5 miles, but not in straight stretches, as the steel ties have been used largely to replace wooden ties as they gave out, no new wooden ties having been laid for several years. It had 16,917 ties left on hand, and 40,000 due on requisition. Besides these, it is about to place orders for 114,000 ties, and all these will be laid this year, bringing the total track mileage laid in steel ties to about 175 miles at the close of this year. A portion of the new ties will be used for a new second track. The line is now 67 per cent. double track, but by the end of this year will be all double track except for a few miles, embracing three high trestles, which it will require time to fill in. The road will also place orders shortly for additional cars and locomotives. The tonnage of ore to be moved this year has not yet been estimated, but it is expected that a much larger tonnage will be needed than in 1909.

The road was built and is operated almost exclusively for ore and coal traffic, from Erie and Conneaut on Lake Erie to Pittsburg. It has made a record for large trainloads and low ton-mile costs. The earnings of the road in 1909 were $7,112,828 gross and $3,299,087 net. The freight carried was 12,590,030 tons, of which 7,555,298 tons were iron ore. The average cost of carrying freight was 0.23c. per ton-mile.

Observations in Coal Mines of Europe

Remarks Dealing with the Improved Conditions Surrounding the Miners, and Details Concerning the Systems of Flushing and Timbering

BY FRANK HAAS*

We must confess that the Europeans know their business; and when all conditions are taken into consideration, there is really no comparison possible between our methods and those found abroad. A mining operation in Europe is looked on more or less as a perpetual proposition, while in this country the life of a plant is the first item for consideration, and in this we find a partial explanation for the apparently extravagant expenditures in plant equipment so noticeable in all parts of Europe.

In Germany we find the best methods of operation. Drift mining is practically unknown in Germany, and shafting extends from 1000 to 2000 ft. through quicksands and loose material presenting the first, if not the most difficult, feature of German coal mining as compared to our own.

To cover the whole of Europe with a paper appropriate in length is manifestly impossible, so I have chosen one of the principal districts of Germany (Upper Silesia), and will devote my comments to this alone.

The lower seam in Upper Silesia is somewhat of a coking coal and used to some extent as such. As a rule, however, the coals are simply high volatile steam coal and of rather indifferent quality. The coal area of Upper Silesia is grouped together into about twelve large holding companies, of which the kingdom of Prussia is one of the most important.

One of the largest operations in the field is located near the town of Kattowitz and is known as the Cleophas mine. All connected works are considered as one mine and this particular group of mines has six shafts, of which three are used for hoisting. The deepest shaft has five levels—at 413, 513, 1108, 1476 and 1673 ft. respectively. The shafts are elliptical in shape, have solid masonry down to the solid rock, which is encountered at various depths from 200 to 500 ft. The mine operates in six seams—the Upper Cleophas, 11.5 ft. thick; the Middle Cleophas, 4.9 ft. thick; the Lower Cleophas, 6.5 ft. thick, and the Cahart seam, 24.6 ft. thick, these constituting the upper measures, while two seams, the Heitzman seam, 6.5 ft. thick and the Sattel seam, 14.4 ft. thick, are of the lower measures. We have here in one area 68.4 ft. of workable coal, or in round numbers 70,000 tons of coal to the acre, a quantity hardly approached by any region in the soft coals of our Appalachian field. The coal is uniform in character, extremely hard, mines in large lumps, and would be known in this country as splint coal.

The outside improvements of a German coal mine certainly present an impressive appearance. Brick masonry and steel construction throughout, with presumably artistic designs in all structures, but revolting to the principle of economy in first cost. Starting with a brick wall some 8 ft. in hight, with iron gates at the various entrances, the other structures consist of the head frame, always a conspicuous object in the community. In general design these headframes are similar to those of our country, more substantially built, however, by greater weight of steel and broader foundations. The head sheaves are placed in a vertical plane rather than parallel. The power houses are very substantial structures, roomy, handsomely finished inside and scrupulously clean. The tipple and screening house covers a large area and is filled with a mass of machinery, chutes, shaking, knocking and revolving screens with washeries and picking tables closely packed together and attended by over 100 employees. It is to be remarked that the Germans pride themselves on their coal preparation. We grant them this virtue, but practised to excess it adds cost without value in proportion. This fact is admitted, but their claim is that they are in the hands of the heartless consumer, who threatens with little provocation the importation of the better English coal.

BATH HOUSES

The bath house commands attention as one of the principal features of surface equipment. This is a large structure divided into two chambers. On one side are shower baths and on the other side, the larger chamber with very high ceiling, the dressing room and storage room for the clothes. The clothes instead of being put in lockers are fastened by hooks to a chain running to the ceiling or a pulley. A miner is given a key and when the clothes are all hung on the hook he draws them up to the ceiling and locks the chain to the side of the room. These bath rooms accommodate as high as 1000 employees and a shift of 500 men can practically be accommodated at one time. Separate bath houses are provided for boys and women each. The company maintains in a very comfortably equipped building a kindergarten for the children of the miners, which was at the time of my visit accommodating some 300 children. Teachers and nurses are provided and free milk is distributed, not only to the kindergarten but also to miners' houses for children on request. A laundry is also maintained where the women of the community can bring their washing and avail themselves of hot water, drying rooms and mechanical ironing device, operated without charge to the miners by an employee of the company. Playgrounds are provided for children and parks for men. Company houses are built as flats, fine construction with glazed brick and ornamental fronts. Very extensive rescue apparatus stations are maintained. At the Cleophas colliery, 18 sets of Draeger apparatus, together with other appliances, are kept ready for service at a minute's notice. This station is supposed to serve for three shafts or about 4000 men.

The labor in this part of Germany is as nearly foreign as we find it in our country. Poles and Slavs predominate, with Hungarians, Syrians and some Italians. A large part of the labor does not speak German, but each man is supposed to understand it by law. This latter is largely a matter of opinion and consequently the actual conditions are very similar to our own. Women are extensively employed, but only on the surface; the age limit is 14 years. The miners, as a rule, are devout Catholics, and holidays are fully as numerous as with our miners, and the confusion resulting from it is about the same as here.

WOMEN WORK ON TIPPLES

The women who work on the tipples are of a strong and healthy type and apparently satisfied with their work. During the year 1907 the labor was distributed as follows:

Upper Silesia.	Pct. of Total Labor.	Wages Per Day.
Underground miners....	52.1	96c.
Other underground workmen	15.4	90c.
Overground men.......	23.2	72c.
Overground boys.......	4.1	28c.
Overground women.....	5.2	30c.
	100.0	

Hoisting engines which are compound have conical drums. With 1000 h.p. they make one lift of 1,673 ft. in 45 seconds. On each trip six mine cars are brought up in three vertical compartments of the cage. Each compartment of the cage has two mine cars in tandem. The landings f the cages are such that all of the loads re taken off together and empties put n; this arrangement is both at the top nd bottom of the shaft. About ½ minte is consumed in taking off the empties nd putting on six loaded cars. The nine cars are of steel construction with o loose end and can consequently be nade tight with no leakage of dust, vhich, by the way, is considered by the Germans a very important matter. The nine cars are of light construction, narow gage, and contain about 0.6 of a on. A car as small as this at first sight oes not look right, especially as the imit of the output of the mine is fixed y the capacity of a hoist; but after takng into consideration all the advantages f a small car, and particularly the unerground conditions which exist, they re, after all, the best practice, at least so ccepted by all the mines of Germany. On the surface they are readily manœuered in all directions on steel plates vithout tracks, usually by women. The ars are dumped in revolving tipples, our or more in number for each shaft, he coal passing to the various shaking, nocking and revolving screens necesary for the six sizes which are comnonly made and then to picking tables, vhere each size except the smallest is crutinized for impurities by six to eight ersons, usually women and boys, the mpty coal cars finding their way back o their proper deck elevation by elevatng chains and gravity track.

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*[illegible], Consolidation Coal Company, [illegible], W. Va.

[illegible] Abstract of a paper read before the [illegible] Coal Mining Institute at its [illegible] meeting, Huntington, W. Va.

The smallest size of coal is mostly consumed by the power plant of the nine, which at this particular mine consisted of 7000 horsepower.

The power distribution about the mine is mostly electrical. Starting with hightension 300-volt generators in large units, rarely less than 1000 h.p., it is ransformed inside the mine to low-tension direct current for electric lights, but wherever possible it is used as alternating current. Motors are used for fans, pumps, and haulage engines inside. Steam-turbine engines have been used for a number of years and are successful and satisfactory in every respect.

This mine has probably the largest pumping capacity of any mine in Germany. One steam pump with 1650 ft. lift delivers 3696 gal. per min.; a five-stage electric centrifugal pump delivers 2640 gal. the same hight, while an additional electrical unit of 2640 gal. per min. is being installed, which gives a total of practically 9000 gal. of water with 1650 ft. lift.

The Mine Maps Are Less Complete

The Cleophas mine is free from gas, is wet throughout, with no visible dust; the haulways are, however, watered each day. The seams are uniform as regards thickness, but displacement faults are numerous. This gives the maps a ragged appearance. Maps, as a rule, are not in good shape; produced on a small scale they do not show much detail and it leads one to suspect that surveys are not made with the same care and completeness as is done in the best practice in this country.

The levels in each seam are all connected by secondary haulage roads driven in the coal and against the maximum rise about 300 ft. apart; from these secondary haulways, room entries are driven and the rooms worked from these against the rise of the coal, usually to the full hight of the seam. The rooms are 20 ft. wide and 40 ft. centers. The upper rooms are worked to the gob. While this is still the prevailing method, it is alluded to as the old method. It has been found that it is dangerous to the workmen, who worked mostly with ladders, and also resulted in a loss of from 40 per cent. to 50 per cent. of the coal due to the fact that the pillars could not be recovered. The more recent method while in general outline and system practically the same as the old, differs in that, when a room is driven, the void so formed is filled completely with a mixture of sand and ashes. The sand and flushing material, which are transported by water, are introduced from an upper level, the room at the lower level being closed in the meantime by a loose double wooden partition with the space between filled with manure. This is for the purpose of holding the solid material and allowing the water to drain off. The material packs very solidly and when the room is completely filled, the extraction of the adjoining pillar is begun at the bottom and the coal completely removed. The weight is shifted from the pillar to the pack material. The latter becomes very hard as soon as it takes the weight, so much so that it is necessary to shoot it with dynamite when the removal of some of it is necessary. As soon as the pillar coal is taken out this void is also filled with *Bergversatz*, as the gobbing material is called. In this way complete extraction of a certain area is made possible and further prevents any considerable subsidence of the surface which otherwise would be inevitable when several such large seams are extracted.

A Tendency to Spontaneous Combustion

Another feature peculiar to this region and remarkable to us is a tendency to spontaneous combustion of the solid coal when exposed to the ventilating current. In fact, it is more than a tendency, rather the rule, for a pillar of coal to fire if not promptly removed or cut from the ventilating system. It has been found that the flushing system is by far the most effective preventive to this danger yet discovered.

To satisfy myself on this and other points by personal observation, I had occasion to enter one of these chambers while in the process of filling. The room had probably been half filled with sand with practically fresh pillar coal on each side. In spite of the water and sand entering rapidly at the normal temperature of the outside air, the temperature in the room was uncomfortably hot, indicating that the process of oxidation had progressed to a considerable degree on the adjoining pillars and required prompt action to prevent its ignition. Still more remarkable is the fact that after this coal has been mined and thoroughly aërated by the screening process it loses this malicious tendency to ignition even though stocked and stored in huge piles for long intervals.

For reasons just stated, it would be advisable to hold the volume of ventilation to a minimum, and this is done to a certain extent. The result is, however, an atmosphere more or less foul, and this with a comparatively high temperature makes the working conditions more or less disagreeable. It is fortunate, indeed, that no gas is encountered, for with coal liable to spontaneous firing and explosive gases, conditions would arise that would appear almost hopeless.

In an adjoining mine at the Ferdinand shaft still another method is employed in the recovery of coal of the thick seam. This consists in taking out the lower bench of coal, say 6 or 7 ft., flushing this space full of sand, then using this as the bottom, working over the same area with another bench of coal and continuing this three or four times, depending on the hight of the seam, and finally taking out the adjoining pillar in the same way. The advantages claimed for this are more safety to miners who otherwise would have to work on ladders, and also some economy in timber. It was stated that by putting the post with butt end upward they could be drawn out of the sand and used again in the bench worked above. The claim of such recovery is not, however, largely substantiated and it appears very doubtful whether much economy could be charged to this. The difficulties of this system are evident at once in the various elevations of the bench requiring considerable labor in preparing roads to get the coal out of the rooms. The small light cars minimize this expense, however.

The main haulways, even though driven in the coal on the bottom of the seams, have brick side walls with steel cross beams. In the secondary haulways there is also much steel used for cross timbering. The room headings and rooms have enormous amounts of timbers. Posts in rooms are sometimes 30 ft. long, set 5 ft. apart with cross timbers at the top. Very little of this timber is recovered and the cost of timber alone without the labor of setting it amounts to the equivalent of 25c. per ton of coal recovered. The Upper Silesia field has the most favorable timber supply of any in Europe. Considerable timber comes from her own area, but a large part is imported from Russia and Austria. Germany is well advanced in the practice of forestry and it is neither expected nor anticipated that the cost of timber in the future will affect the cost of coal very considerably.

Forestry, by the way, as practised in Europe, would be a very profitable and interesting study to the American mining engineer; like many other things, its importance is not appreciated until its practical and successful application has been observed, or driven to it by dire necessity.

The common type of haulways on the level is by endless rope, passing over the cars. On the secondary headings endless gravity ropes are used, by which the loads pull the empty cars. Horses are also used to some extent, particularly in development work, but they are generally replaced as soon as possible by the rope haul. Electric motors have recently been introduced in the level headings and are considered a success. It is doubtful whether electric motors will be so generally used as in our mines from the fact of the small cars and insufficient head and side clearance, which is now their practice, but above all the miserably kept track. It seems as though the condition of track was of the least consideration in these coal mines. It is true that with endless rope small cars do not require very good track and without making radical changes in their track conditions electric locomotives can never expect to succeed.

FIXED RULES FOR TIMBERING

The system of timbering in German coal mines, of which we have heard so much, illustrates most strikingly the methodical manner characteristic of their work. It is evident that for each mine some preconceived rule is laid down that upright posts must be spaced so many feet apart, and that they must be of specified size. Cross timbering is the rule from post to post; with ordinary roof the cross timbering is both parallel with the advancing face, but in most cases the cross timbering is both parallel and perpendicular to the working face. Five feet is perhaps the usual distance between posts. The timber is mostly black pine and posts are wedge shaped or sharpened somewhat at the bottom, the object of this being to give the support a yielding effect without fracturing the post at once when the weight comes on; this practice is common not only in Continental Europe but Great Britain as well. Carrying out the timbering of a room by fixed rule has many advantages but it eliminates the judgment of the individual miner and is certainly extravagant of timber. With roof good, bad or indifferent, the miner places the specified props at the proper distance and considers his obligation completed with no thought whether the prop is actually needed or whether, judged by the conditions, it is strong enough.

Upper Silesia is the hope of the future fuel supply and it is the field from which any considerable increase of output may be expected. While England may encroach with better and cheaper coal in the seaport trade, Upper Silesia will furnish the bulk of the steam and domestic, with some metallurgical coal for the central and eastern portions of the German Empire.

German Mining Interests in France

SPECIAL CORRESPONDENCE

The chief iron producers in Westphalia and German Lorraine have taken large interests in the iron-ore district of Meurthe et Moselle, either directly or combined with French companies. The well known iron and steel manufacturer, Thyssen, has purchased the extensive concessions of Batilly and Jouaville; the Stumm brothers own the Conflans concession, in the region known as Region des Minettes; the Burbacher Hütte have acquired 589 hectares at Bellevue; Haspe, Hoesch, and Hoerde are jointly owners of the Jarry mine.

Other German companies have preferred to keep themselves in the background and to combine with French firms, so as to be assured of a certain quantity of ore. The Aachner Hütten Actienverein disposes of seven-tenths of the St. Pierremont mine output, where an important shaft is being sunk by the cementing process. The Lothringer Hüttenverein Aumetz-Friede, at Kneuttingen, has made a similar arrangement for four-fifths of the Murville mine output. Mention should be made of the Röchlingenschen Eisen und Stahlwerke at Volklingen a.d. Saar, as representing a most interesting case. This company is, in fact, in copartnership with the Aciéries de Longewy. The latter guarantees the former half of its iron-ore output from its Valleroy mine, and the former company in return guarantees half of its coal output from the "Wurmrevier."

The same may be said of the majority of metallurgical companies on both sides of the border. The companies in French Lorraine import their coke mainly from Westphalia and export important and increasing quantities of iron ore to Germany. The Krupps apparently have not as yet become interested in French Lorraine; on the other hand, they hold an interest in the iron mines in Normandy, where the current ore contracts are said to call for 12,000,000 tons.

The Protection of Boy Labor in Coal Mines

SPECIAL CORRESPONDENCE

The several laws that have been passed in recent years to protect boy labor in the mines, have proved practically abortive through collusion between the parents of the boys and those magistrates and others who were authorized to issue certificates under oath, testifying to the age of the applicant. Probably not in one instance out of ten was the boy the age which was given in the certificate. The consequence was that boys from 10 to 12 years were found working at all hours of the day and night in the breakers, and sometimes in the mines. In recent years something was effected to mitigate this public scandal, but things had reached such a pass that the mine operators coöperated with a number of philanthropists who were interested not only in the boys around the mines, but in all other industries, to have the law passed which is now on the Pennsylvania statute book.

This law provides that any boy who works in the mines shall not be less than 14 for outside work, and not under 16 for inside work, and that the boy shall be able to read and write. A certificate sworn to before a magistrate to that effect, experience shows, would be absolutely of no value to eliminate fraud and perjury. Chief Inspector Roderick, and the inspectors of the various anthracite districts determined that the law for the protection of mining boys at least should not become a dead letter, and that it should be enforced among working boys in and out of the mines.

On Thursday, March 17, Mr. Roderick and a number of mine inspectors met at the Hotel Jermyn in Scranton and after a prolonged discussion, they came to the conclusion that the best way to enforce the law was to see to it personally that every boy working in or around the mines be examined by them individually, in the first place as to whether the boy could read and write; and in the next place, to insure if there was any doubt as to his age, from the appearance of the boy. It was also agreed that the validity of the certificate should be tested by each mine inspector personally in the district over which he has supervision.

It will be an easy matter for the mine inspector to ascertain whether a boy can read and write. He will be taken to the office of the superintendent and examined in a strict, but formal way. If he passes this test, he will then be asked to produce his certificate. If this appears to be doubtful, the boy must bring his baptismal register with him when he comes to work.

Eliminating Dust from Anthracite Breaker

For Less Than $6000 a Dust-collecting System Can Be Installed, Resulting in Fewer Accidents and Increasing the Operating Efficiency

BY J. J. JONES

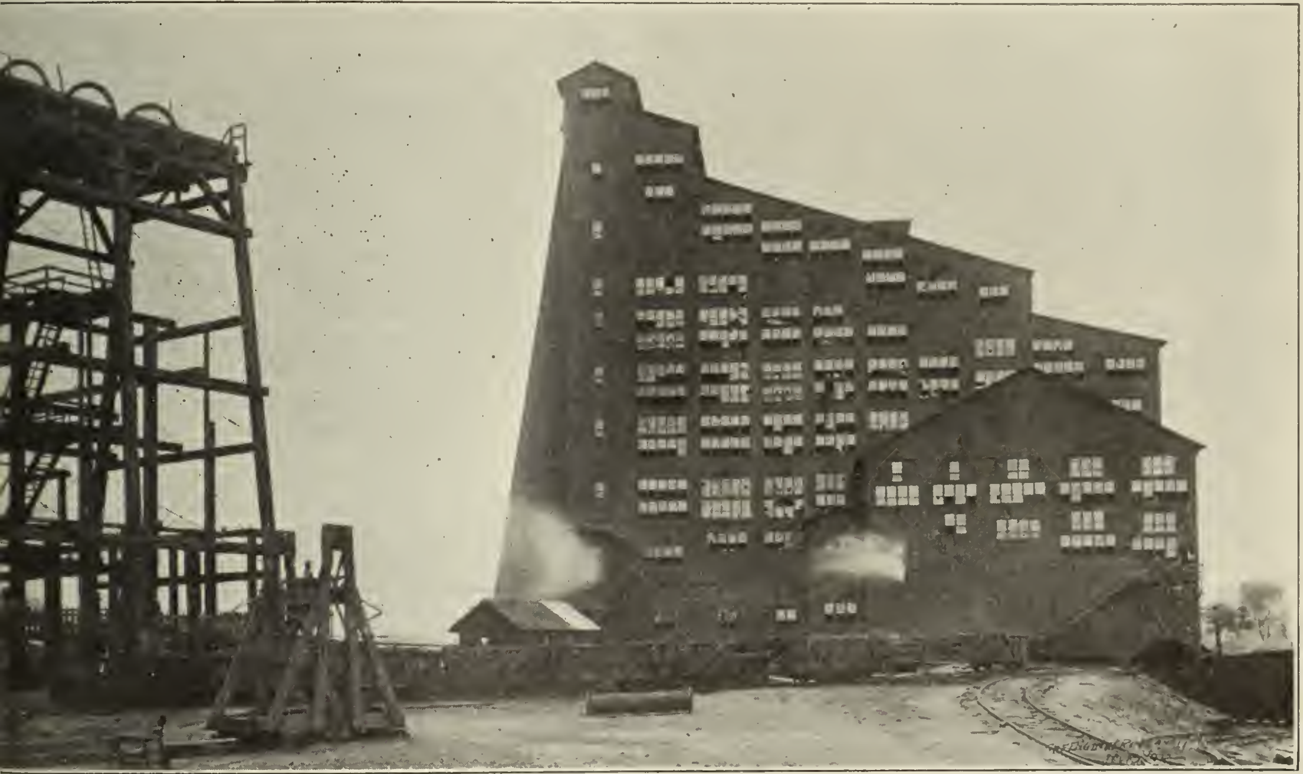
The preparation of anthracite coal for arket requires screening for sizing and ushing to separate the refuse from the oal. This treatment results in the production of a large amount of dust, which aterially interferes with the men emloyed in the breaker and also with the ction of the machinery. The eliminaon of this annoying dust is one of the resent breaker problems. During eight onths of the year, a large volume of is dust usually finds its way through he cracks and windows into the open ir. If the breaker is built in the neighorhood of a town or city, it creates inonvenience, annoyance and is a public uisance to the community, to say nothng of the depreciation of real estate bout the breaker.

When there is no current of wind, bout 75 per cent. of this breaker dust ettles within a radius of a few hundred eet. But on a windy day, the dust is ften carried several miles before it is eposited on the ground. To eliminate he dust nuisance several schemes have een tried at different breakers, but so ar the devices have not been effective.

Recently B. G. Carpenter & Co., of Wilkes-Barre, Penn., obtained a patent on a device which practically eliminates all dust. This system is simple as well as cheap and easy to operate. It consists of a fan, air ducts and separating chambers as shown in the accompanying diagram, which is a sketch of the device as installed at the Maxwell colliery. An installation of this system requires air-tight housing of all the machinery from which the dust rises, with a removable partition to admit of occasional cleaning and repairs. The housing is connected to a hood and then to the suction pipe of galvanized steel, through which the dusty air is drawn by a fan, 12 ft. in diameter and 6 ft. in width, having a speed of 150 r.p.m., which produces about 120,000 cu.ft. of air per minute.

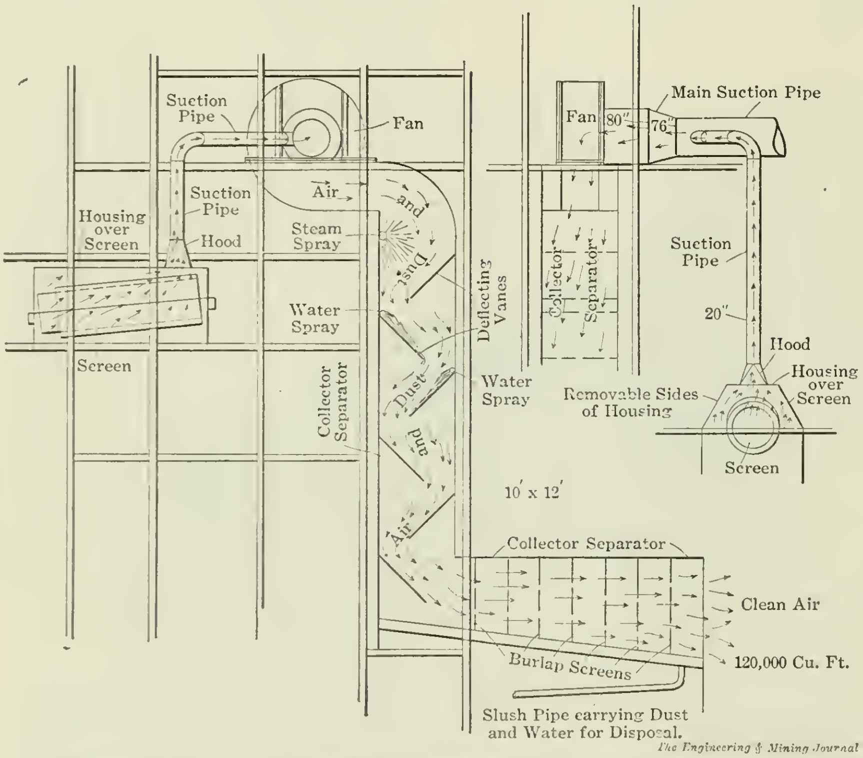
The diameter of the air ducts varies according to the length, number of curves and the kind of dust to be drawn through. All the suction pipes are so designed that each has an equal resistance against the current of air. Another thing to be considered in this connection is that the dust made by a bone roll is considerably heavier than that made by a coal screen. The specific gravity of the coal dust is 1.52 + while that of the dust made at the bone roll has a specific gravity of from 1.60 to 2, the average being 1.80; as a consequence, the latter dust requires more force to draw it through the pipe than the former.

The diameter of these air ducts as installed at the Maxwell breaker is 20 in. and that of the main suction pipe is 76 in.; the fan is connected to the shaft by means of a belt. The fan forces the air into the vertical chamber, which latter has dimensions of 10x12 ft., and is a rough, air-tight wood structure with a number of deflecting vanes attached to both sides of the chamber with an angle of 45 deg. to the vertical. The vanes are made of rough yellow-pine boards. This roughness gives more surface area as well as being a better retainer of water than smooth boards. At a convenient point above the upper vane, exhaust steam from the breaker engines is introduced to dampen the air besides two water sprays which are attached to the



SHOWING THE MAXWELL BREAKER IN FULL OPERATION AFTER THE INSTALLATION OF DUST ELIMINATOR. DUST CLOUDS PREVENTED A PHOTOGRAPH BEING TAKEN BEFORE THE ELIMINATOR WAS INSTALLED two upper vanes as shown on the sketch. The diameter of the water pipe is 2 in. The water is pumped up by the breaker pump and flows out at the upper spray with a head of 15 ft. When the water reaches the foot of the chamber it is loaded with dust.

There is another horizontal chamber which is connected at the foot of the vertical separator, in which the minute particles of dust that have not been taken up by the first separation are caught by means of burlap screens upon which the air gives up its moisture as well as its last traces of dust, and a mixture of the dust and water in a semi-liquid form drops down to the bottom. The water thus collected from this and the former separation is piped to a slush hole and flushed with the culm into the old workings.



General Design of Scheme for Eliminating Dust from an Anthracite Breaker

One Gallon of Water Moistens 6 Oz. of Dust

The inventor of this system made a test as to the amount of dust that the water would take. He found that 1 gal. of water moistened 6 oz. of dust, or a capacity of about 4½ per cent. According to the above calculations, if a breaker produces 20 tons of dust a day, the amount of water required to eliminate the dust is about 12,000 gal. The accompanying photograph shows the Maxwell breaker in full operation after the installation of the dust eliminator. Before the dust was cared for in this manner, the breaker was enshrouded in the black dust cloud.

Those who realize the amount of dust that is scattered by a breaker in operation will readily see the benefit to health, cleanliness and beauty of this simple method of elimination of dust as illustrated by the above photograph. Moreover, an installation of the system in a breaker gives a large return for a small investment, in that the removal of the dust from the interior of the breaker keeps it clean, and no extra men are needed to sweep the breaker floors after a day's work; the cost of illumination is reduced; better preparation of coal is secured because the clear atmosphere permits the workmen to more closely watch each operation, and consequently the amount of condemned coal is reduced to a minimum; accidents are minimized and the health of the men is improved; the machinery operates with less wear, the use of lubricants is lessened and the life of belts and ropes is lengthened.

The cost of installation of this system varies at different breakers; much depends on the internal arrangements of a breaker and the location of the fan. But it may be said in this connection, that the following is the approximate cost:

COST OF INSTALLATION.

Fan air ducts, etc	$4,000
16,000 feet lumber	460
Labor	700
Concrete, piping and steam connection	300
Total	$5,460

Besides the Maxwell breaker, many other breakers in the anthracite field have installed the system. Among them are the Hollenback and National collieries of the Delaware, Lackawanna & Western Coal Company; the Harry E. colliery of the Temple and Iron Company; Dorrance colliery of the Lehigh Valley Coal Company; the No. 5 colliery of the Susquehanna Coal Company, and the New Diamond colliery.

Heretofore little has been understood about the production of dust in the anthracite fields. The engineer at the Maxwell breakers has estimated at various times the quantity of the dust removed by the Carpenter system. It varies from 20 to 40 tons a day. Taking the minimum figure for the basis of an estimate for the production of dust in the entire anthracite coalfield, where about 320 collieries are operated an average of 230 days in the year, it is evident that each breaker produces 20 × 230, or 4600, tons of dust, and 320 × 4600, or 1,472,000, tons of dust for the entire field. In 1909 there were about 71,000,000 tons of coal mined, of which 61,969,428 tons were shipped and marketed. From these figures it is obvious that the production of dust amounted to about 2 per cent. of the output.

COLLIERY·NOTES

In considering the dangers that accompany the accumulation of dust in a coal mine, it is quite possible that a small amount of dust is more dangerous than an excessive quantity. Experiments should be conducted to determine whether or not a large quantity of dust present in a mine will have a choking effect.

An English engineer, basing his opinion upon experience, says: "In coal seams lying horizontally, or only slightly inclined, steel mine cars are best and last a long time without any considerable cost for repairs; however, where the coal seam is inclined, wood cars are preferable, by reason of their necessary frequent renewals or repairs caused by the breakages general in these seams."

The Lehigh Valley Coal Company is preparing to start work on a new breaker at Mahanoy City, Penn. This breaker will be run by electricity, and will be the first of the kind in the southern anthracite coalfield. The slate will be separated from the coal by means of magnesium tables, which by the principle of friction clean the coal more effectively than the jigs and separators now in use.

In all mines using horses or ponies underground, a "wash" should be provided as close to the stables as possible. Some horses positively revel in the water, while it is of incalculable benefit both to them and to the stable-keeper. After a day's work, the dirt and clay adhering to the bodies of the horses should be washed off. The "wash" should be 10 yd. in length, 6 ft. wide, in dish form, being 30 in. to 3 ft. at its lowest part. It should be planned with a traveling-way at one side for the drivers. The water should be changed every day.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. W. McAllister, of Greenwood, B. C., is visiting New York.

Daniel Guggenheim returned to New York, March 26, from Europe.

Alfred James has gone to Mexico, where he will remain about six weeks.

Robert T. Hill has gone to London, whence he will return in about 10 days.

Henry S. Washington expects to return to New York from Brazil early in May.

Dr. James Douglas has gone to Arizona, expecting to return in the latter part of April.

J. Volney Lewis, New York, is examining some mining properties in the western part of North Carolina.

Edwin E. Chase, of Denver, Colo., is in the State of Sonora, Mexico, examining some copper properties.

Royal A. Smith, president of the Live Oak Development Company, has returned from Duluth, Minn., to Arizona.

Franklin Leonard, Jr., has been elected president of the Ophir Mining Company, of Nevada, in place of Charles H. Fish.

James MacNaughton, general manager of the Calumet & Hecla, has returned to the mines after an extended sojourn in Florida.

John Knox, Jr., in charge of the underground work for the Calumet & Hecla Company, underwent an operation for appendicitis recently.

George G. Hackstaff, manager of the Kansas-Mexico mine at Parral, Mexico, is on a trip to Denver and other points for the purchase of mine equipment.

Addison H. McKay has resigned his position as president of the Mercantile Banking Company of the City of Mexico, to devote his entire time to his mining interests.

David Jones has been appointed mine superintendent for the St. Clair district of the Philadelphia & Reading Coal and Iron Company, in place of the late Thomas Beddow.

C. E. Abbott, formerly chief engineer, has been appointed general superintendent of the Ore Mines division of the Tennessee Coal, Iron and Railroad Company, with headquarters at Bessemer, Alabama.

The Rhodesian government has decided to appoint a medical committee for the purpose of inquiring into and reporting upon the prevalence of pneumonia and scurvy in mines, and to make such recommendations as it may see fit for the prevention of these diseases. Drs. W. G. Clark, A. M. Fleming and Macaulay comprise the committee.

OBITUARY

Sidney W. Tyler died in Denver, Colo., March 27, aged 69 years. He was born in Windham, Conn., but had lived in the West for a number of years, and practised as a mining engineer and geologist in Colorado and elsewhere.

William Barnsdall died at Bradford, Penn., March 27, aged 56 years. He was born in Titusville, Penn., and when a young man engaged in the oil business, removing to Bradford in 1880. In connection with his father, William Barnsdall, Sr., and his brother, Theodore N. Barnsdall, of Pittsburg, he conducted some extensive operations, and was widely known in Pennsylvania and elsewhere. He was secretary and treasurer of the Manufacturers' Gas Company, of Bradford, of which his brother, T. N. Barnsdall, is president. He was interested in the Union Natural Gas Company, of Kansas; the Kansas Natural Gas Company; the Dominion Gas Company, of Canada; the Potter Gas Company, of Pennsylvania; and was identified largely with the Northern Oil Company, whose holdings are chiefly in Elk county, Penn. He had other interests also, and was an active and successful man. He leaves a widow and one son.

Hugh McDonell died at his residence in the City of Mexico, March 22, aged 57 years, after a short illness. He was born in Allegheny, Penn., but when a child removed with his parents to Missouri, where he was educated. In 1879 he went to Leadville, Colo., and engaged in mining. From that time on mining was his occupation and profession, and he was actively engaged in it in Montana, California and Alaska, as well as in Colorado, becoming an expert whose advice and opinion were sought in many quarters. About 1902 he made a long trip to Europe, visiting a number of mines in Spain, Sweden and Norway. On his return from Europe, he settled in Mexico, and soon became one of the best known mining men in the Republic. He was successful in his Mexican operations, and owned the Rincon mine at Temascaltepic, besides being interested in other operations. He was a prominent member of the American Club in Mexico. He leaves a widow and a nephew, Bernard McDonell, who is superintendent of the Rincon mine.

SOCIETIES and TECHNICAL SCHOOLS

American Institute of Chemical Engineers—The summer meeting of the institute will be held at Niagara Falls, N. Y., June 22-24, next. A prominent feature of the meeting will be visits to the interesting chemical industries in that locality. An important program of papers is being arranged for by the committee on meetings.

Utah Society of Engineers—The regular monthly meeting was held at the society's room, Newhouse building, March 18. H. P. Saunders read a paper on "The Concentration of Ores," which was followed by an informal discussion. J. H. Tempest, J. P. Marshall, H. W. Shiley, and W. L. Emery were elected to membership, and arrangements for the annual banquet were made. Benjamin F. Tibby has been appointed treasurer to fill out the unexpired term of John C. Hornung, who resigned owing to moving from the State.

Australasian Institute of Mining Engineers—At the annual meeting at Melbourne, Victoria, Jan. 31, an increase of 49 members during the year was reported, making the total number 375. The new president chosen was G. A. Richard, Mount Morgan, Queensland; with Richard Hamilton, Kalgoorlie, Western Australia, as vice-president. Members of Council chosen were: Stanley Hunter, A. S. Kenyon, A. H. Marrin, Victoria; G. D. Delprat, Vincent F. Shallcross, New South Wales; W. H. Corbould, Queensland.

Mining Society of Nova Scotia—The eighteenth annual meeting was held at Halifax, March 15 and 16, closing with the annual banquet on the evening of March 16.

The papers to be read at the meeting were:

"Description of Haulage System at Nos. 3 and 4 Collieries of the Nova Scotia Steel and Coal Company, Sydney Mines," by John Johnston.

"Notes on the Use of Explosives and the Methods of Shot Fring," by C. E. Coll.

"The Commercial Value of the Oil Shales of Eastern Canada," by Dr. R. W. Ells.

"Description of Electric Endless Haulage at Colliery No. 5 of the Nova Scotia Steel and Coal Company," by Robert Robinson.

"Tungsten Deposits at Moose River, N. S.," by E. R. Faribault.

"Use of Low-grade Fuel under Boilers," by John Preston.

"The Clays of Nova Scotia," by Professor Ries.

"Blast Furnace Stock-handling and Charging Apparatus," by W. H. Graham.

"Treatment of Boiler Water," by A. L. McCallum.

"Scheelite at Moose River, N. S.," by A. A. Hayward.

"The Use of Coke Oven Gas as a Fuel," by T. J. Brown.

"Practical and Economic Mining," by Neil A. Nicholson.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

March 25—Some exceptionally rich strikes have lately been made in both quartz and gravel in different parts of California. The most notable, perhaps, is that made by Ah Kai and his Chinese associates on a lease on Jerry Goodwin's ground at You Bet, just across Bear river from Dutch Flat, Placer county. The patch of ground had been overlooked by former white miners because it could not be hydraulicked, but the Chinese ran a short tunnel and struck the old river bed, taking out $204,000 in a short time. Many Chinese operate in that section, working by crude methods, but no extensive operations are carried on by whites, owing to the hydraulic-mining laws preventing them. The Chinese are satisfied with lower wages and poorer ground, but occasionally strike into rich patches. There are thousands of acres of auriferous gravel in that section of Placer county which are not being worked because the laws regulating hydraulic mining are so rigidly enforced by the California Débris Commission that to build impounding works, dams, etc., is both expensive and risky. The continued operation depends on the will of the members of the commission, who have the power to close down the mine at any time they think an excess of débris is permitted to pass out of the dam.

From the Crystal quartz mine at Angels, owned by James V. Coleman, of San Francisco, a $200,000 "pocket" has just been taken within a short time. This was found in the ordinary working of the mine. The Tarbot mine, three miles from Angels, has also just yielded a pocket of $10,000. At the Standard mine, Sailor ravine, near Downieville, exceptionally rich rock is being taken out. This is at least 10 miles north of Alleghany, where so many rich strikes have been made. It is now considered that there are great possibilities in the mineral region lying between the Standard mine and Alleghany.

The annual meeting of the United States Diamond Mining Company was held at Oroville recently, and after the auditing committee had reported that the accounts were correct, a resolution was adopted to close down the mine indefinitely and the manager was so instructed. This is the enterprise started a few years ago by M. J. Cooney and associates to open ground near Oroville, supposed to contain diamonds. Some small diamonds had been found in years past in the hydraulic mines of that region, and favorable indications were supposed to be found in the ground located and purchased by this corporation. A good deal of development work has been done during the operations of the company, but no diamonds of value have been found. Hence the decision of the directors to quit further prospecting. The company, however, keeps itself in existence, and has elected a board of directors, of which M. J. Cooney, of Oroville, is president.

Work is being advanced rapidly on the baghouse at the Mammoth Copper Company, at Kennett. The cement foundations are completed, and the steel structural material is on the way. The building is to be completed in a specified time in accordance with an agreement with the farmers of the county. In the same county, the Balaklala Copper Company is experimenting with the Cottrell process for condensing fumes, which is used by the Selby Smelting and Lead Company. Some late improvements are to be introduced.

The Union Copper Company, Copperopolis, has transferred all its holdings to the California Copper Company, and the latter has given a mortgage to the State Trust Company of Boston to secure a 6 per cent. bond issue of $450,000 to be spent in operating the mine and plant on a large scale.

The litigation between O. E. Cheeseborough, S. W. Loeney and Tarkington over the Tarkington mining property in the Radamacher district of Kern county has come to an end. While the case was being heard in court at Bakersfield, Tarkington, the virtual owner, admitted that he had not done the annual assessment for the past two years. This news was telegraphed to Searles, and the claims were immediately relocated by parties who had nothing to do with the suit.

Crocker, Greenwood and other San Francisco capitalists obtained some years ago a valuable mining concession from Nicaragua, for the proper operation of which a railroad connecting Managua with the coast was essential. The railroad concession was granted by Ex-President Zelaya and a first payment of $25,000 made. It appears that Zelaya did not fufil his part of the contract and a suit has been filed in the Federal Court at New Orleans to substantiate the rights of the plaintiffs before the Nicaraguan government.

The right of a foreign corporation to condemn lands for a right of way for a ditch line was decided in favor of the foreign corporation in a recent decision. The defendant was the Sacramento Irrigation Company and it was claimed that only domestic companies possessed the right of condemnation.

Miners and prospectors operating along the line of the Oregon-California Railroad will be pleased to learn that the Department of Justice has sent a report to the United States Senate, stating that proceedings have been instituted to recover lands sold under that company's grant. The conditions of the grant are said to have been violated in the sales of part of some 820,000 acres of land. The company still has over 2,000,000 acres of land unsold. No doubt many acres of mineral lands have gone out of the mineral domain on most of these railroad grants because no segregation of agricultural and mineral lands was made by the Government as should have been done. The grants excepted the mineral lands; but when there was no one to protest, these went to patent with the other lands and could not be recovered for the miners. All over the Pacific coast the railroads are now owners of mineral land to which they really had no legal right in view of the wording of their grants from the Government.

The Noble Electric Steel Company, which has for some months been operating an electric fuel plant on the iron ores at Heroult, Shasta county, is about undertaking a similar experiment in the Minaret region of Fresno county. The company has some 17 claims in that section and has sent men to work upon them though the snow is still deep in the mountains. The Minaret region is supposed to hold the largest iron-ore deposits on the Pacific coast, but they have never been developed, owing to distance from transportation lines and lack of local deposits of fuel.

A site has been acquired at the upper end of Oakland harbor, San Francisco bay, to establish a graphite factory. The Alaskan Graphite Company, of which S. J. Philpotts is president, has acquired large holdings of graphite deposits in Alaska, and it is this company which is establishing the factory. The material is much the best in quality which has thus far been found on the west coast of the United States, and is said to be in abundant quantity.

A suit as to title of a magnesite mine in western Sonoma county has been going on the past week, in which is involved the proper marking of a claim by monuments when the location was made. George Madera, of Healdsburg, and the

Western Carbonic Acid Gas Company are the plaintiffs, and the defendant is the Sonoma Magnesite Company, of which A. B. Davis *et al.* are owners. The judge denied the motion for a nonsuit, and held that there was some evidence showing that monuments had been set up in locating the mine by George Madera some years ago.

The Pacific coast only uses 5000 to 6000 tons of this magnesite annually, and it has thus far been found impossible to ship any East and compete with magnesite from the Grecian and Austrian mines. There are many deposits of magnesite in California, but only a few are being worked, and they are the ones which lie near railroads.

Goldfield

March 26—Work on the Goldfield-Ely railroad will commence within a few weeks. Contracts for the grading between Goldfield and Tybo have been let, the final location having been decided upon between these points. A new survey is to be run from Tybo, through Hamilton to Ely and thence through Cherry creek and Deep creek into Salt Lake. The company is contemplating a tunnel a mile in length through the north end of White Pine mountain which will shorten the road materially. It is expected to have the road from Goldfield to Hamilton in operation by fall.

Butte

March 23—The American Smelting and Refining Company's plant at East Helena has offered a new arrangement by which the smaller shippers along the Lake Pend d'Oreille district will be enabled to ship with greater frequency. It has been the habit of the smaller shippers to wait until they had a railway car of ore before shipping, so that they might take advantage of the relatively low carload rates, and for that reason many properties have not been worked because the owners could not get the necessary grubstake to last them until they got returns. The company now offers to get all ore which has been sacked and give the shipper the benefit of carload rates, even though the ore be less than a carload, and assures shippers that remittances will be received within two weeks from the time of shipments.

The attempt of the Davis-Daly Copper Company to build a tramway from its Colorado shaft through the streets of Butte to the Great Northern Railway tracks continues to meet with much opposition. When the city council was considering the advisability of granting the company that privilege, the owners of the property along the proposed tramway attempted to enjoin the council from granting that permission, but the local district court held against them. Now that the actual construction work has been begun, the property owners have instituted action seeking an injunction against the company itself. The property owners' contention in the present suit is that the proposed tramway will depreciate the value of the adjoining property and that no provision has been made for compensation.

The Central Trust Company, of New York, has brought suit in the Federal circuit court in Helena against the Montana Coal and Coke Company and the International Trust Company to foreclose a mortgage given in 1900 to secure a $500,000 bond issue. This is the second action of a similar nature against the coal company, suit having been brought a short while ago by the International Trust Company to foreclose on a $400,000 bond issue made in 1907.

The hearing of the Government's protest against the application of James W. Murphy and Maurice Eisenberg for patent for the Golconda quartz-lode mining claim is now being heard in Butte. The claim is a few miles west of Butte and near the British-Butte property. The facts are much like those involved in the British-Butte controversy with the Government on the patent of its claims, which was recently decided against the Government.

Denver

March 26—Much interest centers in the suit for $1,000,000 brought by the Doctor-Jack Pot Mining Company, of Cripple Creek, aginst the Work Mining and Milling Company now before Judge Lewis in the U. S. circuit court. The Work company owns the Little Clara, which is very rich, and has made a heavy production, but the plaintiff company claims that the apex of the Little Clara is on the Lucky Corner claim, which is the property of the latter company, and the suit is to recover the value of the ore alleged to have been extracted from the Little Clara.

The original orebodies of the Rico-Aspen group and the Enterprise mine, which were later consolidated under the name of the United Rico Mines Company, were in vertical fissures in the sandstone, and terminated at the overlying shale under which the ores were deposited for a considerable distance on either side of the fissures, forming continuous shoots on their strike. All the metal extracted hitherto came from these shoots, but they have been practically worked out and the only hope of future success would appear to be to follow these shoots into the mountain. The Atlantic-Cable, acquired by the same company, is a horizontal deposit in the flat at the foot of the same mountain, and in the townsite of Rico, at about the junction of Silver creek with the Dolores river; and in this have been proved large bodies of zinc-lead sulphide, the mining and separation of which have not been an unqualified success. Drill holes have proved the limestone sheet to be mineralized close to its contact with the underlying quartzite, and it is a fairly promising prospect if properly opened up.

Salt Lake City

March 26—There has been some talk recently of a shortage of ore in the Salt Lake market but this reported shortage appears to have been regarded as greater than it actually is. The supply is not much less than normal for this season of the year. The poor condition of the roads and some loss in shipments to the valley smelteries from southern Nevada camps, due to the washouts on the Salt Lake railroad, have had some effect on the market.

The United States Smelting and Refining Company has six lead furnaces in blast at Midvale, which is all of its lead furnaces. The American Smelting and Refining Company is running six furnaces on lead ores at Murray, and one furnace on matte concentration, making a total of seven out of eight furnaces in operation.

Park City is shipping an increased tonnage over the winter months. Bingham is producing about as usual; some ore is ready for shipment by leasers as soon as the roads are in better condition. A few mines in the Tintic district are not producing as heavily as before, but, owing to new properties shipping, the district production is normal, or even larger than usual at this season. Practically no ore is coming from the camp of Alta, owing to snowslides which have blocked the aërial tramway, and to the poor condition of the roads in Cottonwood cañon. Beaver county has shipped little ore this year, though some mines are preparing for an increased production during the spring and summer.

There is not over 10 per cent. less ore than usual being shipped to the valley plants. The deficit is largely in gold and silver ores from Nevada, with some decrease in lead. The winter has been severe, and many small properties and leasers have been unable to ship. It is expected that during May, June and July the production and are shipments will largely increase.

The greater part of the land along the Grand river in Utah and Colorado, withdrawn by Secretary Garfield with a view to protecting any power sites it might be found to contain, has been restored to entry. The remainder, following an examination by the U. S. Geological Survey has been incorporated within a power-site withdrawal.

Recently work has been started by the Utah Conservation commission on a new map showing the natural resources of the State. The map will be 4½x6 ft., and will indicate by colors and characters the irrigable and nonirrigable land, agricultural land, mineral land, including mining districts and the character of the ores, the mean temperature, rainfall and precipitation in different sections of the State, topographical features and other information. The average flow of streams, drainage area, elevation along streams, run off, etc., will be incorporated in tables to accompany the map. State roads, railroads, reservoir sites, public, private and State land, forest reserves, and as much information as possible without overcrowding the map will be given. At a meeting of the commission recently held in the office of Gov. William Spry, details of the map were outlined by H. P. Poll who has been authorized to draw it. The map will be the most complete that has been made of the State. The commission has announced that copies of the preliminary report recently issued may be had by addressing the clerk of the commission at the office of the governor. The report is a preliminary outline of the resources of the State.

At a meeting of the Silver King Coalition directors, March 17, it was decided to pass the quarterly dividend as it would be necessary to curtail mining operations for a month in order that a part of the shaft might be retimbered. While this is being done, arrangements will be made for electric haulage, covering about three miles of workings. Attention was called to the fact that the company was the sole owner of more than 2000 acres of patented mining ground, and in addition owned an undivided interest in two claims known as the Conkling and Arthur. The company also owned an interest in the Kentucky group with the Uintah Treasure Hill company as coöwners. The company also owns an undivided half interest in the Vesuvius, Andes, Custer, and Delaware claims in which the Silver King Consolidated owns an undivided one-half interest. The statement adds that suits in partition are now pending in the United States court with each of the above-named companies. It was therefore considered advisable to further add to its surplus in order that the company may be in a position to purchase the interest of its coöwners, should the property involved in the several suits be directed to be sold under the decrees of partition. Whether it would be advisable to sell or purchase as given in the statement, can only be determined when the time of sale arrives. In closing, the statement adds that dividends, unless something unforseen occurs, will be resumed. The statement notifying stockholders of the passing of the quarterly dividend refers to one phase only of the suits which are pending against the company. The probability of judgments for ore alleged, and in one case admitted to have been taken from jointly owned ground, is not mentioned.

Toronto

March 25—This week a deputation of the Canadian Mining Institute including T. B. Caldwell, Lanark; Col. A. M. Hay, Haileybury; H. Mortimer Lamb, Montreal; G. G. S. Lindsey and Professor Willmott, Toronto, waited on Premier Sir Wilfrid Laurier at Ottawa and urged several important changes in mining laws. These included the placing of the issue of mining titles and the administration of mining laws in regard to lands under federal control, in the hands of the Department of Mines, and the consolidation and codification of the Dominion mining laws, now in a state of confusion. Hon. W. Templeman, Minister of Mines, indorsed these proposals and the Premier intimated that they would be carried into effect. A subcommittee of the Mines Committee of the House of Commons has been appointed to draft a bill consolidating the mining laws.

Several of the Cobalt ore-stealing cases for which a large number of arrests were made last December were brought to trial here this week. In the cases of Nicholas Zojatz and James Connolly, *alias* Parr, the juries disagreed. George Barber was convicted on the charge of selling ore without authority. T. C. Robinette, counsel for the prisoner, thereupon asked for a stated case to be presented to the High Court. He claimed that the prisoner could not be found guilty under the act, which referred to the sale of ore, whereas the evidence tended to show that the sale was made after the ore had been refined and was therefore a sale of silver and not of ore. As the other cases yet to be tried turn on the same point, they were traversed to the next sitting of the court pending the decision of the High Court on the question.

Cobalt

March 26—One of the biggest deals that has yet been put through in the Porcupine district was consummated a short time ago, when Eastern capitalists, headed by C. L. Dennison, president of the Buffalo mine in Cobalt, purchased the Wilson-Edwards properties. The Wilson vein is generally conceded to have the most sensational surface showings in that section, and is to a great extent responsible for the rush that ensued. A plant, including a 6-drill compressor, is on the way and effort is being made to get the material in before the break up. Good reports continue to come from the properties that are being developed, and the work uptodate is promising. A carload of ore has been sent out from the Timmins property, on which a mill test will be made. Additional areas of gold-bearing formation have been located in the townships of Bryce and Holmes.

During April, six Cobalt mining companies will distribute dividends amounting to $970,293. Uptodate for the present year nine companies have paid and declared in dividends $2,324,527. This does not include the profits returned to the owners of the privately owned companies, the O'Brien and the Drummond. Of the dividends the Nipissing contributes $900,000 and the La Rose $300,000.

The Cobalt Gem nugget, which is the largest piece of silver float ever found in this district, has been purchased from the owners by the Ontario government for $5054. The nugget weighed 1640 lb. and was 40.62 per cent. pure silver containing 9715 ounces.

The Lewisohn interests, who control the Kerr Lake mine in Cobalt, have made the second payment on the Wetlaufer mine, South Lorraine. This gives control of the property, which will now be opened up directly under this management. The work accomplished has demonstrated the value of the property and the ore in the lower levels is as good as near the surface. A 12-drill compress has been purchased. The Wetlaufer is the best developed and most important mine in South Lorraine and its purchase by the Lewisohns will give a considerable impetus to mining operations in the district.

From all appearances the Mines Power, Ltd., will be in a position to deliver air and electricity very soon. The steam-generated power costs on the average about $175 per horsepower-year. The electric energy is to be sold for $50 per horsepower-year, while the air will be sold at 24 to 25c. per 1000 cu.ft. of air compressed to 100 lb. pressure. The Cobalt Power Company promises delivery in April. The Hydraulic Air Company has some work to do yet.

An option has been given to New Liskeard men interested in the Hudson Bay mine at Cobalt, on the McAlpine properties at Shanty Lake, Gowganda. Several veins have been found, some of which show native silver. The shipments from Gowganda now amount to 300 tons.

Mexico

March 25—The new American ambassador for Mexico, Henry Lane Wilson, has arrived at the capital and is now in active charge of the diplomatic office. The mining interests, while not directly concerned with the matter of diplomatic representation with the Republic, have nevertheless a lively indirect interest. It is expected that Mr. Wilson will be very satisfactory in connection with this important post.

It is reported that the London Exploration Company will close its option for the Sierra Morado mine in Guerrero. The same interest is also considering the Tiro General property at Charas, S. L. P., and has options in the Sta. Eulalia district, Chihuahua, and in the Concepcion del Oro district, Zacatecas.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

General Mining News

American Smelters Securities Company—The common stock of this company consists of 300,000 shares, of which 177,510 are owned by the American Smelting and Refining Company; the remainder by the Guggenheim Exploration Company. Among the other assets of the company are the Garfield smeltery, which is said to have cost $6,000,000; and the Baltimore refinery, for which about $4,000,000 was paid.

Arizona

COCHISE COUNTY

Calumet & Arizona—At the Irish Mag, No. 3 raise on the 550 level has struck ore.

Superior & Pittsburg—Prospecting of the new high-grade sulphide orebody on has shown the vein 15 ft. thick. Preparations have been made to run an incline raise on the vein to the 1300 level. Sinking has commenced at the Briggs shaft from the 1200 down.

Mascot—This copper company near Wilcox has installed the largest distillate engine in the world, which will run an Ingersoll 10-drill air compressor. The east crosscut on the property is in 200 ft. and has cut three veins 25, 10 and 17 ft. in thickness. The company has developed a large tonnage.

Tombstone Consolidated—Since the middle of February the mine has been unwatered from 900 to 955 ft. The large pumps will be uncovered in about 40 ft. more.

Arizona Commercial—The smeltery was treating about 210 tons of ore daily from the fifth and sixth levels. Drifting in the Black Hawk vein at the seventh level has advanced 300 ft. westward from the point 40 ft. from the Eureka shaft, where the vein was opened by the crosscut. Some good ore has been opened by this drift, and raising will be begun from there to the intermediate level above, where the drifts encountered some of the best ore yet extracted from the mine. The pumps are raising about 2,500,000 gal. of water every 24 hours. Owing to an accident, the smeltery has closed down temporarily.

GILA COUNTY

Keystone—The stock of this company has sold off lately in the New York market, but from the office of the company no news about it has been given out, and when asked it was said that there is none to give out, but probably a report of developments up to date will be made upon Mr. Channing's return to New York, which will be shortly after the middle of April.

A correspondent at Globe reports to us under date of March 30 that although Keystone management refuses to make any statement of results of development work and refuses to allow anyone except employees to go underground, it is generally understood that the level work and churn-drill operations are making a favorable showing. According to best advices, probably conservative, the known orebody is 800 ft. long, 400 ft. wide and 100 ft. thick. Average copper contents is probably about 2 per cent., or slightly less. About 60 men are employed in development, chiefly on the 250-ft. level. The churn drills are at work on Philadelphia claim, about 900 ft. northwest of shaft.

GRAHAM COUNTY

Gold Crown—This El Paso company is operating in the Graham mountains, 14 miles south of Safford. F. J. Hall is president.

YAVAPAI COUNTY

Arizona Smelting Company—The reorganization has been completed and active operation will begin April 1. Martin J. Heller will act as consulting engineer.

Hillside Consolidated—This property at Cherry includes four different claims, on which there are 6000 ft. of workings and two small mills of 25 tons capacity. The district is 15 miles from the railroad, and at present there are several small operations under way there. The deepest workings are 500 ft. The company has commenced sinking a 300-ft. shaft. The ores carry principally gold and some copper. M. M. Green is manager.

California

AMADOR COUNTY

Argonaut—This company will soon operate the Hamby mine four miles from Angels.

Burgess—This new camp, at an altitude of 10,000 ft., has considerable work going on by leasers during this winter.

INYO COUNTY

Buckeye—Machinery is now being taken into the mines for a hydroelectric installation and for a reduction plant. The shaft is now down 200 ft., and when equipment is installed, it is proposed to sink it to 1000 ft. The property is at Bishop. L. C. Davis is manager.

KERN COUNTY

In the Kernville district the Keyes mine is taking out rich ore. The Glen Olive will soon start up under charge of Benjamin Chavez. The Oujana company, owning the old Big Blue, is expected to commence operations soon.

Mammoth—Mr. Keating expects to put a new mill on this mine at Kernville.

MARIPOSA COUNTY

Trujillo—Operations will soon start in this mine, C. G. Lewis in charge.

MONO COUNTY

The Pittsburg-Liberty mine in the Masonic district will soon resume the treatment of tailings at the cyanide plant. The mill is crushing 20 tons of $30 ore daily. The gasolene engine has reduced fuel expenses at mill by one-half. In the True Friend three shifts of men are working on the long tunnel. On the Serita leasers are at work.

RIVERSIDE COUNTY

Mohawk Herald—The company, E. M. MacDermott, manager, will soon erect a 10-stamp mill on the Anaconda mine, near Indio.

Colorado

BOULDER COUNTY

Logan—This property at Crisman has been sold to A. S. Cox The mine has been a producer.

SAN JUAN DISTRICT

Camp Bird—The February returns show: Ore crushed, 6618 tons, yielding 9985 oz. bullion and 534 tons concentrates. The cash receipts were $205,779, and the operating expenses, $52,167, leaving a net balance of $155,890.

Silver Ledge—The 200-ton mill, idle for several years, has resumed under management of Karl A. Knupfer. Electric power is used.

TELLER COUNTY

Granite—This company, which owns a group in the heart of the town of Victor, comprising the Granite, Gold Coin, Monument and Dillon, this month has shipped about 1000 tons of ore, yielding $36 in gold to the ton. The mine and dumps are being worked by leasers.

Republic—This property, working the J. I. C. mine through the Rigi shaft, on Battle mountain, has a shoot of ore in the lower workings which carries ore that runs from 1½ to 4 oz. gold to the ton, and is shipping about two cars per week to the smelteries.

Old Gold—This mine, on Beacon hill, is shipping 10 cars of ore per month, that will yield 2 oz. gold to the ton.

El Paso-Gold King—This mine, under lease to Owen Roberts, is making daily shipments of ore yielding 1½ oz. gold to the ton.

Illinois

Ziegler—This colliery, owned by Joseph Leiter, of Chicago, the scene of prolonged labor troubles and finally closed, has been leased to a new company formed by local people. It is near Christopher, in Franklin county.

Indiana

GIBSON COUNTY

With continued good weather the oil-fields have been busy. Leases have blanketed almost the entire county and in order to hold them wells are being put down in considerable number. L. Sharer & Co. recently completed a good oil producer on the Kearns farm; the Rogers-Risch Company completed three wells—two gas and one oil; R. Lee Clark, of Lafayette, completed his third oil well on the Cate farm. All are 75-bbl. producers.

VIGO COUNTY

The A. & L. Coal and Clay Mining Company has incorporated, with office at Terre Haute, to mine coal, clays and other minerals; to own, lease and develop coal and clay lands, and to equip factories for the manufacture of clay products. The directors are Charles W. Abbott, Daniel E. Loudermilk and Robert H. Catlin.

SULLIVAN COUNTY

Fire has been raging in the Mammoth Vein mine, one mile north of Sullivan, owned by the Alliance Coal Mining Company. The fire was first discovered in the east entry on March 21. A chemical apparatus has been at work on the flames for a week and it is thought the fire will soon be under control. Over 200 men have been thrown out of employment.

Michigan

COPPER

Mohawk—No. 6 shaft is at the second level, and the crosscut from this point to cut the lode has been extended about 35 ft., over half the distance. Drifting from the first level, 210 ft. from surface, continues yielding a good grade of stamp rock which is being shipped direct to the mill.

Isle Royale—The "A" shaft, sinking to open the Baltic lode, is down about 950 ft., where the fifth level is being cut out. This shaft is sinking on the formation with small quantities of copper appearing, but nothing of a continuous or commercial nature. A drift toward the southwest has been extended for 400 ft. with the formation shattered.

North Lake—The company recently penetrated the No. 2 Adventure lode with its No. 7 drill hole, but the core taken from the formation at this point carried but little copper.

Franklin—This company has finished its first drill hole, which is searching for the No. 3 Hancock lode, without results, the drill apparently being in the footwall side or too far east. The drill has been moved.

New Baltic—No. 3 drill hole is down 750 ft. in an amygdaloid formation, capping the Baltic lode, and it is expected that this lode will be encountered within the next 100 ft. Another drilling outfit has gone into commission, and in all probability sufficient data will be secured to warrant the starting of a shaft during the summer.

South Lake—This company is operating two drilling outfits. No. 1 drill hole is down 1700 ft., and No. 2 hole 1350 feet.

Atlantic—Drifting is in progress from the 15th level to the north with copper in small quantities appearing. At the 25th level, drifts are being extended north and south with the same results. In the crosscut from the 16th level to the sandstone an encouraging formation was cut 700 ft. from the shaft. This lode is now being opened, and its extension determined.

Minnesota

Nassau—This iron property, near Hibbing, has been acquired by the Jones & Laughlin company.

Montana

BUTTE DISTRICT

Amalgamated—At the Mountain View mine sinking on the air shaft was begun two weeks ago. The shaft is down 1200 ft. and will be sunk to 1400 ft. An air raise has been started from the 100-ft. level to the surface, a distance of 350 ft., and about 200 ft. of the raise has been completed. This has no connection with the air shaft. On the 1800-ft. level the crosscut to the Pennsylvania mine is now within 80 ft. of the Pennsylvania workings. By means of this crosscut some of the Mount View ore will be worked through the Pennsylvania shaft and the ventilation of both mines improved. At the Badger State on the 1300-ft. level, the vein has been cut 300 ft. south of the shaft, and drifting is being done east and west while the crosscut is being continued south. The shaft is down 1700 ft. and will be continued to 1800 ft., where a station will be cut. Through the Badger State workings a drift is being run on the old Speculator lode on the 1200-ft. level, which is found to run high in zinc and low in copper. The new boiler plant at the Badger State has been completed and is now in operation. At the Pennsylvania 1300 tons are being hoisted daily. The new 350-gal. electric pump on the 1800-ft. level is giving satisfaction. Owing to the fact that the pump can more than take care of the mine water and that when run at all it must be run at full capacity, the pump is run for two hours and then shut down that length of time, thus averaging one-half its capacity. At the Leonard the No. 1 shaft is being retimbered and will be used to lower timber and supplies.

GRANITE COUNTY

Crescent—Manager Hand is expected to return shortly, when the operations will be resumed. The mine has been idle since October.

New York & Montana—The management has decided to run a 300-ft. tunnel on the property at Colomia, three miles north of Garnet. Some years ago a shaft was sunk 400 ft., but operations by that method proved too expensive and it is thought the tunnel will lessen considerably the mining costs. A 10-stamp mill and concentrator are on the property.

Granite-Bimetallic—At a recent meeting of the directors the following officers were elected: Charles D. McLure, president; August B. Ewing, first vice-president; Edward S. Orr, second vice-president; L. N. Rumsey, secretary; and G. T. Tansy, treasurer.

MADISON COUNTY

Conrey Placer Company—The dredge recently ordered will be ready for operation Nov. 1. It will have a capacity of 300,000 cu.yd. of gravel per month. The hull will be 150 ft. long, 58 ft. wide, and 13 ft. deep. The dredge will be operated by electricity and will require 1050 h.p. The capacity will equal that of the present three combined, and will thus double the output.

Nevada

ESMERALDA COUNTY

Goldfield Consolidated—In spite of the immense production necessary to keep the big mill in operation the ore reserves are increasing ahead of the extraction. In the Combination mine large stopes are being worked on both the Combination and January veins. They are to be carried through to the surface where they will terminate in "glory holes." Work is in progress around the caved Hampton stope, the purpose being to make it thoroughly accessible whenever it is desired to draw out the ore.

Merger—Six leases are now being worked on Merger estate, and two new hoists have been put in operation.

Combination Fraction—Reports of a strong body of promising ore, breaking between $30 and $40 per ton, on the 500-ft. level and another development just above the 380-ft. level resulted in a sudden jump in the stock. According to the new manager, Charles Wilkinson, the Nevada-Goldfield mill will again be in operation on Combination ores as soon as sufficient ore is in sight to run continuously.

Commonwealth—A lateral from the old ompany tunnel is being driven to tap 3-ft. oreshoot recently exposed by a winze from the level above.

Merger Mines Company—The gasolene hoist now in operation is to be replaced by a 50-h.p. electric hoist, the old gasolene engine to be used for raising water.

Pittsburg-Silver Peak—The glory hole s assuming enormous proportions, and arge lenses of ore are being opened near he surface. The ore is by no means igh grade, but the method of breaking he rock and getting it to the mill is so economical that there is good profit in handling the large tonnage.

LINCOLN COUNTY

Consolidated Pioche—Extensive tests are being made in the East on samples of the large tonnage of gold-silver-zinc ore developed. It is planned to build, immediately, the first unit of a reduction plant to treat the ore after the manner determined by these experiments.

Prince Consolidated—Development work steadily increases the tonnage already blocked out and the company is now waiting for the completion of the work of reconstructing the Salt Lake Route's line through Meadow Valley wash.

NYE COUNTY

The estimated production during week ended March 19 is: Tonopah, 3450; Belmont, 750; Montana-Tonopah, 589; MacNamara, 200; West End, 160; Tonopah Extension, 840; Midway, 80; total 6069 tons valued at $151,725.

Tonopah—A new shaft has been started on the Sand Grass claim at the extreme western end of the property. It is 2000 ft. west of the Red Plume, in the center of a large acreage of virgin ground, and is already 165 ft. deep. Lateral work will begin at the 400-ft. level. Mill report for the week shows 3275 tons of rock everaging $18 crushed. Bullion shipment consisted of 54 bars of bullion valued at $44,550, and 13 tons of concentrates worth $13,950, making a total recovery of $58,500. An average extraction of 92 per cent. was recorded.

Montana-Tonopah—A strong vein carrying good values throughout has been encountered on the 615-ft. level, supposedly a continuation of the Martha vein. The semi-monthly clean up resulted in 25 bars of bullion.

Belmont—The report of Superintendent Bradshaw for February shows 2525 tons shipped to the smelter with net returns averaging $21.02. The development of the Belmont vein on the 1100-ft. level shows the continuation of a good grade of ore.

Round Mountain—A new 50-h.p. electric hoist has been installed to prosecute development work in new territory. J. F. Thorne, the new superintendent, is sending a little more than 100 tons daily through the mill. Bullion returns for February show an output of $36,000. The directors declared the eighth quarterly dividend of 4c. per share, Feb. 12.

Bullfrog Pioneer—The Mayflower 100-ton mill has been leased and will be immediately put in operation reducing Pioneer low-grade ore. Daily shipments are being made of 15 to 20 tons of high-grade ore.

Keane Wonder—The uncovering of an entirely new orebody of high-grade rock on the lower tunnel level is reported.

Pioneer Oil Company—A complete equipment for drilling to depth has been shipped to Indiana Springs, 70 miles south of Rhyolite by Manager McFarland.

Nevada Ore Treating Company—The custom mill at Beatty has begun operation on a shipment of $40 ore from Pioneer. The company has established a rate of $6 as a treatment charge for ores up to $50.

War Eagle—The mill at Round Mountain is treating 1500 tons of Jumping Jack ore.

WASHOE COUNTY

Western Smelters Corporation—The company has commenced work on a 250-ton smelting plant near Reno. W. E. Patterson is manager.

New Mexico

DONA ANA COUNTY

Bennett-Stephenson—This company in the Organ mountains, having settled its legal difficulties, is again operating. The 400-ft. shaft will be sunk to 600 ft. The ore is lead, with copper and silver and some wulfenite. A 200-ton mill is on the property. J. J. McCullough, Las Cruces, is in charge.

Memphis—This property, two miles north of the Bennett-Stephenson, is shipping copper ores from surface development. D. H. Donworthy is manager.

SIERRA COUNTY

Bimetallic—This Deming (N. M.) company, Alfred Strum, president, is developing a gold and silver property near Kingston.

Sigma—The new shaft on the Wicks vein, near Hillsboro, is down 300 ft., and will continue to 500. A. G. Viegis is manager, and Fred Phillips, superintendent.

North Dakota

The surface equipment of the Lloyd lignite mine at Burlington, one of the larger mines of the State, has been burned. The owners propose to put up new buildings and machinery at once.

Ohio

Sunday Creek mine No. 209, near Athens, has been sealed in consequence of a serious fire which was started by a blown-out shot.

Pennsylvania

ANTHRACITE COAL

Lehigh Valley Coal Company—The Mineral Springs breaker has been burned; loss $250,000. Over 1000 men are out of employment.

Temple Iron Company—At the annual meeting in Reading, Penn., the following directors were chosen: George F. Baer, Albert Broden, Thomas P. Fowler, J. S. Harris, W. J. Richards, F. C. Smink, E. B. Thomas, M. H. Truesdale, F. D. Underwood. The board elected George F. Baer president; F. Law, vice-president and treasurer.

BITUMINOUS COAL

Options on 3500 acres of coal land in the Pendleton district, Cambria county, have been secured by Peter J. Little, of Ebensburg, who, it is understood, represents J. H. Weaver & Co., of Philadelphia, who operate two mines in the county.

A syndicate of Philadelphia people has taken an option on a large tract of land in Allegheny township in Westmoreland county. The land carries the Freeport vein, and lies along the Allegheny and Kiskiminetas rivers. The option is at $50 per acre. Diamond drills have been put at work on the property.

BUCKS COUNTY

Interest has been recently revived in the mineral belts on the old Logan grant in Milford and Buckingham townships. Lead ore was found there and mined in a small way many years ago. Now it is claimed that zinc ore has been found in Milford, and the owners propose to make further explorations.

South Dakota

Homestake—The company has resumed its dividends at the old rate of 50c. a share monthly.

Utah

BEAVER COUNTY

Majestic—A shipment from the ore recently encountered in the Hoosier Boy claims is being prepared for the market. It is proposed to build a tramway from the Harrington-Hickory mine to the railroad.

Red Warrior—Work is being continued on the orebody recently opened on the 300-ft. level. Shipping ore taken out in development has been stored on the dump. The company is now hauling this ore to Milford.

BOX ELDER COUNTY

Homber—This company, which owns a graphite deposit near Perry, has recently become interested in the manufacture of mineral paint under the name of the Homber Mining and Manufacturing Company, and the work of constructing a mill has been begun at Ogden. The company has acquired ground near Richfield from which red oxide of iron is obtained, also some ochre deposits in San Pete county. It is expected that the initial cost of the plant will be in the neighborhood of $15,000.

JUAB COUNTY

Tintic ore shipments in carloads for the week ended March 18 were as follows: Victoria, 7; Grand Central, 5; Swansea, 1; Beck Tunnel, 3; Colorado, 16; Sioux Consolidated, 19; Iron Blossom, 19; Dragon Iron, 22; Scranton, 6; Gemini, 6; East Tintic Development, 2; Chief Consolidated, 6; Eagle & Blue Bell, 6; Centennial-Eureka, 38; Opohongo, 2; Gold Chain, 2; total, 160 cars.

Utah—This property at Fish Springs has marketed another carload of silver-lead ore. The smeltery returns on 38 tons were reported to have been $3289.

Lower Mammoth—At a recent meeting of the directors it was announced that ore shipments should cover the cost of development, and would obviate the necessity for further assessments. The orebodies between the 1700- and 1800-ft. levels are larger and better than expected.

Iron Blossom—Work is being done on the 500 level of the No. 3 shaft. The drift is 200 ft. east of the shaft, and has encountered a new fissure. The company is drifting on the 1400 level of the far south shaft. It is said that shipping ore is being mined from a raise on the 500 level. This ore is silicious and carries more gold than usual.

East Tintic Development—Two carloads of silver-lead ore have been shipped. Four feet of ore is reported in the winze below the 235-ft. level.

East Tintic-Gold King—At the annual meeting of the stockholders, it was decided to make the stock of the company assessable. Development work will be started soon.

Grand Central—A dividend of 6c. a share was declared by the Grand Central, payable March 25. The distribution amounts to $36,000. The mine is in good condition.

Victoria—This company has announced a dividend of 4c. a share payable on March 25. The dividend amounts to $10,000. The property is in good condition.

Chief Consolidated—An increased force of miners has been put to work on ore. During February, the company shipped 10 carloads of ore that netted better than $1000 a car. Up to March 11 the ore shipments were 12 carloads. The greatest part of the ore is coming from the 1400 and 1600 ft. levels. The grade of the ore has been improving. The shaft is now below the 1700-ft. level, and sinking is in progress. This work is slow on account of the hoisting plants being taxed almost to its capacity in raising ore. Drifting will be started on the 1800-ft. level. The new hoisting plant which has been ordered is expected to arrive in June. Practically all of the Eureka City company's stock has been exchanged for Chief Consolidated.

SUMMIT COUNTY

Owing to the gradual breaking up of winter, with no sudden changes in temperature, the Park City roads are better than they were at this time last year. This will contribute to more satisfactory conditions for hauling ore during the spring and summer.

American Flag—Ore has been opened by a crosscut on the 400-ft. level. This is thought to be the vein from which ore was produced on the tunnel level above.

New York Bonanza—The drift southeast of the shaft on the 1000 level is following a fissure which carries about 10 in. of mineralized vein matter, showing galena.

Little Bell Consolidated—The company paid its second dividend, amounting to $15,000, March 22. A report to stockholders shows that during the quarter ended Feb. 28, 1910, the company marketed 1428 dry tons of ore which carried 21.18 per cent. lead, 75.66 oz. silver, 0.0474 oz. gold, and 2.28 per cent. copper. The net smeltery returns on this ore were $46.30 a ton, or a total of $66,113. The earnings for the quarter amounted to $40,063 which, after paying dividend No. 2, added $25,053 to the company's surplus.

Virginia

Arrangements are reported complete for the consolidation of all the mining interests in the Black Mountain district, southwestern Virginia, under the organization of the Dominion Coal Company, an Ohio corporation. The companies to be absorbed are the Black Mountain, the Derby, the Imboden, the Monarch, the St. Charles and the Virginia-Lee coal companies.

West Virginia

Buffalo Colliery Company—A central power plant is being erected, which will furnish power to the Buffalo colliery and also to the Hatfield mine, which was recently bought by the company. A transmission line to Hatfield is being put up. The company has also let a contract for a new coal-washing plant at Buffalo, Mercer county.

Wisconsin

ZINC-LEAD DISTRICT

Wisconsin Zinc Company—This company has subleased the Grant County, adjoining the Empire mine, on the north; the new shaft on the Longhenry land has opened up a big body of heavy sheet ore.

Gogebic—A new shaft will be sunk on the Seitz land, east of the Klar-Piquette, where recent drilling indicated rich ground.

Kohinoor Blende—The 75-ton mill is completed, and operations will be commenced April 1.

Dickson-Oettiker—A small milling plant has been erected, east of the St. Rose, and mining resumed.

Peaceful Valley—A 25-ton mill has been installed on the Henry Kettler land, north of the Best.

Wallace—This Highland company has purchased the 100-ton mill of the Appelton-Galena.

Wyoming

CARBON COUNTY

Rambler Copper and Platinum Company—This company has been shipping high-grade copper ore since August, 1909, and is now installing a 50-ton unit for the concentration of the platinum ores and of the lower-grade copper ores. It is claimed that there are 15,000 tons of ore containing platinum blocked out. The company is experimenting on a method for the treatment of this ore. W. J. Sherwood is manager and Robert A. Marr is engineer and metallurgist.

Canada

BRITISH COLUMBIA

Crows Nest Pass Coal Company—At the annual meeting held in Toronto, March 11, a financial statement was presented showing net profits of $145,029, which, added to the balance at credit on Dec. 31, 1908, gave a balance at profit and loss of $156,025. The liabilities included bills payable amounting to $1,221,134. The output of the year was 899,045 tons of coal, and 250,254 tons of coke. President Elias Rogers stated that since the first of this year, the tonnage had greatly increased. In January, the output was 99,489 tons, compared with 58,718 tons in January, 1909, and in February, 95,977 tons, as against 65,500 tons last year. During the year a total amount of $215,839 had been expended on improvements. Considerable dissatisfaction was expressed at the small proportion of profit made on the output, which was stated at 16c. per ton.

ONTARIO—COBALT

The shipments from Cobalt for the week ended March 18 are as follows: La Rose, 238,974 pounds; McKinley-Darragh, 150,561; Buffalo, 124,500; Nipissing, 65,381; Crown Reserve, 61,110; Hudson Bay, 61,330; total, 701,856 pounds.

Orizaba—This property in the Maple Mountain district is looking better, and another 100-ft. shaft will be sunk.

Silver Bar—Some of the buildings were destroyed by fire recently.

Silver Lode—Operations are to be resumed, and the shaft will be sunk.

Silver Cliff—The mill is completed and is waiting for power. There are 18,000 tons of mill rock on the dump and in the stopes.

Mexico

BAJA CALIFORNIA

Beryl—This American company has given an option on its gold mines and milling plant in the San Andres district to English interests. The mines are being examined. The ore in sight is estimated at 75,000 tons.

Julius Ceasar—Patrick Burns, of British Columbia, has bought these mines in Baja California.

CHIHUAHUA

Virgen—This gold property in the Placere de Guadalupe section, east of Chihuahua, has been purchased by Luis Terrazas, Jr., of Chihuahua, who will extensively exploit it and install new machinery.

Sierra—This Cole-Ryan company operating at Ocampo is planning to build a hydroelectric plant.

Orient—The mining properties owned by the Stillwell interest and the Kansas City, Mexico & Orient Railway are now in charge of R. H. Burroughs, formerly of Guanajuato, and it is reported that considerable work necessitating machinery purchases is to be started. Mr. Burroughs has headquarters at Chihuahua.

Santa Elena—This lead property in the Terrazas camp north of Chihuahua is shipping ten carloads weekly to El Paso. Harbottle & McKenzie are the operators.

Santa Eulalia Exploration Company—The properties are undergoing examination by engineers of the Exploration Company.

Mary M.—This company is increasing its operations in the vicinity of Alamos, Son. T. C. Woodworth is the manager.

Ronquilla—The Arizona-Parral company is carrying on a large amount of work at this Parral mine. The new power and milling plants are in operation.

Parral - Chihuahua Company — This company is developing two properties at Parral, the San Eduweges and San Miguel, and machinery will be installed at both, shortly.

Parral Consolidated—Electrical sinking pumps are being installed at the Prieta mine, and as soon as the lower workings are unwatered the new mill will be put in operation again. R. L. Wilson is in charge.

La Republica—This company is operating a high-grade silver mine near the western border of the State, making an extraction of over 90 per cent. by concentration and cyanidation. The property has to contend with over 1000 gal. of water per minute, and all operations are handled with sectionalized machinery, necessitated by transportation conditions. New motor-driven Aldrich triplex pumps are now being installed. E. H. Webster, formerly of the Dolores mine, is manager, and J. Gordon Hardy, of El Paso, consulting engineer. The company treated for the quarter ending Jan. 1, 3067 tons, which yielded 198,410 pesos, at an expense of 108,271 pesos.

COAHUILA

At Sierra Mojada the American Smelting and Refining Company is operating 4 mines with an approximate monthly shipping output of 3000 tons of lead-silver ore. La Constancia mine, an independent operation, is shipping 200 tons monthly to Torreon. This company will begin prospecting with diamond drills.

JALISCO

The Chapala company will extend its Etzatlan transmission line to the Ameca district. Power is being offered in that district at 125 pesos per h.p. a year.

Amajac—Machinery for remodeling the reduction works in the Hostotipaquillo district has been shipped. The new plant will start with a capacity of 75 tons daily, and custom work will be done. Much ore is available in the company's Refugio, Tres Estrellas and Las Animas mines.

Magistral-Ameca—Stoping is in progress preparatory to milling. The 100-ton plant will be completed May 1. The Elmore flotation process will be used in the treatment of copper ores for the first time in Mexico.

MEXICO

Esperanza—The company reports the return for February as follows: Mill ran 24 days and crushed 13,863 dry tons of ore; estimated realizable value of bullion produced, $180,061; concentrates, $8878; total, $188,939; working expenses, $98,428; estimated profit, £17,086.

SONORA

El Tigre—During 1909 this company reports an exportation of 4150 tons of first-grade ore and milled product, for which $1,087,275 was paid. Operating expenses approximated $500,675, including betterments, which leaves its earnings $586,600. It is claimed that when the milling capacity is doubled, the visible ore supply is sufficient for five years.

Sonora Central—The San Domingo mine, near Alamos, is being steadily worked and good ore has been developed, which justifies the erection of a reduction plant.

La Libertad—This gold property near San Antonio de la Huerta is being developed by H. L. Miller.

Durazno—The operators of this mine, east of Alamos, shipped 165 oz. gold bullion.

Zambona—The mill is treating the tailings from previous operations at the Minas Nuevas with satisfactory returns.

Monarca—The holdings of this company, near Carbo, are being exploited with core drills.

Essex—Fifteen men are employed in opening a lime and porophy contact deposit in the Sierra Azul mountains, east of Imuris.

Los Animas—The company has recently expended $25,000 for machinery.

Greene-Cananea—The erection of ore-bins, sufficient in capacity to receive the output of the Sierra de Cobre and Elisa mines, has been started at the entrance to the 3000-ft. Elisa tunnel. The plans specify arrangement for an addition to meet the requirements of the Henrietta mine, when the tunnel has been extended that far. Three shafts are being sunk on the Sierra de Cobre, and the development work at this point is more exhaustive than at any other mine. The quantity of first-grade ore considerably exceeds that requiring concentration. An electric hoist of medium size is being placed at Oversight No. 11 shaft, and a much larger one has been ordered for the main shaft at the Cananea-Duluth. All reclassifying work at concentrator No. 2 will be finished during April, and every unit will be put in operation.

TEPIC

Santa Maria del Oro—John McSorley, representing California capitalists, is negotiating for the principal mines of the Santa Maria del Oro district. He will also acquire properties in the old Compostela district.

VERACRUZ

Oil Fields of Mexico—This oil company, Percy N. Furber, president, and Arthur C. Payne, manager, has listed its stock on the New York curb market. The company has a government concession to oil land in the gulf field and has been operating for some time.

Africa

WEST AFRICA

Gold returns for Ashanti and the Gold Coast in February are 16,976 oz. For the two months ended Feb. 28 the total was 44,220 oz. bullion in 1909, and 34,333 oz. in 1910; a decrease of 9887 oz. The bullion reported this year was equal to $677,290, or 31,799 oz. fine gold.

Asia

INDIA—MYSORE

Kolar Goldfield—Gold production in February is reported at 45,464 oz., being 1084 oz. less than in January. For the two months ended Feb. 28, the total was 88,929 oz. bullion in 1909, and 92,012 oz. in 1910; an increase of 3083 oz. The bullion reported this year was equal to $1,811,600, or 82,811 oz. fine gold.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, March 30—The bituminous-coal trade in the East is in fair condition. Business is steady but there is no marked improvement in conditions. There is, however, less trouble about car supply and coal is moving more freely than for some time.

The anthracite trade has had a little spurt of activity, owing to the coming of the usual April discount on list prices at tidewater.

In the West the main question is as to the probability of a strike. Opinion generally is inclined to the view that there will be no suspension of mining, or at least only a very short one. Moreover, there are accumulated stocks of coal at many points sufficient to tide over a stoppage of moderate duration.

The Wage Scale Agreement—At Cincinnati on March 28, the scale committee presented to the Miners' convention the proposition of the operators, which was as follows:

1—The present agreement to be continued until March 31, 1911, with the exception of the mining prices.

2—In western Pennsylvania thin vein, in the Hocking—the basing district of Ohio—and in the block and bituminous districts of Indiana, the price for mining to be increased 5c. per ton on 1¼-in. screened coal for pick mining, and 4c. for machine mining; in Indiana districts where mine-run coal is the basis the increase will be 4c. for pick and 3c. for machine mining.

3—The inside day-wage scale to be advanced 5.55 per cent. with the conditions of the Columbus scale of 1898. All narrow work, deadwork, room-turning and outside day labor to be paid an advance proportionate to the pick-mining rate.

4—Local differences to be referred for adjustment to the various districts affected, with the agreement that in such adjustment "there shall be no additional cost to the operators in mining coal during the life of this agreement."

After a short debate, the miners voted to reject this proposition, but without substituting anything in its place. The joint scale committee thereupon resumed its conference, but no result had been reached up to the present writing.

The operators in the Southwestern Interstate Association, including Missouri, Kansas, Arkansas and Oklahoma, have refused to grant the demand of the miners for an advance of 10c. per ton for pick mining and payment on a run-of-mine basis. They have issued a statement saying that an advance is impossible, in view of the fact that they have to compete with crude oil as a fuel, as well as with coal from other States.

COAL TRAFFIC NOTES

Coastwise shipments of coal by water from chief Atlantic ports, month of January, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	1,527,876	913,754	2,441,630	65.8
Philadelphia	169,608	357,229	526,837	14.2
Baltimore....	19,555	285,289	304,844	8.2
Newp't News	....	244,106	244,106	6.6
Norfolk......	....	192,142	192,142	5.2
Total......	1,717,039	1,992,520	3,709,559	100.0
Total, 1909.	1,398,362	1,835,696	3,234,058	.....

Total increase this year 457,501 tons, or 32.7 per cent. New York includes all the harbor shipping points.

Bituminous coal and coke tonnage of leading railroads in Pennsylvania and West Virginia in January, short tons:

	Bituminous.	Coke.	Total.
Pennsylvania......	3,624,729	1,413,157	5,037,886
Balt. & Ohio........	2,139,323	403,048	2,542,371
Buff., Roch. & Pitts.	613,947	59,750	673,697
Buff. & Susqueh'na	106,150	28,810	134,960
Penn. lines, N. Y. C.	862,175	6,798	868,973
Pitts. & L. Erie.....	934,202	643,437	1,577,639
Pitts., Shawmut&N.	109,228	2,808	112,036
Norfolk & Western.	1,388,939	273,078	1,662,017
Ches. & Ohio.......	1,267,117	44,624	1,311,741
Virginian	....	....	....
Total..............	11,045,810	2,875,510	13,921,320
Total, 1908........	8,573,784	1,895,467	10,469,251

Total increase this year, 3,452,071 tons, or 33 per cent. Anthracite tonnage of Pennsylvania and Baltimore & Ohio is not included.

Coal tonnage of railroads in Ohio Coal Traffic Association, month of January, short tons:

	1909.	1910.	Changes.
Hocking Valley	244,945	412,472	I. 167,527
Toledo & Ohio Cent	96,765	149,572	I. 52,807
Baltimore & Ohio ...	100,426	197,272	I. 96,846
Wheeling & L. Erie .	212,991	325,481	I. 112,490
Cleve., Lorain & Wh.	155,138	253,252	I. 98,114
Zanesville & Western	105,261	128,862	I. 23,601
Toledo Div., Pen. Co.	162,820	219,907	I. 57,087
L.Erie, Alliance&Wh.	96,351	105,290	I. 8,939
Marietta, Col. & Clev.	3,002	13,095	I. 10,093
Wabash-Pitts. Term.	....	4,405	I. 4,405
Total...............	1,177,699	1,809,608	I. 631,909

Total increase this year, 53.6 per cent. Only the Ohio lines of the Baltimore & Ohio are included; the main line tonnage is given elsewhere.

Anthracite tonnage of the Baltimore & Ohio, main line, in January was 90,099 tons in 1909, and 106,598 in 1910; increase, 16,499 tons.

Coal receipts at St. Louis, year ended Dec. 31, were 6,890,286 short tons in 1908, and 7,150,340 in 1909; increase, 260,054 tons.

Coal shipments reported by Southwestern Interstate Coal Operators' Association, year ended Dec. 31, short tons:

	1908.	1909.	Changes.
Missouri..........	2,370,022	2,574,873	I. 204,851
Kansas...........	5,122,509	5,779,397	I. 656,888
Arkansas.........	1,948,911	2,090,540	I. 141,629
Oklahoma........	2,728,292	2,554,566	D. 173,726
Total...........	12,169,734	12,999,376	I. 829,642

The total increase in shipments in 1909 was 6.8 per cent.

New York

ANTHRACITE

March 30—A week of almost summer weather has not been favorable to the market. On the other hand, the coming of the April discounts has caused some activity in orders from dealers. Quite a number of collieries closed down from Thursday to Tuesday of this week.

On Friday of this week, April 1, the schedule prices for prepared sizes are reduced to $4.25 for lump and $4.50 for egg, stove and chestnut, all f.o.b. New York harbor. Quotations for steam sizes are unchanged and are f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Contract making continues slowly, and there are a larger number not yet closed than is usual at this date. As heretofore noted, the tendency this year is to take the cheaper grades of coal.

The Government contract for coal for Panama has been let for Pocahontas coal at $2.63@2.75 per ton, f.o.b. Norfolk or Newport News. The ocean freight will run from $1.43 up to $1.60 per ton.

Spot business is quiet and sales are a little disappointing. Prices continue low; the best grades of steam coal being about $2.75 per ton, but lower grades are sold down to $2.50 and even $2.40, f.o.b. New York harbor. Transportation is good and car supply is improving. All-rail trade is reported fair.

The coastwise-vessel market is still a little unsettled, but vessels are plentiful and rates are inclined to be lower.

There is some talk about the probability of a strike in the West. Coal men here do not think a strike would affect this market; and many think that the Western operators would be quite willing to see a short stoppage.

Birmingham

March 29—Coal operations in Alabama continue at the top notch. All operators i this section of the country are up with eliveries. Additional orders for coal re in sight and there is promise of teady operation through the summer. fforts are being made to bring in more ibor for the mines. The outward movement of coal from Alabama is steady. 'he coke demand is keeping up with ie supply and the producers are losing o time at the ovens, all being kept in ull operation.

Chicago

March 28—Despite the unfavorable utlook on the labor situation, the average consumer of steam coal continues o be optimistic regarding the future, and n consequence sales of steam coals are iot heavy in general. Prices have sagged i little from last week's record; even creenings, for several weeks very firm it abnormal figures because of large denand and small supply, have moved lown slightly. The feeling among consumers seems to be one of confidence n the future supply. Owing to the very varm weather and the approach of April vith its discounts on anthracite, there is ardly any trade in domestic coals.

Illinois and Indiana lump brings $2.20 @2.40; run-of-mine, $1.90@2.10; and screenings $1.90@2. Smokeless, the leading coal from east of Indiana, holds to $3.55@3.65 for lump, and run-of-mine brings $2.90@3.05. The supply of smokeless continues large, making frequent depression of prices, as shipments arrive in waves. Hocking is steady, in good demand and well regulated supply, at $3.15 per ton.

Cleveland

March 28—Loading for Lake shipment continues, and a number of boats will be ready to start as soon as navigation is open. Not many season contracts have been closed so far. Local business is quiet, as most people think there will be no strike. There is plenty of coal to be had now.

Quotations for Middle district coal, Cleveland delivery, are $2 for 1¼-in.; $1.85 for ¾-in.; $1.75 for run-of-mine, and $1.65 for slack. No. 8 district, $2.20 for 1¼-in.; $2 for ¾-in.; $1.90 for run-of-mine, and $1.85 for slack. Cambridge district about the same as No. 8. Youghiogheny is quoted at $2.40 for 1¼-in., and $2.15 for run-of-mine.

Indianapolis

March 28—The action of the miners in convention to allow district agreements, seemed to do away with the possibility of a general strike, but the move by the joint conference late Saturday is thought to be even better than the convention's action, inasmuch as it now appears as though an agreement between all parties concerned will be reached. Much praise is being given President Lewis for having labored on patiently instead of rushing headlong into a general and disastrous strike.

Pittsburg

March 29—The convention machinery in Cincinnati is still in operation, but has not produced a settlement. The prospects have increased that there will be a suspension of mining, and it is more openly admitted that the trade needs a suspension to improve market conditions.

There has been only a moderate demand for coal in the past week, less than would be expected with a suspension imminent. There have been no further advances in prices, while slack has actually declined, fully 10c., and is quotable at $1.05@1.10, although late last week a few sales were made up to $1.15. Two contracts have been made at 80c., for April, May and June shipment, with the usual strike clause, and the market is quotable at 75@80c. for such delivery. Mine-run and nut are quotable at $1.15 @1.25, the higher price being usually asked, but the lower price possible with good buyers; ¾-in. is quotable at $1.25 @1.35, with $1.40 for 1¼-in. domestic.

Connellsville Coke—The tone of the market has improved, there being better inquiry, with some fair business put through. Two contracts with furnaces have been made, involving a total of about 17,000 tons monthly for second half, at about $2.25, ovens, for good grades, and $2.25 or higher is being asked for second half. A sale of 1000 tons of prompt furnace is reported at $2, and the market remains quotable at $1.90@2 for good grades. Foundry coke is nominally about $2.75@2.85 at oven.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended March 19 at 462,320 tons; shipments at 4286 cars to Pittsburg, 8285 cars to points west of Pittsburg and 865 cars to points east of Connellsville, a total of 13,436 cars.

St. Louis

March 28—Strange as it may seem, the market has been very slow all week and prices have eased off considerably. This was altogether unexpected and seems most peculiar in the face of a strike. The only reason which can be assigned for the break is that the railroads are manipulating the market in order to buy cheap coal.

No matter what is done in Cincinnati it will not affect the Illinois field, as the Illinois operators are not represented. Even should an agreement be reached the Illinois fields would be practically shut down for several months, owing to the new stringent Illinois mining law which goes into effect April 1. This law will compel operators to make so many improvements in their mines before they can resume operations that it will take considerable time to fix them up.

Prices are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	1 70	2 22
2-in. lump	1 60	2 12
Mine-run	1 50	1 82
2-in. nut	1 40	1 92
2-in. screenings	1 10	1 62
Pea and slack	0 80	1 32
Staunton, Mt. Olive & Springfield:		
6-in. lump	1.75	2 27
3-in. lump	1 65	2.17
Mine-run	1.30	1.82
2-in. nut	1.40	1.92
2-in. screenings	1.25	1.77
Carterville:		
6-in. lump or egg	1 60	1.27
3-in. nut	1.60	2.27
Mine-run	1 25	1.92
1½-in. screenings	1.10	1.77
Franklin County:		
6-in. lump or egg	1.75	2.42
3-in. nut	1.70	2.37
2-in. nut	1.50	2.17
1½-in. screenings	1.20	1.87
Trenton:		
6-in. lump	2.25	2 77
6-in. egg	2.25	2.77
3-in. nut	1.75	2.27
Pennsylvania Anthracite:		
Nut, stove and egg		6.95
Grate		6.70
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	2.50	5.30
Gas house		4.40
Smithing coal	1.65	4.15

Screenings and fine coal are the only sorts which have held their own.

FOREIGN·COAL·TRADE

Bunker Coal at United States Ports—Coal furnished to steamships in foreign trade at United States ports, month of January, long tons:

	1909.	1910.	Changes.
Coast ports	425,837	456,430	I. 30,593
Great Lakes	2,591	1,031	D. 1,560
Total	428,428	457,461	I. 29,033

Adding the exports, heretofore reported, the total coal sold for consumption outside of the United States was 1,184,713 tons this year.

Transvaal Coal—The coal mined in the Transvaal for the year ended Dec. 31 was 4,974,304 tons, of which 1,348,779 tons, or 27.1 per cent., were sorted or screened out as waste.

French Coal Trade—Imports and exports of fuel in France, year ended Dec. 31, metric tons:

	Imports.	Exports.	Excess.
Coal	15,426,030	1,132,528	Imp. 14,293,502
Coke	1,926,166	182,792	Imp. 1,743,374
Briquets	1,028,684	181,388	Imp. 847,296
Total	18,380,880	1,496,708	Imp. 16,884,172
Total, 1909	17,564,483	1,365,817	Imp. 16,198,666

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices as follows on March 19; Best Welsh steam, $4.08; seconds, $3.96; thirds, $3.84; dry coals, $3.90; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.40; seconds, $2.16. This is a general drop of 6c. a ton. All prices are per long ton f.o.b. shipping port, less 2½ per cent discount.

IRON·TRADE·REVIEW

New York, March 30—Recovery in the iron and steel markets is slow, and buyers do not seem to be in any hurry. They prefer to hold the waiting position they have occupied since December. There is a considerable volume of business to be done, but the closing of contracts is slow.

In pig iron business has been mostly of a small order both in the West and the East. It is apparently the belief of buyers that they can do better by waiting. In Eastern territory the market for foundry iron has been disturbed by offers of Alabama iron at low rates, down to $12.50, Birmingham, having been named for No. 2 foundry. Some business is reported in the Buffalo district, which has gone chiefly to local furnaces. Sellers are inclined to hold back on second-half business.

In finished material some structural contracts are going, but the fabricating companies are still taking business at low rates. The Jones & Laughlin Steel Company has let contracts for two large ore-carriers on the Lakes, which will require a quantity of plates and shapes. Trolley rails are still in demand, but no large orders for standard sections are reported. Jobbers report a good trade in bars and small building material.

Great Northern Iron Ore Properties—The report of the trustees for the year 1909 shows that payments were $1,500,000 dividends to certificate holders and $77,094 expenses; total, $1,577,094. Receipts from dividends, etc., were $1,560,000, leaving a deficit of $17,094. Balance brought forward from 1908 was $256,073, leaving a surplus on hand Dec. 31 of $238,979. Ore shipments from the properties were 3,016,619 tons, an increase of 1,547,694 over the preceding year.

Baltimore

March 28—Imports for the week included 594 tons ferromanganese from Rotterdam; 4821 tons iron pyrites from Huelva, Spain; 24,865 tons iron ore from Cuba.

Birmingham

March 28—No interruption is being allowed in the pig-iron make in the Southern territory and while there is some complaint still to be heard as to the lagging market, there is no iron going to the yards that should give the least alarm. Inquiries that indicate better conditions, are being received by the manufacturers in this section and occasionally there is a sale or two of iron made that gives some encouragement. It is firmly believed here that before the end of the coming month the buying movement will have started. Furnace companies are not inclined to quote the lower figures for iron for delivery during the latter part of the year, confident that there will be better conditions prevailing. Some iron has been selling, immediate delivery, as low as $13 per ton, No. 2 foundyr. For delivery during the last half $13.25 @13.50 is being asked and a small sale has been consummated for delivery during the last quarter of the year at $13.75. Basic and charcoal iron are enjoying a little run. There is no change in conditions with the steel makers. The cast-iron pipe makers say that there could be a little improvement but their plants are in full operation.

Chicago

March 28—The general tone of the iron market seems stronger, though evidences of decided change are not common. Buying of pig iron is in most cases still of small lots; lots of more than 500 or 600 tons, however, are more frequently sold and there are inquiries indicating a large tonnage that undoubtedly will be placed as soon as the market shows signs of strengthening. No. 2 Southern foundry remains at $13 Birmingham minimum ($17.35 Chicago) and No. 2 Northern sells at $18@18.50. Most of the business is being done in Southern, but Northern interests are looking more actively for contracts and are selling considerable tonnage outside of the field in which their iron naturally has preference for special uses. Northern charcoal iron is in fair demand at $19@19.50. Sales are chiefly for second quarter. Furnace interests have weakened to the extent of being willing to contract for good-sized tonnage requirements of the last half at practically the same prices as for requirements of the next three months, but the melter is cautious. He is doing well from his point of view, under his present policy, and does not see why he should change it. For iron and steel products the market continues strong, though not with great activity of buying apparent anywhere. Coke is steady, in good demand and supply, at $5.75 for the best Connellsville.

Cleveland

March 28—The ore market remains quiet with no new business.

Pig Iron—Quite a number of inquiries for foundry and forge iron are pending, the closing being a question of prices. It is believed that furnaces will make concessions rather than let the business get away. Nominal quotations are $18.65 @18.90 for bessemer; $16.50@16.75 for No. 2 foundry, Cleveland delivery.

Finished Material—The heaviest business is in bars, and mills are slow in making deliveries. Some concessions are reported on big contracts. Jobbers report business good.

Philadelphia

March 30—Whatever influences are exerted on pig-iron quotations outside of local market demand during the rest of the year will probably come from new conditions west of the Alleghenies where increased blast-furnace capacity will play an important part. It is generally admitted that the high level has been reached and that nothing but a vigorous consumptive demand will preserve prices at the present level. Eastern makers claim that the situation in the East will not be materially affected by conditions in the West but may be affected by the Southern furnace interests, if they should be obliged to force a market for their products. Quotations remain substantially as last week, $18@18.25 for No. 2X foundry and $17.50 for good grades of Southern. Gray forge has been as low as $17 in this market. Basic iron is strong at $18@18.50 but large business has not been reported recently.

Steel Billets—The conservative policy of buyers still continues.

Bars—Sales of small lots are more frequent.

Sheets—Sheets hold their own well and outside figures are promptly paid on early deliveries. Manufacturers deny that there is any shading.

Pipes and Tubes—Merchant-pipe discounts have increased slightly and further concessions are expected.

Plates—Heavy orders for plates continue to come in or rather specifications on orders placed some time ago. Large quantities of plates will be wanted for shipyards in this locality.

Structural Material—The aggregate of business for the week is above the average, both for bridge building and for general construction work.

Scrap—Scrap is moving at about the usual rate, and large buyers recently resolved to hold off. There is not enough railroad scrap for the mills and it is picked up at the outside price.

Pittsburg

March 29—The iron and steel market shows an improvement in actual business being placed, and in sentiment. The rate of bookings upon finished-steel products by the Steel Corporation has steadily increased until it is about equal to current production, so that the corporation is breaking even. Outside steel companies are doing as well, if not better. The major part of the business is in specifications on old contracts, there being a moderate amount of new business, almost wholly for early delivery, particularly in the next three months.

There is no tendency toward higher prices at any point, and there seems to be little expectation anywhere, on the part of either buyers or sellers, that prices will advance from the present level even should demand improve further. On the other hand there are no material recessions. Some sheet and wire products continue to be shaded on occasion, but to no greater extent than a month ago.

Reports that some agricultural-implement business in steel bars for the year beginning next July had been booked are officially denied. The business has not come to a head yet, and the only important bookings in this trade have been two or three contracts by the Illinois Steel Company, to July 1, with agricultural-implement interests which had exhausted their contracts. The importance of the agricultural bar tonnage is overrated; at best it amounts to only about 300,000 tons a year, while the total tonnage of merchant-mill products is about 6,000,000 tons. Steel bars are 1.45@1.50c., depending on delivery. Demand for hoops and bands is exceptionally heavy, particularly with the stamping trade.

Pig Iron—The market is almost stagnant, from surface appearances, but there s really a fair amount of business done n foundry iron in a quiet way. There is no demand for basic iron, but prices seem o be firmer and it is doubtful if $16, Valley, could be shaded, while $16.25 might have to be paid for extended deivery. Bessemer is extremely quiet, and s quotable nominally at $17.50, Valley, t being understood that there are offerngs at this figure, although there is no definite inquiry. The Valley market on foundry iron has become pretty steady at $16 asked and it would require very special circumstances to develop any cut from this level. Southern iron continues weak. Several sales have been made by furnaces for second quarter at $12.50, Birmingham, for No. 2, while gray forge has sold at $11.25. At $12.50 for No. 2, Southern iron is $1 lower, relative to Valey iron at $16, than the average of 1908 and 1909.

Steel—The market for open-hearth bilets is, if anything, stronger and the top asking prices of a few weeks ago have been paid for a few lots for early deivery, and as high as $29, Pittsburg, is reported as paid in an extreme case for 4x4 billets, while small billets continue o command $30 or higher. Regular prices, for ordinary delivery, continue quotable as follows: bessemer billets, $27@27.50; open-hearth billets, $27.50@28; sheet bars, $28.50@29 per ton.

Ferromanganese—The market has been growing softer, and demand is light. A few sales of prompt have been reported at $42, Baltimore, while second quarter s quotable at about $42.50. On April 1 he freight, Baltimore to Pittsburg, which was advanced January 1 from $1.95 to $2.30, will be put back to the old figure.

Sheets—There is a moderately good demand and most mills are adhering to regular prices. Two or three, which were optimistic late last year and did not paricipate largely in the heavy business then being placed, are shading about $2 a ton. Regular prices are 2.40c. on black, 28 gage, 3.50c. on galvanized, $1.70 per square on painted corrugated roofing and $3 on galvanized corrugated rofing. Blue annealed sheets are nominally 1.75c. for 10 gage, but bring 1.90c. for prompt delivery.

FOREIGN IRON TRADE

British Iron Trade—Exports and imports of iron and steel in Great Britain, two months ended Feb. 28, as valued by Board of Trade **returns:**

	Exports.	Imports.	Excess.
Iron and steel	£ 6,587,356	£ 1,361,764	Ex. £ 5,225,592
Machinery...	4,029,568	648,955	Ex. 3,380,613
New ships....	2,285,981	....	Ex. 2,285,981
Total..... ..	£12,902,905	£ 2,010,719	Ex. £10,892,186
Total, 1909..	10,656,618	1,881,385	Ex. 8,775,233

Increase in exports, £2,246,287, or 21.1 per cent.; increase in imports, £129,334, or 6.9 per cent. The quantities of iron and steel reported were, in long tons:

	1909.	1910.	Changes.
Exports.............	571,002	718,890	I. 147,888
Imports.............	181,911	205,962	I. 24,051

Exports of scrap iron and steel, not included above, were valued at £72,465 in 1909, and £128,620 in 1910; imports were £6795 in 1909, and £11,919 this year.

British Iron Ore Imports—Imports of iron ore into Great Britain, two months ended Feb. 28, were 876,726 long tons in 1909, and 1,111,158 in 1910; increase, 234,432 tons. Of the imports this year, 826,175 tons were from Spain.

German Steel Syndicate—The following statement shows the full business of the Stahlwerks Verband in 1909, the first column showing the total allotments or allowances to the several works, and the second the actual deliveries made on those allotments; the figures are in metric tons:

	Allotments.	Deliveries.	Difference.
Billets, blooms, etc............	1,367,893	1,503,453	Ex. 135,560
Railr'd material	2,405,789	1,847,440	Def. 558,349
Shapes..........	2,392,816	1,614,702	Def. 778,114
Bars.............	3,449,271	2,903,127	Def. 546,144
Sheets and plates	964,578	881,826	Def. 82,752
Wire-rods........	780,659	673,942	Def. 106,717
Forgings and castings.......	637,200	479,200	Def. 158,000
Tubes............	141,336	95,525	Def. 45,811
Total.........	12,139,542	9,999,215	Def. 2,140,327

The only group showing an excess of deliveries over allotments was half-finished material—blooms, billets and similar articles. The total deliveries were 82.4 per cent. of the total allotments for the year.

German Iron Trade—Exports and imports of iron, steel and machinery in Germany, month of January, metric tons:

	Exports.	Imports.	Excess.
Iron and steel..	339,537	39,869	Exp. 299,668
Machinery......	24,288	3,692	Exp. 20,596
Total..........	363,825	43,561	Exp. 320,264
Total, 1909.....	284,237	36,539	Exp. 247,698

Imports of iron ore, 628,416 tons; exports, 248,307 tons. Imports of manganese ore, 31,018 tons; exports, 277 tons.

METAL·MARKETS

New York, March 30—The metal markets do not show much change, and are still inclined to quiet and slight depression, with only small exceptions.

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin, lead, zinc and aluminum, was 127 for the month of January; 124 for February. These figures were reported incorrectly last week.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Feb. 1910..	$ 2,937,134	$ 3,063,116	Imp. $ 125,982
" 1909..	8,860,814	3,576,444	Exp. 5,284,370
Year 1910..	9,100,266	6,194,473	" 2,905,793
" 1909..	16,696,170	6,966,627	" 9,699,543
Silver:			
Feb. 1910..	4,588,619	3,155,329	Exp. 1,433,290
" 1909..	4,852,549	3,508,935	" 1,343,614
Year 1910..	9,086,923	7,403,683	" 1,683,240
" 1909..	9,394,643	7,173,687	" 2,220,956

Exports from the port of New York, week ended March 26: Gold, $1,002,000, including $777,000 French gold coin in transit to Cuba; silver, $989.056, chiefly to London. Imports: Gold, $104,056; silver, $72.859, from the West Indies and Mexico.

Movement of gold and silver through the port of San Francisco, two months ended Feb. 28:

	Exports.	Imports.	Excess.
Gold............	$1,970,208	$272,013	Exp. $1,698,195
Silver...........	1,111,200	531,895	Exp. 579,305

Exports of silver from London to the East from Jan. 1 to March 17, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£ 918,000	£1,265,500	I. £ 347,500
China........	657,000	904,500	I. 247,500
Straits.......	82,800	......	D. 82,800
Total......	£1,657,800	£2,170,000	I. £ 512,200

India Council bills sold in London at an average of 16.13d. per rupee.

Gold—The price of gold on the open market in London was slightly higher, at 77s. 9⅛d. per oz. for bars. American coin was exchanged at 76s. 5d. per oz. Supplies arriving, which were chiefly from South Africa, were divided between London and the Continental banks.

Platinum—Business is steady and the market has a firm tone. Reports from Europe indicate that prices will be at least maintained. Dealers ask $29@29.50 per oz. for refined platinum, and $34.50 per oz. for hard metal.

Our special correspondent writes from St. Petersburg under date of March 17, that prices show little change. In Ekaterinburg 6.05 rubles per zolotnik—$22.75 per oz.—is quoted for small lots; in St. Petersburg 24,000 rubles per pood—$23.52 per oz.—both prices for crude metal, 83 per cent. platinum.

The total yield of platinum in Russia in 1909 is reported at 312 poods, or 164,237 oz.; an increase of 14 poods over the previous year.

Silver—The market has continued firm and closes at 24⅛d. in London. The price in India today is the same as it was just before the extra duty was imposed, proving that when it is a question of luxury, as silver is in the bazaars, the addition of a small percentage to the price has little influence on the demand during a period of prosperity.

SILVER AND STERLING EXCHANGE

Mar.	24	25	26	28	29	30
New York....	52	52	52⅜	52⅜	52¼	52⅜
London.. .	22 15/16	....	24⅛	...	24 1/16	24⅛
Sterling Ex..	4.8705	4.8705	4.8710	4.8715	4.8730	4.8750

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Mar.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
24	13½ @13⅝	13⅛ @13¼	58¾	32½	4.37½ @4.40	4.22½ @4.25	5.35 @5.40
25	13½ @13⅝	13⅛ @13¼	....	32½	4.37½ @4.40	4.22½ @4.25	5.35 @5.40
26	13½ @13⅝	13⅛ @13¼	....	32½	4.37½ @4.40	4.22½ @4.25	5.35 @5.40
28	13⅜ @13⅝	13 @13¼	....	32½	4.37½ @4.40	4.22½ @4.25	5.40 @5.42½
29	13⅜ @13⅝	13 @13¼	58⅜	33	4.37½ @4.40	4.22½ @4.25	5 40 @5.42½
30	13⅜ @13⅝	13 @13¼	58	33¼	4.37½ @4.40	4.22½ @4.25	5.40 @5.42½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Business has again been of small volume, and as the week progressed there has appeared more anxiety among sellers to find a market for their product, but the lower prices which have been named have so far not brought out buying orders except in a retail way. Such sales as have been effected have been chiefly for foreign delivery, which business has been done at 13.10 to 13.20, according to shipment. Most of the agencies are offering electrolytic for domestic delivery at 13¼, delivered 30 days, equivalent to about 13.20, cash, New York, and some transactions have been made at that price and lower. The market for Lake copper has been extremely dull and quotations are essentially nominal. Some small sales of fancy brands have been made as high as 13¾c. The closing quotations are reported at 13⅜@13⅝c. for Lake, and 13@13¼c. for electrolytic in cakes, wirebars and ingots. Casting copper is quoted nominally at 12⅞@13⅛ cents.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¾c. base, carload lots at mill.

The London standard market has also shown a downward tendency and closes barely steady at £58 for spot, and £59 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £61; best selected, £61@61 10s.; strong sheets, £70@71 per ton.

The March statistics of the Copper Producers' Association will be published on April 8.

Copper exports from New York and Philadelphia for the week were 2950 long tons. Our special correspondent gives the exports from Baltimore at 996 tons copper.

Copper in March—The large buying of copper that began toward the end of February continued into March, the sales from Feb. 24 to March 5, probably aggregating in the neighborhood of 100,000,000 lb. However, these large transactions resulted in only a slight increase in the price, electrolytic never rising above 13½c. The statistics published on March 10 acted as a damper upon the trade and with the subsequent increase of pessimistic feeling the market sagged off under comparatively small sales, closing at 13⅛c. for electrolytic.

Tin—The London market has retained its strength and prices show a further advance. The bull party's position was strengthened by reports that the strike at the Welsh tinplate mills had been averted and that deliveries into American consumption for this month are comparatively large ones. An improvement in the statistical position of the metal is, therefore, confidently expected, and the close is cabled as steady at £150 15s. for spot, and £152 15s. for three months.

There was no great activity in the domestic market, consumers showing no interest except in spot material, which is held very firmly, and at the close tin can be bought at about 33¼ cents.

Lead—Demand for this metal has shown some improvement and prices at the close are steadier at 4.37½@4.40c. New York, and 4.22½@4.25c. St. Louis.

The weakness in lead appears to be wholly confined to the market for spot and early deliveries. Notwithstanding the superficial feeling of discouragement about this metal, there appears to be an undercurrent of strength and when it is a matter of contract for future deliveries dealers are disinclined to consider business at present prices.

The London market for lead is unchanged at £12 18s. 9d. for Spanish, and £13 1s. 3d. for English.

Spelter—Orders have been coming forward somewhat more freely, and the market has slightly advanced during the week, closing steady at 5.40@5.42½c. St. Louis, and 5.55@5.57½c. New York.

Considerably more business in spelter was transacted during last week than in the week previous, sales having been made both to consumers and to speculators. On business with speculators as high as 5.45c. St. Louis, has been done, but consumers have found no difficulty in buying at 5.40. The feeling in this market is somewhat more hopeful.

New York quotations for spelter, March 24-26 inclusive, were 5.50@5.55c.; March 28-30, inclusive, 5.55@5.57½ cents.

The London market is unchanged at £23 for good ordinaries and £23 5s. for specials.

Base price of zinc sheets is $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—While the market continues good and business is active, prices are unchanged, 23¼@23¾c. being quoted for No. 1 ingots, New York. Sellers are still reluctant to quote far ahead, in view of the strong position.

Antimony—The market continues dull, and prices are inclined to be weaker. Cookson's is quoted at 8¼@8⅜c. per lb., while 7⅞@8c. is still asked for U. S., and 7¼@7⅜c. for outside brands.

Quicksilver—The market is easier but prices are unchanged. New York quotation is $49 per flask of 75 lb.; jobbers ask 73@74c. per lb. for small lots. San Francisco, $48@49 for domestic orders and $2 less for export. The London price is £9 5s. per flask, with £9 2s. 6d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. Prices in Germany are 500@550 marks per 100 kg.—average 56.7c. per lb.—f.o.b. works in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, two months ended Feb. 28, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.	
Copper, long tons	28,137	10,362	Imp.	17,775
Copper, 1909....	21,896	13,269	Imp.	8,627
Tin, long tons....	8,399	7,901	Imp.	498
Tin, 1909.......	7,150	6,658	Imp.	492
Lead, long tons..	33,993	7,962	Imp.	26,031
Lead, 1909 ...	37,823	6,338	Imp.	31,485
Spelter, l'g tons..	21,033	1,602	Imp.	19,431
Spelter, 1909....	16,915	1,153	Imp.	15,762
Quicksilver, lb...	499,082	107,968	Imp.	391,114
Quicksilver, '09	401,157	171,786	Imp.	229,371

Ores:	Imports.	Exports.	Excess.	
Tin ore and con.	3,963	....	Imp.	3,963
Tin ore, 1909...	2,587	....	Imp.	2,587
Pyrites..........	131,039	....	Imp.	131,039
Pyrites, 1909...	136,790	....	Imp.	136,790

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished in all 26 tons copper matte, 11,966 tons fine copper and 3115 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., March 26—The highest price paid this week for zinc ore was $45 per ton; the base price, 60 per cent. zinc, was $43@44.50. For 80 per cent. lead ore $50 per ton was paid.

SHIPMENTS. WEEK ENDED MAR. 26.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point...	654,800	56,000	....
Platteville.............	477,980	....	527,700
Benton..................	261,000	.....	....
Galena..................	222,000	....	....
Highland...............	126,200	....	....
Cuba City..............	83,390	84,120	....
Lindon..................	72,760	85,030	....
Livingston.............	......	60,000	......
Total..................	1,898,130	285,150	527,700
Year to date..........	18,453,770	1,461,199	3,415,050

In addition to the above there was shipped during the week to the separating plants, 2,080,195 lb. zinc concentrates.

Joplin, Mo., March 26—The highest price paid for zinc sulphide ore was $47 per ton, the base ranging down from $44 early in the week to $43 for the best grades and as low as $40 for medium grades. Zinc silicate ore sold on a base of $18@24 per ton of 40 per cent. zinc. The average price, all grades, was $38.96 per ton. Lead ore declined to $50 per ton.

The production was heavy on both zinc and lead ore, and with comparatively light shipments except from Webb City the reserve stock is again increasing, reaching at the end of this week 7000 tons.

The zinc ore producers this week secured a formal certificate for their new organization, and it is rumored that the secretary's office has been tendered Mr. Siebenthal of the Geological Survey, but as yet his acceptance has not been received. Webb City members, who have maintained an organization with Mr. Hutcheson as secretary, have insisted that he be retained. The organization has been six weeks in forming. Perfect harmony has not existed, and there is strong rumor that the Webb City contingent will continue their organization and withdraw from the new one.

SHIPMENTS. WEEK ENDED MAR. 26.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,809,740	523,520	$114,092
Joplin..................	1,657,610	222,360	41,196
Alba-Neck............	702,140	......	16,148
Duenweg..............	938,170	44,210	15,957
Granby	1,029,320	17,000	14,055
Badger.................	582,110	15,980	12,806
Galena.................	434,070	74,290	10,972
Aurora.................	405,900	75,480	8,006
Spurgeon.............	421,520	67,830	7,296
Carthage..............	292,380	......	6,431
Quapaw...............	294,700	11,810	6,328
Miami.............. ..	272,420	53,660	4,337
Oronogo..............	120,680	60,960	3,348
Sarcoxie..............	119,540	......	2,510
Cave Springs.........	117,790	......	2,473
Jackson...............	119,520	......	2,444
Carl Junction.........	64,620	......	1.389
Saginaw...............	25,730	21,490	1,048
Wentworth......	35,210	......	350
Totals	12,443,180	1,188,590	$271,176
3 months............	140,546,260	21,223,930	$3,501,091

Zinc value, the week, $241,479; 3 mos., $2,919.532
Lead value, the week, 29,697; 3 mos., 581,559

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January.....	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February....	36.94	40.69	34.37	39.47	50.50	53.64
March.......	37.40	......	34.71	......	50.82	......
April........	38.63	......	37.01	......	55.63	......
May..........	40.06	......	37.42	......	56.59	......
June.........	44.15	......	40.35	......	57.52	......
July....	43.06	......	41.11	......	53.74	......
August......	48.25	......	44.54	......	57.60	......
September..	47.70	......	44.87	......	56.11	......
October......	49.50	......	45.75	......	55.02	......
November...	51.31	......	48.29	......	53.94	......
December...	49.45	......	47.57	......	55.26	......
Year.......	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, March 30—The general market continues steady with no changes of importance, but rather a firm tendency.

Copper Sulphate—Business is good and the market steady. Prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller orders.

Nitrate of Soda—Sales continue large and spot nitrate holds firm at 2.15c. per lb. Futures remain at 2.07½c. per lb. in view of the large imports, present and prospective.

Arsenic—The market is weaker. Sales for the week are reported at about 100 tons. Quotations are easier and are given at $2.37½@2.50 per 100 lb. for white arsenic.

MINING · STOCKS

New York, March 30—A holiday for two days broke into the trading this week, the Exchange having adjourned from Thursday over to Monday. Outside of this the general market was confused and for the most part weak and reactionary. The Granby flurry contributed to this, and it was helped by the threat of labor troubles in the West and by the bad position in London. Amalgamated broke several points, and other shares were lower.

On the Curb the copper shares were all weak, and some lost considerably. The trading was not heavy, however. Some trading was done in Cobalt stocks, but generally at reduced prices. Nevada gold stocks were fairly steady, but on small business.

A small sale of Homestake of South Dakota was reported, 60 shares changing hands at $88.25 per share.

At public auction on March 23 there were sold 7500 shares Alice Gold and Silver Mining Company at $1.50 per share; 98,112 shares Argentite-Cobalt Company at 0.5c. per share; 11,510 shares Dominican Placer Mining Company at $110 for the lot.

Boston, March 29—Copper shares have been utterly demoralized, although at the present writing some recovery has followed the low levels and the belief is expressed that the worst has been seen. Granby Consolidated has been the worst sufferer, with a break from $84 to $37 per share, during the week, although recovery to $45 followed today. The break in the price of these shares was savage and came as a surprise, as the stock has been classed as among the gilt-edge mining issues.

The so called Amster stocks come next in importance in the decline. Arizona Commercial went off $12.50 in the week's time, making a low at $20.75, with $2.25 recovery from the low. Support was not proffered in the slightest degree, and the decline in this stock has done considerable harm to accounts, as Boston has had the highest regard for its president, who has had the reputation of always making good. Shannon and Boston Corbin each fell sharply in sympathy with the decline of Arizona Commercial.

The new Lake stocks also suffered in the general declines, although the pressure was less than in most other issues. Lake fell about $10, Indiana about $8 and North Lake about the same amount. Weak margined accounts have been wiped out and the market in general is in better condition, although some serious individual losses have been incurred.

Declines were general throughout the list, although those mentioned were the most serious.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev............	Mar. 12	Apr. 7	$0.05
Bader, Cal	Feb. 24	Mar. 14	0.10
Belcher, Nev	Mar. 9	Mar. 29	0.10
Cardiff, Utah	Mar. 10	Mar. 28	0.00½
Central Eureka, Nev........	Mar. 13	Apr. 23	0.02½
Chollar, Nev	Mar. 8	Mar. 31	0.10
Columbus Con., Utah	..	Apr. 11	0 25
Confidence, Nev.............	Mar 25	Apr. 15	0 20
Crown Point, Nev	Mar. 8	Mar. 28	0 10
Gould & Curry, Nev	Mar. 14	Apr. 6	0 10
Hale & Norcross, Nev	Mar. 9	Mar. 31	0.10
Hancock, Mich.	May 2	....	3.00
New Arcadian, Mich....	Mar. 10	....	1 00
Ojibway, Mich. . . .	Mr Oct.	....	2.00
Oneco, Mich	Feb. 1	....	1.00
Overman, Nev	Apr. 6	Apr. 27	0 10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Seg. Belcher, Nev	Mar. 8	Mar. 28	0.10
Seven Troughs Mon., Utah.	Mar. 12	Apr. 2	0 00½
Sierra Nevada, Nev.	Apr. 7	Apr. 27	0.10
South Columbus, Utah ...!	Mar. 30	Apr 30	0.02
Union, Nev.	Mar. 7	Mar. 31	0.10
Yellow Jacket N.v	Mar. 7	Apr. 11	0.10

Curb stocks showed sympathetic weakness. The real feature was the break in First National from $4 to $2.87½ tonight. This decline was accompanied by reports of a possible $2 assessment. The company has some refunding to do which accounts in part for the weakness.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
III, 1909	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1909	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	......	23.227	......
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387		12.826		56.231	.....
April	12.56[illegible]		12.93[illegible]		57.363	
May	12.893		13.238		59.338	
June	13.214		13.548		59.627	
July	12.880		13.363		58.556	
August	13.007		13.296		59.393	
September	12.870		13.210		59.021	
October	12.700		13.030		57.551	
November	13.125		13.354		58.917	
December	13.[illegible]		13.647		59.9[illegible]	
Year	12.[illegible]		13.[illegible]		58.732	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	......	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	......	3.835	......	13.438	......
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	......	4.607	......	21.438	......
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	......	15.84	......	15.62	......
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Mar. 29

Name of Comp.	Bid.
Listed:	
Acacia	.06
Cripple Cr'k Con.	.02
C. K. & N.	.12½
Doctor Jack Pot.	.08
Elkton Con.	.68
El Paso	.66½
Fannie Rawlins.	.05
Findlay	.09¼
Gold Dollar	.10¾
Gold Sovereign	.04
Isabella	.07
Mary McKinney.	.46
Pharmacist	.03
Portland	1.06
Vindicator	.79
Work	.06½
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.08

SALT LAKE Mar. 29

Name of Comp.	Clg.
Carisa	.60
Colorado Mining.	.78
Columbus Con.	.43
Daly Judge	4.10
Grand Central	1.55
Iron Blossom	.90
Little Bell	1.60
Little Chief	.45
Lower Mammoth.	.50
Mason Valley	1.65
Maj. Mines	2.32½
May Day	.19½
Nevada Hills	.52
New York	‡.13
Prince Con	.85
Red Warrior	6.00
Silver King Coal'n	2.20
Sioux Con.	.43
Uncle Sam	.38
Victoria	1.25

SAN FRANCISCO. Mar. 29.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.15	Belmont	2.55
Belcher	.90	Daisy	.09
Best & Belcher	‡.25	Jim Butler	.14
Caledonia	.59	MacNamara	.34
Challenge Con.	‡.35	Midway	.36
Chollar	.27	North Star	.02
Confidence	‡1.45	West End Con.	.45
Con. Cal. & Va.	1.15	Atlanta	.15
Crown Point	.85	Booth	.14
Exchequer	‡.25	C.O.D. Con.	‡.08
Gould & Curry	.28	Columbia Mt.	.05
Hale & Norcross.	.45	Comb. Frac.	.48
Mexican	1.07	Great Bend	.02
Ophir	1.25	Jumbo Extension	.41
Overman	1.25	Oro	.07
Potosi	‡.30	Red Hill	.04
Savage	.42	Sandstorm	.03
Sierra Nevada	.45	Silver Pick	.10
Union	.73	St. Ives	.17
Yellow Jacket	.95	Tramps Con.	.06

N. Y. EXCH. Mar. 29

Name of Comp.	Clg.
Amalgamated	75¼
Am. Agri. Chem.	45
Am.Sm.&Ref.,com	81⅜
Am. Sm. & Ref., pf.	106
Anaconda	46¾
Bethlehem Steel.	30
Col. & Hock. C. & I.	14
Colo. Fuel & Iron.	38¼
Du Pont P'd'r, pf.	‡85
Federal M. & S.	‡40
Great Nor., ore ctf.	65
Nat'nalLead,com.	80½
National Lead, pf.	‡109½
Pittsburg Coal	20⅝
RepublicI&S,com.	37
Republic I & S, pf.	99¼
SlossSheffi'd,com.	75
Sloss Sheffield, pf.	117½
Tennessee Copper	31½
Utah Copper	45
U. S. Steel, com.	83⅝
U. S. Steel, pf.	119¾
Va. Car. Chem.	59¼

N. Y. CURB Mar. 29

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	18¾
Braden Copper	4¾
B. C. Copper	6½
Buffalo Mines	3½
Butte Coalition	24
Chino Copper	14
Cobalt Central	.16½
Combination Fra.	.48
Con. Ariz. Sm.	2 9/16
Cumberland Ely.	‡9
Davis-Daly	2⅞
Dominion Cop.	7
Ely Con.	.75
El Rayo	2 13/16
Florence	3⅛
Gila Copper	7
Giroux	8½
Gold Hill	1½
Goldfield Con.	8⅜
Greene Cananea.	9⅝
Guanajuato	1⅝
Guggen. Exp.	205
Kerr Lake	.08½
La Rose	4 7/16
McKinley-Dar-Sa.	.95
Miami Copper	22½
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone.	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1 3/16
Newhouse M. & S.	‡3½
Nipissing Mines.	10¼
Ohio Copper	4 1/16
Pacific Sm. & M.	9/16
Silver Queen	.16
Standard Oil	625
Stewart	½
Tonopah	7⅜
Tonopah Ex.	.95
Tri-Bullion	1 5/16
Utah Apex	3¾
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4 1/16

LONDON Mar. 30

Name of Com.	Clg.		
Dolores.	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	8	0
Esperanza	2	16	3
Tomboy	0	18	9
El Oro	1	8	3
Oroville	0	9	9

BOSTON EXCH. Mar. 29

Name of Comp.	Clg.
Adventure	7
Allouez	44
Am. Zinc	27
Arcadian	5½
Arizona Com.	23
Atlantic	8½
Boston Con.	19
Butte & Balak	9¾
Calumet & Ariz.	70
Calumet & Hecla.	600
Centennial	19
Con. Mercur	.12
Copper Range	72¼
Daly-West	9
East Butte	9¼
Franklin	15⅝
Granby	52
Greene- Can.	9½
Hancock	22
Helvetia	3⅞
Indiana	34
Isle Royale	19
Keweenaw	4¼
Lake	68
La Salle	15¼
Mass	6
Michigan	6¾
Mohawk	54
Nevada	22½
North Butte	35
North Lake	17⅛
Ojibway	9
Old Dominion	39
Osceola	145
Parrot	17
Quincy	82
Shannon	13
Superior	49½
Superior & Bost.	14
Superior & Pitts.	13⅞
Tamarack	64
Trinity	8
U. S. Smg. & Ref.	44
U.S.Sm. & Re., pd.	50
Utah Apex	3¾
Utah Con.	29½
Victoria	3⅞
Winona	9¼
Wolverine	‡135
Wyandotte	2½

BOSTON CURB Mar. 29

Name of Comp.	Clg.
Ahmeek	190
Bingham Mines.	3¼
Boston Ely	4⅝
Calaveras	5⅝
Champion	.09
Chemung	10½
Chief Cons.	2
Chino	13⅝
Cons. Ariz.	2⅜
Corbin	.08⅞
Cactus	4¾
Crown Reserve	3⅞
First Nat. Cop.	3⅞
Gila Copper	7⅛
Indiana	34½
Inspiration	8⅛
Majestic	.88
Nevada-Douglas.	2¾
New Baltic	7¾
Oneco	4
Ray Central	3⅛
Ray Con.	‡21⅛
Rawhide Coal	.28
Rhode Island Coal	9⅛
San Antonio	10⅛
Shattuck-Ariz.	‡30
South Lake	10⅛
Superior & Globe.	.63
Trethewey	1⅛
Tuolumne Copper	3⅛
Vulture	9⅝
Yuma	1⅛

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Ground Am. Best . . . . lb.	.01¾@.02¼
German . . . . "	.02¼@.02⅝
LEAD—Acetate (sugar of) brown, ... lb.	.07¾@.08
Nitrate, com'l . . . . "	.08½@.09
MAGNESITE—Greece.	
Crude (95%) . . . . lg. ton.	7.50@8.50
Calcined, powdered . . . . sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg . . . . M.	160@200
MAGNESIUM—	
Chloride, com'l . . . . 100 lb.	.90@1.25
Sulphate (Epsom salt) . . 100 lb.	.90@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide . . . . lb.	.01@.01¼
75@85% binoxide . . . . "	.01¼@.01½
85@90% binoxide . . . . "	.01½@.04
90@95% binoxide . . . . "	.06½
Ore, 80%-85% . . . . sh. ton.	16.00@32.50
MARBLE—Flour . . . . sh. ton.	7.00@9.00
MINERAL WOOL—	
Slag, ordinary . . . . sh. ton.	19.00
Selected . . . . "	25.00
Rock, ordinary . . . . "	32.00
MONAZITE SAND—	
Guar. 97%, with 5% Thorium oxide, normal . . . . lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained	.47
Sulphate, single . . . . lb.	.10¼@.11
Sulphate, double . . . . "	.05⅞@.08
NITRATE OF SODA—	
100 lb. 95%	2.07½@2.15
95% for 1910	2.07½@2.15
96% is 2½@7½c. higher per 100 lb.	
OZOKERITE—best . . . . lb.	.14@.17
PAINTS AND COLORS—	
Litharge, Am. powdered . . . . lb.	.06¼@.06¾
English glassmakers' . . . . "	.08¼@.09¼
Lithopone . . . . "	.03½@.07
Metallic, brown . . . . sh. ton	16.50@22.00
Red . . . . "	14.00@18.00
Ocher, Am. common . . . "	8.50..9.00
Best . . . . "	12.00@15.00
Dutch, washed . . . . lb.	.02¾@.03
French, washed . . . . "	.01¼@.02
Paris green, pure, bulk . . . . "	.17½@.20½
Red lead, American . . . . "	.06¾@.07
Foreign . . . . "	.08¼@.09¼
Turpentine, spirits bbl., per gal.	.62@.63½
White lead, Am., dry . . . . lb.	.05¾@.06
American, in oil . . . . "	.07@.07¼
Foreign, in oil . . . . "	.09@.09¾
Zinc white, Am. extra dry . "	.05¼@.05⅝
French, proc's, red seal, dry "	.07@.07½
French, process, green seal, dry . . . . "	.07⅝@.07⅞
PHOSPHATES—Acid . . .	55@60c. per unit
*Fla., hard rock 77%	7.00@7.50
land pebble 68%	3.75@4.00
†Tenn., 78@80%	5.00@5.50
75%	4.75@5.00
68@72%	4.25@4.50
‡So. Car. land rock 60%	3.50@4.00

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—	
Bicarbonate crystal . . . . lb.	$.07½
Powdered or granulated . . "	.08
Bichromate, Am. . . . . "	.07⅜@.08
Scotch . . . . "	.10¾
Bromide . . . . "	.20
Carbonate (80@85%) . . . . "	.04⅜@.04⅝
Caustic, ordinary . . . . "	.05¼
Elect. (90% KOH) . . . . "	.06@.06¼
Chloride (muriate), 100 lb . .	1.90
Chlorate, powdered . . . . "	.09@.09⅜
Crystals . . . . "	.09½@.09¾
Cyanide (98@99%)	
Carloads (30,000 lb.) . . . . "	18c.
5-ton lots	18½c.
Less than 5 tons	.19
Kainite, long ton, bulk, 8.50; bags,	9.25
Permanganate . . . . lb.	.09¼@.10½
Prussiate, yellow . . . . "	.13@.13¾
Red . . . . "	.29@.32
Sulphate (basis 90%) . . . 100 lb.	2.18@2.21
PYRITE—	
Domestic, non-arsenical, furnace size, f.o.b. R. R. . . . . per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines	10¾@11c.
Imported, non-arsenical, furnace size, ex-ship, per unit	.12½
Imported, arsenical, furnace size, ex-ship, per unit	.11½@.12
Imported fines, arsenical, ex-ship, per unit	.09
Imported fines, non-arsenical, ex-ship, per unit	10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

SALT—N. Y. com. fine 280 lb. bbl.	.72@1.13
N. Y. agricultural . . . . sh. ton.	3.80@4.50
SALTPETER—Crude . . . 100 lb.	4.00@4.50
Refined, crystals . . . . "	5.00@5.75
SILICA—	
Ground quartz, ord'ry . . lg. ton.	7.00@15.00
Silex, ground . . . . "	7.00@15.00
Silex, floated . . . . "	35.00@40.00
Lump quartz . . . . "	5.00@5.50
Glass sand . . . . "	2.75
SILVER—Nitrate, crystals . . . oz.	.33¼@.36¾
SODIUM—Acetate . . . . lb	.04½@.05
"Alkali," per 100 lb., 58/48 . . .	.90@.95
Bicarb. soda, per 100 lb	1.00@1.30
Soda, caustic, per 100 lb., 78/60	1.72½@1.85
Soda, caustic, powdered	.02¾@.03
Salt cake, per 100 lb., bulk	.50@.60
Salt cake, bbl	.85@.95
Soda, monohydrate, per lb. . . .	1.30@1.75
Bichromate . . . . lb.	.05⅝@.06¼
Bromide . . . . "	.20
Chlorate, com'l . . . . "	.08¼@.09½
Cyanide, 120-130% KCN, per 100%	
Carloads (30,000 lb.) . . . . lb.	18c.
5-ton lots . . . . "	18½c.
Less than 5 tons . . . . "	.20
Hyposulphite, Am. . . . . "	1.30@1.50
Phosphate . . . . 100 lb.	2.10@2.40
Prussiate . . . . "	.08½@.09
Sal soda, f.o.b. N. Y . . . "	.60@.75
Foreign, f.o.b. N. Y. . "	.80@1.00
Silicate, com'l . . . . "	.65@1.00
Sulphate, com'l (Glauber's salt) . . . . 100 lb.	.60@.80
Sulphate, com'l, calcined	.65@.85
STRONTIUM—Nitrate . . . . lb.	.07@.08
SULPHUR—Louisiana (prime) to New York . . . . lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore . . . . "	22.50 up
Roll . . . . 100 lb.	1.85@2.15
Flour . . . . "	2.00@2.40
Flowers, sublimed . . . "	2.20@2.60
Powdered commercial, bags	1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York . . . . lg. ton.	$22.00
TERRA ALBA—Fr.&Eng. 100 lb.	.70@1.00
TALC—Domestic . . . . sh. ton.	12.00@20.00
French . . . . "	15.00@25.00
Italian, best . . . . "	30.00@40.00
TIN—Bi-chloride, 50° . . . . lb.	.10
Crystals . . . . "	.22½@.24
Oxide, lb . . . . "	.37@.40
URANIUM—Oxide . . . . "	2.20@4.25
ZINC—Chloride sol., com. 20° "	.02¼
Chloride, granular . . . . "	.04½
Dust . . . . "	.06¾
Sulphate . . . . "	.02@.02½

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as a matter of private contract.

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**Illustrated.*

The Situation in Copper

While pessimism surrounds the copper market and the metal is being sold at concessions in price, the situation is really improving, because of increasing consumption and decreasing production, a condition that is reducing the accumulated surplus, although this is as yet taking place but slowly and the statistics for a single month may show an increase in the stock as was the case for February. At this writing the American statistics for March are not yet available; the European statistics have shown a decrease of about 5,000,000 lb. for that month. It is well known that domestic consumption is increasing steadily. We have received this week the report of Aron Hirsch & Sohn as to the world's production and consumption in 1909, which shows a substantial increase in the consumption of Germany and France in that year, Great Britain being the only important country that lagged behind. Its manufacturers ought to absorb a great deal of copper when conditions become right for a revival of demand from that quarter. In the meanwhile reports from France and Germany manifest a steady improvement in business there.

With respect to production the statistics of Aron Hirsch & Sohn show that the increase in 1909 occurred chiefly in America, which turned out 564,690 long tons (against 482,890 in 1908), while the corresponding figures for the rest of the world were 270,250 and 263,695. In November, 1909, American refinery production attained high water mark, since when it decreased a little in December and January but rose again in February. (We are considering the daily rate). In spite of the upturn in February, further decreases are to be expected, judging from reports of blister copper production, which is anticipatory of the refined by 60 to 90 days. Thus there was a decreased smeltery production in December, which ought to be reflected in the refinery statistics for March and April. The same smelters who produced 111,840,985 lb. in December furnished 108,359,893 lb. in January and only 90,153,019 lb. in February, the decrease in the average daily rate from January to February being about 275,000 lb. This indicates that the refinery statistics during the next quarter will show some falling off, although they will not correspond exactly with the smeltery figures.

The transferral of the accumulation from America to Europe that has been going on for a year has resulted in a rather curious state of affairs. Last May we had about 183,000,000 lb., while Europe had only 114,000,000. Now we have about 100,000,000 lb., which in itself would be nothing to be alarmed about, but Europe has 250,000,000 lb., and until that amount be reduced materially it would seem that we are not likely to export heavily unless our producers should see fit to make a concession in price.

The new production of copper that is coming to market need cause no immediate concern. It will be a year yet before Miami, Ray, Braden, Katanga and Copper River begin to produce much and even then their additions will come but gradually. Before that time many things may happen, and as we have seen lately the older mines do not last forever.

Production of Lead in 1909

Our revised statistics of lead production, based upon returns from all of the refiners, are given in the accompanying table. The difference between the revised figures and our preliminary report published Jan. 8, 1910, is only 180 tons as to the grand total, but as is apt to be the case, varies more materially in the distribution between desilverized of domestic and foreign origin, the refiners seldom being able to make an accurate classification at the very beginning of the year.

PRODUCTION OF REFINED LEAD IN 1909.

(In tons of 2000 lb.)

Class	1908.	1909.
1. Desilverized	174,650	211,499
2. Antimonial	13,109	126,784
3. Southeast Missouri	113,103	20,489
4. Southwest Missouri	18,014	10,392
Total domestic	318,876	369,164
5. Desilverized, foreign	94,992	89,681
6. Antimonial, foreign	(*a*)	2,338
Grand total	413,868	461,183

(*a*) Included with antimonial reported as of domestic origin.

The explanation is necessary that as in previous years the above statistics represent especially the production of the smelters and refiners whose business is mainly the treatment of ores and of lead derived directly from ores, but nearly all of them receive more or less scrap and junk which goes into their charges and reappears along with the virgin lead and for all practical purposes itself becomes virgin lead. There is also in the United States a large production of reworked lead by smelters who make that a special business, which is not included in the primary statistics.

The Coal Miners' Demands

After more than three weeks of conference, the coal operators and miners meeting in Cincinnati, failed to reach an agreement. The mines have been temporarily closed down and it now remains for the different States and districts to settle the wage question.

Although the miners' officials assert that there will be a stoppage of work until their demands are granted, it is unlikely that a long suspension will result save in some isolated instances. Both the miners and the operators realize that the present is an inopportune time for a strike. The last report of the United Mine Workers of America showed an amount in the treasury equal only to about $2 per man. As a consequence, those on strike will have to depend largely on their own funds.

The miners claim that present wages are insufficient to meet the higher cost of living. The operators assert that the industry at present is in a stagnant condition, and profits are insignificant. The coal business is so slack, and prices so poor, that many operators have welcomed a temporary shut-down. Many Ohio and Pennsylvania operators sold coal last year at a price which failed to net them any profit, a policy that was necessarily pursued in order to meet the competition of West Virginia and other nonunion districts.

One reason why the operators took so decided a stand against a wage increase is because they made no reduction in the miners' wages two years ago when the business depression had caused the employers of labor in practically all other lines to cut wages. Reductions in the mining price occurred at this time in practically all unorganized fields producing competitive coal, and this condition of affairs made it difficult for Ohio and Pennsylvania to retain their markets. Notwithstanding their efforts, the outputs of Pennsylvania and Ohio recently have shown a much larger decrease than have those of West Virginia and Kentucky.

From every standpoint, and especially that of economy and safety, the miners' demands that coal be paid for on a run-of-mine basis, is to be severely condemned. For years coal has been paid for on a screened-coal basis, and this practice has been an incentive leading to the better preparation of the daily output. To go back to a mine-run basis would encourage shooting from the solid, with its resulting waste and dangers. If the miners could have obtained both the mine-run basis and an advance on the mine-run basis of 10c. per ton (their first demands), compared with present earnings this would mean an increase of 18 per cent.

Operators in unorganized fields are hoping for a long disagreement, which will give them an open market with good prices for a maximum output. West Virginia operators profited handsomely by the general strike in 1902, and they would welcome a repetition of such good fortune.

President Lewis was quoted as saying that he could organize and tie up West Virginia also, but such statements have been made before without being successfully carried out. It would appear that when all things are considered, the Ohio, Indiana and Pennsylvania miners are greatly aiding competitive fields in their work of securing the markets of the organized States. The evils of such a course will have to be borne by the miners as well as the operators of those States.

The present situation is not nearly so dark as it appeared in the early stages of the conference. It is likely that the operators will grant a wage increase equal to between 5 and 6c. per ton. Aside from the question of an increase in wages, the only two States which have vital problems to solve are Pennsylvania and Illinois. In Pennsylvania the question of the cost of permissible explosions is the point in dispute. The Illinois miners want the operators to assume the pay of the shot-firers, a thing which heretofore has been assumed by the miners. In the larger States, it is likely agreements will be reached in a week or two. In Missouri, Iowa and the Southwest, the suspension may last from 30 to 90 days.

The Granby Affair

After a meeting of the Granby directors, April 5, the following statement was officially made:

"In view of the unfavorable report that had been given out to the public as to the condition of the Granby mines, the directors at their meeting today decided to order another full investigation by well known experts for the purpose of reviewing the said report and ascertaining the exact condition of the mines. This examination, to be effective, will take several months, and may not be commenced until certain explorations now in progress shall have further advanced."

This statement will be a disappointment to the stockholders and to the public, who had been led to expect a publication of the full report now in the hands of the directors and a clearing up of the mystery. The only interpretation that can be placed upon the last statement is that a majority of the directors are not convinced as to the absence of prospective value in the mines, quite apart m the measurable ore reserves (as to ich there is probably not much ques- ı), and are minded to prosecute cer- ı exploratory work before finally king a report.

'his might have been a proper, al- ugh in some respects dangerous, rse to pursue if the situation had n kept secret in the first place, but leak having occurred and the blunt liminary statement having been made, the discrepancy among statements as the ore reserves being of record and ing for an explanation, the directors e made a mistake in not laying all facts immediately before their stock- ders. Even if there be any lingering ıbt as to the possibility of the mines closing new orebodies, the stockhold- should have a chance to make up ir own minds about that.

'he directors of the company who live New York and Boston are themselves largest stockholders of the company. en the bad news about the mine be- ıe known to the president and his as- iates on the board, they emphasized importance of keeping aloof from the ck market and did not attempt to pose of any of their holdings. In ; their course was strictly correct, iseworthy, and we may also say, un- nmon and exemplary. It is clear that information as to condition of the ıe came as a surprise to the Eastern nagement, that there was no unload- of Granby stock after the crisis and t the large stockholders are in the ne fix with the small. Alike they re living in a fool's paradise. But v that happened needs to be explained, l the persons who are responsible— responsibility there must be—ought be exposed, and the directors have de a mistake in turning their back on the policy of immediate frankness.

ıe Census Report on Mines and Mining

Once in 10 years, lately once in five ırs, the Federal Government in con- ction with its census has had an op- rtunity to make a statistical investiga- n of great value to the mining indus- . In the past the results have been 'iable; some reports have been imper- 't, but illuminating so far as they have ne; others have been worthless, not worth the paper they are printed on; none has risen to the great opportunity. It was hoped that in the forthcoming census, under the new director, who is an accomplished statistician and of a broad mind, something better than we have ever had previously might be expected. But it seems likely that we are once more doomed to disappointment.

The trouble now appears to be too much bureaucratic interference. The census officials, realizing the seriousness of some previous criticisms, took the trouble this year to consult experts respecting the preparation of the schedules of inquiry, which are the foundation of a competent statistical investigation. About this time the Geological Survey mixed into the business, and an alliance was made between it and the Census Bureau, one result of which has been that the advice obtained by the Census Bureau from outside experts did not receive full consideration.

Now, according to well authenticated reports, the arrangements between the Census Bureau and the Geological Survey are not working altogether satisfactorily. The two bureaus, by the terms of their agreement, some time ago sent out schedules to the mines and metallurgical works, and in due time despatched special agents to gather the schedules properly filled up. An inspection of the returns, so far received, has convinced some of those in charge that the results are wholly unreliable for the anthracite and bituminous coal regions, so much so that it is now understood that there is in contemplation a retaking of the anthracite census. As for the bituminous reports, although they are in an even worse shape, it is admitted that the task of retaking them would be too great and that nothing more can be done than to make the best possible use of the data already gathered.

The essential difficulty has been found in the fact that some of the questions asked in the schedules were incapable of intelligent answers, wherefore, the replies in many instances have been manifestly absurd. In some cases the cost of labor reported has exceeded the value of finished product and there have also been serious difficulties with the questions relating to constituents of manufacture, by-products and other matters.

It is now whispered privately that a mistake was made in not accepting the advice of the mining experts to whom the forms of the schedules were submitted in the first place. Strong efforts to correct the returns as shown by the schedules in some adequate manner are now under way. It is a great pity to have this shadow thrown over so elaborate a statistical investigation at so early a date.

We once called attention to the fact that New York is the greatest metallurgical center on earth. We have also remarked the considerable mining industry that has been carried on at several places within 75 miles of New York. This radius includes America's greatest zinc mine. Even the city itself has (on Staten Island) iron mines that were worked as late as 10 years ago. Is there any other great capital of the world that has had a mine within its municipal limits? The Staten Island ore was peculiar because of its content of about 1 per cent. of chromium, an element which also characterizes some of the Cuban ore.

The recent developments in Granby, North Butte and Calumet & Arizona, not to speak of some less important enterprises, teaches that the arithmetic of copper production still includes subtraction as well as addition. The statement of James J. Hill that the railways of America need to spend $9,600,000,000 in the next six years, to make their facilities meet the demands upon them, indicates that much metal, including copper, is destined for consumption.

It now seems to be generally recognized that the plans for a grand copper merger have been abandoned. This fulfils our prophecy of last December. While there may be some disappointment to some persons who contemplated unloading at inflated values stocks that are of the nature of incubuses, we think that the welfare of the industry is best conserved by letting developments take their natural course.

The accounts of the recent eruption of Mount Etna, telling of the stream of lava running down its flanks and spreading over them, enables us to picture vividly in the mind the manner in which the formation of volcanic rocks occurred in the Tertiary age.

Metallics

Cerium is an iron-like metal which becomes malleable on warming and melts at 623 deg. Centigrade.

In drives that are within, say, 20 ft. of other workings, blasts should never be fired without first warning the men in those workings.

There is a tendency to employ stronger material in the Rand mining work. In new mills, "concrete steel" is being used, and concrete is now employed in a number of shafts.

The U. S. Geological Survey calculates that the fire loss in the United States is eight times the per capita loss of any country in Europe, and that it amounts to $1,500,000 per day.

The principal minerals which are of importance in the production of the rare earths are cerite, euxenite, fergusonite, gadolinite, keilhauite, monazite, orthite, samarskite, thorite and xenotime.

Barite, on account of its prismatic cleavage, forms a "sliver" pigment rather than a granular one. It is entirely unaffected by weather, and does not dissolve like zinc, nor blacken with sulphur like lead.

It is a habit of millmen in general to increase the length of the stamp stem by welding on pieces of varying length, thus adding to the weight of the stamp. This practice is not to be recommended as the weight so added is not effective from the crushing point of view owing to the elasticity of the material.

In order to obtain the maximum efficiency from a stamp, it is necessary to make arrangements for the immediate removal from the mortar box of all particles suitable for regrinding in a secondary machine as soon as the stamp has done its work, and this is accomplished by a coarse screen and an efficient water feed.

A check valve and a stop valve should be placed in the feed pipe to each boiler, the stop valve being between the boiler and the check valve, so that repairs can be made to the latter while the boiler is under pressure. Feed pipes and check valves should always be arranged so that the water cannot back out of one boiler into another.

Diamond-drill cores are valuable to the geologist, and much time would be saved if the cores are preserved in a systematic manner. The cores themselves may be cheaply and systematically packed in ordinary dynamite boxes, if a definite order of deposition be adopted. Longitudinal divisions are unnecessary, but horizontal separation is desirable.

A blackboard should be provided at every mine where the men coming off shift can record the place where they have left missed holes and the number of them. A miner after blasting should always remain near enough his working place to hear the reports, and even if several men work in the same stope it will generally be possible to count the total number of reports.

Experimental examination of the reduction of sodium sulphate by heating with lampblack shows that it is hardly sensible below 950 deg. C., but is rapid and uniform at that temperature, whatever be the proportion of carbon. With excess of carbon ($Na_2SO_4 \times 4C$), 70 per cent. of the sulphate is decomposed in 20 min., and the speed of reaction increases rapidly with the temperature.

Boron is a poor electrical conductor at ordinary temperature, but its conductivity at a dull red heat is about 2,000,000 times greater than at 23 deg. C. Its hardness is inferior only to the diamond. On account of its remarkable electrical properties, boron can be used technically in the production of motor-starting devices, sensitive pyrometers and bolometers, wireless detectors, etc., while its hardness and conchoidal fracture make it suitable for jewels and dies.

By the Way

A consulting engineer is a necessity to many mines, but some cases could be cited where the chief need of the property is a real live prospector.

The *Northwest Mining News* says that because a competent judge decided that a jackass was the discoverer of the Bunker Hill mine every jackass in the country should not imagine that mines are discovered and made more surely by the novice than the man who devotes his time and talent to the business.

Can a man *voluntarily* assume a risk (such as the hazards of mining) when his job depends upon whether or not he voluntarily (?) does so? A case in point is a long list of rules (where close observance would not tend toward the establishment of friendly relations with the shift boss) printed by a certain mining company, and to be read and signed by each employee. A little sentence above the line left for the signature says "I voluntarily assume the hazards," etc. Any hesitancy a man may feel about signing one of these documents is usually removed by the comforting reflection that the paper will not be upheld by any court.

A correspondent sends us the bulletin of a company that is evidently going to do some prospecting at Bisbee, which contains the following communication from a "practical engineer of a great many years' standing": "I have traveled over Arizona in and out several times and am one who knows your property will become as good as any in Arizona. You want to, in my opinion, get down below water level, where the mineral cooled off, then you will get good ore. As good as any in the mines. You are in the section where the Anticline or Submerged 'Chimney' is plainly in evidence. In fact I judge from your developments up to date it is of the True Fissure Upheaval, Chimney, Cinders, Slickensides, and Talc, combination, which has never known to return anything but a continuous vein of ore to 4000 ft. depth, where you will quit, from the fact that copper will be a solid mineral or metal." Our correspondent inquires if this be not the limit. Oh! Beck. Oh! Posepny. But the president of this joyous company proceeds to quote "another eminent mining engineer" and there we had to pause.

You can't keep a good man (or country) down. We had thought that the good old days were past when the wildest kind of a fairy tale coming from Nevada was the signal for serious conferences in the back rooms of business houses in many States; when one small specimen, aided and abetted by the fevered imagination of a prospector who, immediatel upon finding the said specimen, and without indulging in such foolishness as waiting to do a lot of toilsome digging started a stern chase after his burro or the back trail to the nearest combinec saloon and publicity office, was enougl to start a brand new department in th market letters. In those times it was poor day that did not see the launchin of "another Cripple Creek." But th cry of wolf came too often and som sundry "mining men" hiked back to th San Francisco race track to the tune o "Walk, you sucker, walk." Then Nevad settled down and did a little digging, wit the result that she owns a Goldfield an a Tonopah and an Ely, but a large assortment of budding "Cripple Creeks went back to nature. Nevada got restless, however; they took away her gambling houses and wanted her to go to slee and give the stockholders a show.

"This is no country to sleep in. said Nevada, "let's have a little action. So here comes Jarbidge. Now, we don know anything about Jarbidge excej what we are told, but the "dope" froi there has a strangely familiar ring. W like new camps and new mines; w are only waiting for a chance to g in line and shout "Hurrah for Jarbidge We do not deny that Jarbidge is tl "greatest, most wonderful, etc.," in e istence, that "Goldfield and Tonopah w be taken off the map." No, we do n deny it—but it may become necessar unless Jarbidge does considerably mo digging, and less talking about "8 ft. veins of high-grade gold ore"; *et* Kimberley.

March Dividends

The accompanying table shows the mount per share and total amount of e dividends paid during March, 1910, a number of mining and industrial mpanies in the United States, Canada, d Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
nker Hill & Sull., s.l.	Ida.	$0.25	$75,000
tte Coal, c.	Mont.	0.25	250,000
lumet & Arizona, c.	Ariz.	1.00	200,000
lumet & Hecla, c.	Mich.	8.00	800,000
lorado, s.l.	Utah	0.10	100,000
e Run, l.	Mo.	1.50	98,674
Paso, g.	Colo.	0.01	24,500
deral M. & S., pf., s.l.	Ida.	1.75	180,000
cla, s.l.	Ida.	0.02	20,000
mestake, g.	S.Dak.	0.50	109,200
ernat'l Sm. & Ref.	Utah	2.00	200,000
n Blossom, s.l.	Utah	0.08	80,000
vada Con., c.	Nev.	0.37½	431,700
rth Butte, c.	Mont.	0.50	200,000
rth Star, g.	Cal.	0.30	75,000
incy, c.	Mich.	1.50	165,000
und Mountain, g.	Nev.	0.04	32,000
Joseph, l.	Mo.	0.15	150,000
wstorm, c.	Ida.	0.01½	22,500
ah Copper, c.	Utah	0.75	550,219
kon Gold, g.	U. S. and Can.	0.10	35,000

Foreign Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
ffalo, s.	Ont.	$0.03	$30,000
rr Lake, s.	Ont.	0.50	300,000
Roi No. 2, c.	B. C.	0.48	57,600
egrina, pf., g.s.	Mex.	3.50	35,000
Plata, s.	Mex.	0.10	37,344

. S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
er. Coal.	Md.	$0.75	$37,500
. Chem., com.	U. S.	11.25	833,659
'l Lead, pf.	N. Y.	1.75	426,433
s-Sheffield	Ala.	1.25	125,000
ndard Ore	U. S.	15.00	14,550,000
S. Steel, com.	U. S.	1.75	8,895,293

ronology of Mining for March, 1910

arch 2—Explosion of powder maga- e in Alaska-Mexican mine, Treadwell, ska; 37 killed.—Homestake mine, th Dakota, announced full resump- after strike of November 23, 1909.— ds in Nevada stopped railroad traffic interfered with ore movement.

arch 4—Skookum camp, 20 miles th of Roslyn, Wash., wiped out by lanche. Superintendent E. L. Sim- s killed.

arch 6—Fire destroyed No. 1 bunker the Nay Aug Coal Company, near nton, Penn. Loss $60,000.

arch 7—Strike of engineers in Butte nt.) mines ended.

arch 12—Seven miners killed by gas losion in No. 3 shaft of the Lehigh ilkes Barre Coal Company.

arch 16—The Government filed suit nst Anaconda Copper Mining Com- to compel it to abate smoke nuis- .

March 17—Prairie Oil and Gas Company advanced price of crude oil in the Midcontinental field, the first advance in three years.

March 23—Collapse in price of shares of Granby Consolidated Mining, Smelting and Power Company.—Anaconda Copper Mining Company increased capitalization to 6,000,000 shares, or $150,000,000 to absorb Amalgamated Copper properties.

March 24—Commonwealth mill, Pearce, Ariz., burned; loss $150,000.

March 26—Montezuma Mines Company, of Costa Rica, filed petition of bankrupcy.

March 28—The Butte & Superior Copper Company purchased the North Butte Extension property at Butte.

The World's Production and Consumption of Copper

We give in the accompanying table the copper production and consumption of the world, as compiled and estimated from the statistics of the different countries by Aron Hirsch & Sohn, of Halberstadt, Germany. The figures are given in long tons.

	Production.	Consumption.
United States	487,020	......
Canada	21,420	......
Mexico	56,250	......
Newfoundland	2,100	......
North America	566,790	314,755
Germany	23,500	194,449
Spain	53,000	......
France	......	85,688
England	......	110,648
Austria	1,750	34,605
Russia	18,450	21,705
Italy	3,200	25,189
Scandinavia	12,500	9,700
Other Europe	2,000	12,500
Europe	114,400	494,484
South America	57,400	2,500
Japan	45,000	10,000
China	......	10,000
Africa	7,000	......
Australia	38,350	2,000
Miscellaneous	6,000	......
Total	834,940	833,739

The production of South America is made up of 35,800 tons from Chile, 19,000 from Peru and 2600 from Bolivia.

From these figures it would appear that the production for 1909 exceeded the world's consumption by only 1201 tons. Nevertheless the visible stocks at the close of 1909 are given at 167,454 tons, an increase of 63,603 tons. This apparent difference results in part from the difficulty of comparing the statistics from many countries, which do not all correspond: but in large part from the appearance in the consumption that is, in the totals of manufactured copper in its various forms as reported of old copper, scrap and reworked material which do not appear in the statistics of production; and which are not, in fact, part of the production, though appearing in the output of the metal in its various finished forms.

Accident to D. W. Brunton

The following is from a private letter from Mr. Brunton, which we feel at liberty to reproduce in view of the interest in the details of his accident that is felt by his numerous friends:

"At present, I am stretched out on my back in bed as the result of an automobile accident on March 25. I started from Fort Collins for the Laramie tunnel with the vice-president and shipping agent of the company in their automobile, and about 50 miles northwest of Fort Collins, while going down a tremendously steep grade, the chauffeur lost control of the machine, and we plunged down the mountain side into the cañon below. Mr. Hibbard, the vice-president of the company, who was sitting beside me, was instantly killed. Mr. Akins, the shipping agent, had both arms broken and his face very badly cut, while the chauffeur escaped practically unhurt. I was thrown 25 or 30 ft., knocked senseless and sustained severe contusions of the right arm and right leg. I am still suffering a great deal of pain, and am unable to move or have my right leg moved in any way, but the surgeon thinks the worst will be over in a few days, and that I shall be as good as new in a couple of months."

Abrasives in 1909

There was a large increase in the production of artificial abrasives in the United States in 1909, directly due to the great activity in the trades in which the material is consumed. The total production was far in excess of that of any previous year and was more than double the output in 1908. The accompanying table, compiled from statistics collected for "The Mineral Industry," shows the quantity and value of the alundum, carborundum and crushed steel produced in this country in 1908 and 1909.

	1908, Lb.	Value.	1909, Lb.	Value.
Alundum	3,160,000	$189,600	13,578,600	$ 814,680
Carborundum	4,907,170	294,430	6,478,290	388,697
Crushed steel.	630,000	44,100	818,900	57,260
Total	8,697,170	$528,130	20,874,290	$1,260,637

Platinum Exploration in Russia

No important discoveries of platinum were reported from Russia in 1909, the production being obtained from the old placers. The Russian Permanent Geological Committee detailed some geologists to make researches in the northern Urals. Their work showed that platinum was present in some of the olivine rocks of the district. In several places outcrops of olivine reefs were discovered which carried traces of metal, but none of these proved to be of any industrial value.

DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Self-Dumping Bucket for Winze

By Lawrence May *

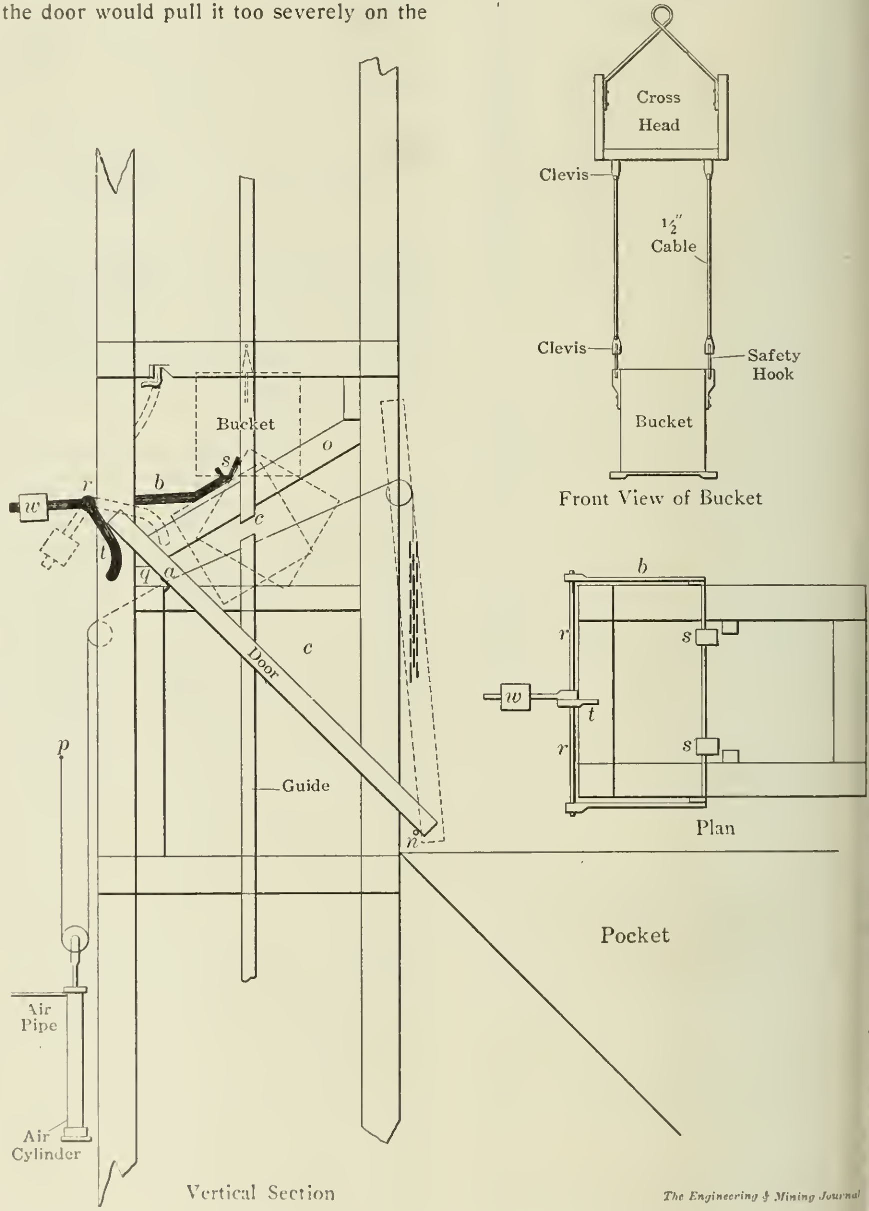
The self-dumping bucket arrangement shown herewith, was designed to meet peculiar conditions for handling ore underground; large capacity was also required. As the shaft is a winze shaft and in extremely hard rock, work above the station level is expensive. Accordingly, the cost of a skip installation put it out of consideration, and the arrangement of this bucket on a crosshead, with platform for men and timber was installed.

The bucket is rectangular, 24 in. wide, 30 in. long, and 30 in. deep. A lug projects 3 in. from the side and is set behind the center. Two "ears" on the upper rim of the bucket are drilled for safety hooks hung from the crosshead with flexible steel cables.

The door upon which the bucket dumps its contents is mounted on the shaft *N;* at *A* a heavy piece of angle iron on the under side of the door projects beyond the shaft timber, and to it are attached the ropes which operate the door. To allow this angle iron to pass, the guide is cut at *C*.

The dumping mechanism consists of the two arms *B*, to which is bolted a heavy iron strip carrying two stirrups *S*, the trigger arm *T*, and the weight arm *W*, all firmly keyed on the shaft *R*. In operation, the bucket is hoisted far enough to clear the door. The engineer then throws a three-way valve, admitting compressed air to the cylinder shown. The piston is forced down, pulling the door by the arm *A*, to its closed position on the bumper *Q*. As the door descends, it strikes the trigger *T*, throwing the dumping mechanism into the position shown by full lines. The bar holding the stirrups rests on the timbers *O*. The whole gear is now held in position by air in the cylinder. The engineer lowers the bucket, the lugs drop into stirrups *S*, and the bucket dumps its contents on the door by turning about the lugs as an axis. After dumping, the bucket is raised to clear the door. The engineer releases the air in the air cylinder. The chain counterweight pulling on arm *A*, draws the door into its clearance position. As the door rises, the weight *W* causes the dumping mechanism to assume the position shown by dotted lines and the shaft is clear for lowering the bucket. The bucket drops on a low truck, is quickly unhooked and run away. A loaded bucket is run under the crosshead, hooked on, and is ready for hoisting.

A large weight is needed to start the door up, but less and less as it ascends. A solid weight heavy enough to start the door would pull it too severely on the finish. Therefore a chain is used, and after the door starts and moves a few inches, the end of the chain rests on a platform. As the door ascends more and more, weight is taken off the pulling rope, by the chain piling up on the platform. Thus the door is almost perfectly counterbalanced in any position and operates smoothly.



Front View of Bucket

Plan

Vertical Section

The Engineering & Mining Journal

Self-dumping Bucket Used at Bully Hill Mine

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*Mining engineer, Bully Hill Copper Mining and Smelting Company, Winthrop, Shasta county, Cal.

Station Marker for Hoist

A simple and accurate arrangement is used on a number of the hoists about Angels Camp, Cal., to mark for the engineer the position of the cage. A light toothed wheel is shrunk on the end of the axle of the drum. This wheel engages another similar smaller wheel which ro- tates a slender spindle on which is wound and unwound a light chain. The chain passes up over a pulley and terminates in a weighted pointer traveling between the upright indicator boards.

Useful Knots for Engineers—II

By A. Livingstone Oke*

Fig. 13, *Bowline on a Bight*—The part arked *A* is passed behind *B* and then n the direction of the arrow to *C*. The ight *B* is then pulled taut. The two oops of this knot may be used as a an sling, a barrel sling, or as a double an-harness, one loop under each shouler. When tightened it will not slip.

In using this knot for lowering a man nto native or other old workings in ountries where snakes are encountered, : is well to put only one leg through the wo loops. Also, in case of an injured an, one of the loops can be kept shorter han the other and adjusted under the rm-pits, the man being seated in the arger loop. This may also be done to llow freedom for the arms when taking amples in winzes or shafts.

Fig. 14, *Open-hand Loop Knot and Figure*-8 *Loop Knot*—The upper loop knot is the one in common use and is adapted principally for small ropes. The lower, or Figure-8 knot, is a better form and may be used on a larger rope as it injures the fiber less than the common form. These knots require a greater length of rope than the bowlines, but may be used in similar ways.

Fig. 15, *Man-harness Knot*—This knot can be tied in a rope with neither end free. The bight *A* is pulled through under *B* and over *C*, and the knot pulled taut. It is useful as allowing a number of men to get a good purchase on a rope for hauling; also to put loops in the rope to receive hooks at points other than the ends.

Fig. 16, *Packer's Knot*—This knot is a modification of a simple slip knot, but has the advantage, when pulled tight, of biting on the standing at *A* and not easily slipping back. It is particularly useful for cording up rolls of camp bedding etc. It can be made permanent by an added half hitch on the standing.

Fig. 17, *Blackwall Hitch*—A convenient method for returning an empty rope on a hook. With a greasy rope, method *B* holds better.

Fig. 18, *Modified Fisherman's Bends*—These are given as alternatives for securing ropes to poles or bars, and are adapted to heavy strains.

Fig. 19, *Fisherman's Bend*—This is a better method than the gooseneck or lark's head (Fig. 20) for securing a rope to a chain or link. It is also used to fasten the rope to a bar or the bail of a bucket. Lashing at *A* is necessary to prevent pulling through. As shown in first position, two turns are taken over the link and the end brought back in front and passed through the turns as shown dotted.

Fig. 20, *Lark's Head*—This knot is useful for fastening a rope to the link of a chain or to a ring in a wall or box. It is not a secure knot unless lashed at *A*. *B* shows a toggle inserted to prevent slipping. *C* is a modified gooseneck on a bar, suitable for securing the end of a rope in scaffolding. The end must be placed at the back and the whole pulled taut.

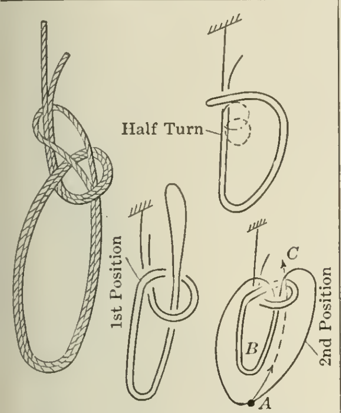

Fig. 13. Bowline on a Bight.

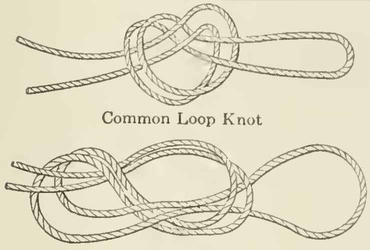

Fig. 14. Loop Knots.

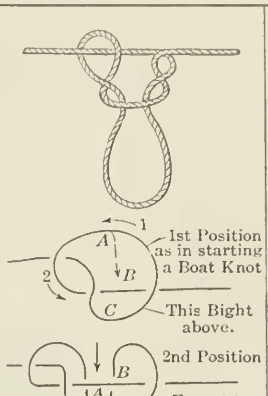

Fig. 15. Man Harness.

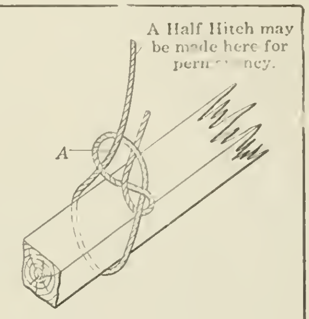

Fig. 16. Packer's Knot.

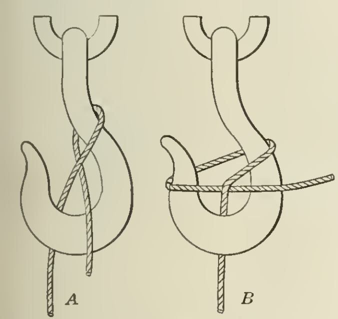

Fig. 17. Blackwall Hitch.

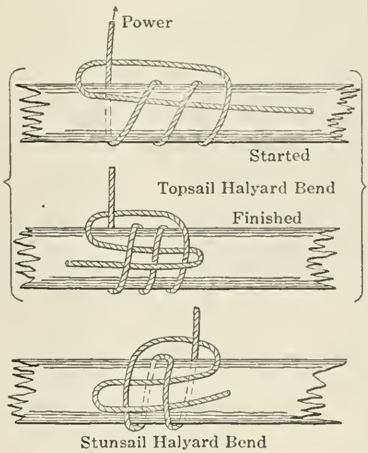

Fig. 18. Modified Fisherman's Bends.

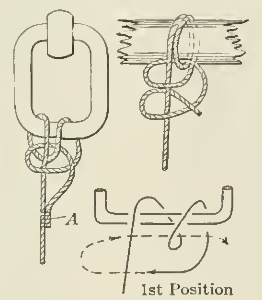

Fig. 19. Fisherman's Bend.

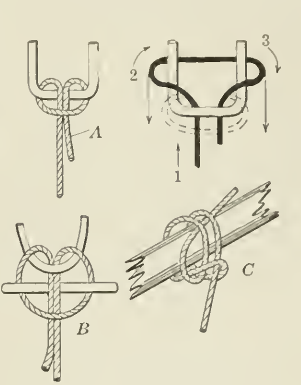

Fig. 20. Lark's Head.

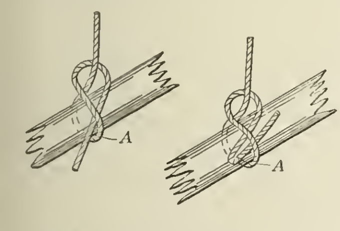

Fig. 21. Half Hitch.

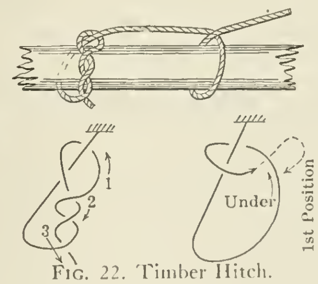

Fig. 22. Timber Hitch.

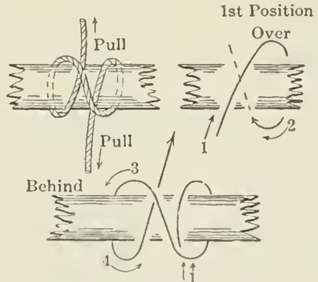

Fig. 23. Clove Hitch.

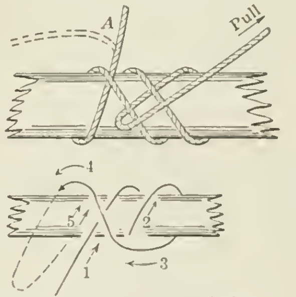

Fig. 24. Rolling Hitch.

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Loops, Harness, Packer's Knot and Hitches

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*Mining engineer, Argentine and General Exploration Company, Ltd., Rodeo, San Juan, Argentina.

Fig. 21, Half Hitch—A quick and simple way of securing a rope to a timber when no great pull is expected. The rope end is placed under the pole, then back over to the right as shown. The end must always be placed right at the back away from the pull, as shown at *A*. The right-hand sketch shows the hitch with a slip to facilitate undoing.

Fig. 22. Timber Hitch—This is the best and simplest of all timber hitches and may be used for towing or otherwise handling timber, rods, pipes, etc.; also for starting lashings on scaffolding or any kind of pole work. For raising or lowering timber, the half hitch should be placed high above the center of gravity to avoid slanting.

Fig. 23, Clove Hitch—This is one of the most useful of all hitches, as it will take a strain in either direction without slackening. It is used for mooring ships, heads of derricks for guy lines and all kinds of rigging work. It is easily undone, or a bight may be put in instead of one end to use as a slip. When commencing to tie the hitch on a horizontal bar, the rule is over and back below, or the reverse of the procedure in tying a half hitch.

Fig. 24, Rolling Hitch—This lashing is used for getting a grip on a large rope with a smaller one. Made in chain it can be applied to wire ropes and will not slip when the load has been taken up. It is also suitable for hauling on electric cables, or withdrawing diamond-drill or other rods. For securing the end *A* may be brought down and lashed to the large rope. In making, the end is passed over the spar twice, then returned back as shown at (3), then over behind as at (4) and up and under as at (5).

(To be continued)

Wear on Filter Leaves

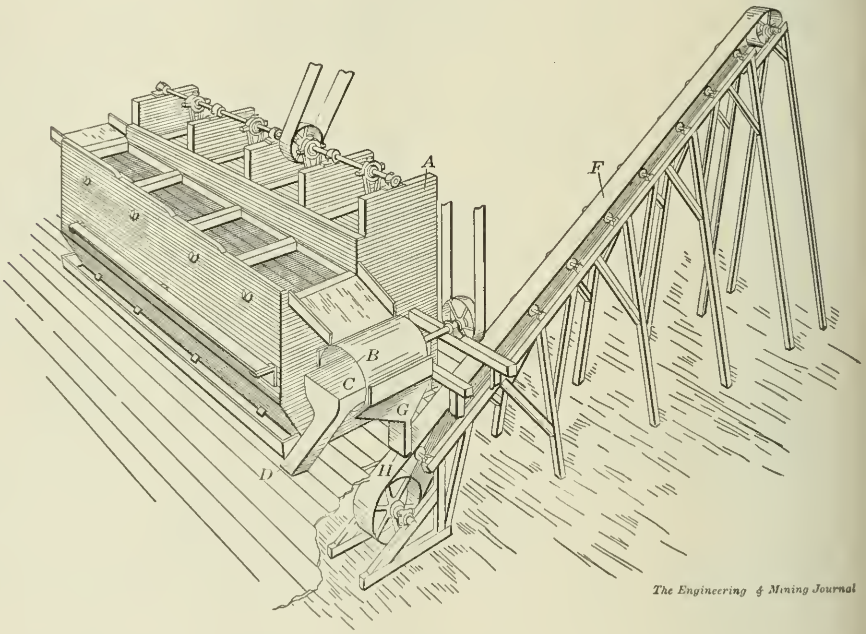
In transferring vacuum-filter leaves into the wash tanks the greatest wear comes on the corners, which are liable to scrape against the sides of the tanks. As soon as the canvas is worn through in one place the leaves are, of course, rendered useless. Heavy canvas patches sewed over the corners of the leaves, will take up this wear and greatly increase the life of the leaves.

At the Montana-Tonopah cyanide plant solutions are kept at an alkalinity of ¾ lb. CaO to the ton in order to facilitate settlement of fine slimes. This results in the formation of an excessive amount of $CaSO_4$ and necessitates washing three leaves from each box of 62 every 24 hours. A wash of 2 per cent. HCl is used. As there is only 2 in. of clearance in the filter boxes, the ends and corners of the leaves soon became worn through, before the simple scheme of reinforcing with corner patches of extra thick canvas was hit upon.

Method of Handling Slimes and Tailings

By A. O. Ihlseng*

The accompanying sketch gives a view of the general arrangement of a device for dewatering tailings and disposing of them in a more economical manner than has heretofore been the practice in the Joplin district. I have always considered that the method of handling tailings from the mills could be improved upon, and that the losses of zinc and lead in the fines and slimes carried away were too high, and that some method of separating the water and fines from the tailings should be utilized. This also left the matter of tailings disposal to be solved.



Dewatering Device and Belt Conveyer for Jig Tailings

While manager of the Oronogo-Circle properties I found an excessive loss in fines. After considering the various screens and devices in use for separating sludge, as the fines and slimes are called in this district, I decided to experiment on simpler lines. I installed at the end of the jig a revolving screen, *b*, 36 in. wide and 30 in. in diameter, of one millimeter mesh. This screen is supported at one end by a shaft, and is driven 10 r.p.m. by a belt from either the jig shaft or any convenient shaft. The pan *c*, suspended in the screen, is supported on the outside. The water and tailings drop on the screen, *b*, and the tailings fall into the hopper *g*. comparatively dry. The water and fines drop in the pan *c* and are carried by the trough *d* to settling tanks, where the slime is allowed to settle for future treatment. The screen is exceedingly simple, efficient and easily kept clean. The separation is perfect.

Dewatered Tailings Handled by Belt Conveyer

The disposition of the dry tailings was then the problem to be solved. At first the tailings were supplied with water from the slime tables to be carried up by the ordinary tailing elevator and distributed to the waste pile. This method of distributing tailings is crude and unsatisfactory in many ways, though its simplicity and crudeness are its chief recommendations. Having the tailings dry, a means was looked for to dispose of them readily. The use of a car and incline, such as is used in handling slate and waste at the coal mines, was tried. This was found to be satisfactory only to a limited extent, as it required labor and attendance.

Shortly after severing my connection with the Oronogo-Circle company I erected one of the largest mills in the district at Galena, Kan., for the Eureka Mining Company, in which I was personally interested. I was determined to provide more economical handling of the tailings, and adopted a 14-in. belt conveyer, something which had never been suggested or attempted in the district. The conveyer has a capacity of 60 tons per hour when traveling 150 ft. per min. The tailings from the screen fall into the chute *h*, and on the conveyer belt *f*. The belt runs on concave rollers placed on the frame. The tailings are dropped at the head of the belt until the pile accumulates to a hight where other distribution is required. A 2-in. centrifugal sand pump takes the tailing water from the slime tables, and pumps through a 2-in. pipe laid on the side of the conveyer frame. This stream of water enters the box into which the tailings from the belt fall, and the mass flows out in the or dinary iron-trough tailing distributers. The arrangement shown in the illustration accomplishes two distinct purposes: It save the fines, and handles the tailings cheaply.

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*Consulting engineer, Joplin, Mo.

Cost of Tailings Elevators

The experience in this district in handling tailings makes this form of distribution attractive. The usual tailing elevator of a 300-ton plant costs $1000 for frame, 20-in. belt, elevator cups, troughs. etc. Such an elevator is 60 ft. high, and delivers the tailings 80 ft. from the mill at an actual hight of 30 ft. It requires about 5 h.p. to operate. In winter the water freezes, and the outside troughs break down with the weight of ice, and frequent accidents occur to the men working on the troughs and head of the elevator. The belts and cups of the elevator must be renewed every six months. or less. Each renewal entails a cost of $350, exclusive of labor. The elevator belts break down frequently as they become worn. The actual loss by stoppage and breakdowns of these elevators amounts to $2500 annually, making the actual maintenance expense run up to $3000 or $3500 annually as a minimum.

Compare the above with the belt conveyer. The entire conveyer costs $500 to install. It will run two years with but little repair. There is nothing to get out of order. A renewal belt costs $125, and can be put on in two hours. A belt conveyer will deliver the tailings at a hight of 32 ft. at the same distance from the mill the tailings elevator delivers its tailings. This is a gain of two feet. Further, the low structure eliminates all accidents.

The conveyer can be extended indefinitely, while the only method of extension in the ordinary tailings elevator of the district is to build an auxiliary, or "dummy," on top of the tailings pile.

Altering Stamp-Mill Foundations

At the Simmer and Jack Proprietary mines, Transvaal, it was found necessary to consider seriously the "re-conditioning" of the mill foundations. C. O. Schmitt, at a recent meeting of the Institution of Mining and Metallurgy, said that this work could have been done more or less successfully by patching up the existing foundations; but, in order to meet a possible future increase of the tonnage to be milled if considered advisable, it was decided to do the work so as to permit of an increase in the weight of the stamps. Figs. 1 and 2 show the battery foundations before and after the alterations.

The stamps as this mill have a new weight of 1250 lb. and an average running weight of 1150 lb., while after the alterations as shown it is considered that an average running weight of 1400 lb. will be permissible, taking into account the size of cam shaft and stem. This represents an increase of 21.74 per cent. on the old weight and will permit of a similar increase in the stamp duty. In addition to the mere increase in stamp duty a greater efficiency is to be expected since the heavier stamp is more likely to reduce the maximum size of ore fed to the mortar box, say 2-in. cubes, in one blow to the fineness required for passing through the screen.

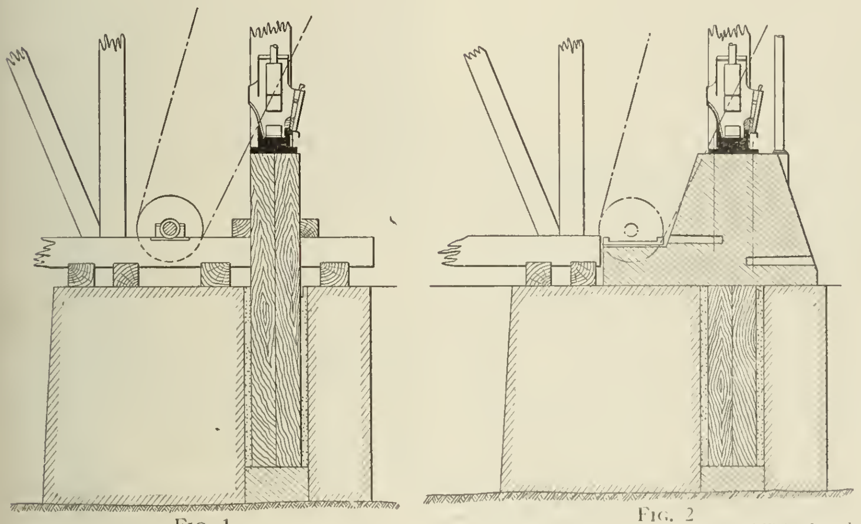
Fig. 1

Fig. 2

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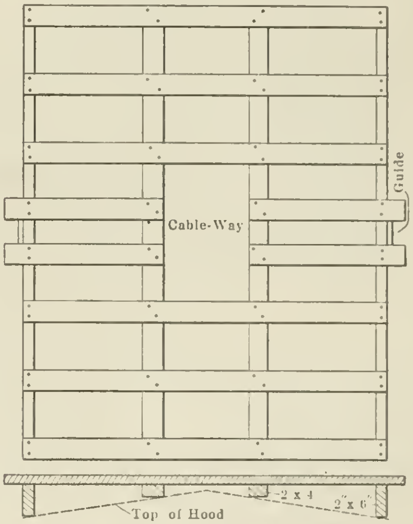
Stamp Mill Before and After Alterations

Fig. 2 is merely diagrammatic and does not show all the alterations made. Besides providing the mortar box with a substantial concrete foundation, the kingposts were cut off and are now mounted on heavy cast-iron shoes which permit of holding the posts firmly in place. The bearings of the mill line shafting are also provided with new foundations, thus making them independent of the ore bin and assuring a true line for this shafting quite irrespective of whether the bin is empty or full. The cam-shaft platform was also rebuilt and it is now carried on columns standing on the foundations, thus avoiding the vibrations always experienced if the platform is supported by the kingposts. This portion of the work, although not affecting the crushing capacity of the mill, is nevertheless important, as it enables the operators to perform their work in comparative ease and comfort.

Shaft Cover

The accompanying illustration shows a shaft cover that is in use in the Southeast Missouri lead district. It is simply a wooden frame which is slightly larger than the shaft. There is an opening in the center through which the cable runs. As the cage comes up the hood strikes the wooden frame and lifts it. When the skip or cage descends the frame goes down to the collar of the shaft and remains there until the cage comes up.

Another device which accomplishes this same end is a gate in front of the shaft. This gate is lifted as the cage comes up. When the gate is thus open, the cage covers the shaft. As the cage goes down the gate is dropped in place, thus closing the entrance to the shaft.



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Cover for Shaft

Economy of Tube Mills

In a tabulation based on a comparison of results from 75 stamps and one tube mill vs. 75 stamps and four tube mills, C. O. Schmitt shows that the capital, interest and operating costs of the two plants when based on pulps of equal fineness are as 35 to 46 in favor of the larger number of tube mills. In other words, a saving of 30 per cent. on capital account is made by providing one tube mill for every 17 stamps instead of one for 75 stamps, with a saving of 24 per cent. on the sum of capital charges and working costs.

Conditions in the Yerington Copper District

Several Developed Mines Awaiting Construction of Smeltery; Ores Contain from 3 to 6 Per Cent. Copper; Labor and Living Conditions Good

BY JOHN TYSSOWSKI

There is little actual mining activity in the Yerington copper district of Lyon county, Nevada, at the present time. The attitude of mine owners and operators is one of awaiting developments in the railroad and smeltery situation, as without transportation and smelting facilities close at hand only the highest grade of ore can be mined at a profit. The Nevada Copper Belt Railroad is now running trains as far as Mason, two miles beyond Yerington, so the mines can well afford to wait a little longer until the smeltery is also built. The larger properties already have considerable tonnages of ore blocked out for stoping.

Mason valley is a broad, level, north-and-south basin through which the Walker river flows for about 23 miles before heading east and south for Walker lake. The average width of the valley is about seven miles and the land is fertile wherever water is available for irrigation. Potatoes and hay are the principal crops raised, and pasturage is afforded for many cattle. Numerous ranches dot the valley, which is settled to quite an extent.

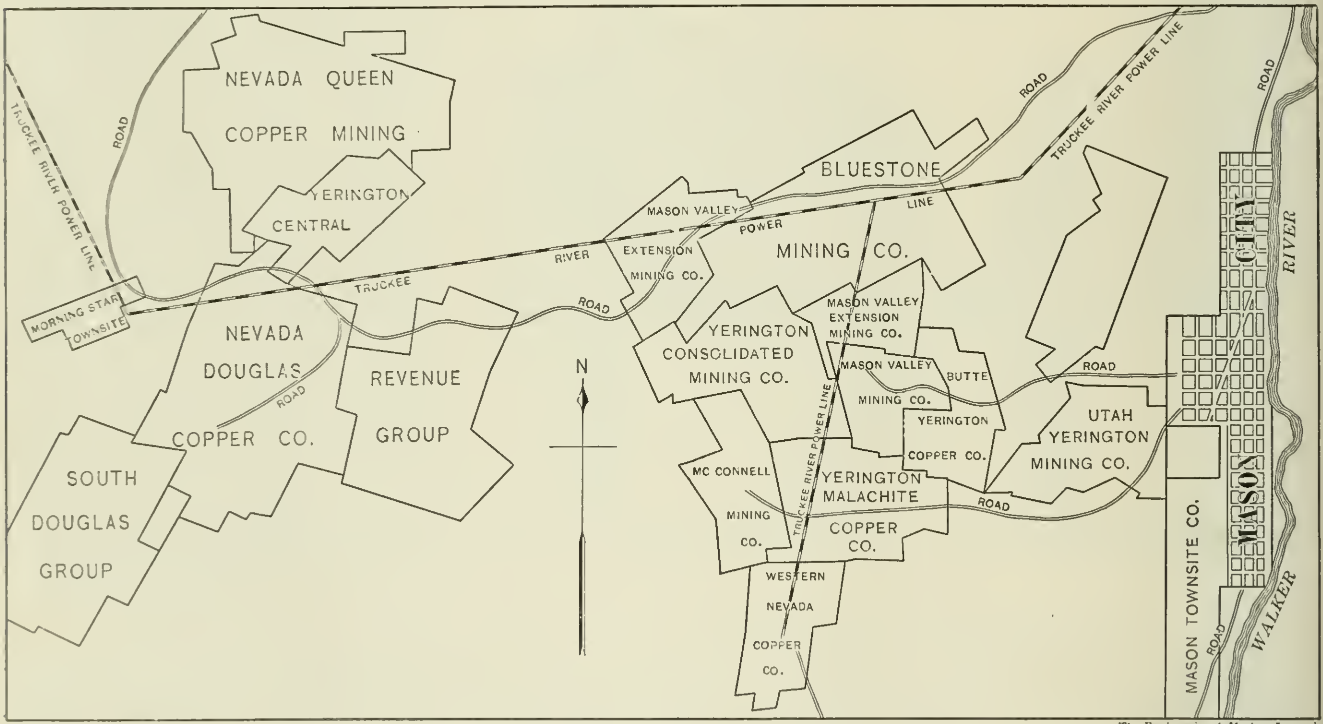
The Copper Belt railroad leaves the Hazen-Mina branch of the Southern Pacific at Wabuska and passes Mason townsite, 1[illegible] miles farther south. It will then go to the head of Mason valley, and thence turning to the north, will extend up Smith valley to the Nevada-Douglas properties, a total distance of 38 miles from Wabuska.

In close proximity to Mason, on the west flank of the valley, are the Bluestone, Mason Valley, Malachite and Western Nevada mines. About five miles eastward, on the other side of the basin, are the Blue Jay, Yerington Copper and other mines of the eastern belt. From Mason, by wagon road across the hills, only eight miles to the west, is the Nevada-Douglas group situated on the east flank of Smith valley which practically parallels Mason valley.

Economic Conditions

Living is fairly cheap in the district, at least for Nevada, the adjoining country furnishing almost all the necessary foodstuffs. Non-union labor is plentiful, the prevailing scale of wages being $3 for muckers and $3.50 for machine men. The Truckee River General Electric Company supplies electric power at $5 to $6 per h.p. per month, depending upon the size of the installation. Lumber sells at $30 per M, but little is required in the mines as far as present developments show. Gasolene can be put down at the mines for 25c. per gal., and a plentiful supply of water may be had anywhere in the Mason or Smith valleys by sinking shallow wells. This must be pumped to the mines against heads varying up to 1000 feet.

The published freight rate for hauling ore on the railroad from Mason to Wabuska is 3¾c. per 100 lb. for ore and concentrates not exceeding a value of $50 per ton; 5c. per 100 lb. from $50 to $100 per ton; 8c. per 100 lb. from $100 to $300 per ton. With a smeltery at Wabuska this would of course be the total freight charge. At present it is difficult to haul ore from the vicinity of Mason to Wabuska for $3.50 per ton. Aerial trams will probably be installed to deliver ore to the railroad.



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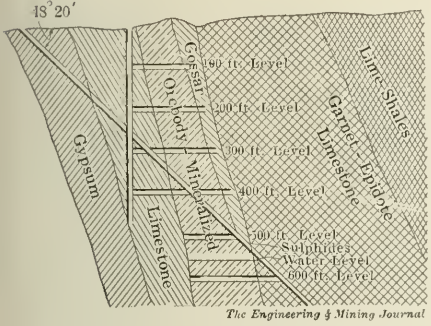
Map Showing Principal Mines of Yerington District, Nevada

The Mason Valley Group

As indicated, the mines of the Yerington district naturally fall into three geographical groups, i. e., those on either flank of Mason valley and those to the west and across the range on the east slope of Smith valley. The Mason Valley mine, of the group on the west slope of the Walker River basin, is the only one in the district now being actively developed. This property, controlled by Gunn-Thompson Company, of Salt Lake City, is employing about 20 men under J. J.

Welch, superintendent. The accompanying sketch will give an idea of the vertical extent of the workings. From the No. 1 tunnel the main fissure has been drifted on for about 300 ft. to the east and crosscuts run at intervals into the garnet-lime, ore-bearing formation. On the No. 3 level the fissure has been followed for about 700 ft. to the south and 200 ft. to the north, and the ore crosscut. A winze connects the levels and an intermediate has been opened between the Nos. 3 and 4 tunnels. A filled stope is being started above the No. 3. To the south, on the main or No. 4 level, the ore has been followed to where it is cut off near the end line of the property, and drifting has advanced nearly as far to the north. There are three winzes below the No. 4, one now showing ore at a depth of 70 ft. It is claimed that an ore reserve of over 600,000 tons averaging 3½ per cent. copper is blocked out. The ore is chalcopyrite and heavy iron sulphide in a garnet-limestone gangue and is claimed to be self-fluxing. Carbonates show near the surface and there is some secondary chalcocite.



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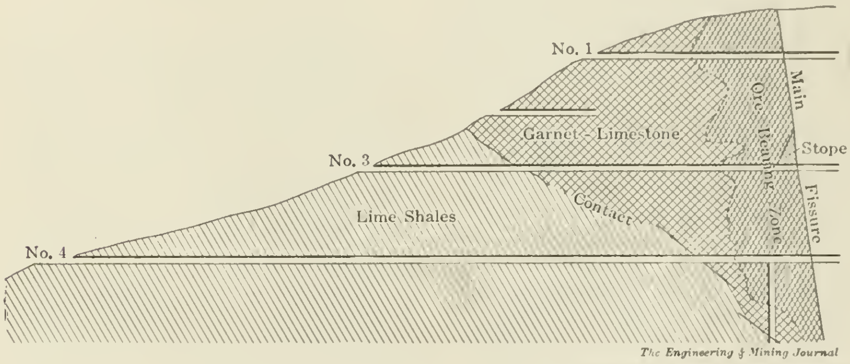
Section of Ludwig Orebody



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Section Through Mason Valley Mine

Magnetic Separators to be Used on Bluestone Ore

The Bluestone, to the north of the Mason, is probably as well developed as any mine in the region. The company is a close corporation controlled largely in New York: A. C. Weck is in charge of the property. The mine is opened by four tunnels. The ore is a pure chalcopyrite in epidote-limestone, deposited, according to Prof. A. C. Lawson of the University of California, by downward-percolating solutions. After being given a slight roast, the ore will be concentrated on Wetherill magnetic separators at a ratio of 4 tons into 1, which is reported to give a self-fluxing concentrate. At present only about five men are employed about the mine.

On the south of the Mason is the Malachite group, controlled by W. F. Snyder of New York, Grant Snyder of Salt Lake City and O. H. Soune of Yerington. The last mentioned is in charge of the property. Pits and tunnels show surface indications of two zones of mineralization. A shaft has been sunk 150 ft. in limestone. This property is still in the prospect stage; no work is being done at present.

Adjoining the Malachite on the west is the McConnell, controlled largely by E. W. Clark, E. B. Critchlow of Salt Lake City, and F. Pierce. Until recently this property was under option to the Nevada-Goldfield Reduction Company which sunk a shaft 400 ft. in waste. Formerly large shipments of high-grade ore were taken out above the tunnel level and on the outcrop which shows a heavy iron gossan. The ore lies close to the contact of the limestone and granodiorite. The property is idle.

The Western Nevada holdings are situated to the south of the McConnell. Samuel Newhouse, of Salt Lake City, and E. Myers, of New York, control this property, which is developed by two tunnels and a winze 300 ft. below the lower level.

Nevada-Douglas Group

The only developed property on the east slope of Smith valley is the Nevada-Douglas, which groups includes four copper-bearing zones: The Ludwig fissure vein; the Casting Copper, probably a continuation of the above; The Amalgamated and the Douglas, impregnations in an epidote-limestone belt. The accompanying section gives an idea of the development of the Ludwig, which claims 650,000 tons of ore averaging over 5 per cent. copper actually blocked out. Most of the high-grade ore from the oxidized zone extending a little below the 500-ft. point has been taken out, leaving, however, considerable ore which will be of shipping grade. It will require careful mining to recover this ore. Some secondary enrichment shows below the oxidized zone below which chalcopyrite occurs.

The gangue is silicious, and the heavy iron gossan carries copper in varying quantities. Water now stands at about the 540-ft. point, so that the lower workings are not accessible. A 6 x 12-ft. two-compartment incline shaft has been sunk 43 ft. below the 600-ft. level. Four or five men are employed about the surface. A deposit of gypsum on the footwall of the Ludwig orebody is interesting and will undoubtedly prove of commercial value eventually. Before the Ludwig was acquired by the Nevada-Douglas company a shaft was sunk 85 ft. at the Casting Copper where the compressor plant for the works is situated. A prospect shaft 125 ft. deep and a tunnel 650 ft. long have also been opened here.

The Amalgamated has been prospected only by a few pits and tunnels. At the Douglas, tunnels are claimed to prove 1,000,000 tons of 6 per cent. copper ore. Samuel Arentz is in charge of the Nevada-Douglas operations.

The Eastern Group

Practically no work is being done on the mines to the east of the Walker river. Of these properties the Blue Jay and Yerington Copper have shafts down about 400 ft., the Butte Yerington has sunk about 300 ft. and the Yerington Copper Mountain 100 ft. All have done considerable surface trenching and tunneling which is also true of all the properties of the Yerington district.

Conditions at the Yerington Copper property are fairly typical of this section. Mineralization occurs in a fissure in monzonite, locally termed granite. The surface showing is good, and a tunnel run 300 ft. on the strike and from a point 260 ft. below the summit of the hill shows up the mineralized zone and some good ore. A shaft is down about 400 ft. to the water level, and drifts and a crosscut at a point near the bottom show from 3 to 6 ft. of mineral-bearing material, with a footwall of monzonite and hanging-wall of highly altered limestone.

These eastern workings are situated at elevations ranging from 300 to 500 ft. above the floor of the valley. The distance across the valley to the railroad is probably five miles in an air line. The roads are good in dry weather, but heavy when the ground is water soaked.

One characteristic of the operations about Yerington is the simple surface equipment; electrically driven compressors, small air hoists and plain buildings.

being general. What money has been spent seems to have been put into the ground. Favored by cheap power and good labor conditions, and having a prosperous agricultural section close at hand, the Yerington copper district is fortunate. The completion of the railroad and erection of the proposed smeltery near Wabuska will supply all that is necessary for the final tryout. Much has been said for and against the district, but there is no doubt that a number of the properties are good prospects and a few certainly show all the indications of being real mines.

Rio Tinto Company, Ltd.

The Rio Tinto Company, Ltd., mined 604,799 tons of ore for shipment in 1909, of which 600,946 tons were invoiced to consumers, and 1,184,188 tons for local treatment, a total of 1,788,987 tons with an average copper content of 2.349 per cent. The copper produced by treatment at the mines was 24,364 tons, and that in the pyrites shipped was 11,008 tons. A total of 35,496 tons of copper were sold. Deliveries of sulphur ore were 569,604 tons as compared to 668,477 tons in 1908.

It is expected to quarry some ore from the San Dionisio lode in 1910, more than 1,000,000 cu.m. of overburden having been removed in 1909. Nearly 1,200,000 cu.m. of overburden were taken from the South lode, but more must be moved before the normal output of the lode can be again attained.

The revenue account shows a surplus at the end of the year of £1,322,265, from which were distributed two 30s. dividends on the 375,000 ordinary shares and two 2s. 6d. dividends on the preferred shares, making a total dividend distribution for the year of £1,206,250. The dividends on the ordinary shares amounted to 60 per cent.

Treatment of Titaniferous Iron Ores

Wilhelm Borchers, Aix-la-Chappelle, Germany, describes (Brit. Pat. 24,590, Nov. 16, 1909), a process of treating titaniferous iron ores, having for its objects the production of iron free from titanium, and a slag useful for metallurgical purposes.

Titaniferous iron ore and carbon are put into an electric furnace and smelted. A deoxidizing agent is added at a temperature of about 2000 deg. C., in sufficient quantities to extract the greater part of the iron and silicon present. The resulting products are a crude iron containing all or nearly all of the silicon of the ores, and a slag with a small amount of iron but a large amount of titanic acid. For the success of the process only a small quantity of silica should be present, and limestone or other fluxes should not be used.

The deoxidizing agent is obtained as follows: When considerable slag has collected, it is electrically heated in the same or another furnace to a temperature exceeding 2500 deg. C. Coke or charcoal in quantities of 40 to 80 per cent. of the weight of the slag is added, preferably in a heated condition, reducing the slag to a product consisting of 20 to 30 per cent. iron, 40 to 60 per cent titanium, 20 to 25 per cent. carbon, with little or no silicon. This product is employed for reducing the titaniferous iron ore in the place of coke or coal heretofore used. The heat set free during the reaction on the iron ore, aids the smelting not only in regard to speed, but also as to the certainty of the desired result.

International - Amet Oil Gas Producer

A new gas producer, using oil as fuel and known as the International-Amet oil gas producer, has recently been placed on the market. It is claimed to give much greater economy than producers of other types. A number of operating tests have been observed in which 1 gallon of oil has produced 8 b.h.p. An engine working over a period of several months has averaged 6½ b.h.p. per gal. under variable conditions of load, temperature and oil from 14 to 22 gravity. These results were obtained on a plant of comparatively small size, viz., 100 h.p.

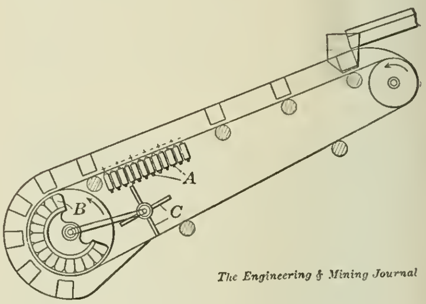
Among the advantages claimed are economy of space and simplicity of apparatus. Another advantage is that with this process in warm weather, or by artificially heating the oil in cold weather to 100 deg. F., a producer can be put into full operation in 1½ min. The apparatus for producing gas is of the simplest nature, consisting of a closed box-like combustion chamber, free of baffles or checker work. It is supplied with air by a blower of the positive type, requiring a pressure of no more than one pound to the square inch. The oil is introduced at the same pressure. The partial combustion ensuing therefrom is not a fierce blast, but a gentle flame which does not produce any damaging effect on the brick lining.

The gas is conducted from the combustion chamber through a brick-lined passage to a water seal communicating with the washer; and from the washer to the holder and engine. There is also a holder for equalizing the gas pressure and automatically regulating the rate of production of gas to meet the demand. The depreciation on a plant of this character is much less than that of a steam plant. The generator itself being made of cast iron, lined with brickwork, is subject to little wear and tear. The producer is manufactured by the Smith-Booth-Usher Company, of Los Angeles.

Magnetic Separator

In U. S. Pat. 945,408, Jan. 4, 1910, Sheldon Norton, of Mineville, N. Y., describes a magnetic separator for separating magnetic from nonmagnetic particles of iron ore.

Referring to the figure, which is a sectional elevation of the separator, the ore mixed with water is discharged from a spout on an inclined belt with magnets at *A* and *B*, the latter mounted in the lower drum. The belt by means of rollers is given a trough-shaped cross-section as it travels downward, but after passing the lower drum, it runs flat to the upper one, where it is troughed again by rollers. The magnets not only assist the magnetic particles to settle by gravity, but also retard their movements down the belt, while the water and nonmagnetic particles flow down freely. The magnetic particles are carried around by the magnets *B*, and when out of their influence fall from the belt by gravity, facilitated by a beater *C* with arms.



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NORTON MAGNETIC SEPARATOR

Production of Abrasive Garnet

The entire production of abrasive garnet in the United States comes from the Adirondack mines in the State of New York. The production in 1909 was 3802 tons, valued at $121,700, as compared with an output of 2530 tons, worth $78,090 in 1908. The increase in production would have been fairly satisfactory if demand had increased at a corresponding rate. The mines, however, held in stock at the close of 1909 a considerable part of the output.

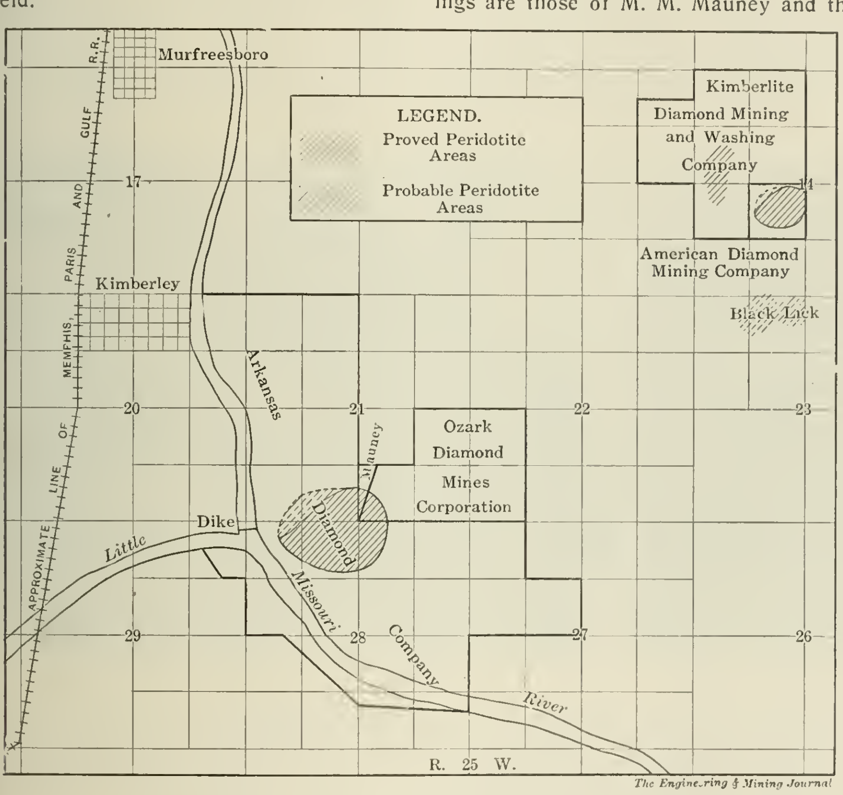
Correction

In reference to the article in the JOURNAL, of January 15, "Analysis of Mine and Mill Practice on Rand—1," Mr. Weston writes: "I find one or two mistakes due to my carelessness and bad writing. I meant to say most of the best amalgamations were *now* carried out, not *not* carried out. The dip of the City Deep reef is 38 deg., not 38 per cent."

The Arkansas Diamond Fields in 1909

BY JOHN T. FULLER*

The progress of diamond mining in Arkansas during 1909 was slight, due principally to lack of capital for development, but it is expected that 1910 will show considerable progress toward the ultimate proof as to whether or not the field is a profitable venture. The total output from the entire field to date is approximately 1000 diamonds, or about 500 carats. The most important event of the year, from a general standpoint, was the extension of the Memphis, Paris & Gulf Railroad into Murfreesboro, thus giving direct rail communication to the field.


Murfreesboro
R.R.
GULF
AND
PARIS
MEMPHIS,
OF
LINE
APPROXIMATE
LEGEND.
▨ Proved Peridotite Areas
▨ Probable Peridotite Areas
Kimberlite Diamond Mining and Washing Company
14
17
Kimberley
American Diamond Mining Company
Black Lick
20
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Arkansas
Mauney
Ozark Diamond Mines Corporation
Dike
Little
Diamond
Missouri
Company
River
29
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Diamond-bearing Areas, Pike County, Arkansas

The existence of two peridotite pipes in this region has been determined. Both are in township 8 south, range 25 west, Pike county, Arkansas. One pipe is in sections 21 and 28, most of which is held by the Arkansas Diamond Company, M. M. Mauney and the Ozark Diamond Mines Corporation owning about 10 acres. The second pipe lies in section 14, and as far as determined is held by the American Diamond Mining Company. There is a possibility that this pipe extends into the land of the Kimberlite Diamond Mining and Washing Company, and that the yellow ground claimed by the latter company is a second exposure of the same pipe. The Black Lick and the dike on the Ozark property are still debatable and undetermined.

Four Companies Incorporated

There are at present in these fields four incorporated companies and two private holdings. The accompanying map shows the extent and relative position of these properties. The companies at present in the field are the Arkansas Diamond Company, Ozark Diamond Mines Corporation, American Diamond Mining Company, and Kimberlite Diamond Mining and Washing Company. The private holdings are those of M. M. Mauney and the Grayson & McCloud Lumber Company, at Black Lick. In February, 1909, the Kimberley Townsite and Land Company was formed, and a townsite laid out, which has since been incorporated as the town of Kimberley.

The Arkansas Diamond Company

A large number of prospecting pits have been put down on the property of the Arkansas Diamond Company, with the view of determining the hardness and extent of oxidation of the underlying peridotite. These pits also incidentally proved that the peridotite area extents farther to the west than was at first thought. When an accurate survey can be made it will probably be found that the volcanic area will prove in excess of the 60 acres originally estimated.

Early in August a small diamond-washing plant was erected for testing and experimental purposes. This plant consists of a revolving sizing screen, screening to five sizes, one 8-ft. rotary washing pan, and one Harz jig. A 20-h.p. portable boiler and engine supplies the motive power.

This plant was erected and operated solely for the purpose of determining the mechanical details and degree of concentration to be expected in a larger, permanent plant which is now under consideration. The new plant will be a direct double-treatment plant, capable of handling 1000 loads of 16 cu.ft. per day of 10 hours. It is hoped to have this plant ready for operation by January of next year.

About 800 diamonds have been recovered from this property, ranging in size from 1/16 to 6 carats. The blue-white stones are valued at $125 per carat in the rough and $400 per carat in the finished gem. About 25 of these stones of all grades have been cut and found to be of exceptional hardness, brilliancy and value.

Ozark Diamond Mines Corporation

Considerable prospecting work with a core drill has been carried out by this company on the eastern part of its ground. It is believed that the company has discovered a dike of peridotite lying 20 to 40 ft. below the surface and striking north and south, as indicated on the map. The bore holes indicate this dike to be about 100 ft. wide.

No work of any importance has been performed on the western area of this company, on which, as shown by the accompanying map, there are about 8 acres of the pipe worked by the Arkansas Diamond Company. This area was originally owned by M. M. Mauney, and sold by him during the year to the Ozark company. On these 8 acres and the two acres still held by Mr. Mauney, about 75 diamonds have been found without any systematic search or washing. One of the stones from this tract is a blue white of excellent quality. An 8-ft. rotary washing pan was purchased last June, but has not been erected.

Other Companies and Individuals

The Kimberlite Diamond Mining and Washing Company has recently been incorporated, the land having been held during the last year as a trusteeship. The property lies to the east and north of the American Diamond Mining Company's land. Several long trenches have been dug, and three or four prospecting shafts put down from 20 to 40 ft. in depth. The company claims to have exposed a large body of completely oxidized kimberlite or peridotite, but no finds of diamonds are reported to date.

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*Mining engineer, Murfreesboro, Ark.

But little work has been performed by Mr. Mauney on the 2-acre tract of the pipe still in his possession. A charge of 50c. admission is made to visitors, which entitles the person to search for diamonds and keep all he may find. Several diamonds have been found in this way, and it is reported that one $45 stone was picked up by a visitor.

There is a peridotite pipe on the property of the American Diamond Mining Company, of as yet undetermined extent. A number of test pits and bore holes have been put down, and several acres of surface soil removed, determining definitely the existence of a pipe. The recovery of 15 diamonds is reported. There is no work being done at present.

The Black Lick comprises about 40 acres, over which there has been considerable controversy. It has not yet been determined whether or not peridotite exists there. Owing to the fact that the surface soil is a rich black gumbo, similar to the soil overlying the first-discovered pipe, this area was jumped by a number of persons, and mineral claims were staked out and filed thereon. The Grayson-McCloud Lumber Company, to whom the tract belongs, brought suit against these persons and they were evicted by order of the court. No prospecting work worthy of the name has been performed and no diamonds found.

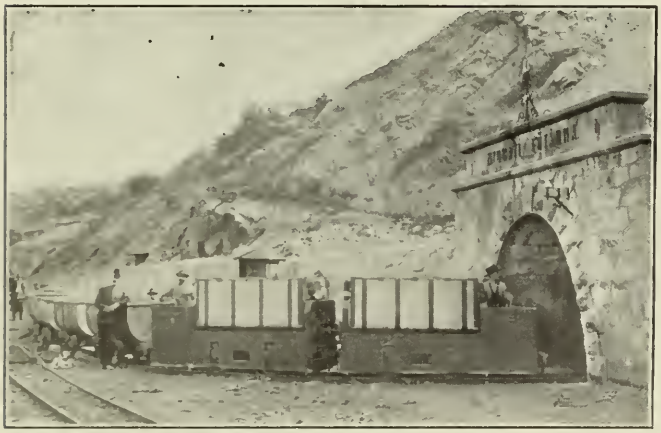
Discoveries of vanadium ore are reported by a British consul to have been made recently in the Cerro de Pasco mining district, Peru. The export of this mineral has so far been exclusively to the United States.

Storage-battery Locomotive for Use in Mines

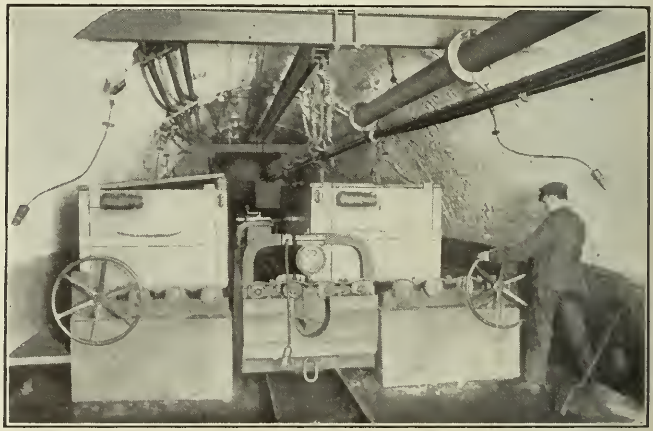
By J. B. Van Brussel.*

A unique type of storage-battery locomotive, for which are claimed several marked advantages over those operated by overhead trolleys or third-rail conductors, is now in use in a large number of important German and Hungarian mines. These locomotives are thoroughly reliable, and without question less dangerous to the miners than the usual locomotives, as they eliminate the need of any exposed conductors. They also have a large sphere of action without extensive overhead construction.

The locomotives are equipped with motors of from 8- to 32-h.p. capacity; each locomotive is provided with two sets of batteries when uninterrupted service is required. The batteries are mounted on the top and are removable for charging. The gearing for this purpose is of special design, with permanent rolls fixed in the locomotive frames directly above the truck. By providing this equipment it is possible to shift the discharged batteries and replace them with fully charged sets with a minimum expenditure of time and labor. One storage battery is charged in the charging room, while the other is operating the locomotive in the mine.



Double-unit Storage Battery, 24 Horsepower, in Operation, Petroseny Mines, Hungary



A Discharged Battery Being Removed for Charging. Charged Battery at Left

Charging the Batteries

It is stated that the storage batteries used seldom discharge more than 60 or 70 per cent. of their capacity, and it requires, for charging, only about 1/3 of the time usually taken for discharging when in operation. Partially discharged batteries may be fully charged in about 1½ hours.

The mining locomotive of this type of 20-h.p. capacity has two batteries of 90 cells each, the capacity of each cell being 74 ampere hours. They are capable of operating 400 effective ton-kilometers on a single charge.

The cost of operation is from 1/3 to ½ the cost of animal power, it is claimed, and the current required is from ¼ to 1/3 kilowatt-hour per ton-kilometer. A further advantage of these equipments over the trolley and third-rail mining locomotive is that no added weight is needed for adhesion, as the storage battery provides all the necessary weight required.

Five of these storage-battery locomotives are in use at the Konigsborn mines, near Heesen, in Westphalia (Germany). Eight storage batteries are provided, each having 81 cells of a capacity of 74 ampere hours. In the Hungarian Petroseny mines, there are 8 battery locomotives in operation. These locomotives are working in pairs. The double units thus formed are capable of hauling 40 coal cars without difficulty. At these mines there are used 16 sets of batteries, of the Tudor type. Each locomotive has 51 cells, with a capacity of 74 ampere-hours each.

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*Brussels, Belgium.

Victoria Copper Mining Company

The Victoria Copper Mining Company, of Michigan, operated at a loss of $32,090 in the year ended Dec. 31, 1909. The production was 1,062,218 lb. of copper. For the last three months the cost per ton of rock stamped was $1.07, stamping 521 tons per day. The yield of copper was only 10.2 lb. per ton, and its total cost was 13.67c. per lb. There were 118,605 tons of rock stamped during the year. A large amount of diamond drilling was done and a good core taken from hole No. 17, 4514 ft. east of the working shaft, indicating a lode 17 ft. wide. An incline shaft is being sunk to open this ground. The company is figuring on the development of an extensive water power to supply power to nearby mines.

Copper Deposits of the Globe-Kelvin Districts—I

Near Miami Disseminated Orebodies in the Pinal Shists Are Being Extensively Developed by Miami, Inspiration, Keystone, Cordova and Others

BY EDWIN HIGGINS*

With enormous overbodies developed, exploration work proceeding on a substantial scale, concentrators in course of erection, and needed railway projects under serious consideration, the Globe and Kelvin districts of Arizona bid fair to become two of the most important copper producers of the Southwest. Although special reference is here made to the disseminated deposits in the vicinity of Miami and Ray, there are other classes of copper deposits within a radius of 15 miles of the Pinal mountains that are of great importance. For many years the Globe district has been well known, first as a silver and later as a copper producer. During these years, operations were conducted in the lode deposits, replacement masses in limestone and irregular mineralizations of shattered or permeable rocks, and it was not until ore was encountered on the Miami property, in January, 1907, that serious attention was given to the disseminated deposits. This discovery came near not being made, for operations were about to be discontinued; it is said that the superintendent on the ground continued work in the shaft after orders came to stop, with the result that ore was encountered within a few feet more.

No. 1 Shaft and Experimental Mill of Miami Copper Company

Looking South from Cordova's Sullivan Shaft

Globe is situated to the northeast of the Pinals, in Gila county. It is on the Gila Valley, Globe & Northern Railway. For a long time Globe was the terminal point of this railroad, but recently it has been extended to Miami to, secure the traffic originating with the mines and prospects in this vicinity. The Gila Valley, Globe & Northern Railway is a subsidiary of the Southern Pacific and connects with the main line of this system at Bowie. From the north Globe is at present inaccessible, except by wagon road.

Kelvin may be reached from Globe by a stage trip of 39 miles; by the railroad it is necessary to make a roundabout trip, covering almost two days. Conditions will be greatly improved when the Phœnix & Eastern Railway extends its road from Winkelman to San Carlos. Work on this extension has been in abeyance for some months, owing to trouble in securing a right-of-way for a short distance, but it is thought that this will soon be arranged and construction work again started.

Geology

Much has appeared recently in the technical press regarding the geology of the Globe district. Through these articles, but primarily through the accurate and exhaustive work of F. L. Ransome, results of which were published by the U. S. Geological Survey in 1902, this subject has received wide publicity. Up to the early part of 1907, however, practically nothing was known regarding the disseminated copper deposits.

According to Ransome, the Pinal schists, of pre-Cambrian age, are the oldest rocks of the district. These represent ancient sediments which, prior to the deposition of the lowest Cambrian rocks known in this region, were upturned and compressed, intruded by granitic rocks, and metamorphosed to their present crystalline condition. A long period of denudation and degradation reduced this crystalline basement to a fairly even surface, or peneplain, upon which the next younger rocks were deposited. These comprise shales, conglomerates and quartzites, of a total thickness of from 500 to 800 ft. These rocks are thought to be of Cambrian age and are referred to the Apache group. Overlying the Apache group is a series of fossiliferous limestones ranging in age from Devonian to Pennsylvanian. These have an observed maximum thickness of about 400 ft. and are referred to as the Globe limestone. It is probable that an erosion interval separates the Globe limestone from the Apache group. The original top of the Globe limestone, which closes the record of marine sedimentation, is nowhere preserved in the district.

During the long interval between the close of the Pennsylvania and the extensive effusive eruptions of dacite, which are provisionally referred to the early Tertiary, occurred the second great deformation of the region, imposing upon it structures to which are in large measure due the features of the present topography. The Paleozoic sediments and their underlying crystalline basement were cut by hundreds of faults. Following or accompanying the faulting, large masses of diabase were intruded, chiefly in the form of sills, between the sedimentary beds of the fault blocks. Long-continued erosion followed the intrusion of diabase, during which the rocks were further faulted and the original sulphide ores were deposited.

Following this period of erosion were extensive eruptions of dacite which appears to have covered all of the region with the exception of the higher portions of the Pinal mountains. The time of the volcanic eruption may be tentatively referred to the Tertiary, but the region affords no known facts upon which to base a more precise date. After the dacite eruption the region was again deformed by extensive normal faulting. The rocks, traversed by numerous faults, were carved into nearly their present topography, and the waste was deposited in the valleys as a variable fluviatile accumulation which has been termed the Gila conglomerate. The age of this conglomerate is probably early Pleistocene or possibly late Tertiary. During its deposition there was at least one eruption of basalt. Faults also occur in the Gila conglomerate.

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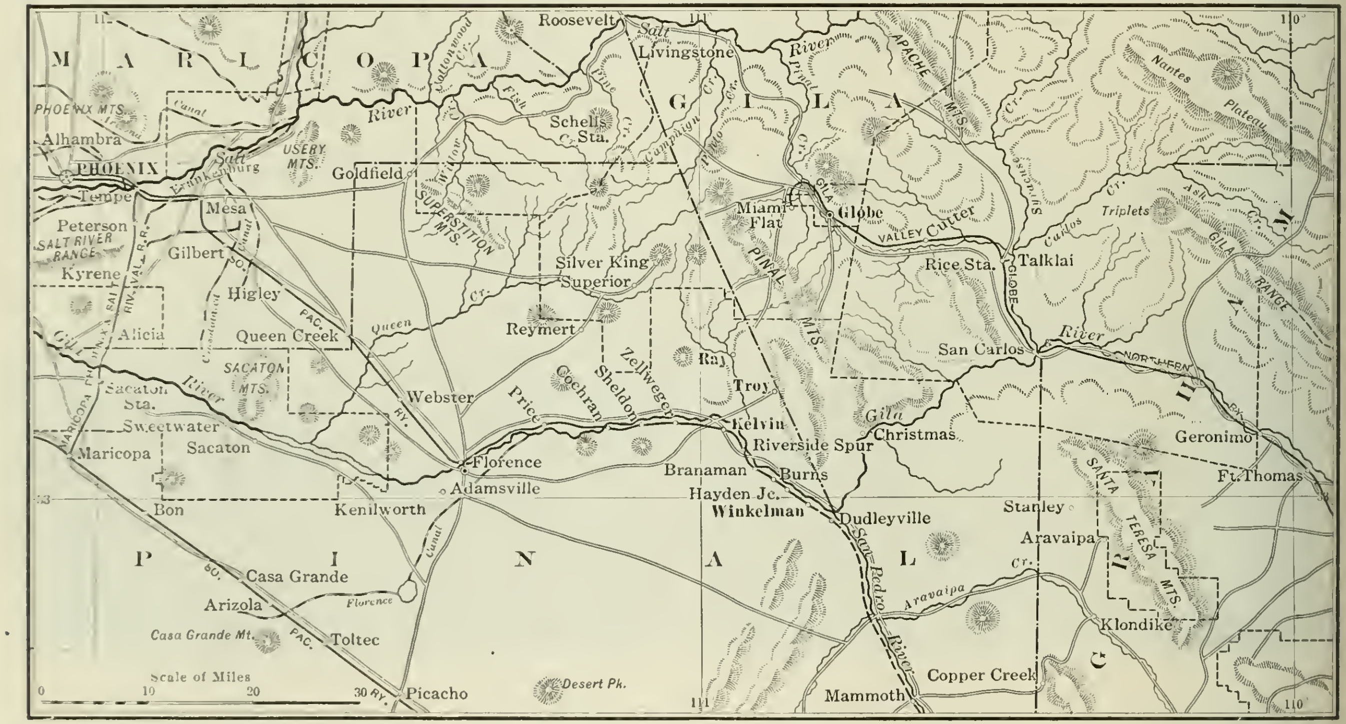
*Consulting mining engineer, Columbia Trust building, Los Angeles, Cal.

PINAL SCHISTS

Ransome describes the Pinal schist as generally light gray in color, with frequently a silvery, satiny luster. In texture it ranges from cryptocrystalline, slaty sericite-schists, through finely granular, fissile rocks of somewhat sugary texture, to imperfectly cleavable, highly crystalline muscovite-schists. The sericite-schists, with their regular cleavage and inconspicuous crystallization, are characteristic of the larger schist areas at some distance from the Madera diorite contact. The coarser, more conspicuously crystalline muscovite-schists are found near the contact and in masses of schist inclosed by the granitic rock.

The Pinal schist has a prevailing nearly vertical schistose structure, probably in the main parallel to original bedding planes. It is intruded by granitic rocks, and both schist and intrusive masses were degraded to a peneplain before the deposition of the Apache group upon the complex basement thus provided. The preponderance of quartz over all other mineral constituents, the still greater preponderance of quartz and muscovite together and the general absence of calcic minerals are strongly indicative of the formation of the Pinal schists by metamorphism from quartzose sediments.



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COUNTRY AROUND GLOBE AND KELVIN, ARIZ., WITH PARTS OF GILA, MARICOPA, PINAL AND GRAHAM COUNTIES

THE DISSEMINATED DEPOSITS

The orebodies so far developed to the west of Miami flat consist of small bands and disseminations of chalcocite in the Pinal (sericite) schist. Roughly, this zone may be said to extend along the contact of the schist with the Schultze granite, from the Black Warrior through the Miami and Inspiration groups; passing on through the Keystone and Live Oak the mineralization is found extending into the granite near the contact. The outcropping schist has been weathered and leached to depths ranging from 50 to 200 ft. or more; it is iron stained in places—in others, copper stained. Downward-percolating surface waters, charged with the copper once contained in the eroded surface and the present leached zone, have enriched the cupriferous pyrite of the primary deposition, thus forming a commercial orebody containing from 2 to 5 per cent. copper. An accompanying sketch map shows the location of the principal groups of claims in this district and gives some idea of its geology. The sketch was made by permission from a copyrighted map, by Sultan & Wayne, engineers, Globe; the geology, which is approximately correct, was sketched in from data obtained elsewhere.

DEVELOPMENT AND CHARACTERISTICS OF THE MIAMI OREBODY

The property of the Miami Copper Company was taken under option by the General Development Company and work begun in January, 1907. In April of the same year ore carrying 3 per cent. copper was encountered at a depth of 220 ft. in the Red Rock (No. 1) shaft. By the month of June a depth of 270 ft. had been attained and ore was opened up for about 50 ft. square. The shaft was then continued down to the 720-ft. level and work started on the 370, 470 and 570. In March, 1908, it was figured that there were 2,000,000 tons of ore developed, and in January, 1909, the estimates showed 13,315,000 tons available. Since that time little attempt has been made to increase the tonnage of ore developed, the aim having been to block out more thoroughly the orebody already developed. Recently, however, three Star churn drills have been put to work prospecting some of the virgin ground.

On the 270 level development work has outlined an orebody approximately 270 ft. east and west by 180 ft. north and south; also a small body 250 ft. further north, 200 by 60 ft. The workings on this level cover approximately 1⅓ acres and the ore averages 3.2 per cent. copper. The extreme top of the orebody is 200 ft. below the collar of No. 1 shaft. Near its top the orebody is entirely surrounded by leached ground, the dividing line be-ng well marked. As depth is attained he leached ground continues on the ortheast, east, southeast and south, the ine of demarcation between the ore and eached ground being distinct and narked by slips and fault planes. The hange from practically barren rock to re occurs within a few inches.

The west side of the orebody, from the 270 to the 570, as far as explored, is ounded by an oxidized zone carrying ilicates and carbonates, the silicates predominating. This oxidized zone has not een explored to a great extent, but it is ot believed to be of great width, for ulphides have been developed beyond n No. 3 shaft. To the southeast, beyond he leached ground, work on the 470 and 570 has extended into the Gila conglomrate. On these two levels the width of he leached ground is from 10 to 40 feet.

On the 370 the orebody is divided into wo parts by a horse of leached and parally oxidized rock projecting down from he capping. Including the leached round, the size of the orebody on this evel is 700 ft. east and west by 800 ft. north and south. This includes approximately 12 acres in ore, averaging 2.96 per cent. copper, and 2 acres in leached and oxidized ground.

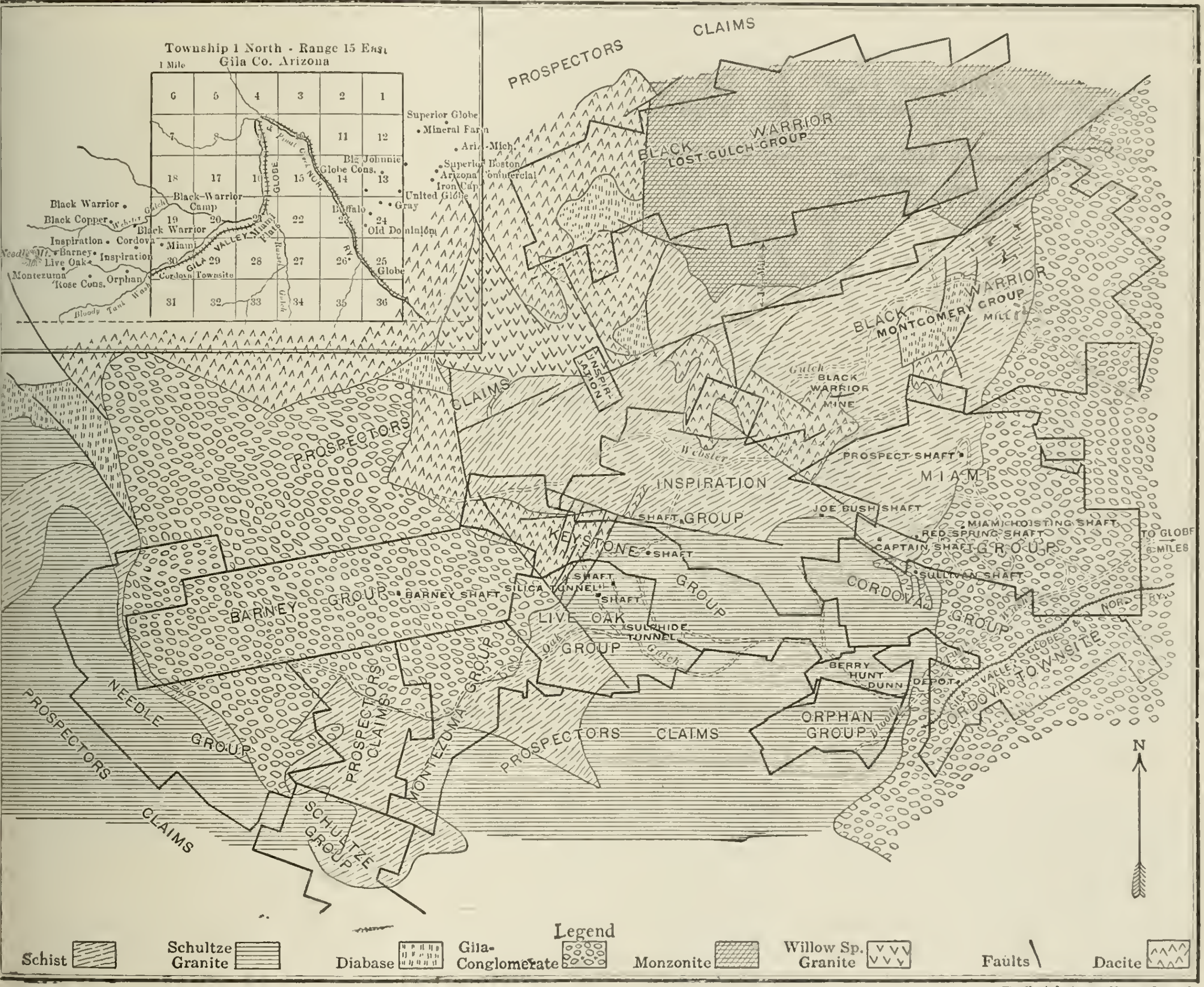
On the 470 level the orebody is 700 ft. east and west by 1300 ft. north and south, and shows approximately 16 acres of ore averaging 2.76 per cent. copper. When this level is fully developed it will probably show 20 acres of ore. The 570 level has not been as fully developed as the 470, but sufficient work has been done to determine that it contains at least as much ore as the 470. The ore on this level averages 2.65 per cent. copper. From the above it may be seen that the orebody increases in size with depth, at the same time decreasing slightly in copper content. It is probable that no ore carrying less than 2 per cent. copper will be mined, except under favorable conditions.

Although the orebody has no regular strike and dip, the Pinal schists carrying the ore strike north 26 deg. east and dip from 50 to 55 deg. southeasterly. Nowhere is the division between the sulphide and oxidized ore as sharp as between the leached ground and the orebody.

Development Work at Miami Property

Work at the Miami property is being directed toward the development of the orebody, prospecting with three Star churn drills, sinking the future working shaft (No. 4) below the 420 level and the construction of a concentrator. Development work is proceeding from No. 1 shaft. The orebody is being blocked out in rectangles preparatory to mining on a large scale; the method of mining will be described in a later article. Early in January, 1910, there were 700 men on the payroll. Of these 100 were working underground and 30 on surface work directly connected with mining; the total number having to do with mining management was 200. On mill work there were 400 men.

In underground development, from 3000 to 3500 ft. of ground was being broken per month; this yielded from 450 to 500 tons of ore per day. In this work the

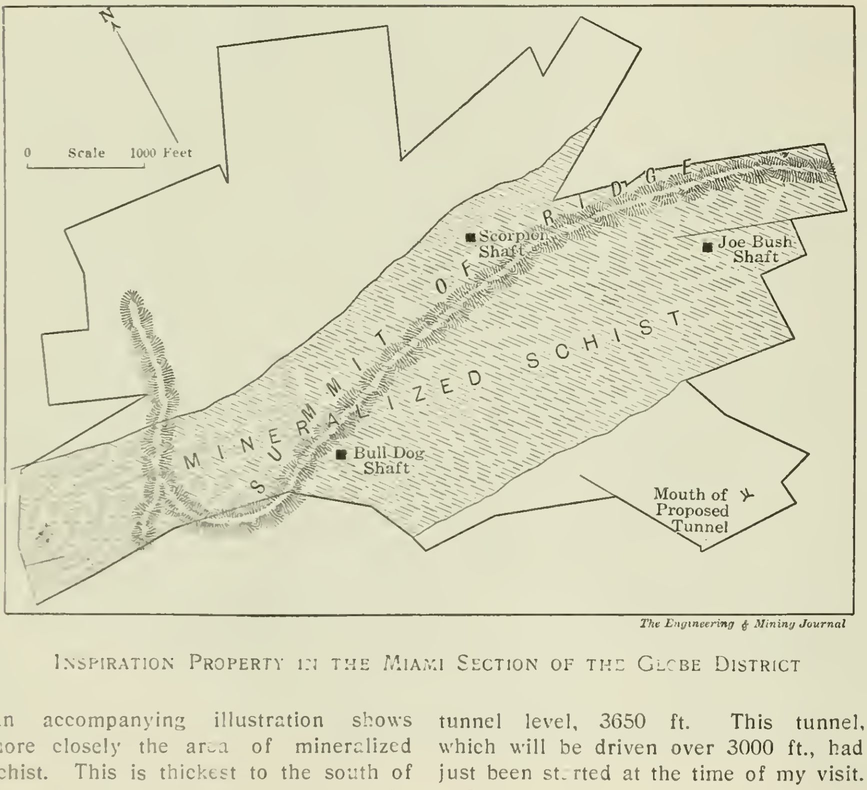


The Engineering & Mining Journal

Geological Map of the Miami Section of the Globe Mining District, Arizona costs were approximately as follows: Miners, $1.25 per foot; trackmen and trammers, $1.25; powder, caps, fuse, candles, $0.90; total, $3.40 per foot. Reckoning 3.5 tons to the foot, gives $0.9714 as the cost of delivering a ton of ore to the shaft for hoisting. Hoisting under present conditions probably costs 50c. per ton, so that the cost of delivering ore on top, during development, is in the neighborhood of $1.50 per ton. The ore dump, shown in an accompanying illustration, contains more than 150,000 tons of ore of various grades, the average probably being about 2.75 per cent. copper.

INSPIRATION COPPER COMPANY

The property of the Inspiration Copper Company adjoins the Miami on the west.



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INSPIRATION PROPERTY IN THE MIAMI SECTION OF THE GLOBE DISTRICT

An accompanying illustration shows more closely the area of mineralized schist. This is thickest to the south of the ridge, gradually thinning out to the north. The overburden, or capping, here varies from 50 to 350 ft., so that a great deal of the ore may be mined by stripping and milling.

The Inspiration Company began work in January, 1909, since which time the Bull Dog shaft has been sunk 300 ft., the Joe Bush 425 ft. and the Scorpion 300 ft. Work was started on the 300 level of the Bull Dog shaft, when a fault was encountered and work stopped. The development of the Woodson orebody from this shaft will be deferred until a compressor plant is installed. In the Joe Bush shaft, ore was encountered 95 ft. below the collar; the orebody has been proved to be 325 ft. thick here. I learned little regarding the exact value of the ore on this property, but from a reliable source I understand that it is of comparatively high grade. The ore in the bottom of the Joe Bush shaft is said to carry more than 3 per cent. copper. On the 400 level there is more than 800 ft. of development and several headings are being driven. Not much work is progressing in the Scorpion shaft. A station has been cut at the 275 level preparatory to the exploration of the orebody through which the shaft passed last summer. Work is also being carried on in the Mercer tunnel and in the Taylor tunnel.

As indicated on the accompanying sketch, a tunnel will be driven to get under the ore developed from the Joe Bush shaft. Eventually a shaft will be sunk in the vicinity of the portal of this tunnel to catch the ore beneath the tunnel level. The elevation at the collar of the Joe Bush shaft is 3841 ft.; that of the tunnel level, 3650 ft. This tunnel, which will be driven over 3000 ft., had just been started at the time of my visit.

Only a small proportion of the Inspiration ground has been drilled, although work is now progressing with two Star churn drills. Although the Inspiration property has been developed much less extensively than the Miami, work up to the present has been quite satisfactory, and there can be little doubt but that Inspiration will eventually make one of the important producers of the district.

OTHER PROPERTIES

In addition to Miami and Inspiration, the Warrior, Live Oak and Cordova properties also are in operation. On the Live Oak work is progressing in a 1200-ft. tunnel and in a 350-ft. shaft. Work is being done in two shafts, one of which is about 650 ft. deep, on the Cordova property. The Black Warrior is just beginning to prospect with churn drills. Previously this company had been working on an orebody of chrysocolla from which it shipped no ore carrying less than 8 per cent. copper.

The Keystone is operated by the Lewisohns. This property has one shaft down 350 ft. and has been partially prospected by churn drills. There are other developments in the district, of which I took no notes.

(To be continued)

Salt Monopoly of Venezuela

The government of Venezuela, according to a recent consular report, has signed a contract with the Compañia de Navegacion Fluvial y Costanera de Venezuela by which that company secures a lease of the salt monopoly for a period of two years, with the privilege of two years' extension. This gives the company possession of all the present salt works and all the salt deposits of the country. It virtually concedes to the company, in addition, a monopoly of the coastwise salt transportation during the period mentioned.

The company will pay the government a rental of $820,250 for the first year, $868,500 for the second year, $916,750 for the third year, and $965,000 for the fourth year, payable monthly.

The importation and industrial manufacture of salt except by the company is prohibited, and even the company is prohibited from introducing foreign salt into the country. The contractors agree to dispose of salt at the various salt works or deposits, numbering 14, at prices ranging from 5.75c. to 8.10c. per 2.2 lb. The company must sell salt to fishermen at 1.93c. per 2.2 pound.

The contractors agree to maintain enough salt in stock to prevent fluctuations from the above prices under penalty of $1000.

The contractors are free from all imposts, duties, etc., on the properties or on machinery, utensils, etc., which they may introduce, and are authorized to construct Dacoville railways in the salt works if they consider it worth while, and the government will pay 40 per cent. of the cost.

The contractors agree to give a bond to the government before entering into possession of the salt works in the amount of $96,000. They also agree to limit the sales for the last four months of their contract to 2,000,000 kg. (1 kg. 2.2 lb.) per month, not to sublet the whole or any part of the salt works, and to submit every question arising as to this contract to the Venezuelan courts, and not to apply to any other government for diplomatic intervention. It is understood that it is the intent of the lessees of the salt concession to increase the output greatly so as to provide for the exportation of large quantities.

Smelting Bismuth-Lead Ore, Sinaloa, Mexico

Campaign Indicated That Charge Should Contain 10 Per Cent. Lead and 2 Per Cent. Bismuth. Recovery of Bismuth 80 to 90 Per Cent.

BY S. E. BRETHERTON*

At the Bismuth King mine near Rey del Bismuto in Sinaloa, Mex., I made a test run for the recovery of bismuth, gold, and silver. The company had a small blast furnace 30x60 in. at the tuyeres, and 14 ft. 10 in. deep, top of crucible to feed floor, with the ordinary lead crucible. Several smelting campaigns had been made previously, producing fairly clean slag. Not having kept accurate records of ore smelted, the losses were not known, but must have been considerable, as no forehearth or settler had been used to catch what little matte, speiss or bullion that is usually carried over with the slag mechanically, especially when rodding the furnace. They had used an extra large slag pot which was little better than nothing; with an intermittent slag tap, the slag rushes through a small receptacle so fast that there is no time for the matte or speiss to settle. The ore was mostly oxidized and litharge was used for the lead supply, so that no large amount of matte had been made.

When I arrived on the ground, ore, limestone and coke were already delivered, and a limited supply of lead ore, containing 18 per cent. sulphur, and 8 to 10 per cent. zinc. This meant a large matte fall in the blast furnace. To save time I cut up an old abandoned boiler and made two excellent matte settlers from the shell. While these were being made, I had my assistant contract for some of the local hardwood, to be delivered green, as I wished to use it in the blast furnace to save coke.

I started the blast furnace with inexperienced Mexican labor which did excellent work, as the following results will show: The furnace was in blast only 26 days, and at the end of that time there was no incrustation on the walls of the furnace, or in the crucible, nor had any fire shown at the feed doors during the run. I had several shut downs of a few hours each on account of the machinery.

CHARACTER OF ORE

I think it best to describe local conditions so that the results will be more thoroughly understood and appreciated, especially as bismuth is considered more difficult to recover than lead. The ore contained: Bismuth, 2 per cent.; iron, 33; silica, 31; alumina, 12.5; magnesia, 2; zinc, 1; copper, 9, and a trace of lime, arsenic and sulphur. The gold and silver contents are omitted as they do not enter into the slag formation of the ore. The principal value is gold. The bismuth and lead assays were made by the wet method, and not the commercial or dry assay which is 2 per cent. less.

For lead ore there was a limited supply of sulphides, rich in silver and containing: Lead, 50.7 per cent.; copper, 1.4; zince, 8.4; sulphur, 18; iron, 6; silica, 11, and alumina, 1; with sufficient lead bullion containing no bismuth and some silver, made from old litharge to nearly fill the crucible of the blast furnace.

At first I started with 9.75 per cent. lead and 1 per cent. bismuth in the charge, and soon had the bullion up to its proper proportion of bismuth contents. The slag averaged 1.1 oz. silver and 1.2 per cent. lead. There was too little gold and bismuth in the slag for the chemist to determine, so that an excellent recovery of the metals, bismuth included, was being obtained. In order to curtail the lead ore and make the bullion richer in bismuth and gold, I reduced the amount of lead ore in the charge one-half, and fed the bullion back to the furnace, until it assayed over 17 per cent. bismuth. I also fed back some matte, thinking that by using less lead ore containing sulphur, I could perhaps enrich the matte by resmelting. The matte made after this did contain more copper, thus showing a concentration of the matte.

About this time I discovered that the bismuth losses were very high, due no doubt to insufficient lead in the charge, as the lead from the bullion fed back could only melt and drop through the furnace and not mix properly with the charge, as a collector. I then took stock of the bullion in the crucible and furnace, and increased the percentage of lead in the charge for a few days, and as close as I could estimate, found that the recovery was 91 per cent. of the bismuth. It was then necessary to reduce the amount of lead in the charge in order to continue the run a few days longer with the supply of lead on hand.

CUPELLING THE BULLION

As soon as it was learned how the bismuth losses increased as the lead in the charge was decreased, the management decided to shut down and put in a cupel furnace, which I had suggested originally. Cupelling the bullion has the following advantages, especially when smelting so far from a railroad and the markets:

(1) Freight and treatment saved by shipping a richer and smaller amount of bullion.

(2) Less burden to be smelted in the charge to get the necessary lead. Litharge averages over 90 per cent.

(3) Litharge is easily crushed fine to mix through the charge to collect the precious metals, remaining with the charge better than metallic lead, as it does not melt so quickly and with ore containing arsenic or sulphur, the oxygen in the litharge has a beneficial effect.

(4) It enables the metallurgist to carry more lead in the charge and make cleaner slag where the lead ore is limited, or the ore contains enough lead to interfere with other methods of treatment, but not enough to gather the metals properly in the blast furnace.

The loss of lead is necessarily greater by cupelling and resmelting, and it is necessary to have sufficient lead in the original ore mixture to supply these losses, and some lead to be left with the precious metals in order to ship them by freight instead of express. The value of the extra lead lost by resmelting is scarcely worth considering, when taking into account wagon freight, railroad freight, and refining charges.

The question which naturally occurs when it comes to blast-furnace smelting for the recovery of bismuth is: Can the lead be cupelled from the bismuth as well as from the gold and silver? For reply I quote Hofman's Metallurgy of Lead, page 507, as follows:

"Bismuth is concentrated with silver in the lead until toward the end of the process, and then greatly retards the progress of the work. It is finally oxidized and enters the litharge giving this a greenish color, and is absorbed by the hearth material, while the silver also retains some bismuth with great tenacity. If this bismuth is to be recovered, the silver is concentrated only to a certain degree (say to 50 or 60 per cent.) in the lead which is then cupelled in a separate furnace . . . "

To satisfy himself my assistant at the Rey del Bismuto made some experiments in the assay furnace with small cupels; on the strength of this statement and test, and my experience with a large cupel furnace in Leadville, Colo., and recently at Lodi, Nev., where I had erected a 7- to 8-ton, daily capacity, cupel furnace of an improved design, it was decided to put in a cupel furnace to assist in the recovery of bismuth at Rey del Bismuto. As a precautionary measure

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*Consulting mining and metallurgical engineer, 311 Mills building, San Francisco, Cal.

I advised the construction of a dust chamber and small baghouse, suitable for such a small blast furnace and cupel furnace. It will require considerable cooling of the cupel-furnace fumes before they can enter the baghouse. But with careful feeding of the blast furnace, the fumes can pass into the baghouse as soon as they pass through an ordinary dust chamber, to catch the bulk of the dust carried over mechanically.

Distribution of Bismuth in Furnace Products

Again referring to the bismuth and its distribution in the blast-furnace product, I found that it does not go into the matte as much as the lead, but it does pass off in the flue dust in greater proportion. For example, the bullion shipped contained 8.3 parts lead to 1.7 parts bismuth, while the flue dust only carried five parts lead to one bismuth and the matte contained 18.3 parts lead to one part bismuth. The proportion of bismuth to lead in the slag is uncertain. The slag averaged about 1 per cent. lead, the chemist often not finding more than a trace by the fire essay. His results when I suggested the use of a silver button in the crucible as a collector, when making a fire assay for lead, were no higher. A wet determination for lead on a mixture of all the daily slag pulps, was started but not completed when I left, the acid supply having run short. I think the ratio is about one part bismuth to 10 parts lead in the slag, although the chemist claimed at the start, when we were using more lead on the charge, that it was impossible to determine the bismuth in the slag, even when taking 20 grams of the pulp and using the wet method for assay.

Bismuth Recovery

In conclusion I think it is safe to say that 80 per cent. of the bismuth contained in a 2 per cent. ore (assay made by all wet method), and all the bismuth found by the combination fire and wet assay, can be recovered by lead smelting in the blast furnace, by using not less than 10 per cent. lead in the charge, and in connection with a suitable dust chamber and baghouse. Less bismuth in the ore would call for a smaller per cent. of recovery. A higher per cent. of recovery of the bismuth will result when the ore contains more than 2 per cent. bismuth. The chemist told me that the combination method of making a bismuth assay (a fire assay by using excess lead as a collector and then dissolving the button for bismuth) averaged about 81 per cent. of the bismuth found, by using all wet method. I consider that the blast furnace, under favorable conditions, will do equally as well as the combination method assay for bismuth. The recovery of gold and silver as shown by the assays, was all the ore contained, in fact the gold showed a gain, and in Nevada where I cupelled the bullion and used the lead over again, the recovery of gold and silver was equally good. Little has been written on the metallurgy of bismuth. The acid process which I understand is being used in Australia for the recovery of bismuth is too expensive and not suitable for the ore of the Bismuth King mine.

Green Wood vs. Coke

I will relate another experience I had which might be of interest to readers of the Journal, that is, the use of wood already referred to. This wood was used to replace coke in the blast furnace, using 1½ lb. of wood to 1 lb. of coke. The advantage and economy in doing so is self-evident, when coke costs over $30 gold per ton and wood $1.25 per ton. Green wood weighs more than two tons to the cord. This had to be cut into short blocks and fed with the coke. I did not attempt to use anything but green wood, as there would be some danger of over fire, if dry wood had been used. I used wood 23 days out of the 25 days' run, with no apparent difference in the action of the furnace, either at the feed door or in the crucible. The average coke used for the entire run was 10.2 per cent. on ore and limestone, which would be less had we included the weight of new slag and matte resmelted.

The normal per cent. of coke for lead smelting, 15 to 16 per cent., was used for several days, but reduced the average to 10.2 per cent. by replacing nearly half of the coke with wood. This experience added to the experience I had at Ingot, Shasta county, Cal., when using small, green oak to save coke in a copper-matting furnace, during bad wagon roads or the wet season, leads me to believe that good green hardwood, aided with hot blast, would enable the metallurgist to get along without coke, where such wood can be obtained in sufficient quantities for a small smeltery for the production of copper matte. The success with wood at the Rey del Bismuto was in a great measure due to the way I had the feeders put in the charges, and the able assistance rendered by my assistant, W. W. Clayton, in seeing that the foremen and feeders carried out my instructions.

A New Use for the Low-pressure Turbine

The Mirrless Watson Company, of Glasgow, Scotland, has recently installed an exhaust-steam-turbine system at the works of Nobel's Explosives Company, at Stevenston, Scotland. The turbine takes steam at 1 lb. above atmosphere and exhausts to a condenser. Arrangements are made for the introduction of live steam to the turbine in case the exhaust supply becomes deficient.

Reciprocating engines will work at a comparatively high efficiency between the range of ordinary boiler pressures and atmospheric pressure, but they are inefficient in utilizing the available energy below atmospheric pressure. A steam turbine is, on the other hand, particularly suitable for utilizing efficiently the steam energy at the lower range of pressure, and its efficiency increases as the final pressure is decreased, or as the vacuum is increased. Thus, the more efficient combination is, no doubt, a reciprocating engine exhausting into a low-pressure turbine.

During the official tests of the condensing plant, the high-pressure steam connection to turbine was blanked off, the steam supplied to the engines was at the rate of 15,075 lb. per hour, and was exhausted to the turbine at a vacuum of 5 in., the turbine exhausting to condenser at a vacuum of 26.8 in. The engines developed 451 kw. and the turbine 326 kw., the auxiliaries consuming 38 kw., giving a net gain of 288 kw., or 63.85 per cent.

The Definition of Industrial Terms

At the recent annual meeting in Boston of the Division of Industrial Chemists and Chemical Engineers of the American Chemical Society, a committee was appointed by the chairman, under authority of the by-laws, "On the Definition of Industrial Terms." In constituting this committee, it is the desire of the division that it coöperate as far as possible with trade organizations in the several lines of industry in formulating definitions of their products which shall be as accurate and as fair as possible to the interests involved. The organization of such a committee was suggested by various interests who desire a more authoritative definition of some industrial terms such as "petroleum ether," "gasolene," "benzol," "bronze," "benzine," "steel," "portland cement," etc. It is proposed, when an interest is expressed for the definition of terms in any special field of industry to organize a sub-committee to consider this field and define the principal terms in use in it.

The general committee is desirous of receiving suggestions from all who are interested in the subject as to terms which are considered the most important to be defined at the present time, owing to ambiguities which may now exist, and as to the best methods of accomplishing the work. The value of authoritative definitions as approved by the industrial division of the American Society will, of course, be recognized. Communications should be addressed to Clifford Richardson, chairman of the committee, at 30 Church street, New York. The other members are J. B. F. Herreshoff and George P. Adamson.

The Zinc Deposits of Mohave County, Arizona

SPECIAL CORRESPONDENCE

The zinc region of Mohave county, Arizona, is about 6 miles wide by 12 miles long, in the Cerbat range, from 10 to 22 miles north of Kingman. The mines in which zinc is known to exist in paying quantities are the Golconda, Tub and Blackfoot in Union basin; the Idaho and Champion at Cerbat; the De La Fountaine, Star Spangled Banner, and C. O. D. on Stockton hill; the Keystone at Mineral Park; and the Pinkham, Midnight and Tennesee at Chloride. These properties were worked for gold, silver and lead, the zinc generally being considered as a detriment. There are many other properties that will show good zinc contents, if explored with that end in view.

F. C. Schrader, of the U. S. Geological Survey, describes the mineral bearing portion of the Cerbat range as follows: "The rocks are the pre-Cambrian complex, consisting of gray granite, gneissoid granite, and dark schists, including horneblende, mica, and garnet schists. They are flanked on the west in the Cerbat district by local areas of rhyolite and other Tertiary volcanic rocks. To the north, through Mineral park and toward Chloride, they are intruded by granite masses. They are locally cut by dikes of pegmatite, aplitic granite, diabase, vogesite, kerstantite, minette, and rhyolite. The deposits occur in well defined fissure veins, of which there are two sets, one striking about north 20 deg. west, and the other north 70 deg. west, usually with steep dips. Some of the deposits are also intimately associated with the vogesite, minette, and aplitic dikes."

EARLY SHIPMENTS

The first ore shipped for its zinc contents was over 10 years ago, when Byron Collins shipped a car of zinc ore from the Blackfoot mine to the smeltery at Cañon City, Colo. This was not a commercial success. In June, 1907, another shipment was made from Blackfoot to Cañon City, by a Canadian syndicate. This car ran about 48 per cent. zinc, and also contained gold and silver, and should have paid, as zinc commanded a high price, but owing to working conditions at the mine, did not do so. In 1907 a Blake-Morscher separator was placed in the Tennesee mill for working the large tailings dump accumulated when that mine was worked for its lead contents, and a magnetic separator was erected to treat the ore of the Idaho mine at Cerbat. Both were successful in separating the pyrite from the zinc, and made what would at present prices be good marketable material. They were just reaching the producing stage in December, 1907, when the slump in zinc prices forced them to discontinue.

GOLCONDA MINE

The Union Basin Mining Company, in March, 1908, secured control of the Golconda mine, which had been worked 20 years prior, for gold, silver and lead in the oxidized zone. Development has shown that this is the same ore as found below, with the zinc practically all leached out. The leaching process has stopped at approximately 70 ft., which may be taken as the water level, though no water in quantity is encountered until a depth of 300 ft. is reached. Below the water level, the ore assays about as follows: Zn, 47 per cent.; Fe, 7; Pb, 1; CaO, 0.40; SiO$_2$, 14; S, 28; Au, 0.20 oz.; and Ag, 6 ounces.

A tunnel in former times had been run in on the vein about 240 ft., exploring the oxidized zone. This reached a point where the vertical depth was over 70 ft., and a vein of zinc about 8 in. wide was showing along the bottom of the drift for 50 ft. A winze was started in this ore, and the first 40 ft. produced a car of ore that returned 50.9 per cent. zinc. Most of the ore shipped since then would have also yielded this percentage, if it had been as carefully handsorted.

This ore has been explored to a depth of 300 ft. below this tunnel level, and 700 ft. along the vein. There has been no break in the ore which has varied from 8 in. to as high as 5 ft. of zinc blende of the above analysis. The vein occasionally splits in two parts, with a talc filling between. For each ton of high-grade shipping ore mined about two tons of a low-grade ore are taken out, and piled up for the mill. This lower grade is due to the difficulty of saving the friable zinc blende while breaking down the harder rock, and consists of rich ore mixed with barren material. There are two parallel veins.

Since April, 1908, when the first car of ore was shipped, the Union Basin Mining Company has steadily pushed its development work and shipments, until now its monthly shipments to the Bartlesville Zinc Company are about 800 tons of 47 per cent zinc. The total shipments amount to 7500 tons. Twice this amount of concentrating ore, practically free from pyrites, has been piled up for milling. The levels already opened will yield about three times the amount already mined.

The success of the Union Basin Mining Company, when it is considered that the mine furnished the working capital and the funds to pay for its holdings, has been the most striking of any in this section. This is due mainly to the persistence of the orebody and the freedom of the zinc blende from pyrite.

THE FUTURE OF THE DISTRICT

The deepest development on the mine is 335 ft., and the zinc is practically the same as when work was started. There are no deep workings in the district to serve as a guide, and what further development will show can not now be told, but there are no indications of any change at the present depth. The total zinc production of the district so far has been by the Union Basin Mining Company.

That this small section in the Cerbat range has considerable zinc ore there is no question. In general the gold and silver contents of the blende are low, but some small veins run as high as 1 oz. gold and 30 oz. silver to the ton. The chief drawback to present working and shipping is the fact that in all deposits of any size so far as known, except that of the Union Basin Mining Company, the zinc blende is intimately intermixed with pyrite. With proper separating machinery, however, it is probable that this will be a blessing in disguse, as the pyrite carries in most cases much more gold and silver than does the blende.

It is generally understood that the large buying of prospects, and even in some cases of properties with some development on them, has been for the United States Smelting, Refining and Mining Company, or interests under their control.

Bismuth in Bolivia

Most of the world's supply of bismuth is drawn from Bolivia, where Aramayo, Francke & Co., Ltd., is the chief producer. In its report for 1909 this company stated that its Tasna mines continue to produce bismuth at a rate sufficient to supply the market and are in as good a condition as they have ever been. The same company has accumulated at its smeltery at Quechisla a lot of copper-bismuth matte, containing about 12 per cent. copper. Efforts have been made to devise an economical method for the treatment of this. In so far as the copper is concerned the result of a bessemerizing process has been unsuccessful, but on the other hand the company states that it has been successful in establishing a system to extract the bismuth and is now able to get that metal from this matte at a lower cost than the bismuth obtained directly from the produce of the mines. The sales of bismuth in 1909 showed a large increase over 1908.

The Prairie Oil and Gas Company on March 17 advanced the price of high-grade mid-continental oil from 35 to 38c. and fuel oil from 28 to 30c. The change is the first in the price of fuel oil since March, 1907.

Notes on the Metal Losses in Copper Slags

Physical Losses Due to Incomplete Settling and Gas Flotation of Matte.
Chemical Losses Arise from Oxidation and Solution of Metals and Sulphides

BY C. A. GRABILL*

I note a contribution[1] by Lewis T. Wright on metal losses in copper slags, and as data in that line are limited I will add some from portions of the field beyond that included in Mr. Wright's figures and representing work where the proportion of the noble metals was greater than ordinary.

Broadly speaking there are two general classes to which all such losses may be assigned, physical or mechanical losses and chemical losses. The first of these classes is due to three causes: Insufficient settling; insufficient difference between the specific gravities of matte and slag, and flotation of the matte by gases. These causes, or rather the conditions which are responsible for them, in modern reduction works are or ought to be abnormal. Of course there are times and places where, owing to physical or commercial reasons these factors may interfere with the metallurgist's peace.

Losses Due to Insufficient Settling

The regularity of the losses at widely separated plants and in different modes of smelting, and settling experiments on both large and small scale show that the losses from insufficient settling are small. Settling experiments on a small scale are, unfortunately, difficult to accomplish. If we could obtain some method whereby the assay office could make a regular return, not only of the valuable metals in the slag, but of that proportion due to faulty furnacing, and that due to the composition of the charge, furnace control would be much advanced. But settling experiments, such as can be carried out in laboratories with present equipment, are poor criteria by which to judge work. Who is to say what influence the container has; or the time factor; or temperature; or the gases in contact with the slag?

Specific Gravity

The second cause is frequently overrated. It may come into action in case of heavy barium slags or with very zinky mattes in the presence of high iron slags but these are not normal conditions. The determination of the specific gravities of the cold materials is not especially useful, as the expansion of slag with the temperature is much more rapid than that of matte and its change of volume on solidifying is also more marked.

Gas-Flotation Losses

The last cause is also unusual, but I think more common than it is given credit. My attention was drawn to it several times recently. A furnace had been banked for a considerable length of time, and on starting it showed a clear case of flotation of matte by gas. The first slag that appeared was thick, sluggish and chilled quickly although there was plenty of it and it seemed brighter or rather whiter than normal. Tests showed that while the regular temperature was from 1100 to 1200 deg. C. this slag was only from 1000 to 1050 deg. C. in spite of its appearance. On passing through the settlers much matte appeared in the slag pots as minute specks on the surface of the slag. Most of these were about the size of a pinhead. They were continually rising to the surface of the slag until it chilled. On cooling a small button of matte might be found in the pot, but the surface of the slag was covered with small flecks and underneath the top crust were a great many matte shot while others were distributed throughout the pot.

On tapping the settler matte appeared as usual but was followed by a mushlike material that chilled quickly in the taphole unless watched carefully. A potful of this material was allowed to settle and cool and on breaking showed a large button of porous matte, a porous slag full of bubbles and matte-shot, and a layer of matte-shot in, on and under the top crust. An additional settler and settling pot were of little help although ordinarily the pot alone was sufficient for a fairly clean separation. As soon as the slag reached its usual temperature, which was in a short time, it became clean.

Examination of Matte Shot

Analysis of the slag and matte showed no marked difference in composition from the regular run. The sulphur in the matte was 2.5 per cent. above that being produced regularly. Examination of the matte-shot showed that many were hollow, being a mere film; others were solid, spherical or pear shaped, and supported by a bubble of gas at the upper part. Those of the latter form on reaching the surface of the slag were released and sunk back, but the hollow ones broke and made a small patch on the surface, not having sufficient weight to break the surface tension of the slag and remained there until cool.

The slag ran about 46 per cent. SiO_2 and the phenomenon was probably due to the fact that during the banking of the furnace more or less magnetic or ferric oxide had been formed in the furnace with a considerable amount of cold matte and slag. On starting, hot slag and matte were added to this and the equilibrium was disturbed, resulting in the reduction of the oxides by the matte,

TABLE I. AVERAGE ASSAYS OF COPPER MATTES AND SLAGS.

	Description.	Oz. per Ton.		Per Cent. Cu.	Oz. per Ton Cu.	
		Au.	Ag.		Au.	Ag.
(1)	Slag, first part of month	0.0232	0.299	0.342	6.78	87.5
	Matte first part of month	8.47	60.3	27.8	30.4	216.7
(2)	Slag, second part of month	0.0256	0.602	0.373	6.86	161.5
	Matte, second part of month	10.8	125.9	24.8	43.5	507.0
(3)	Slag for month	0.024	0.397	0.352	6.82	112.6
	Matte for month	9.22	81.7	26.7	34.5	305.5
(4)	5 slags lowest in gold	0.01	....	0.36	2.78	.....
	Mattes corresponding	12.11	....	36.3	33.4	.....
(5)	5 slags highest in gold	0.04	....	0.36	11.1	.....
	Mattes corresponding	11.15	....	25.3	44.0	.....
(6)	8 slags lowest in silver	....	0.19	0.27	.....	70.3
	Mattes corresponding	....	53.0	24.9	.....	212.5
(7)	5 slags highest in silver	....	0.88	0.50	.....	176.0
	Mattes corresponding	....	218.85	44.8	.....	488.5
(8)	6 mattes highest in gold	18.85	....	48.1	39.2	.....
	Slags corresponding	0.0217	....	0.458	4.73	.....
(9)	7 mattes lowest in gold	6.09	....	18.1	33.6	.....
	Slags corresponding	0.0171	....	0.236	7.25	.....
(10)	Mattes, 70 to 100 oz. Ag for first part of month	....	86.2	42.1	.....	204.5
	Slags corresponding	....	0.290	0.440	.....	65.9
(11)	Mattes, 70 to 100 oz. Ag second part of month	....	81.9	15.3	.....	535.0
	Slags corresponding	....	0.543	0.321	.....	169.2
(12)	Black copper	....	95.1	95.3	.....	99.8
	Slag (excess fuel)	....	0.262	1.37	.....	19.1
(13)	Matte high in silver	....	392.0	39.5	.....	993.0
	Slag corresponding	....	1.76	0.318	.....	553.0
(14)	Matte same place as above	....	182.3	37.2	.....	490.
	Slag corresponding	....	1.05	0.322	.....	326.
(15)	Matte low in copper	4.01	....	6.95	57.6	.....
	Slag corresponding	0.0268	....	0.133	20.2	.....

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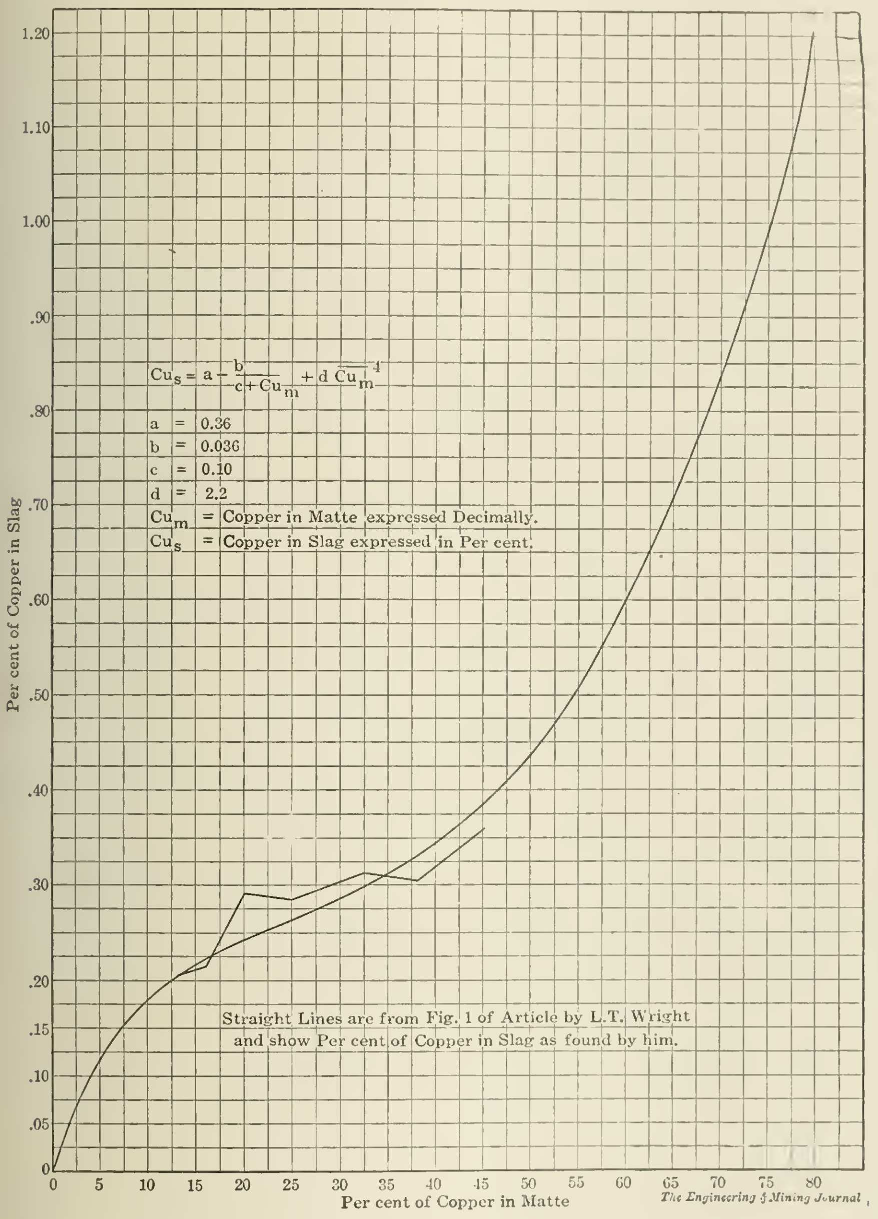
*[illegible] Montana street, El Paso, Texas.

[1] Bull. A. I. M. E., Sept., 1909.

as the temperature rose; but it still being low the time of reaction was unduly lengthened and was not completed until the slag had passed the settlers.



Curve Showing Losses of Copper in Slag

Another tenable explanation is that while the furnace was idle considerable matte with a low melting point, say 900 deg. C., had accumulated in the crucible of the furnace. Matte formed from pyrite would probably have, if this temperature had not been exceeded, about 36 per cent. sulphur; that is the decomposition of pyrite would at this temperature yield FeS. On starting the furnace, slag of higher temperature was formed, and mingling with the colder matte raised its temperature to a point where the FeS decomposed to Fe_2S_1, the escaping gas being sulphur. On cooling, the small amount of sulphur would be re-absorbed by the matte or slag with which it was in contact and leave no visible trace. The higher sulphur in the matte from the foul slag would seem to support this, but I am inclined to think the first explanation the more probable. I have noticed traces of this condition in almost all slags from low-grade matte. With settlers of large capacity and ordinary furnace conditions its effect is slight.

Chemical Losses

The second general class, chemical losses, is responsible for the usual condition of things at a well regulated plant and may be divided into: (1) Losses due to solution of the metals or their sulphides; (2) losses due to slagging as oxides, ferrites, silicates, etc. I have not included losses due to the solution of matte because, as Mr. Wright's factor shows, it does not ordinarily occur. I agree with him that solution of the sulphides, individually, does occur but I would extend it to include metals and oxides. Matte itself is a mutual solution of Cu_2S and FeS, the former increasing the solubility of the mixture for gold and silver (silver sulphide being soluble in both), and the latter adding the property of dissolving iron, copper, magnetic oxide, and more or less of other miscellaneous substances such as zinc sulphide, lead sulphide, etc. FeS is a good solvent for copper and will take up from one to two times its own weight.

I have seen mattes as low as 6 per cent. copper showing moss copper and containing 25 to 28 per cent. sulphur, indicating that even in them part of the copper was metallic. Doelter states, in an article which I regret I have only seen in review, that melted slags are highly dissociated, and this is confirmed by their sudden increase in electrical conductivity at or near their fusion point. It would be reasonable to suppose therefore that the dissolved substances are also more or less dissociated, and the solvent action would necessarily be for each component of the matte and not for the group. Looking at it in this way copper itself would seem to be a substance divided between two solvents: i. e., FeS and slag rather than the gold and silver being divided between the copper in the slag and that in the matte.

Constant Ratio of the Solute

It would not, however, mean that the law of a constant ratio of a substance divided between two solvents would apply. The law is, that if a substance be dissolved in two solvents, insoluble in each other, and in both of which the solute has the same molecular weight, then the amount of the solute present in unit volume of one solvent will always bear a constant ratio to that in unit volume of the second solvent irrespective of the amounts present, temperature being constant. Put in plain English this means that if applicable to the copper in matte and slag the per cent. of copper in the slag would always be a fixed per cent. of the per cent. of copper in the matte; that is, $S = aM$ where S is the assay of the slag, M that of the matte and a the constant giving the relation between the two. Unfortunately for convenience slags do not seem to follow this rule, but follow more nearly the equation $S = a - \frac{b}{C + M} + d\,M^4$ where a, b, c and d are constants suitably taken.

Fig. 1 shows this plotted over the diagram on which Wright plots his assays. It is by no means exact as small changes in the composition of a charge will sometimes make a great deal of difference in the assay of the slag as will be shown below. That it may represent certain facts is possible. For example: The quantity a may be the solubility of pure Cu_2S in the slag at the point of separation, the second factor representing the failure to attain that point owing to the presence of the matte, M in the denominator representing the decreasing effect of the matte as its copper contents increase; the last quantity may be the effect of the increasing amount of metallic copper, copper oxide and decreasing of the FeS in the matte.

If we could find a method of determining the osmotic pressure of the dissolved materials in the slag we might arrive at some method of computation that would be of real value but it would certainly require more variables. Metallic copper is soluble in glass under certain conditions and according to Dammer advantage is taken of this fact in the preparation of aventurin glass, the glass holding as much as 5 per cent. copper under certain conditions before copper crystals form. Gold and silver are supposed by some investigators to do the same.

Condition of Copper in the Slag

It seems rather improbable that copper oxide and sulphide can exist together in slag, particularly at the higher temperatures, in a more or less dissociated condition. Melted copper oxide slag, or overblown converter slag, is not a stable material when mixed with molten matter in large amounts and there is no particular reason for supposing it is stable in small quantities. It seems that copper in the slags from low-grade mattes occurs as sulphide and metallic copper and as metallic copper and oxide in slags from the richer mattes and black copper. It follows then that any condition in the furnace tending to produce metallic copper such as oxidized ore, low fuel and blow holes would render the slag foul or at least tend to do so. For example, one end of a furnace might be normal and produce a matte high in copper, while at the other, owing to a blow hole, oxides might be forming which would react with the first part of the matte from the remainder of the furnace and form metallic copper, which would be taken up by the balance of the matte but with a reduced solubility as it is already high in copper. Consequently the slag would tend to absorb more than the proportion corresponding to the grade of the matte.

Table I given herewith represents the work at a certain smeltery for one month, the samples being those of the day and night mattes and slags combined in averages for different conditions as noted. Also other samples from various places. The third group represents 60 samples each of matte and slag, the others vary from five up. While not so many as those quoted elsewhere they may be interesting from their individuality.

These slags and mattes were all produced by semi-pyritic smelting except No. 12 and perhaps Nos. 13 and 14, which approximated strict matting. Nos. 1 to 11 are different groupings of the samples of No. 3. The others are from other localities.

Solubility of Gold in Matte and Slag

The gold assays of the slags present one marked regularity and that is that the quantity seems to be constant irrespective of the amount in the matte, the copper in the matte or any other factor tabulated. This is borne out by plotting. Of the 60 assays only 10 vary from the mean, 0.024, more than to the nearest hundredth; of these five are high and five are low and both groups appear with mattes above the average in gold and the copper in the two sets of slags is identical. The copper in the accompanying mattes is 36 per cent. for the low golds and 25 per cent. for the high one, which would seem to indicate that the gold varied inversely with the copper in the matte, but No. 15 which represents a month's run at another plant has a matte of less than 7 per cent., and yet the slag is only 0.002 of an ounce higher than the general average at the first plant, No. 3 with 26 per cent. of copper.

It is true that the seven mattes lowest in gold accompany slags lower than the average but so do the six mattes highest in gold. Gold sulphide is readily decomposed by heat. It would seem therefore that at a temperature at which iron and copper sulphide begin to give up their sulphur, gold can exist only dissolved as metal. Metallic gold in excess seems to be responsible for the color of ruby glass, the solution at high temperatures being colorless and showing its characteristic color only on standing at the softening point, that is, at a point where the solubility is diminished. That being the case it would seem that the gold in the slag should vary directly with that in the mattes. It probably does but the effect is obscured in the samples under consideration by the fact that the copper in the matte increases with the gold and increases the selective solubility of the gold in the matte at the same rate.

Gold is insoluble in FeS and hence its solubility in matte is due to the copper present; therefore if we double the copper, other things being equal, we should double the solvency for gold as compared with slag, and halve the gold contents of the slag; but in the cases given here, if we double the copper in the matte we double the gold and also double the gold in the slag.

Solubility of Silver in Matte and Slag

The case of silver is more apparent. It is soluble in iron sulphide but more so in copper and particularly in Cu_2S. It probably dissovles as metal and sulphide, perhaps as chloride and possibly but improbably as oxide. It dissolves in glass as does gold. We should expect therefore that the copper in the matte would tend to increase the solubility of silver in matte and decrease the slag assays but that its effect would not be so marked and that the silver in the slag would approximate the amount required by the law of constant ratios. They do. Referring to No. 1 and No. 2 we see that the silver in the matte doubles and so does the silver in the slag, the copper in the matte remaining practically constant.

TABLE II. SHOWING INCREASED LOSSES IN GOLD AND SILVER BY CHANGING THE CHARGE.

	Gold, Oz.	Silver, Oz.	Copper, Per Cent.	Iron, Per Cent.	Insoluble, Per Cent.	CaO, Per Cent.
(1) Matte	6.8	36.6	20.4			
Slag	0.02	0.2	0.27	26.2	36.9	16.3
(2) Matte	10.3	62.7	42.9			
Slag	0.02	0.25	0.30	30.0	35.3	12.2
(3) Matte	7.7	40.9	21.1			
Slag	0.04	0.15	0.38	35.3	34.7	....
(4) Matte	7.65	39.3	16.6			
Slag	0.04	0.5	0.30	33.5	37.3	7.6
(5) Matte	8.0	42.0	17.5			
Slag	0.05	0.45	0.45	35.1	35.5	5.8
(6) Matte	7.2	38.9	12.9			
Slag	0.03	0.25	0.25	32.7	36.1	11.1

On the other hand, taking Nos. 10 and 11 we see that by raising the copper in the matte from 15 to 42 per cent. the silver in the slag is diminished from 0.54 to 0.29 oz. per ton, the silver in the matte remaining nearly constant. This holds for Nos. 13 and 14, monthly averages at another plant, and approximately even for the black copper in No. 12.

Of course, I am far from saying that other things have no effect and I give here Table II to show what a small change in the charge may do, although I have never had anything as marked in my own experience.

The furnace was running on a semi-pyritic charge yielding products of which Nos. 1 and 2 are shift samples. The charge was changed by substituting an oxidized iron ore carrying 7 per cent. of TiO_2 for one-half of the CaO, with the result of which Nos. 3, 4 and 5 are shift samples. It was changed back with the result indicated by No. 6. This was tried several times with the same result and stopped for obvious reasons. The change doubled the gold loss, increased the silver loss 50 per cent. and the copper about one-third. As to the cause, whether decreased lime or not, each can judge for himself.

If we could assume that gold dissolves s metal, silver as metal and sulphide, nd copper as metal and sulphide and s oxide in mattes of 70 per cent. and ver, it seems that in a rough way we nay state the amount so dissolved by he equations presented in the next olumn.

$$Cu_s = a - \frac{b}{c + Cu_m} + dCu_m^1$$

$$Ag_s = a \frac{Ag_m}{1\ Cu_m}$$

$$Au_s = a + b\,Au_m - c\,Cu_m$$

Cu_s, Ag_s and Au_s are the copper, silver and gold, respectively, in the slag and Cu_m, Ag_m and Au_m are the copper, silver and gold in the mattes. The letters a, b, c and d are suitable constants. They give fair results applied to furnaces yielding slags of similar composition, but of course do not express results due to variations in composition of charge.

Annual Report of Phelps, Dodge & Co.

The copper-sales department of Phelps, odge & Co. marketed, in 1909, 35,033,415 lb. of copper. Dividends nounting to $5,396,652 were paid, and e company carried forward a surplus f $446,559 at the close of the year. uring the year the Burro Mountain cop-er mines, in New Mexico, were acquired nd partially paid for. It is intended to old this property as a large ore reserve, nd about 2,000,000 tons of ore have ready been exposed.

PHELPS, DODGE & CO.

BALANCE SHEET, DEC. 31, 1909.

Assets.	
sh	$2,114,814
lls receivable	18,862
counts receivable	764,739
ocks owned:	
Copper Queen Consolidated Mining Company	26,989,605
Moctezuma Copper Company	8,000,000
Detroit Copper Mining Company of Arizona	6,000,000
Stag Cañon Fuel Company	4,000,000
Burro Mountain Copper Company	1,487,640
	$49,375,660
Liabilities.	
e to subsidiary companies and others	$3,939,496
pital stock, 449,896$\frac{5}{100}$ shares ssued	44,989,605
rplus	446,559
	$49,375,660

COPPER QUEEN

The production of the Copper Queen nes is given in an accompanying table. addition, small shipments of copper d lead-silver ores were made by sers.

PPER QUEEN MINES PRODUCTION, 1909.

	Tons.	Copper, Lb.	Silver, Oz.	Gold, Oz.
ned and ipped to re-ction w'k's	566,518	83,010,976	585,075	8,239
ned and ipped to her points.	28,833	1,249,807	7,777	405
ecipitates ade and ipped to ouglas	272	169,008	76	
otal	595,623	84,429,791	592,928	8,644

The following development was done: afts, 308 ft.; drifts, 45,363; raises and nzes, 14,649 ft. New ore-bearing terriies were discovered and partially deoped at several points, notably in the cle Sam country, on the lime contact h the western boundaries of the Sacramento hill porphyries and in the lower levels of the Lowell mine. No data as to working costs at any of the Phelps-Dodge properties are given, but it is stated that at the Copper Queen, extracting ore accounted for 38.76 per cent. of the total mining cost; development and repairs, 31.31; tramming, hoisting and loading, 14.75; taxes and miscellaneous, 11.14; freight, 4.04 per cent.

Mining is carried on by the square-set system. Superintendent Gerald Sherman says: "As we extract most of our ore from irregular masses embedded in great bodies of soft, decomposed material which is in constant motion, we cannot block out ore for purposes of measurement. But I can state that there is as much ore in sight today as at any period during the past 10 years while I have been manager of the property."

PRODUCTION OF COPPER QUEEN SMELTERY.

	Tons, Tre't'd.	Copper, Lb.	Silver, Oz.	Gold, Oz.
Copper Queen ores and precipitates	544,963	75,466,772	534,151	8,938
Copper Queen slags and cleanings (Bisbee)	7,669	402,633	87	.....
Moctezuma ores and concentrates	112,563	24,811,747	421,648	1,054
Custom ores	70,295	7,858,812	1,623,925	22,160
Total production	735,490	108,542,964	2,579,811	32,152

At the Copper Queen smeltery there was in operation an average of 7½ blast furnaces and 5.8 converter stands, the plant consisting at the present time of ten blast furnaces and eight stands of converters. The ores treated are enumerated in an accompanying table.

DETROIT OPERATIONS

The Detroit Copper Mining Company mined 449,977 tons of concentrating ores, 8898 tons of smelting ore, and 10,007 tons of silicious ores for converter linings. The concentrating department reports that 451,642 tons of Detroit ore assaying 3.106 per cent. copper, were concentrated, producing concentrates assaying 15.85 per cent. copper, and making an extraction of 78 per cent. The tailings assayed 0.8 per cent. copper; concentration ratio was 6.57 to 1; 332 gal. water were used per ton of ore milled; and 1293 tons were milled for each 24 hours' actual running time.

The smelting and converting department reports a saving of 94.5 per cent., and the output is given in an accompanying table.

ORES SMELTED, 1909, DETROIT MINING COMPANY.

	Tons Ore Treated.	Bullion Produced, Lb.	Assay of Original Ore. Per Cent. Copper.	Yield in Bullion per Ton Ore. Per Cent. Copper.
Concentrating ore	449,357	20,430,650	3 106	2 273
Smelting ore	8,753	2,547,000	15.39	14 55
Silicious ore to converters	7,650	770,560	5.316	5 03
Total Detroit ore treated at Morenci works	465,760	23,748,210	3.373	2.55
Silicious ore shipped to Douglas	2,340	243,385	5.77	5.2
Total Detroit ores treated at Morenci and Douglas	468,100	23,991,595	3.385	2.562
Purchased ores treated at Morenci	4,150	599,426	8.191	7.22
Total ores	472,250	24,591,021	3.427	2.605

MOCTEZUMA AND STAG CANYON

The Moctezuma Copper Company produced 517,927 tons of ore, of which 510,094 tons averaging 3.22 per cent. copper were concentrated. The average tonnage treated per day of running time was 1,475.93 tons; the average grade of concentrates, 11.80 per cent.; the ratio of concentration 4.61 to 1; the yield 2.56 per cent. and the average assay of tailings 0.584 per cent. During the year, Moctezuma's Pilares mine in the state of Sonoro, Mexico.

The Stag Cañon Fuel Company, at Dawson, N. M., mined 1,087,768 tons of coal and drove 44,086 ft. of entry in mines Nos. 1, 2, 4 and 5. A system of electric shot firing was introduced, which has given satisfaction and has reduced accidents to a minimum.

Charging and Cleaning Machine for Zinc Furnaces

Machines Electrically Operated. Time Required for Charging 120 Muffles, 20 Minutes; Cleaned in 30 Minutes. Wage Saving, 50 Per Cent.

BY O. SAEGER*

In the management of zinc reduction works the most important operations, the charging and cleaning out of the muffles or retorts, require a large staff of skilled workmen who have to perform their hard and unhealthful labor under relatively unfavorable conditions. The dust-raising charge in front of the furences has to be introduced into the narrow muffles or retorts by innumerable throwing movements in an unnatural position of the body. The withdrawal of the white-hot residues from the muffle necessitates the furnace crew approaching the furnace which has a temperature of about 1000 deg. C. The men cannot avoid inhaling the dusty and gaseous impurities of the air emanating from these residues, although the very best appliances are used for drawing off the gases. Hence, it is obvious that the conservation and replacement of skilled furnacemen is becoming more and more difficult and that wages have to be raised constantly.

UNHEALTHFUL OPERATION NOW PERFORMED MECHANICALLY

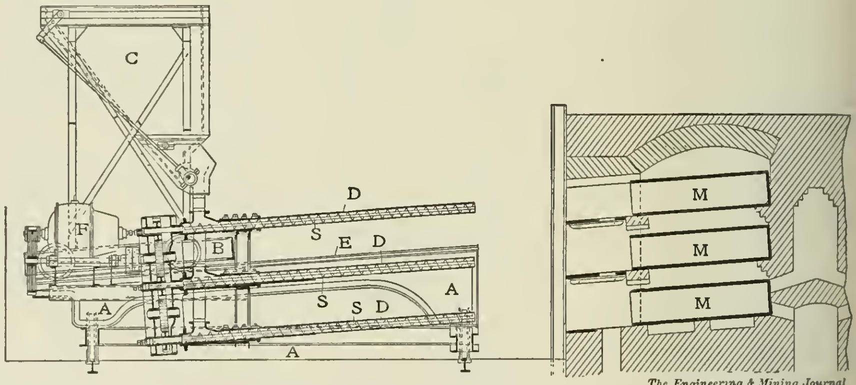
In other metallurgical processes similar economic and hygienic drawbacks have been overcome by the introduction of mechanical appliances. Serious difficulties have been met in trying to introduce devices for mechanically filling and cleaning the zinc furnaces. I tried to load and discharge upright muffles in the same manner in which upright coke retorts are manipulated. The experiments failed, for the same reason that all attempts to produce zinc in shaft furnaces have failed. Economically, the output of zinc had been much more favorable than in the shaft furnace experiments, but quite unsatisfactory in comparison with the yield of the regular zinc furnaces with slanting muffles which have been retained.

It became necessary to adapt the apparatus to the one- and more-story zinc furnaces already existing without materially disturbing their construction. The machines were required to fill rapidly the numerous narrow and hot muffles, difficult of access and individually holding little charge, without raising dust and without manual labor; and, after the completion of distillation to clean them rapidly in order to complete both operations in the least possible time.

THE CHARGING MACHINE.

The mechanical apparatus shown in Figs. 1 and 2 fills the above requirements.

The filling or charging machine has essentially the following parts: The lower truck *a*, the upper truck *b*, the charge hopper *c*, the gutters *d*. The lower truck *a* consists of a strong iron frame running along the furnaces and is provided with a platform for the motorman and the upper truck *b*. This upper truck can be moved forward and backward at right angles to the running direction of the lower truck on the rails *e*, which are fastened to the lower truck on an incline corresponding to the slanting position of the muffles *m*. The movement of the trucks is performed by cog-wheel gearing connected with the motor. The same motor also runs the screw conveyers *s* in the covered steel gutters *d*, by means of a cog wheel gearing. The mineral charge runs from the hopper *c* into the conveyers in such a manner that each conveyer receives, by a special regulator in the feed pipe, exactly the same quantity of charge. Fig. 1 shows the charging machine at rest in front of the furnace.



The Engineering & Mining Journal

FIG. 1. CHARGING MACHINE FOR ZINC FURNACES

OPERATION OF THE SAEGER CHARGING MACHINE

The motorman sets the lower truck in motion and brings it from the furnace just charged to the adjoining one. By a second pull of the lever he moves the upper truck forward and by a third one the conveyers *s* are thrown into gear as soon as the front ends of the feed gutters *d* enter the muffles *m*, when the charging of the muffles commences. The upper truck moves with the constantly charging gutters up to the rear of the muffles, filling them half full. As soon as the end of the muffle is reached the upper truck, by means of a reversible lever, runs backward automatically, and the conveyers *s*, which are kept in motion until they leave the muffles, fill the space left vacant while entering, more snugly and more completely than a furnace man could do it by hand.

The number of charging gutters to be kept in operation at the same time depends upon the kind of furnace, whether it be a one- or a more-story one. The machine is at present built with eight adjoining feed gutters in one plane, which can be raised or lowered in their entirety from one story to the next. Another machine has six gutters, in two vertical rows of three each. Figs. 1 and 2 show a longitudinal section of the latter design, which adapts itself to the more common three-story furnaces, with two muffles side by side. The results obtained with this machine have been so favorable that the difficult problem of charging zinc muffles mechanically may be considered successfully solved.

MACHINE FOR CLEANING MUFFLES

In order to make the success of the charging machine complete it was necessary to arrange also for a mechanical cleaning of the muffles. The charging machine alone would get through rapidly with its work, but it would operate with constant interruptions if the clearing away of the hot residues had to be done by hand. The cleaning machine is composed of the following main parts:

The lower truck *a*, the upper truck *b*, the clearing or scraping conveyers *s*, Fig. 2. The lower truck *a* consists like the charging machine of a stout iron frame movable alongside the furnaces and provided with a platform the motorman, and the guide rails *e* nforming to the slant of the muffles. the rails *e* the upper truck is moved ward and backward in the axis of the ffles *m* by the motor *f* precisely the ne as the upper truck of the charging chine. Upon the entry of the revolv- scrapers *s* in the muffles the motor- n reverses the motion of the scrapers il they come out of the muffles. Dur- the forward and backward move- nt the scrapers draw out the residues d drop them into the pit in front of muffle opening.

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*General manager of the zinc works of [illegible] von Giesche's heirs, Rosdzin, Upper [illegible] Prussia.

[illegible] Translated from *Metallurgie*, Jan. [illegible]

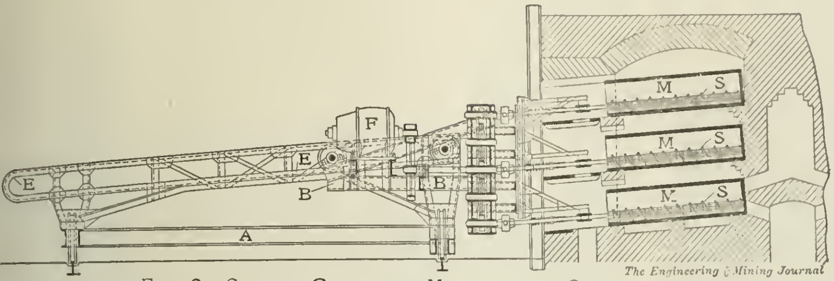


Fig. 2. Saeger Cleaning Machine in Operation

The scrapers, which have to made stout as possible, do not suffer ex- sively from the heat, because they cooled off considerably in the hot es at the furnace after their short spell of work. Notwithstanding, the forward end is made exchangeable and provided with a sprinkling device working automatically with the machine. The seats of the feeding gutters and of the scrapers are made slightly movable in order to allow for small variations in the position of the muffles.

Advantages Derived from Use of Mechanical Appliances

According to the results achieved during an uninterrupted campaign of several months at a zinc furnace containing 240 muffles, that is 120 muffles at each side, the 120 muffles were cleaned out by the cleaning machine in 30 minutes and filled by the charging machine in 20 minutes. Hence 15 seconds are required for cleaning and 10 seconds for charging one muffle

The additional work of zinc drawing, taking off and putting on the receivers, exchanging damaged muffles requires, of course, additional time and the keeping of a portion of the former furnace crew. The real furnace crew may, however, be reduced by one-half and the work which has hitherto taken from eight to nine hours can be performed in a five-hour shift, with the hardest part of the labor avoided.

The saving in wages may be estimated at 50 per cent., no extra expenses being chargeable as the consumption of power by the machines is very slight and the wear and tear not more than that of the furnace tools used when applying manual labor. The most essential advantages of the mechanical charging and cleaning of the zinc furnaces may be briefly stated to be the following:

(1) One-half the wages; (2) more healthful work; (3) shortening of the damaging cooling-off period of the furnaces in cleaning and charging; (4) prolongation of the time for distillation and improving the yield; (5) reduction of the social obligations on account of employment of fewer men; and (6) easier control of the work.

Tin Production in the Province of Yunnan, China

Practically all of the tin produced in ina is derived from the Kotieou mines, miles from the railroad in the province Yunnan. During the last 17 years recorded output, according to W. F. llins, in *Bull.* No. 63 of the Institution Mining and Metallurgy, has shown a ady increase, from 2.7 per cent. in 1 to 4.2 per cent. of the world's pro- ction in 1908.

The whole industry is in the hands of Chinese, and any interference by ropeans is strongly resented. Meth- are primitive in the extreme. Smelt- is carried out in furnaces that have n evolved under local conditions. chief difficulties met with are an sence of water for concentrating the , and the high price of charcoal for elting. It is anticipated that the com- tion of the railroad may have a stim- ting effect on the development of the ustry.

nly Alluvial Deposits Worked

The deposits now worked are all of uvial origin. They are found on the face or sunk in hollows in the lime- ne, probably of Middle or Lower assic age. There are about 150 mines ttered over an area 25 miles long by miles broad. The deeper deposits are ch richer and in this case the opencast method of mining has been abandoned for true underground work, or rather burrowing, for European and American methods have not been adopted. The tin stone is usually sand-grain size, and occurs with iron deposits. The ore usually contains a little magnetite and as much as 55 per cent. hematite. There is always a small percentage of lead in the ore. The amount of ore mined in any year is chiefly dependent upon the rainfall and the amount of capital available. Since almost all of the companies are small, the working expenses have to be paid directly by the output, which is sold as concentrate. Little mining is done until the rainy season, which usually lasts from May to September.

A short distance from the entrance of the mines, the atmosphere is so foul that the lamps will not burn, so that the digging, sacking and carrying the ore to the surface by the miners is performed in the dark. Wind-boxes are used in some mines to aid ventilation. There is no regular circulation of air.

Government Regulations

The mines were, until recent years, subject to a code of provincial mining regulations. These regulations have been abolished in favor of the temporary regulation of the Imperial Government. The mineral now belongs to the Government and neither prospecting nor mining may be done without permission, obtained through the local authorities, from Peking. The miners pay no direct taxes to the government. A small local tax is sometimes paid upon concentrates for the maintenance of roads. The bulk of the taxation is borne by the smelteries, aggregating about 12½ per cent. of metal value. This tax is supposed to go to the maintenance of the standing army. In addition to these taxes the metal pays a maritime export duty of 60c. per 133 lb. Practically all of the tin is exported to Hongkong where the greater part of it is refined by Chinese merchants for European consumption. The accompanying table shows the output for a number of years.

TIN PRODUCTION IN YUNNAN PROVINCE, CHINA.

Year.	Production, Long Tons.	Year.	Production, Long Tons.
1891	1,741	1900	2,898
1892	2,063	1901	3,026
1893	1,923	1902	3,788
1894	2,343	1903	2,443
1895	2,129	1904	2,979
1896	2,013	1905	1,463
1897	2,476	1906	3,948
1898	2,733	1907	3,480
1899	2,568	1908	4,558

Electrical Colliery Installation in Scotland

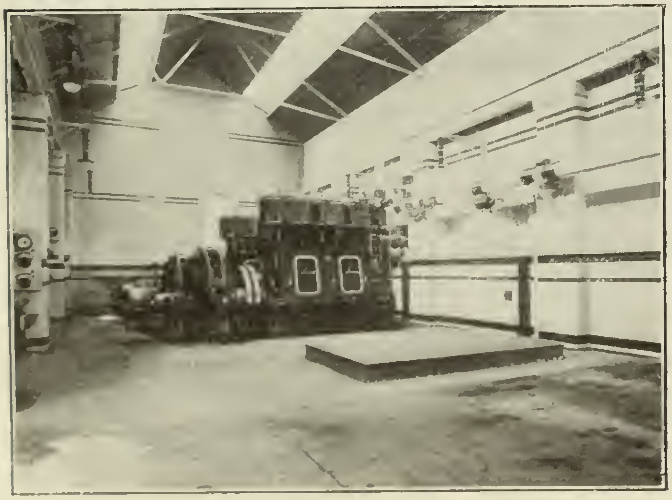
A Central Generating Plant with High-pressure Distribution Can Deliver Electrical Energy to Any Point for Less Than 3-5 c. per Unit

BY J. B. VAN BRUSSEL*

The following article refers to an interesting application of electricity to coal mines, and some months ago, the plant described was the object of a communication before the Mining Institute of Scotland, at the occasion of a general meeting.

Water-softening Plant at the Power Station

View of Power House and Evaporative Condenser



Generating Plant in the Power House

Water-tube Boilers for the Electrical Plant

The installation is in operation at the collieries of one of the most important coal companies of Fifeshire, in Scotland. The pits of this company, to the number of ten, are distributed over an area of about 16 square miles, and produce over 1,250,000 tons of coal per annum.

In 1907, the company, which had disposed already of a number of isolated plants, supplying electricity for lighting purposes, decided to go in for a central generating plant with high-pressure distribution to suitable points. It was decided to deal in the first instance with the workshops and five of the pits, these being, the Nellie, Mary, Newton, Jenny Grey and Melgund, but to design the layout with a view to the ultimate inclusion of the whole field in the scheme. Recently the company has acquired a further mine, the "Donald colliery," and this has been included in the area of the new supply.

The situation selected for the power house by the consulting engineers for the work, Sayers & Caldwell, of Glasgow, was the Nellie pit, and this generating station now includes two 450 kw. sets and a 1.000-kw. exhaust, or mixed pressure turbo-generator; space is provided for the addition of a third 450-kw. unit.

There are four Babcock & Wilson boilers, set in two batteries. They are constructed for a maximum working pressure of 200 lb. Each boiler is fitted with a chain-grate stoker and internal superheater to give 100 deg F. superheat; the expected maximum evaporation with wet dross and gum is about 10.000 lb. per boiler. For boiler-feed purposes, three single direct-acting steam-driven pumps are installed.

At the present time two Belliss & Mor-

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*Brussels, Belgium

View Showing Steam Piping and Boilers

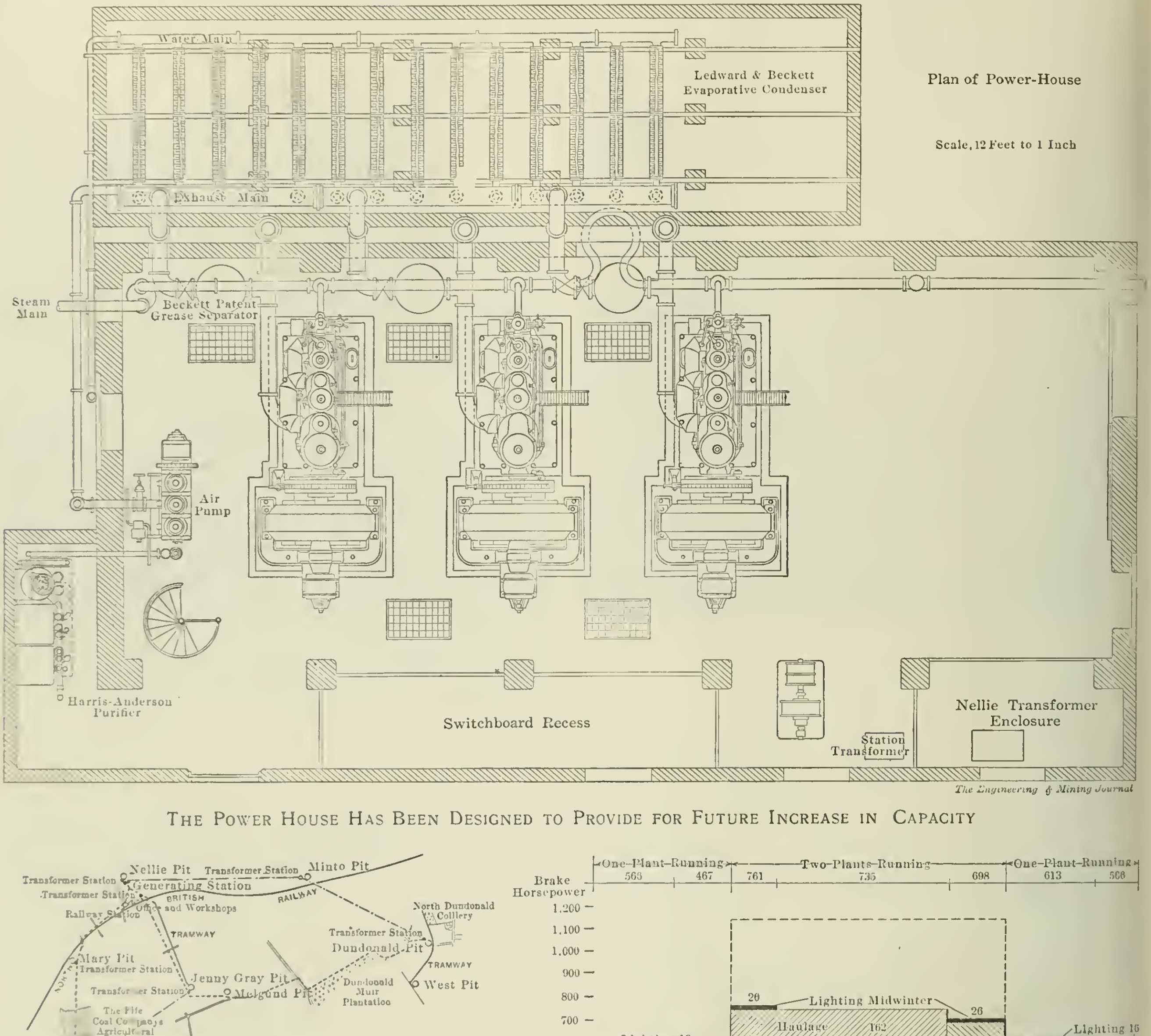
One of the Transformer Stations

Showing Part of Pump House

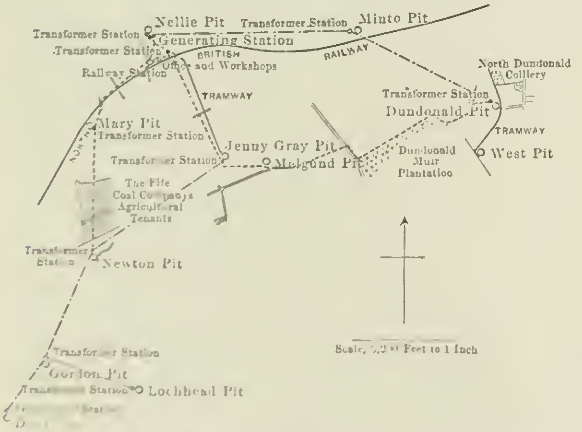
View of Overhead Line

com three-crank triple-expansion engines, direct-coupled to Bruce-Peebles three-phase alternators, are provided in the power house. The alternators are 50-period machines, generating at 3300 volts and giving 420 kw. on an 0.8-power factor, and at 375 r.p.m.; they are provided with exciters mounted on the main shafts. These sets will carry 25 per cent. over load for periods of two hours at six-hour intervals, either exhausting into the condenser with a 26-in. vacuum or to atmosphere.

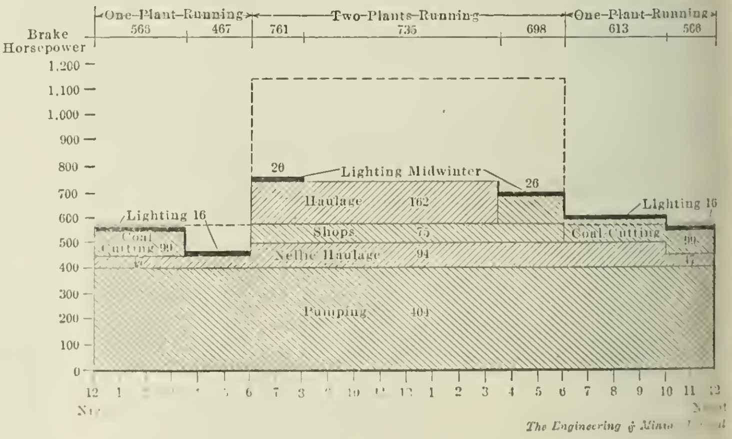
The engines are supplied with steam at 160 to 180-lb. pressure and 470 to 500 deg. F.; both sets on test gave a steam consumption of about 18.3 lb. per kw.-hour with a load of 422 kw., steam pressure 159 lb. and a vacuum of 25 inches.



THE POWER HOUSE HAS BEEN DESIGNED TO PROVIDE FOR FUTURE INCREASE IN CAPACITY



PLAN SHOWING POSITIONS OF THE COLLIERIES SERVED BY THE GENERATING STATION



INDICATING INCIDENCE OF LOAD OVER 24 HOURS FOR ESTIMATED IMMEDIATE REQUIREMENTS OF PITS AND WORKSHOPS

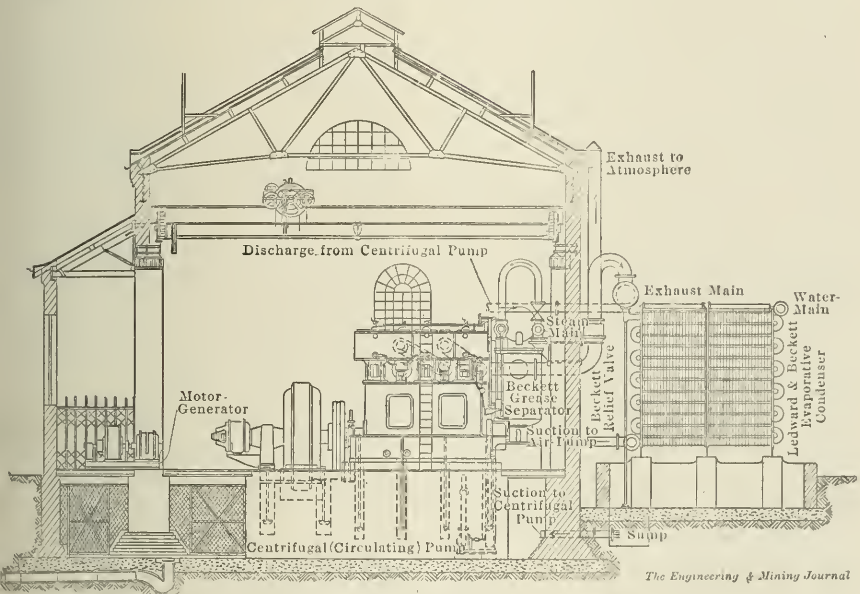
EVAPORATIVE CONDENSER

The engines exhaust through atmospheric valves and Beckett oil separators into an 18-in. cast-iron collecting main, feeding a Ledward & Beckett evaporative condenser outside the engine house; the condenser consists of 336 corrugated pipes in 14 coils of 24 pipes each. A film of water is maintained over these pipes by a 3-h.p. motor-driven centrifugal pump, this requiring the circulation of 10,000 gal. of water per hour, of which 800 gal. is evaporated and made up afresh. The adoption of surface condensers would have involved four times as much circulating water, and, in addition, elaborate cooling arrangements.

As regards the power-house switchgear, the high-tension portion consists of four generator panels and six feeder panels; only two of the former and four of the latter being at present fully equipped. The feeder panels in use supply the transformer for the Nellie pit; the transformer for the power-house motors; the overhead line supplying the Mary and Newton pits, the workshops, Jenny Grey pits, and the Dundonald colliery

There are, in addition, two panels dealing with low-tension three-phase current from the power-house transformer. One of these controls a 50-k.w. motor-generator supplying continuous current at 200 volts for the lighting of the power house, Nellie pit-head, and the offices and shops; and the other the air pump, condenser, and centrifugal pump motors. There is also a continuous-current panel controlling the 200-volt lighting supply from the motor-generator already mentioned.

Fixed to the sides of the brick piers, within which the main panels are accommodated, are the synchronizing bus-bar voltmeter and earth-detecting panels. Each generator panel contains a three-pole oil switch with automatic reverse power trip gear, indicating wattmeter, ammeter, etc., and the exciter pillar is arranged in front. The feeder panels each carry a similar oil switch with overload and out-of-balance trips, indicating wattmeter, ammeter, and integrating wattmeter. The low-tension three-phase panels are also fitted with similar oil switches; there are no fuses on any of the three-phase panels. A 10-ton traveler runs the whole length of the power-house.


Exhaust to Atmosphere
Discharge from Centrifugal Pump
Exhaust Main
Water-Main
Steam Main
Beckett Grease Separator
Beckett Relief Valve
Ledward & Beckett Evaporative Condenser
Motor-Generator
Suction to Air Pump
Suction to Centrifugal Pump
Sump
Centrifugal (Circulating) Pump
The Engineering & Mining Journal

Scale, 8 Feet to 1 Inch

Cross-Section of Power House Showing Machinery in Position

High-Tension Distributing System

The high-tension distributing system consists of overhead lines from the power station to the Mary and Newton pits to the southeast, and sundry lengths of lead-covered and armored paper cables under the North British Railway track, and from the power-house to the adjacent terminal pole. The general plan gives an idea of the extent of this portion of the work, the heavy dotted line indicating the two lines now in operation of the work, the dotted line from the Jenny Grey pit to the Dundonald colliery, the extension not yet at work, and the chain-dotted lines further extensions, which may or may not be realized. The point, however, of the interconnected network, completed, as shown by these chain-dotted lines, is that in conjunction with the special arrangement of isolating switches in the several transformer stations, any section of line, excepting that from the Newton pit to the south, could be made dead (for repairs or other purposes) without interfering with the supply. The earthing guards have been arranged for operation with the supply from either direction, in view of this linking up.

All cables and apparatus in connection with the overhead lines are protected from the effects of lightning, and excessive pressures from other causes, by spark gaps; and public roads and positions in the vicinity of the pits are guarded by adequate cradling

Transformer Stations

The transformer stations are each designed to contain two 200-k.w. transformers, and the necessary switchboard, but contain only half their equipment at present. The transformers are oil-cooled and wound to transform from 3000, 3150 and 3300 volts to 525 volts, these ratios being arranged to compensate for the varying line losses at different points.

The transformer full-load efficiency is about 97 per cent. The switch-gear in the transformer houses is of Ferranti type, comprising a high and low-tension panel for each transformer, with auto-oil switches, instruments, energy meter, etc.; the gear is designed to automatically cut out a faulty transformer, and on the high-tension side space has been left for a high-tension feeder panel in case it is desired to carry high tension supply down the shafts. On the low-tension side, three 200-kw. circuits are provided.

The shaft and in-bye cables are three-core bitumen insulated and filled, and double armored with galvanized steel wires; they are supported in the shafts at intervals of 40 to 50 ft. by cleats of special design, and suspended in-bye by hempen slings. Electrical continuity of the armoring throughout each network is effected by substantial armor clamping rings, and the whole is efficiently connected to the best earth obtainable on the several systems.

The latter are of substantial construction, and are designed for underground conditions. Arrangements are also provided on each board by means of auto transformers for the supply of current to 50 lamps. One of our views shows one of these boards in position.

The sub-circuit fuseboards are of heavy mining type, with porcelain barrel fuses, and have all connections on the front of the slate panels; they are inclosed in cast-iron cases with armor anchor rings, and the lids of braced iron plate are hinged and secured by wing-nuts.

Motors

The motors have been supplied for haulage, pump, and fan drives, and include both the slip-ring and squirrel-cage types, with control panels and starting switchgear suitable to the particular requirements of each drive.

As to the outlay, it may be taken that the generating costs, based on the load diagram produced, plus the capital charges; namely, interest on capital, and sinking fund to redeem the capital in 20 years, will enable the company by the equipment described to deliver electrical energy at any point in the coalfield for something less than 3/5c. per unit, and that with an increased load the cost per unit will be even cheaper.

Underground Mine Stables

Underground mine stables should be designed to have sufficient ventilation without drafts; the stalls should be dry and warm, each so partitioned that the horse in it is quite separated from its neighbors, yet still able to see them from a distance, so that biting each other is precluded; horses thrive best when in company. The regulator providing air from the intake should be open to form such area as to allow each horse 250 cu. ft. of air a minute, when the stables are close to the shaft; considerably more air should be provided if the stables are placed at a point distant from the shaft.

Value of Alaska Coal is Overrated

After a careful investigation of the coal lands in Alaska, William Griffith, an experienced mining engineer of Scranton, Penn., says that the extravagant stories concerning the value of Alaska coal lands are much exaggerated.

Mr. Griffith declares that the bulk of Alaskan fuel is of an ordinary quality. He favors a sliding scale of royalties, according to the grade of the coal, and says: "Conservation without utilization is a wrong idea and a drag to progress." His estimate of the quantity of coal in Alaskan fields is given as 300,000,000 tons. As to what may be expected in the way of a yearly output, it is stated that 2,000,000 tons annually is a liberal estimate.

One other point of importance brought out by Mr. Griffith in his report, shows that in many parts of Alaska, timber is being rapidly exhausted for fuel because the coal cannot be developed. As to the value of the Alaska coalfields, assuming 2,000,000 tons as a liberal average annual output, Mr. Griffith states that at the high royalty of 50c. per ton there would be an annual value of about $1,000,000, which might continue for 100 years. At 4 per cent. the present worth of such an annuity is approximately $25,000,000, without considering the deductions usually made to cover the ordinary uncertainties of mining.

It is further stated that the building of railroads in Alaska means the introduction of labor-saving machinery, cheaper food and materials, more and cheaper labor, and a general amelioration of the stern conditions which now prevail. The introduction of such improvements will immediately be followed by an outflow of wealth far beyond our expectations, which will be wrought out from the abundance of low-grade ores or placers, and from the tailings or refuse from the rich diggings of the past years, which cannot now be profitably worked and are necessarily wasted. Mr. Griffith says that the prime necessity of Alaska, with respect to railroad construction, is the opportunity to utilize some of its dormant coal reserve.

All Alaska coal lands have been withdrawn from entry. The present plan of conservation, according to Mr. Griffith, is a wrong policy. In this connection he says: "Let our Congress enact new laws for the control of this question with full knowledge of the situation. If it is proposed to control the coal industry of Alaska through some sort of leasehold arrangement, let us provide a high per ton royalty for the relatively small quantity of high-grade coal we possess, and a lower rate for the medium- and low-grade coals; thus arranging the royalties on a sliding scale in some manner proportionate to the percentage of fixed carbon contained in the coal; or some similar plan which will force the conservation of the very important high-grade navy fuels for the higher uses of the district and the nation, to which they are adapted, thus in a measure compelling the mining of the lower-grade coals for the more ordinary local purposes necessary to the development of Alaska."

Inflammability of Shale Dust

British Correspondence

At a general meeting of the Mining Institute of Scotland, in Edinburgh, Dec. 11, a paper was read by Robert W. Dron descriptive of the "Index-Beds in the Carboniferous Limestone Series of Scotland." This was followed by a paper on "Shale Dust and Coal Dust Tests at Broxburn," prepared jointly by William Clark, manager of the Broxburn mines, and Robert McLaren, H. M. inspector of mines. The authors explained that the term shale as used by them meant oil shale as distinguished from ordinary shale. They recalled that within recent years it has been thought by some that watering the dust in coal mines is not only an ineffective means of preventing an explosion, but that in many instances it destroys the roadways where the strata are of a soft material. In order that some other method having for its object the extinction of the flame from coal dust might, if possible, be adopted, they carried out a series of experiments. They were anxious to find out by experiment the inflammability or noninflammability of shale and shale-mine dusts in the presence of a firedamp explosion, and they demonstrated that:

(1) Shale-mine dust, even if it exists in large enough quantities, will not constitute a danger in mines, as it is not inflammable in the presence of a firedamp explosion, but will have rather the effect of retarding the flame.

(2) That it is possible to neutralize or destroy the power of coal dust to propagate an explosion by mixing with it equal proportions of a noninflammable dust, such as that got from spent shale or fireclay. Spent shale is preferable, being a waste product, and of a friable nature, which renders it easy to reduce to dust. It is also of low specific gravity, and is thus more freely mixable with coal dust.

A new weekly paper with an assured circulation of 30,000 has made its appearance at Essen, Germany. It is called the *Kruppsche Mitteilungen* and is distributed gratis among the employees of the great steel firm. It is printed on the company's own press and is mainly designed to be a substitute for the notices which used to be posted periodically at various points in the Krupp workshops.

COLLIERY·NOTES

As the result of a new ruling by the State mine inspector, all persons holding the position of mine foreman or fireboss in the mines of West Virginia, hereafter, must hold a certificate from the department of mines.

As a guide to safety where shots in mines are fired through the medium of a fuse, it may be stated that an ordinary fuse burns at the approximate speed of 1 ft. in 30 sec.; however, some margin of time should be allowed for variation from atmospheric or other causes.

The misnomer "safety" as applied to permitted explosives seems to have caused some users to imagine that these explosives are safe under all conditions. It cannot be too strongly impressed on the users of these "permitted" explosives that all that can be really claimed for them is that they are less dangerous than gunpowder, so far as the ignition of firedamp and coal dust is concerned. These explosives are absolutely dangerous unless used with certain definite precautions.

One authority on the subject of peat mining says: "It seems to me that many peat deposits are so located in near proximity to towns that it would be possible and practicable to erect an electric plant at the bog, using the peat as a fuel and converting it into electric current, which would be transmitted to the nearby towns. The peat could be used directly as a fuel, or in the production of gas in a gas producer." In North Carolina, a number of towns are situated close to deposits of good peat, and it is possible that such a plant could be made a profitable investment. There are towns in other States similarly situated that offer the same commercial advantages.

The damage caused to a shot-firing wire by thoughtless treatment on the part of a shot-firer in paying out or in taking up a cable, is certain to result in breaks, which are all the more troublesome because they may occur without apparent injury to the insulation and can then only be found by testing or carefully feeling along the line. One authority says that to pay out a cable properly, the end should be made fast to the fuse wires, the coil gripped by one hand and rotated clockwise (as though it were a wheel on a spindle) as far forward as the hand will take it. At the end of the forward movement the coil is seized at the point nearest the body by the other hand, which continues the motion, each hand alternately taking the other's position. As the cable falls to the ground, the operator should walk away from it backward, if he can conveniently do so and leave the line lying straight out before him.

PERSONAL

Mining and metallurgical engineers are in-
ited to keep THE ENGINEERING AND MINING
OURNAL informed of their movements and
ppointments.

J. E. Spurr is at Tonopah, Nevada.

Pope Yeatman has returned to New
ork from Chile.

J. Parke Channing was at Cananea,
exico, recently.

Franklin Leonard, Jr., of New York,
as recently in Virginia City, Nevada.

Edmund Shaw, of El Paso, Texas, is
Mexico, rebuilding a cyanide plant.

Harry E. Kirk has returned to
ananea, Mexico, from a trip to the West
ndies.

Robert H. Richards has just returned
Boston from a professional trip to
ew York.

Leon Dominian has left Mexico and
xpects to be in New York about the
iddle of April.

F. P. Morrell, of Cleveland, O., has
een at Parral and in the Inde district
Mexico, examining mines.

Victor Rakowsky is spending a few
ays at French Lick Springs, Ind., and
ill leave for the Southwest shortly.

Jesse Scobey has been making an ex-
mination of the San Pedro Analco mine
the Santiago river, Jalisco, Mexico.

James D. Bryden has been appointed
ine superintendent for the Cedar Hill
oal Company at Cedarhurst, Colorado.

Thomas H. Leggett, who has been in
olorado on professional business, is ex-
ected to return to New York this week.

Charles F. Shelby has changed his
dress from Cananea, Mexico, to "care
Cerro de Pasco Mining Company, La
undicion, Peru."

C. W. Fuller, recently in Nevada, has
cepted a position with the San Toy
ining Company at Santa Eulalia,
hihuahua, Mexico.

H. C. Wilmot has accepted the man-
ership of the Commercial Mining Com-
ny at Rye Valley, Oregon. His Salt
ke office will be closed while he is so
gaged.

Sir Alfred Keogh has been appointed
ctor of the Imperial College of
ience and Technology, London, Eng-
nd, to succeed Dr. Henry T. Bovey,
signed.

E. A. Montgomery, president of the
erra Madre Club of Los Angeles, Cal.,
s been in Washington for several
eeks in the interest of the Mining
reau bill now before Congress.

Edward Flynn, recently appointed in-
ector of mines for the Tennessee Coal,
on and Railroad Company, is spend-
g some time studying conditions in the
al mines of the Pittsburg district.

Dr. Edward D. Peters has been designated by the Board of Overseers of Harvard University as "Gordon McKay professor of metallurgy," in honor of the donor of the great endowment fund.

Donald F. Irvin has joined the engineering staff of the Vulture Mines Company, Vulture, Arizona. He is a graduate of the University of California and has had several years of practical experience.

Henry S. Reed, Jr., has resigned his position with La Gloria mines in Chihuahua, Mexico, to accept the appointment of engineer at the Tres Hermanos mines, Batopilas, Chihuahua, Mexico.

Harry S. Matthews, of Birmingham, who was recently elected vice-president of the Alabama Consolidated Coal and Iron Company, has assumed charge of affairs in Alabama for the company. In company with C. P. Ludwig, chief engineer, a complete tour of the properties of the company will be made. Guy R. Johnson, heretofore vice-president and general manager, will remain with the company in charge of the physical operations.

The old banking house of W. S. McCornick & Co., of Salt Lake City, Utah, which has been connected with many important mining transactions since 1873, when it first began business, was incorporated as a joint-stock bank on April 1. The incorporators include C. M. MacNeil, president, and D. C. Jackling, general manager of the Utah Copper Company; Spencer Penrose of the same company, Charles Hayden, of New York. W. S. McCornick will be president and D. C. Jackling vice-president of the bank.

W. A. Green, heretofore auditor and treasurer of the Southern district of the Republic Iron and Steel Company, has been appointed by President T. W. Guthrie manager of the Southern district, with headquarters in Birmingham, Ala. Mr. Green will have full charge of the work of the company in the Southern district and the local officials will be responsible directly to him for the operations of their respective departments. Mr. Green has announced the following appointments: J. E. Johnson, Jr., general superintendent Thomas division; W. I. Kluttz, assistant general superintendent Thomas division; J. W. Penhallgon, general superintendent ore mines and quarries; F. G. Morris, general superintendent coal mines; R. L. Cross, purchasing agent; W. H. Johnson, traffic manager.

OBITUARY

Harold E. Sherman died in New York, April 3, aged 53 years. He was born in New York, but went to Nova Scotia when a young man and was connected with the coal-mining industry there for a number of years.

Col. Dudley Evans, who died in New York, March 27, aged 72 years, was best known as president of Wells, Fargo & Co. He had also been for a number of years treasurer of the Batopilas Mining Company, of Mexico.

Dr. Franklin R. Carpenter died suddenly April 1, in Chicago, where he was temporarily on business. He was widely known as an expert on many smelting questions. Dr. Carpenter was born at Parkersburg, W. Va., in 1848, and graduated from the University of Ohio, at Athens. Immediately after graduating he went to Colorado, where he at first engaged in teaching. He soon made a reputation for himself and was twice elected State superintendent of education, but never held the position on account of political complications. This experience ended his political career and he turned his attention to mining. In 1886 he went to the Black hills in South Dakota, and commenced to investigate the mining and smelting operations then in use there. Soon after he was appointed director and professor in the State School of Mines at Rapid City, where he remained for several years, at the same time continuing his work in smelting. Finally he gave up his connection with the school and went to Deadwood, where he built and operated the Deadwood & Delaware Smelting Works, the first pyritic smelting plant in the country run on a commercial scale. About 1900 he returned to Colorado, making his home in Denver. He designed and built the Clear Creek Mining and Reduction Works at Golden, which were generally known as the Carpenter works. By this time he had acquired a high reputation as an expert and was consulting engineer for a number of companies in Colorado and South Dakota, while his advice was frequently asked on smelting questions. He wrote several books and was a frequent contributor to the technical press and to the *Transactions* of the American Institute of Mining Engineers. He leaves a widow and five children. Aside from his mining work, Dr. Carpenter was a student of genealogy, and it is said that few men were better posted on family history.

SOCIETIES *and* TECHNICAL SCHOOLS

Scranton Mining Institute—The season work was closed by the annual dinner, held in Scranton, Penn., April 2. It was attended by many prominent mining men and was a successful occasion.

North Dakota School of Mines—This institution is installing a briquetting plant for lignite, with a capacity of two tons per hour and a complete gas plant of the latest type with automatic recording apparatus for temperatures, pressures, etc., together with a complete laboratory for coal and gas analysis and testing.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

April 2—The conditions affecting the supply of water for mining during the summer have happily changed within the past few weeks. The snow supply in the mountains had been fast melting, owing to warm weather, but recent storms added several feet to the snow storage in the Sierras and this is not likely to be melted by rains so late in the season. The miners therefor think they are sure of a good water supply this coming season.

The mines and smelting plant of the Afterthought Copper Company at Ingot, east of Redding, Shasta county, are not advantageously situated as to railroad facilities. When the mine and plant were worked they had to haul everything by team from the terminus of the Terry railroad over very bad roads, and in winter these roads were impassable. It was decided to quit work until a piece of railroad could be built to connect with a main line. Necessary financing has been done and this branch road will be built and soon work will be resumed at these mines.

Ore reserves of the First National Copper Company in Shasta county, Jan. 1, are announced as 1,134,140 tons of developed ore and 791,630 tons of probable ore. During January, 981,278 lb. of copper were produced and net profits amounted to approximately $30,000. The company produced in 1909, 11,569,314 lb. of copper, and is figured to the earning at the present time 60c. per share net.

Bakersfield capitalists are arranging to purchase 20 mining claims in the White river district, Tulare county, near the Josephine mine. The ore in that section is in large bodies, but is of low grade. Large mills will be required. A 20-stamp mill will be first used during development work. The 10-stamp mill of the Josephine mine will shortly be started up. Not much development of note has ever been done in the White river district.

Goldfield

April 1—A public letter signed by H. C. Brougher, a director, and one of the heaviest individual stockholders of the Tonopah-Belmont Development Company, charges the directors of that corporation with mismanagement of the company's mine and mill, and the stockholders are asked to send proxies that a new board may be elected at the annual meeting of the stockholders to be held at Camden, N. J., May 3. It appears that several of the directors are serving the Tonopah & Goldfield railroad in like capacity, and it is charged that the best interests of the mining company have been sacrificed for the benefit of the railroad. Three years ago a 60-stamp mill was erected at Millers, 13 miles from Tonopah, on the Tonopah & Goldfield Railroad, and a high transportation charge placed on Tonopah ores.

Denver

April 3—The Cripple Creek output for March, as reported by the smelteries, valley and local mills, is given at 59,000 tons having a gross value of $1,358,400, the average value being $23 per ton. Two dividends were paid: the Doctor-Jack Pot, $15,000; March 1; and the El Paso, $24,000, April 1. The camp generally is in a most prosperous condition, and all the companies and claim owners are getting busy in anticipation of the boom that is expected on the completion of the deep drainage tunnel in seven to nine months from now. That there are good grounds for this expectation no one will dispute, as evidenced by the numerous strikes of rich ore that have been made in the deepest levels of so many of the big mines during the last year or two.

The Newhouse tunnel company has taken over the Gunnell mine, which as far back as 1880 ranked third among Gilpin county mines, with an estimated yield of $2,500,000 up to that date. It was discovered by H. Gunnell in 1859, and like most of the mines in that camp the surface oxidized ores were enormously rich, and after the owners had taken about half a million dollars of gold from it, it was sold in 1864 to a New York company, the Central Gold Mining Company, which paid $80,000 for 200 ft. on the vein. The Gunnell Gold Company, Gen. Fitz John Porter, agent, paid $300,000 for 480 ft. In 1877 gold bullion worth $15,000 to $16,000 was shipped to Denver every month. The mine has been closed for many years. The vein held good in width as depth was gained, and it is known that there is plenty of good ore in the deepest workings, and it will now probably be unwatered and worked from the Newhouse tunnel at great depth. The breast of the Newhouse tunnel, however, has not been advanced since last October.

At Leadville the snow is going off with great rapidity, and as the spring is unusually early, prospectors are already starting for the hills, particularly into what is now called the gold belt, from South Evans to the other side of the Mosquito range, Here, too, the St. Louis, Ollie Reed, Gold Basin, Little Ella, Blanche, Cleveland and Valley are regularly sending out their production of gold-bearing ore, and that, together with the strike of silver-lead-gold ore made by George Campion, leasing on the Blanche, has encouraged prospectors and workers in that part of the district. The Yak tunnel is being pushed ahead, the breast being now in Maxy territory. The Resurrection gold mine, owned by D. H. Moffat, which is under lease to the Yak company, is being rapidly drained, and it is expected will be completely unwatered in about a month. It is estimated that when all the ground opened for work by this tunnel in Big and South Evans gulches is ready for leasing, that employment will be given to 700 men.

Butte

April 3—At the special meeting of the stockholders of the Anaconda Copper Mining Company, at Anaconda, March 23, 1,026,621 shares out of the total of 1,200,000 shares were represented by President B. B. Thayer who held the proxies. The capitalization was increased to 6,000,000 shares of $25 par value. The report of James F. Kemp and Herman A. Keller on the properties of the various Butte companies, which the Anaconda company proposes to absorb, was submitted. By a unanimous vote the directors were authorized to offer to the several affiliated companies in Butte, in exchange for all property of those companies, shares of stock in the Anaconda Company as published in the JOURNAL of April 2, 1910. Of the companies which the Anaconda company proposes to buy out, the Boston & Montana company with its Mountain View, Leonard Pennsylvania, East and West Colusa and Badger State mines and its smeltery at Great Falls is generally conceded to be the most valuable. The North Butte company is the one notable absentee from the proposed consolidation, and the exact cause is a matter of guess work, in Butte at least. There have been rumors to the effect that the laws of Minnesota, under which the company was incorporated, necessitated the votes of all the stockholders before the entire assets of the company could be sold and that the requisite votes could not be obtained. There have also been rumors to the effect that the physical valuation of the property caused its rejection by those behind the erger, but of the two theories the ormer is generally accepted as the more robable. It will be noted that in the an as outlined at the stockholders' eeting the Anaconda company will beme the operating company and the old erating companies will become the olders of Anaconda stock.

Following the meeting of the Anaconda opper Company the Boston & Montana mpany held a stockholders' meeting on e 26. Out of a total of 150,000 shares, 9,550 were represented and the offer the Anaconda company to purchase all e property and assets of the Boston & ontana Company was accepted and the rectors authorized to make the sale for 200,000 shares of Anaconda stock. All the Amalgamated's subsidiary comnies will hold stockholders' meetings thin the next month to act on the Anaconda company's offer.

At the special stockholders' meeting of Washoe Copper Company held March , the directors were authorized to acpt the proposal of the Anaconda Copr Company which offered 380,000 ares of Anaconda stock of the Washoe mpany's property.

The Butte & Superior Copper Company s acquired control of the North Butte tension Mining Company, which owns Black Crow group of claims, adjoin- the Butte & Superior property on the st. An option has also been taken on Daniel Quilp claim which lies beeen the Butte & Superior and the Butte Milwaukee ground, and the Narrow ge claims have been purchased. This es the Butte & Superior about 150 res of contiguous mining ground. By agreement between the Butte & Surior and the North Butte Extension the mer acquires 800,000 shares of the ter's stock and in return will pay off current indebtedness of the North tte Extension and also run a crosscut m the Butte & Superior Black Rock aft at the 1600-ft. level to the North tte Extension's Black Crow shaft. The ck Crow shaft is down 600 ft. and en the crosscut has reached a point der the shaft a raise will be run to nect with it.

Salt Lake City

pril 1—The Utah Ore Sampling Comy at the present time is sampling a ge part of the custom ore which comes the Salt Lake market from Idaho, ntana, Oregon, Nevada and Utah. It operating mills at Murray, Silver City Sandy. This company has sucded to the interests of the Taylorinton Ore Sampling Company in Utah of the Pioneer Ore Sampling Comy, and is now the largest independent npany engaged in the business in this tion. Ernest R. Woolley is president Arthur W. Gates, manager. This npanv reports that no marked change has occurred in the Salt Lake ore market. There has been a gradual increase in ore shipments owing to the somewhat improved condition of the roads. During the past week some ore was shipped from Alta.

A recurrence of the difficulties between the farmers and smelters seems possible at the present time. The farmers' committee threatens to reopen court proceedings and has, through its lawyers, sent a letter to the American Smelting and Refining Company, alleging that the company's plant at Murray has violated the court decree requiring that the smoke and fumes pass through a flue and settling chamber instead of directly into the stack. The letter further states that, on visits of inspection, the smeltery was found to be operating twice in accordance with the decree, and fifteen times contrary to it. Damage to animals and crops is charged. The letter concludes that unless there is a strict compliance with the decree, steps will be taken for its enforcement. The committee has arranged to make visits to the plants twice a month during the growing season, and once a month during the rest of the year.

The Godfrey case was made a test for the smeltery-smoke cases and was bitterly fought through the Federal court here, then in the Circuit Court of Appeals in St. Louis, and finally affirmed by the Supreme Court of the United States.

The farmers in the neighborhood of Garfield are also inclined to be uneasy. An action was filed in the district court on March 21 by Walter Steadman against the Garfield Smelting Company for $13,720. Mr. Steadman represents thirteen other farmers beside himself, and claims damage done by the smeltery fumes to vegetation and livestock during 1908 and 1909.

The United States company at Midvale is successfully using its baghouse and zinc oxide treatment of fumes, and no complaints have been made regarding its operation.

The damage to the Yampa smeltery at Bingham caused by a cloudburst late last year has been repaired. This places the Yampa again in its normal condition.

The taking of testimony in the case of the Silver King Consolidated vs. the Silver King Coalition was resumed on March 28. The plaintiff is now presenting its side of the case. During the week miners who worked in the Parson's stope testified as to the quality of the ore, and the size and number of the sets in different parts of the stope where they worked.

It is reported that the contract for grading the Bingham & Garfield Railroad has been let to the Utah Construction Company, of Salt Lake. The proposed line will be over 17 miles long and will extend from the mines of the Utah Copper Company at Bingham, to the concentrating mills at Garfield, and from there to the smeltery.

Deadwood, S. Dak.

April 2 The labor situation at the Homestake mine has reached a normal condition. New men have been brought in from Joplin, Mo., Cripple Creek, Butte and Michigan points. About 1500 miners and underground men are now employed. William O'Brien, mine superintendent, states that the new men do about one-seventh more work than the old men. The new shovelers average about 13 tons of ore per man each 8-hour shift. There are about 800 Slavonian laborers still left in Lead who refused to sign up the card demanded by the company. The Western Federation of Labor practically admits defeat in the Black hills. The last attempt that will be made by them is to win the spring election in the city of Lead. The company is unwatering below the 1100-ft. level which was allowed to fill when the trouble began. The slimes plant at Deadwood is to be enlarged to take care of additional slimes.

Sufficient men have been found to take the place of the 50 per cent. that refused to go back at the Mogul and Golden Reward mines and mills and both companies have resumed milling. All of the mines in the Bald Mountain district will be working normally soon. Hereafter American labor will predominate.

Ely, Nev.

April 2—The Boston-Ely Company is continuing important development work, situated as it is outside of the recognized porphyry area of the camp. Operations at present are confined to sinking a winze from the 1120-ft. level of the Emma shaft. The winze was started at a point 200-ft. north of the shaft and is on the contact between the "jasperoid" and the carbonate ore. The present depth is 50 ft. and it will have to go 50 or 60 ft. deeper to reach the level of the bottom of the shaft, which appears to be near the ground-water level. The shaft itself is in hard ground and as the contact is pitching away from it the company determined upon the winze as the most suitable means of preliminary development.

The Success Mines Company, at the head of Duck creek, 12 miles due east of Ely, is working a dozen or more men. This company, while only recently incorporated, has been working for several years. D. C. McDonald, of Ely, is manager. The development consists of a 300-ft. shaft and several hundred feet of drifts. The ore is high in iron and carries gold, silver and lead. Several cars of ore were shipped to Salt Lake City last year and it is expected that shipments will be resumed this season as soon as the roads are in condition. The Success mine is looked upon as one of the main inducements for the erection of a lead smeltery in Steptoe valley.

Between 1300 and 1400 men are at present on the payroll of the Steptoe Valley Smelting and Mining Company at McGill. The full battery of 16 McDougall roasters is now kept busy on the concentrates from the mill and calcines are being turned out a little faster than the reverberatory furnaces can handle them. If there is a weak spot in the company's system it lies in the furnace building. The shutting down for relining keeps one of the furnaces out of commission practically all the time, and the present output of concentrates is a little more than the other three can handle. Construction of a fifth furnace, started last fall, will quite likely be completed this spring. The converter plant shuts down every other Sunday, so it is evident that this portion of the plant has the situation well in hand. Installation of Waddell classifiers in all parts of the mill, and the feeding of dry ore from the bins directly to the rolls are two innovations which helped to bring the plant up to its present capacity. All water for the eight sections of the mill is brought by gravity alone through a 34-in. pipe from the reservoirs on Duck creek. The company, however, has an auxiliary plant in Steptoe valley below the works should this be needed.

Scranton, Penn

April 4—The large washery of the Mount Hope Coal Company, near St. Clair, was destroyed by fire March 31, causing a loss of over $10,000. The fire is supposed to have been incendiary. It was a serious loss, for not only was the washery destroyed, but the accounts of the company, maps and working plans which were in an adjacent office were also destroyed. While the fire was in progress a tremendous explosion occured when the supply house took fire. There were 1200 lb. of blasting powder stored in the place. The explosion caused the wreck of the boiler house and the hoisting machinery. No lives were lost.

All the mines throughout the anthracite region were idle on April 1 to commemorate the concession of the eight-hour day in the bituminous regions. The majority of the washeries worked, however. Many of the anthracite miners were not at all pleased to have to remain idle to celebrate an event which in no way concerns them. There were a number of mass meetings announced, but they were sparsely attended.

The Harleigh colliery of the Black Creek Coal Company, near Hazleton, has suspended stripping temporarily as the operations are not so far advanced that coal can be regularly mined. Coal has been reached, but it is mined only in such quantities as are immediately needed around the mines. Before it can be mined for the market a plane and haulage apparatus must be built and the construction of these will take at least six weeks. The Markles are said to be negotiating for the mine.

Indianapolis

April 3—The 21,000 coal miners in Indiana who are taking part in the general suspension of mine operation, will probably resume work at an early day, according to information given out from the headquarters of the United Mine Workers' Association in this city. The Indiana Operators' Association meets at Terre Haute, April 6, and it is understood that the operators have agreed to meet the demands of the men. A definite date for the resumption of mine operation will not be fixed until the joint conference is over. Coal shipments to points within and without the State during the past week have been extremely heavy. This condition has existed for the past month, but the near approach to the time of the predicted suspension the shipments increased materially. The equipment of the roads was hardly sufficient to handle the shipments—all the empty gondolas were rushed to division points and pressed into service. These conditions have been changed in a day's time. The Indiana mines were worked steadily and to their fullest capacity for six weeks, but notwithstanding all this precaution, a number of large consumers have not a week's supply of fuel ahead. The mines are idle and the railroads are cleaning up the remnants of stock at the mines.

Cobalt

April 3—The early breakup of winter which is practically unprecedented, has made the roads into the outlying districts impassable. In consequence, there are large quantities of supplies that it will be impossible to move. It is stated that there are stalled at Charlton 50 cars of provisions, supplies and machinery.

The Gowganda district has made a very favorable impression, and public confidence in its future seems to be restored. The Millerette was the largest shipper, sending out 198 tons. The Reeves-Dobie shipped 62 tons; the Boyd-Gordon, 30 tons; the Miller Lake-O'Brien, 11 tons, while the Welsh and the Burke-Remey each made a small sample shipment of between one and two tons. The Elk Lake camp has also contributed, the Lucky Godfrey having shipped 20 tons, the first shipment from the district.

Difficulty has been experienced in the Porcupine district on account of the early breakup. The companies putting in machinery have been rushing the work and practically all the supplies are now over the roads. The people who purchased the Milson-Edwards claims sent up a special train from Cobalt with 15 teams to rush supplies in. The Timmins has shipped a car of ore to New Jersey to have a mill-test made. The work so far on the different properties has been encouraging. The Timmins has run a crosscut from one of the shafts to the main vein at 50 ft. and found free gold. At the Foley-O'Brien property there is also free gold at the bottom of the shaft. On the Wilson property no sinking has as yet been done, but shots were put in all over the face of the outcrop and with one or two exceptions, all showed gold. There will be plants working on seven properties this summer. At present the great need is a summer road and the Government has been petitioned to build one.

Toronto

April 4—Applications for provincial mining licenses this year were unusually numerous. All licenses expire at the end of March and the rush to take out licenses for the season exceeds anything hitherto known. The number will probably be between 4000 and 5000.

Excitement has been caused by the reported discovery of commercial coal on the Metagami river, 60 miles north of the Grand Trunk Pacific Railway, west of Cochrane. About 20 square miles of territory along the river have been staked, each claim comprising a square mile. The permit to prospect for coal, however, does not include other valuable minerals. No definite information with regard to these finds has been received by the Department of Mines, and in official circles there is a disposition to accept the report with a good deal of reserve. It has been known for some time that lignite occurs in that region, outcrops having been discovered in 1903 on the banks of several rivers flowing northward on the Hudson Bay slope. The lignite then found was of good quality but there was no evidence of its occurrence in payable quantities. The government, in view of the extensive staking, has decided to send an expert to the locality as soon as the ice breaks up to investigate and report upon actual conditions. In the meantime, numerous prospecting parties are going into the district.

Joseph W. Boyle, of Dawson, Yukon Territory, president of the Canadian Klondike Mining Company, states that the company has recently purchased the largest placer gold-mining dredge in existence. The machine has 15-cu.f buckets. Over 435,000 ft. of timber was required for its construction, which was purchased in Vancouver. The lumber and machinery were forwarded to Dawson and the dredge put together there Mr. Boyle says that by the new method of thawing adopted, the dredging season in the Yukon has been considerably lengthened. His company was last yea able to begin making about 195 days and hopes this year to do still better.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

The first news from the placer strike, 5 miles up Taku river is from nine neau prospectors, who state that coarse ld is in the gravel all along the creek t the gravel beds do not freeze and the iter has caused all efforts to sink to drock to be abandoned.

Golden Gate—This Sitka company is ıking preparations to add five more ımps to its mill this season.

Archangel—This mine, Willow creek strict, Knik, has been bonded by Frank atson, of Spokane, Wash., and development work will be started.

Birner's Bay—This Juneau company's operty has been sold to the International Trust Company, of Boston. Ace work will be started this spring.

Ebner—This mine is to be operated by new company. A larger mill will be ilt. H. F. Tripp is in charge.

Alaska Treasure—Development at the ne on Douglas Island is being pushed. crosscut is being driven 3300 ft. W. Priestley, Jr., is superintendent.

Arizona

COCHISE COUNTY

Commonwealth—The new plant at arce was burned causing a loss of 50,000. The mill was also to treat ore m Courtland. The mill will be relt.

Copper Queen—Since the completion the trolley system on the 1400 level the Lowell, all the ore is being hoisted the Sacramento shaft. The new drift m the Lowell winze on the 1500 level run into some good sulphide ore ng the north end line of the Hoatson perty of the Superior & Pittsburg. rk is being done on the 400-level ılage system. The Uncle Sam shaft producing a small amount of highde oxide ore both from the N level the B level. The territory both above below the body of chalcopyrite and nite ore in the Holbrook 400 haulage t, which was run into some time ago, been prospected by drifts on the and 500 levels. The drift on the level is beyond the point on the where the ore exists and has exed only a small stringer of ore. The t on the 500 level below the 400 ore also been disappointing as it has wn up no ore. The new drift on the 0 level at the bottom of the Gardner ze has just entered low-grade sulde ore.

Shattuck-Arizona—Shattuck continues regular shipments from the 600 level.

Denn-Arizona—A rich strike of oxide ore is reported at the Denn property.

Calumet & Arizona—Repair work continues in the Oliver shaft. There are three crews working each shift and three shifts per day. All development work from the Irish Mag shaft has been temporarily suspended until the repairs at the Oliver have been completed. Only ore is being hoisted.

Superior & Pittsburg—The drift on the 1500 Junction in which ore was recently discovered has been advanced through the ore and entered waste. The extent of the ore in this direction is 70 ft. Another crosscut has been started. At the Briggs shaft on the 1200 level a drift has been run south.

GILA COUNTY

Inspiration—The company has three churn drills working west of the Joe Bush shaft. A raise put up from the 400-ft. level of the Joe Bush shaft is 300 ft. high and at this hight is near the surface. This raise is the first of a series by which the ore will be mined by the "mill-hole" method.

Superior & Boston—The winze from the 400-ft. level of the Gardner workings is 35 ft. deep. Drifting east and west along the vein on the 400-ft. level is progressing and the breasts of both drifts are in ore. Sinking of the McGaw shaft and the Great Eastern winze is nearing the seventh level.

Boston-Miami—The ninth and tenth churn-drill holes put down are respectively 800 and 900 ft. deep. The former hole is located in the granite-porphyry area and is the deepest hole yet drilled in the district. One of the churn drills recently made a record of 84 ft. in 12 hours. F. W. Hoar is superintendent.

GRAHAM COUNTY

Shannon—There have been important developments in the mine at depth and costs have been reduced. The ore treated averages 57 lb. of copper to the ton.

MOHAVE COUNTY

Keystone—This Mineral Park property is under bond. New equipment is being installed. S. R. Porter is in charge.

Oneida—A shaft is being sunk by the Venture Exploration Company of Duluth, J. P. Hamilton, superintendent.

Dandy—This mine, Weaver district, has been bonded to J. P. Hutchinson, of Chicago and work will be undertaken.

Fairview—This zinc property sold to the White company, of Lima, O., is being developed in charge of D. S. Richards, of Chloride.

Frisco Mines and Power Company—This company is planning to install a treatment plant for free-milling ore. New York office, 257 Broadway.

Gold Hill—This new company will place a mill soon. E. B. Van Dieman, Kingman, is manager.

YAVAPAI COUNTY

United Verde Extension—The reported strike at 800 ft. on the Little Daisy is attracting much attention. The company is developing the extent of the orebody. J. J. Fisher is manager.

Venezia—Governor R. E. Sloan and J. B. Tomlinson, have decided to erect a 10-stamp mill on the property in Crook Cañon.

California

AMADOR COUNTY

Kennedy—The main orebody at the 3300 level holds out in size and value. The February yield was $60,000.

Treadwell—This mine, Sutter creek, is to be under charge of Joseph Oneto.

Argonaut—What is believed to be a new orebody has been struck on the 3300 level of this mine at Jackson.

BUTTE COUNTY

White & Hunter—This mine at Oregon City is being reopened.

Russell—Richard Phillips has bonded the mine at Hurleton and will prospect it.

KERN COUNTY

In the Randsburg district ore is being milled from the Corona mine, owned by the Lacrosse company of Pasadena; the Houser mine is also milling ore. The Sydney group is having ore treated at the Phœnix mill, Johannesburg.

MONO COUNTY

Posey Cañon—H. B. Skewes and others have taken a lease on this gravel mine.

SHASTA COUNTY

In the Harrison Gulch district the Midas company has cut the Gold Hill vein 700 ft. below the surface, which has previously been worked by drifting on the mountain side. The Victor company has ordered a new mill.

First National Copper—Thompson, Towle & Co., say: "It is becoming evident that stockholders will have to stand another assessment. Two years ago the stockholders contributed $1,500,000, which was then stated sufficient to meet all construction charges, etc. The company again came to grief a year ago, when the management attempted to raise $1,000,000 by an issue of convertible bonds. It did not succeed, but pledged a portion of these bonds as collateral for $375,000 of notes which fall due April 15, 1910, and $375,000 of bonds maturing July 1, 1910, so that $750,000 of new money will have to be provided some way. While the company has been showing net earnings of $20,000 to $30,000 per month, it has needed this money for working capital, and it is not available for other purposes.

Michigan—This group of copper claims adjoining the Bully Hill has been bought by the Bully Cave Company, E. J. McLaggan, superintendent.

Hornet—The Mountain Copper Company is installing a plant for precipitating copper from the mine water.

SIERRA COUNTY

Neocene—Preparations are being made on a large scale at this mine, Scales, for extensive work hydraulicking this season.

Irelan—On this group at Alleghany, George Hegarty only has a few men at work this winter but extensive development will be carried on this spring.

General Sherman—This mine at Alleghany has been bonded to Daniel McGonigal and work will now be resumed. There are three tunnels on the mine, one 700 ft. long.

Sierra Buttes—A strike has been made in the No. 6 tunnel on what is supposed to be the Whiskey vein which proved so rich above. Jay C. Folsom is superintendent.

TRINITY COUNTY

Trinity River Dredging Company—This company, holding an option on 900 acres of dredging ground above Lewiston, will install a dredge this spring. A water right of 1000 in. has been purchased.

Headlight—The second payment of $40,000 has been made on this mine at Carrville. The mine is to be worked on a large scale. D. W. Shanks is manager. A 40-stamp mill with cyanide plant is being installed.

TUOLUMNE COUNTY

Karnac—This company near Jamestown has installed gasolene engine at the mill. There is a 20-inch vein in the bottom of the Hancock claim.

Tarantula—The newly installed machinery at this mine is now in complete operation.

Columbus and Cleveland—These two mines at Cherokee have been bonded.

Colorado

LAKE COUNTY—LEADVILLE

Gold Basin—This property is shipping about six carloads of ore per month, some of it carrying as high as 11 oz. gold to the ton, and 38 oz. silver, the average, however, being 1 oz. of gold and 8 oz. of silver.

New Monarch—The output from the Cleveland and Vinnie shafts of this company is about 75 tons of ore per diem.

SAN JUAN DISTRICT

High-grade ore has been discovered on the Pandora claim, Telluride, by Lessee Carter. The Japan-Flora has recently shipped the highest grade of silver ore which has been produced in Telluride county in recent years.

Atlas—This property at Sneffels is carrying on development work. Ore of a milling grade has been opened on the Klondike lode from the San Pedro tunnel. The Atlas crosscut tunnel will reach this orebody by midsummer. Recent developments in a northwesterly direction along the Atlas vein have been of a favorable character. It is expected that the property will be on a paying basis by the end of the year. Fred Carroll is manager.

Revenue—The tunnel at Ouray has recently opened large orebodies of a higher grade than has been mined formerly. The property has been taken over from the leasees and extensive work is planned for the ensuing year.

Silver Ledge—The 200-ton mill has just been completed, and started operations. It is equipped with Blake crushers and rolls, two chilian mills, and 20 Wilfley tables, with Richard classifiers and Callow tanks. The ore is a silver-lead-zinc sulphide, and there are large bodies of it in this mine, which was a former dividend-payer, but closed owing to the last slump in the market. The manager is Karl A. Krumpfer.

TELLER COUNTY—CRIPPLE CREEK

Cresson—This mine is increasing its production. The output for March was about 2500 tons. At the 1000-ft. level it is said that a large body of ore is being mined that averages $25 per ton from wall to wall. Richard Roelofs is manager.

Pharmacist—This mine is being operated by four sets of lessees. It is expected this year to double the production of 1909, which was $41,000.

Stratton's Independence—Results for February: Production, 2140 tons averaging 26 dwt. per ton. Dump ore milled, 5300 tons; net profit, $10,350.

Idaho

CŒUR D'ALENE DISTRICT

Bunker Hill & Sullivan—To settle the long-standing litigation between this company and the Federal company, the latter has offered to turn over the Last Chance lead-silver mine in exchange for 27,000 shares of Bunker Hill stock, valued at about $1,400,000. The offer will probably be accepted as the heaviest stockholders in Bunker Hill & Sullivan have signified their approbation of the plan. The conflict was over areas of mining ground that overlapped.

Jack Waite—The third payment, $40,000, has been made and the final payment will be made in March, 1911. The property was bonded for $150,000.

Orofino—Patrick Burke has made his final payment under the bond on this property, the total consideration being $75,000. With lead-silver ore in sight to run a mill for a year, the company has decided to erect a 100-ton concentrator.

CUSTER COUNTY

Sunbeam Consolidated—This property, a few miles from Custer, is installing a hydroelectric plant. C. E. Gable is in charge. The ore is free-milling gold. The property is developed to 400 ft., and carries free-milling gold ore which is being treated in a 75-ton mill, using plates and the Monadnock mill. With the installation of water power, the operations of the property will be largely increased.

IDAHO COUNTY

South Fork—Wilbur D. Greenough, of Spokane, has taken a bond for $112,000 on the three-quarters interest in this gold mine between Golden and Elk City.

Indiana

GIBSON COUNTY

Ayrshire—The company has suspended work on the coke ovens which it is erecting near the mines. The ovens will not be completed until assurance of a steady production from the mines is obtained.

PIKE COUNTY

The representatives of the leading oil companies in this field have been placed under arrest charged with violating the statute concerning the waste of natura gas. The issue is regarded with concern.

The directors and stockholders of the Paloka River Coal and Coke Compan are suing the Binghamton Trust Company to recover $300,000 damages because of failure to sell the Hartwel mines and 2400 acres of coal land afte a purchaser was secured. The Hartwell mines are among the best equippe mines in the State. Electric motors ar used to transport the coal to the mai shaft, and electric lights are used i the mine. The mine property is in th hands of the trust company as receive and the old company wants to get possession of the mines, since the receive failed to unload the property.

SULLIVAN COUNTY

Alliance—The company, at Sulliva will take advantage of the suspension t improve the Caledonia mine. The min will be equipped with electric haulag electric lights, telephones and other improvements.

Kentucky

The Berwind-White Coal Mining Company, it is stated, has bought about 100,000 acres, lying along the Tug fork of Sandy, near the Virginia line. A large part of the property is coal land, an exension of the Pocahontas field. It can be reached by a short branch from the Norfolk & Western. The plans of the purchaser are not announced.

Michigan

COPPER

Houghton—Drill operations, under the upervision of Dr. L. L. Hubbard, have been started to expose the Superior lode.

Lake—The crosscut from the 6th level has reached the lode; this crosscut has been extended 230 ft. from the shaft. At the 5th level a crosscut was driven across the foot-wall lode and found it to be about 20 ft. wide, with about 10 ft. of it well charged with copper.

Mass—E. W. Walker, consulting minng engineer, of Detroit, is at this proprty to make an examination.

Michigan—The company is continuing xploratory work on the Bee tract both by drilling and underground. Drifting rom the bottom of the old shaft on this ract has encountered encouraging ground.

Cherokee—This company has been organized under Michigan laws with a captalization of 100,000 shares, par value 25, to develop land in sections 2 and 3, 1-37, known as the Penn.

Mohawk—No. 6 shaft is down to the second level and the crosscut to the lode s under way. Drifts north and south from the first level have been extended 5 ft. with the formation in the north drift a little the better.

Bohemia—The first drill is down 300 t. and is believed to be in proximity to he No. 1 Adventure lode.

Winona—The stamp mill, being erected jointly by this and the King Philip company, has been inclosed and the erection of the stamping machinery will soon be underway. This mill will contain two heads with a capacity of about 1500 tons daily and will be ready in August.

Victoria—The new shaft on this property going down 3500 ft. east of the present producing shaft is down 125 ft. The emporary surface equipment has been completed and greater progress can now be made in sinking. Previous to the starting of this shaft drilling was done at this point and a very encouraging core taken. The producing shaft is bottomed at the 22d level and is sending about 500 tons daily to the mill. Conditions underground remain unchanged with the exception of a comparatively rich shoot which was opened at the 18th evel by a crosscut across the formation toward the footwall.

Missouri

A project for a lead-smelting plant at Webb City, promoted by George W. Moore, has been given a public bonus of $10,000 and a site.

Montana

BROADWATER COUNTY

Calumet & Corbin—The company which is operating the Minnesota mine in Jefferson county has recently acquired the Mammoth group of quartz claims, comprising 140 acres, in the Radersburg district. The shaft on the Mammoth claim is down 75 feet.

Keating—At a directors' meeting, J. M. Hodgson, of Houghton, Mich., was elected to fill the vacancy on the board of directors caused by the death of R. B. Dear, of Duluth. The management states that the control of a majority of the company's stock has been acquired by the Radersburg Consolidated Mining Company, a company recently organized under the laws of South Dakota. The company was organized as a holding company and also controls the Manhattan-California Gold Mining Company, operating near Placerville, California.

BUTTE DISTRICT

The March output of Butte was about 24,000,000 lb, which is 5,000,000 to 6,000,000 lb. below normal. Butte Coalition produced nearly 1,000,000 lb. more than North Butte.

Butte & Ballaklava—In the west drift or the 800-ft. level, the management states that 2 ft. of copper glance have recently been encountered, the vein itself being about 9 ft. wide and all ore. In the east drift on the 800-ft. level, 11 ft. of ore is shown, which averages 10 per cent. copper. The company has recently issued a financial statement showing its condition Jan. 1. The mine and equipment is valued at $2,291,213, and the cash and money due from stock which has been allotted, is $215,552. Practically the only liability is for its capital stock of $2,500,000.

Butte Central—The claims against the old Butte Central and Boston Copper Company are now being paid off and it is understood that the title to the Ophir mine, now held by a trustee, representing the creditors, will be transferred to the new Butte Central Copper Company and that the work of unwatering the shaft, preliminary to further development work on the property will be begun soon.

Poser—On this mine the property of W. A. Clark and adjoining his Elm Orlu on the west, a shaft has been sunk over 500 ft. at which depth copper ore has been mined. On the 300-ft. level the values are principally silver.

Davis-Daly—The company has $80,000 cash in its treasury and is not expending over $8000 per month on development, keeping its expenditures down to the lowest possible figure. Within the next month the crosscut on the 1800-ft. level should cut the main vein, which was 25 to 30 ft. wide on the upper levels.

Butte & Superior—The hoist which was at the Colonel Sellers mine of the Butte & Milwaukee is being moved to the Black Rock, where it will be used to lower timbers and supplies through the pump shaft. The management states that the work of constructing the concentrator will be begun in April.

JEFFERSON COUNTY

Boston & Corbin—On the 700-ft. level 2 ft. of bornite has been struck. The strike was made at a point 200 ft. nearer the shaft than ore has been found on any of the other levels.

Robert Emmet—This company, Corbin, has decided to build a concentrator this spring.

LINCOLN COUNTY

C. E. Lurgeris, of Libby, is planning the installation of a cyanide plant 35 miles from Libby.

Bluebird—The company has been incorporated by J. A. Ford, Henry Brink and James Ford for the purpose of working claims on the big dike, 26 miles south of Libby. It is the general belief in the district that this dike is the source of the placer gold in Libby creek.

Fisher Creek—Twenty stamps will be added to the plant at Bramlett creek, near Libby, Arthur Gordon, manager.

Nevada

ESMERALDA COUNTY

Goldfield Annex—Shipments of rich gold-copper-silver ore started during the week, and developments on the 800-ft. level indicate an extensive orebody.

Florence—The mill is handling 150 tons of $20 to $25 ore with an average recovery of 95 per cent. In the mine good ore has been exposed on the Engineers' and Little Florence veins, but is not being heavily drawn on because of the good showing in other parts of the mine.

Booth—The installation of a blower and pipe system has greatly improved conditions of ventilation underground.

Pittsburg-Silver Peak—The full equipment of 120 stamps is now dropping regularly. The addition of the last 20 stamps places the mill first in point of number of stamps and second in capacity in the State.

LINCOLN COUNTY

The Salt Lake railroad will be rebuilt on the same roadbed temporarily. It is said that it will take about four months to open the road for traffic. The branch from Calinete to Pioche will be in operation by May 1.

Horseshoe—A small force of men has been working in the mine clearing out, and doing development on the 100-ft. and 300-ft. levels. The mill will start again soon, and make a run on the Little Buck ore.

Lyon County

Work on the Copper Belt railroad south of Mason City, Yerrington district, is being prosecuted diligently. The smeltery plans are well under way and work will begin as soon as practicable. It is practically certain that Jules Lebarthe will superintend the construction and afterward the operation of the plant.

Nye County

Tonopah shipments for the week ended March 26, are as follows: Tonopah, 3250 tons; Tonopah-Belmont, 850; Montana-Tonopah, 890; McNamara, 170; West End, 170; Tonopah Extension, 840; Midway, 100; total, 6270 tons.

Tonopah—The mill report for the week shows 3300 tons of $19 ore crushed with the production of $58,250 worth of concentrates and bullion.

McNamara—A strike of 3 ft. of high-grade ore on the 275-ft. level is reported.

Tonopah-Belmont — As development work progresses there appears to be no break in the big vein recently exposed. Although it has been followed for 320 ft. on the 1100-ft. level, it maintains its strength for at least 65 ft. below and also appears on the 1000-ft. level.

Tonopah Extension—The mill reports show an average extraction above 90 per cent.

Eclipse—The new 10-stamp custom mill at Bullfrog is operating on Tramp Consolidated ore. The capacity is between 40 and 50 tons and custom ores carrying gold above $12 will be accepted for treatment on a guarantee of 90 per cent. extraction.

Montgomery Mountain—A reorganization of the company contemplating an assessment of 3c. per share in exchange of old stock for new, is planned to meet financial obligations. The Peery estate and Samuel Newhouse are the principal stockholders.

Montgomery-Shoshone—The January and February reports show a net loss of approximately $20,000.

New Mexico

Socorro County

Rosedale—This company has now in operation its 20-stamp mill and cyanide plant at Rosedale. Over 6000 ft. of work has been done. L. R. Babcock is manager.

Sierra County

Statehood This property at Hillsboro has a shaft down 500 ft. and several thousand feet of development. A 30-ton mill operated by a Diesel engine, is being erected. W. H. Weston is manager.

New York

William Hall Allen and associates, of New York, have leased the old Pennock lead mine, with mineral rights over 600 acres adjoining at Macomb, St. Lawrence county. This mine, at one time worked extensively, was abandoned 45 years ago. There are three shafts on the property and about 450 ft. of drifts. The lessees will put up a power plant and air compressors. The Sam Jones mine, adjoining was reopened two years ago, and a concentrating plant built, which is now at work.

Pennsylvania

Anthracite Coal

Yost Mining Company—This company has begun shipping from its new colliery at Yatesville. It controls 12 acres, on which it has completed a slope to the Marcy vein and built a breaker of 400 tons daily capacity. H. M. Houck, of Pittston, is president and H. E. Rissinger superintendent.

South Dakota

Hidden Fortune-Columbus Consolidation—Henry Frawley, of Deadwood, president of the company that is to take over these two mines, is arranging for a long-term lease which will give the company a royalty. The mines adjoin the Homestake on the north and northwest.

Minnesota Mines—While driving a tunnel at the 200, a rich strike was made.

Tinton Reduction Company—A. G. Lockhart, mine superintendent at Tinton, states that the 200-ton mill will resume soon. During the winter, 15 men have been developing the Rough and Ready vein which is proved over 200 ft. wide, with a little less than 1 per cent. tin across the face.

Utah

Juab County

Iron Blossom—This Tintic mine is sinking the south shaft. On March 27, the shaft was 50 ft. below the 1400-ft. level. A station will be cut when the 1500 is reached. About 70 tons of ore is being mined daily from the 500 level, and a slightly greater tonnage is coming from the No. 3 shaft.

Lower Mammoth—A shipment of two cars of lead-silver ore and one car of copper ore is being prepared for the market. The orebody in the stope from the 1800-ft. level is increasing. Work is being done on the 2000-ft. level.

East Tintic Development—Connections have been made by the winze between the 230- and 330-ft. levels. An increase in silver is reported from the lower levels. It is expected that the sinking of the shaft from the 500- to the 600-ft. level will be resumed soon.

Chief Consolidated The total shipments up to March are reported to have aggregated 2006 tons of ore, on which the net smelter returns were $46,147, or about $23 per ton. Production was begun last October. Shipments are now being made at the rate of 30 tons per day. Most of the ore comes from the 1400-ft. level, but some is also being mined from the 1600 level. Beside the work in ore, drifting is being done on the 1400, 1600 and 1700 levels.

Union Chief—This property, Santaquin district, has been developed by means of two tunnels, the lower one being 1400 ft. long; connections, which required raising a distance of about 360 ft. have been made.

Salt Lake County

North Utah—A new strike of lead-silver ore is reported in a raise from the lowest level of the Butler-Liberal section of the property.

Thor—Drifting has been done on the vein which was cut recently on the tunnel level. From 6 in. to 1 ft. of galena ore associated with lead carbonate is reported along the foot wall. The ore, which is being mined in development, will be shipped when the roads in Big Cottonwood are open.

Bingham-New Haven—The new mill is said to be making about 80 to 90 tons of concentrates per day. About 200 tons of ore are being mined daily, and shipments of 150 tons, including concentrates, are reported. Development work is being actively carried on.

Summit County

The Park City ore shipments for the past two weeks were as follows: Daly West, 2,100,000; Silver King Coalition, 1,454,320; Daly-Judge, 767,000; Daly-Judge (zinc), 665,600; Little Bell, 52,000; total, 5,038,920 pounds.

Opohongo—This company has been operating through the Black Jack workings, and is stoping ore between 300 and 400 ft. Development work is being done on the lower levels and new ore has been found on the 1400. About two carloads of ore are shipped weekly.

Tooele County

Consolidated Mercur—The February product of the mill was shipped to Eastern buyers without refining. The output was valued at $45,000.

Bullion Coalition—A strike of lead ore is reported to have been made by leasers above the tunnel level. No mining is being done at present on company acount, but several sets of leasers are at work.

Washington

Ferry County

Blue Grass—This company is making preparations to do development. J. J. Noel is president.

Kettle River—Fine progress is being made on the construction of the 50-ton concentrator for this mine, and operations will start soon.

Blacktail—This property has been sold to J. O. Callett, of Spokane. The mine is developed. It is expected that shipments will begin soon.

Tom Thumb—Republic people have taken a lease on this mine and shipping will be resumed.

Swamp King—Some high-grade gold ore has been struck in the shaft. The company will install machinery.

SNOHOMISH COUNTY

Eclipse—This company has purchased the Copper Independent at Silverton, and will install power drills and a hoist.

West Virginia

The Consolidation Coal Company has now completed its large washing plant at Monongah in the Fairmont district. It is understood that this is preliminary to the erection of a large block of coke ovens, the first in the district.

Wyoming

At Cheyenne, March 31, the Government filed suit in the United States Court to recover title to 2000 acres of coal lands in the Elk Mountain district, Carbon county, alleged to have been fraudulently entered upon.

Canada

BRITISH COLUMBIA

Consolidated—In February the Trail plant smelted 39,835 tons of ore, of which 34,796 tons was from the company's mines. The product was 10,565 oz. gold; 169,215 oz. silver; 459,310 lb. copper; and 3,080,394 lb. lead; total gross value, $454,596.

Hedley—Heavy machinery has arrived at this mine and preparations are under way for a big season's work.

Granby Consolidated—This company has acquired about 1000 acres of low-grade copper-gold ore in the Phœnix district, formerly known as the Summit group, and development work will be started immediately.

ONTARIO

The shipments from Cobalt for the week ended March 25 are as follows: La Rose, 334,680 lb.; Nipissing, 190,626; Crown Reserve, 186,651; Kerr Lake, 120,000; O'Brien, 62,500; Coniagas, 55,300; McKinley-Darragh, 48,800; King Edward, 41,377; Waldman, 63,992; Buffalo, 52,675; Right-of-way, 63,432; Chambers-Ferland, 58,000; Millerette (Gowganda), 48,000; total, 1,326,033 pounds.

Hargraves—This property has shipped a car of high-grade ore, being the first sent out since reorganization.

Valentine Mines—This company has been organized to take over and develop the Large lot, on Cross lake.

Chambers-Ferland—The royalty question has been finally settled and this property will now become a regular shipper.

City of Cobalt—A tramway has been completed to the Northern Customs concentrator, and a contract closed for the milling of a large tonnage of low-grade ore. A. Southworth has resigned as manager and is succeeded by A. S. Stevens.

Scottish Ontario—The construction of camp buildings at Porcupine has been completed and a steam hoist and boilers have been shipped. The rock taken out is being shipped to Scotland for tests. A camp buildings at Porcupine has been tons are ready for treating.

Mexico

CHIHUAHUA

The production of the Parral camp for the week ended March 26 amounted to about 9400 tons, a considerable increase over several preceding seven-day periods. About 7000 tons was locally milled.

One of the two new furnaces at the American Smelting and Refining Company's Morse plant was blown in last week, and it is expected that the second will be in readiness within 60 days. This plant will then have a daily smelting capacity of about 800 tons.

Dolores—A recent bullion shipment consisted of 63 gold-silver bars of value of about $62,000.

Chinipas—The operative properties in this section are the White Chief and Durazno-Tetamoa, at both of which amalgamation-cyanidation plants are in service.

Palmarejo & Mexican—Operations at the mine for 15 months have been confined to developing the Prieta vein and a large tonnage is ready for stoping. The company has decided to equip the mine with a machine-drilling plant. The general manager, George E. Stephenson, is now in the United States arranging for the purchase of the plant. It is expected that by the end of 1910 the construction of a new milling plant of 300 tons per day will be commenced, and by the time that the plant is finished it is estimated over 300,000 tons of ore will be blocked out.

GUERRERO

La Dicha—J. S. Schwab has been appointed receiver for the Mitchell Mining Company of Arizona, which owned this property and the projected railroad from Acapulco.

OAXACA

On March 23 floods destroyed the steel bridge, near Ocotlan, on the Taviche road, which will increase the delay in opening the line by at least 60 days.

San Juan—This Taviche property has been restored to C. A. Hamilton and associates by an important decision of the Mexican supreme court.

SAN LUIS POTOSI

The American Smelters Securities Company, which recently purchased the mines and plant of the National Metallurgical Company, Matehuala, will install another copper furnace, of 250 tons daily capacity, raising the total capacity to 750 tons. All ore from the Dolores y Anexas of the Guggenheim interests in the Matehula district will go to this plant. Heretofore the higher grade has gone to Aguascalientes. The Cobriza and other purchased mines will be extensively developed.

SONORA

S. L. Pearce, of Alamos, has sold 625 pertenencias to parties said to represent the Lewisohn interests. The property is near Piedras Verdes, where 800 hectares are being prospected with drills by Seely W. Mudd.

San Javier—This company, operating a 10-stamp mill near Sobia, is making arrangements to also treat custom ores.

Humilidad—A shaft is being lowered on this claim, the boundary of which is but a few hundred feet from the Catalina shaft of the Calumet & Sonora.

Greene-Cananea—The widely published report to the effect that a pipe line, to bring fuel oil from California to Cananea is to be laid, has not been confirmed.

ZACATECAS

San Barnabé—An option on this old property at Zacatecas has been taken by a British company, John Cooper, representative.

Africa

CONGO FREE STATE

Union Minière du Haut Katanga—This Belgian company has ordered a concentrating and milling plant of 900,000 tons yearly capacity for the Tanganyika copper deposits.

RHODESIA

Gold production in February is reported at 48,443 oz. fine, making a total of 102,356 oz. for the two months ended Feb. 28. By values the output for the two month was $1,932,860 in 1909, and $2,115,699 in 1910; an increase of $182,839 this year. Other production in February included 20,360 oz. silver; 6 tons copper; 75 tons lead; 392 tons chrome ore; and 13,728 tons coal.

South America

BRITISH GUIANA

Gold exports from the colony, two months ended Feb. 28, were 8081 oz. bullion in 1909, and 7570 in 1910; a decrease of 511 oz. The bullion reported this year was equal to $132,326, or 6402 oz. fine gold. The exports of diamonds for the two months were 818 carats, valued at $3563; an increase of $1717 over last year.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, April 6—The coal trade in the East shows no special change. It is not likely that it will be affected by labor troubles. Most of the large companies which ship to the East operate with nonunion labor and do not come under the socalled Interstate agreement. Most of them, however, have given advances to the miners. The Berwind-White Company announces an advance of 5c. per ton on pick mining and 5½ per cent. on day labor in all its mines both in the Clearfield district and in the Windber district in western Pennsylvania. The Consolidation Coal Company has announced a similar advance which applies to the mines in the Cumberland district in Maryland, the Fairmont in West Virginia, and the Somerset in Pennsylvania. The Westmoreland and other coal companies in the Irwin district have given a similar advance, which applies to most of the gas coal coming to tide. All of these are nonunion districts. The miners of the Clearfield and other districts in central Pennsylvania have voted to remain at work pending further negotiations over the wage settlement.

In the West the joint conference at Cincinnati failed to make any settlement and the Interstate agreement seems to have been practically abandoned, the different districts being left to make their own agreements. On April 1 there was a general suspension of mining, the miners coming out throughout western Pennsylvania, Ohio, Indiana and Illinois, while the same movement extended to the Southwestern district, including Missouri, Kansas, Arkansas and Oklahoma. The number on strike is variously estimated, but is probably not far from 300,000 men. Meantime, meetings have been called in the different districts to settle, if possible, the wage scales, and it seems probable that this will be done within a short time. In Indiana, for instance, the operators have announced their willingness to concede the 5c. advance, which the miners asked as a compromise, and the same thing will probably be done in Ohio very shortly. In western Pennsylvania there may be more delay owing to the explosive question, which has been a bone of contention for some time; and in Illinois there are the run-of-mine basis and the shot-firer questions to be settled, which will require some discussion.

Meantime, there are large stocks of coal on hand at many consuming points and at a number of the mines, and there is no probability of a shortage of coal developing unless settlements should take longer than now appears probable. In case the negotiations are protracted, moreover, there is a surplus of coal from West Virginia and Kentucky which can be drawn upon in case of need.

Coal Traffic Notes

Coal shipments from the Cumberland region in 1909 are reported as follows: Cumberland & Pennsylvania railroad, 2,747,378; Georges Creek & Cumberland, 205,201; Western Maryland, 3,047,551; total 6,000,130 tons. This compares with 5,784,591 in 1908, showing an increase of 215,539 tons, or 3.7 per cent. Statistics for this district were recorded earlier than for any other in the United States. For 68 years, 1842-1909, inclusive, the total shipments were 171,823,113 tons.

Coal and coke tonnage of Chesapeake & Ohio railway, seven months of fiscal year from July 1 to Jan. 31, short tons:

	Coal.	Coke.	Total.
New River	4,633,628	209,852	4,843,480
Kanawha	3,627,534	31,520	3,659,054
Kentucky	285,147	228	285,375
Connecting lines	55,223	30,651	85,874
Total	8,601,532	272,251	8,873,783
Total, 1908-9	7,279,420	197,707	7,477,127

Deliveries this year to points west of mines, 4,471,388 tons coal and 127,806 coke; points east, 1,137,175 tons coal and 144,444 coke; tidewater, 2,988,819 tons coal. Total increase in tonnage this year, 1,396,656 tons, or 18.7 per cent.

Coal tonnage of Norfolk & Western railroad, eight months of fiscal year from July 1 to Feb. 28, short tons:

District:	Commercial.	Company.	Total.
Pocahontas	6,258,334	814,893	7,073,227
Tug River	986,472	103,846	1,090,318
Thacker	966,665	461,601	1,428,266
Kenova	436,861	124,112	560,973
Clinch Valley	415,207	38,411	453,618
Total	9,063,539	1,542,863	10,606,402

As compared with the previous year, the total shows an increase of 2,347,399 tons, or 28.4 per cent.

Receipts of domestic coal at San Francisco in January, 37,819 long tons in 1909, and 35,548 in 1910; decrease, 2271 tons.

Coal shipments from Seattle and Tacoma, Wash., in January, 26,833 tons in 1909, and 25,870 in 1910; decrease, 963 tons. Shipments mainly to California and Alaska.

Coal passing Davis Island dam on the Ohio in January, 616,870 tons in 1909, and 451,350 in 1910; decrease, 165,520 tons.

Coal passing locks on the Monongahela above Pittsburg in January, 192,946 tons in 1909, and 192,073 in 1910; decrease, 873 tons.

Coal receipts at St. Louis in January, 621,647 short tons in 1909, and 930,979 in 1910; increase, 309,332 tons.

New York

Anthracite

April 6—The weather continues warm and domestic trade is quiet. There is still quite a run of orders from dealers for April delivery.

Schedule prices for prepared sizes are $4.25 for lump and $4.50 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes prices are unchanged and are for pea, $3 to $3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor according to grade.

Bituminous

Contract making is looking up a little and more business has been closed, but buyers are still adhering to their preference for the lower-priced coals. There has been an unusual amount of shopping around this year looking for low prices.

Spot business still continues rather disappointing. The Sound is taking things rather quietly, but the far East is coming into the market a little better. Prices continue about as last quoted, $2.75 New York harbor for the best grades of steam coal and from that down to $2.50@2.40 for lower grades. Transportation is good and car supply is still improving. All-rail trade shows no change.

There is a good deal of discussion about the Western strike. The general impression here is that a stoppage is not altogether unwelcome to most of the operators. It is also believed that the suspension will not last long. The miners in the Central Pennsylvania district, from which a great deal of coal comes to the seaboard, have voted to continue at work pending the settlement of the wage question, so that it is not likely the seaboard trade will be affected to any degree.

In the coastwise trade vessels are plenty and rates are gradually settling down to the summer level which promises to be rather low.

Birmingham

April 4—Every ton of coal being mined in Alabama is finding a ready demand. Efforts are still being made to secure more labor in the mining sections and the railroads are being urged to give steady service. While the home consumption of coal is heavy there is a large quantity going outside of the State. Good prices hold for the product.

The coke production in Alabama is steady, and there is need for all of it. The coke production by the end of the year will be improved something like 10 per cent., several hundred coke ovens being under construction and still more being contemplated.

Chicago

April 4—Owing to large supplies laid in by the principal consuming interests, the coal market has little abnormal about it, despite the suspension of mining at the Western mines that are the city's chief supply for steam coal. There is a steady sale of such coal as comes into market and some receipts, as of smokeless West Virginia coal, are too large for profitable sales. It is variously estimated that there is enough coal in yards and on tracks to supply this market for the next 30 to 60 days. The domestic trade naturally is at a very low ebb because of warm weather all over the upper Mississippi valley. Speculative buying of steam coals has not yet amounted to anything important, but there is some of it and it will increase as supplies become scarcer. Prices on Illinois and Indiana coals have risen slightly and the fine coals especially seem destined to command high prices for an indefinite time.

Lump and egg from Illinois and Indiana mines are quoted at $2.25@2.75; run-of-mine brings $2.20@2.50; and screenings sell for $2.25@$2.30. Smokeless brings $3.05@3.30 for lump, and $2.75@3.05 for run-of-mine. Hocking Valley coal continues steady at $3.15. Inquiries from the country indicate that the demand there for coal will greatly surpass, in proportion, the demand in the city, few country consumers having laid in storage piles.

Cleveland

April 4—The coal market has been at last stirred up over suspension of mining. Buying for storage, which had about ceased, has started up again, though it is not easy to fill large orders now. Most people, however, believe that the suspension will not last long. Nominally prices are unchanged, but they are really irregular, and it is not easy to give actual quotations. This is especially the case with slack, for which some fancy prices have been paid.

Pittsburg

April 5—The suspension of mining at the end of last month found consumers with stocks sufficient to last for from two to six weeks. There is more coal being offered than is being inquired for, as the brokers have coal from the nonunion districts. A definite market basis has not been established yet, slack being offered at $1.20 and less, and mine-run at $1.25 and less, and it is likely that in some cases $1 could be shaded on slack.

A conference between miners and operators in this district is being held today in Pittsburg, but it does not seem probable that an adjustment will be reached at this time. While definite opinions are not generally hazarded, the balance of probability seems to lie in the mines getting started again about May 1. Both sides realized that a suspension for a moderate time was required.

Connellsville Coke—The market has been quiet the past week, but prices have been fairly well sustained, perhaps largely through the sentimental effect of the suspension of coal mining. Prompt furnace coke remains quotable at $1.90@2. A small contract for second half was made in the week at just a shade under $2.25, which was the asking price of several producers, and this may be quoted as the contract market on good grades. Foundry coke remains quotable nominally at about $2.75@2.85.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended March 26 at 453,986 tons, a decrease of 8000 tons from the previous week; shipments at 4748 cars to Pittsburg, 7872 cars to points west of Pittsburg and 961 cars to points east of Connellsville, a total of 13,581 cars.

St. Louis

April 4—The miners in Illinois and in all the surrounding States struck on April 1, as was expected. The market, however, was without any exciting feature up to the very end. Early in the month prices were very stiff and for a while it seemed that the coal operators and jobbers had the market well in hand and that the price would continue to advance. However, the railroads and larger consumers began to get alarmed, and succeeded in turning the market downward by circulating reports that a settlement would be reached, and by manipulating the market in other ways. Consequently, toward the end of the month prices were on the decline for the last 10 working days.

Nearly everyone has a fair supply of coal on hand and for immediate needs there is no demand whatever. A few mines carried over a little coal which they are holding for better prices. However, they are finding no demand as yet. This is a marked contrast to 1908, when 1000 cars were carried over by the various mines throughout the State of Illinois.

A few firms who handle anthracite coal are beginning to get busy to line up their anthracite trade. The new circular of $6.45 per ton for chestnut, stove or egg, and $6.20 for the grate size, went into effect April 1. Very little has been sold yet, as dealers have been giving their attention to soft coal exclusively for the past 60 days.

Standard:	F.o.b. Mine.	F.o.b. St. Louis.
6 in lump	$2.00	$2.52
2 in. lump	1.75	2.27
Mine-run	1.50	2.02
2 in. nut	1.40	1.92
2 in. screenings	1.10	1.62
Pea and slack	0.90	1.42
Staunton, Mt. Olive & Springfield:		
6 in. lump	2.10	2.62
3 in. lump	2.00	2.52
Mine-run	1.60	2.12
2-in. nut	2.00	2.52
2-in. screenings	1.00	1.62
Carterville:		
6-in. lump or egg	1.80	2.47
3-in. nut	1.75	2.42
Mine run	1.50	2.17
1½-in. screenings	1.25	1.92
Franklin County:		
6-in. lump or egg	2.20	2.87
3-in. nut	2.00	2.67
2-in. nut	1.50	2.17
1½-in. screenings	1.25	1.92

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, two months ended Feb. 28, long tons:

	1909.	1910.	Changes.
Anthracite	297,096	406,287	I. 109,191
Bituminous	1,000,130	1,074,263	I. 74,133
Total exports	1,297,226	1,480,550	I. 183,324
Steamer coal	872,171	936,051	I. 63,880
Total coal	2,169,397	2,416,601	I. 247,204
Coke	155,917	138,802	D. 17,115

Canada took this year 982,682 tons of coal, or 66.4 per cent. of the total. The coke went chiefly to Mexico and Canada. Of the bunker coal this year 934,072 tons were loaded at coast ports and 1979 at Lake ports. Cuba took 160,551 tons of coal.

United States Coal Imports—Imports of coal and coke into the United States, two months ended Feb. 28, long tons:

	1909.	1910.	Changes.
Anthracite	3,114	14	D. 3,100
Bituminous	208,103	289,324	I. 81,221
Total coal	211,217	289,338	I. 78,121
Coke	28,594	20,186	D. 8,408

Canada furnished this year 247,380 tons of coal and nearly all the coke; Australia, 18,451 tons coal; Japan, 20,943 tons coal.

German Coal Trade—Exports and imports of fuel in Germany, month of January, metric tons:

	Exports.	Imports.	Excess.
Coal	1,789,986	603,572	Exp. 1,186,414
Brown coal	6,546	551,547	Imp. 545,001
Coke	302,611	62,157	Exp. 240,454
Briquets	121,911	15,787	Exp. 106,124
Total	2,221,054	1,233,063	Exp. 987,991
Total, 1909	2,217,285	1,158,857	Exp. 1,058,428

Exports of coke this year included 2108 tons to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices as follows on March 26: Best Welsh steam, $4.08; seconds, $3.96; thirds, $3.84; dry coals, $3.90; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.40; seconds, $2.16: This is a general drop of 6c. a ton. All prices are per long ton f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, April 6—The iron and steel trades still continue rather quiet. The waiting position has not been abandoned yet and the Western coal strike has affected the market sympathetically in some degree.

Pig-iron buying has been comparatively light. There seems to be little or no demand for bessemer or basic pig from the merchant furnaces in the Central West. There is more buying of foundry iron, but the users do not seem disposed to extend their commitments beyond the second quarter, unless they can secure substantial concessions in price. The continued offering of cheap Southern iron has disturbed the market in Eastern territory.

In finished material some business has been done in structural steel and there is also a good demand for bars and similar material which are reported selling well through jobbers. Railroad orders seem to have been suspended for the present.

Two foreign orders for rails are reported, one of 12,000 tons for Queensland and one of 10,000 tons for Manchuria; both going to Steel Corporation mills.

Importing Chinese Ore—A despatch to the Cleveland *Iron Trade Review* says: "A contract has been signed between the Western Steel Corporation of Seattle, Wash., and the Hanyang Iron and Steel Works, of Hangkow, China, by the terms of which the Steel Corporation contracts for the annual shipment of 100,000 tons of iron ore and 100,000 tons of pig iron from China, to Irondale, for a period of 15 years, with the privilege of renewal. The first shipments are expected to arrive on Puget sound May 15. It is stated the iron ore can be landed on the Pacific Coast for $3 per ton.

Baltimore

April 4—Imports for the week included 30 tons spiegeleisen, 2155 tons ferromanganese, and 83 casks silicospiegel from Liverpool; 600 tons manganese ore from Rotterdam; 17,350 tons iron ore from Cuba. Exports included 2025 tons steel rails to Argentina.

Birmingham

April 4—The activity in steel is attracting all the attention in the Southern field. The pig-iron market continues quiet. There is a little demand for iron and the quotations are a little higher than they have been. The lowest price now quoted is $13 per ton, No. 2 foundry, and very little is to be had at that price, save perhaps for immediate delivery. The furnace companies are beginning to hold to $13.50 and very little iron is going to the furnace yards. The make has been reduced a little by the blowing out of a furnace or two, but this was found necessary because of needed repairs. The demand for steel, in all shapes, is strong and there is no indication that the plants of the Tennessee company will be closed down any time this year. A recent sale of 10,000 tons of steel billets is reported. The rail mill has orders in hand that will require a steady operation for months to come.

Inquiries for pig iron are still coming in, the third quarter being the principal period. Some inquiries are coming in for the last quarter but so far the furnace companies are not willing to quote flat figures. The sale of a good round amount of iron to the cast-iron pipe people is reported in this district. Rumor has it that the iron was secured under the $13 basis. Basic and charcoal irons are still in good demand.

Chicago

April 4—Buying of pig iron continues to be light, and in small lots scattered throughout the foundry trade, with here and there a lot of fair size and with inquiries indicating heavy prospective needs but an unwillingness to buy until the melter feels that the bottom of the market has been surely reached. At $12.50 Birmingham, or $16.85 Chicago, considerable Southern No. 2 iron has changed hands, and Northern is by no means so steady as it has been, though holding up well to $18 for No. 2. The greater part of the business, as heretofore, is in Southern, and the aggregate tonnage perhaps is not so indicative of weakness as quotations imply, for buying, though in small lots, is general and steady. The ordinary melter of pig iron is buying for the third quarter or last half, with no perceptible difference in prices between deliveries in these periods and iron needed in the second quarter, for which there is enough demand to show that foundrymen are running closely up to their visible requirements in buying. Of basic and malleable irons sales have been good in the last week, for the last half generally. Iron and steel products continue in fair demand, with railroad supplies and structural material selling well. Coke is dull at $4.75 and in large supply.

Cleveland

April 4—Some inquiries for iron ore are reported, from eastern furnaces, but no sales. The ice is going out at the Sault, which looks like an early opening of navigation.

Pig Iron—Few sales are reported. There are some offers for second-quarter iron, but at prices which furnaces do not like. For Cleveland delivery $16@16.50 is quoted for No. 2 foundry, and $16 for forge.

Finished Material—A little business has been done in structural steel. Some cutting on sheets and plates is reported. A good order for girder rails and steel ties has been placed by a local trolley company.

Philadelphia

April 6—Large sales of basic and foundry pig iron have been made within a few days as the outcome of negotiations started two or three weeks ago. The transactions in basic hung fire several days over the question of price. Further transactions will probably take place, especially in basic, the requirements for which are heavy and the necessities urgent. There has been much delay in the placing of orders for foundry and recent orders represent only a small portion of the total estimated requirements. The quotations given for basic are $18.25 but the actual price paid is held back. No. 2 X foundry is quoted at the same figure and most of the sales made were controlled by the makers of the better brands on the market. More liberal offerings have been made of Southern irons and appearances indicate that less money will be taken for early summer deliveries. The ruling quotation for forge is $17.25. Southern is offered 25 or 50c. less.

Steel Billets—An improving demand for open-hearth billets is apparent but most of the orders are for small lots.

Bars—Retail sales of bar iron are naturally heavier at this time but there is very little business done in a large way.

Sheets—Manufacturers report a slight increase in business coming from a few large users.

Pipes and Tubes—No open changes in quotations have been made but prices are not as strong as they were.

Plates—The average volume of small orders has been booked this week and the outside selling prices were easily maintained.

Structural Material — Manufacturers are figuring on a dozen or more large requirements which will assuredly terminate in orders. Local requirements for small lots are urgent and top prices prevail.

Scrap—Heavy melting steel scrap has been largely cleaned up and No. 1 yard scrap is in good demand. Heavy cast scrap has been sold at 50c. a ton higher.

Pittsburg

April 5—Demand for steel products has not shown any further improvement in the past week, but it cannot be said, either, that it has decreased. There is really more business being done than is generally assumed. The trouble with the industry, or what would be regarded as trouble by producers, is that demand is just a trifle under producing capacity instead of being just a trifle over, whereby the market has no "snap"; in other words, there is not the least basis for advancing prices. If, suddenly, demand were reduced 10 per cent. and 20 per cent. of existing capacity disappeared at the same time, conditions would doubtless be produced which would lead to the market being considered a very active one, although the total business actually transacted would be reduced.

There is an improvement in buying in some directions which is clearly attributable to the progress of the season. There is no improvement in railroad buying, but as a matter of fact the railroads have been fairly good buyers; a comparison of actual orders placed in the past few weeks shows that they have been well ahead of the average rate in 1908 and 1909, although correspondingly behind the average rate in the three preceding years. Demand for pipe has somewhat improved, but not enough to take care of the heavy stocks accumulating, and last Wednesday night the Lorain plant of the National Tube Company was closed, its warehouses being fuller than for years. There was too much pipe taken by jobbers last fall, when the market was excited and expecting advances, to permit of much additional taking from mills in the winter, when distribution into actual consumption was light.

Pig Iron—Few sales are openly reported in the market, but it is evident that there has been a great deal of quiet selling in the past few weeks, at concessions from regularly quoted prices. This has strengthened the furnace position but it is doubtful if it has strengthened the market, or will permit of any advances in the near future. We note a sale of 3000 tons of bessemer and one carload, both for shipment east, at $17.50, Valley, and continue to quote that as the market. A sale of 500 tons of malleable was made at $16, Valley, this price being quotable on malleable, No. 2 foundry and basic, although in the case of foundry it could probably be shaded by a close buyer.

Ferromanganese—The market has been weak, with prices irregular. Sales of prompt have been made at $41, Baltimore, and this price could probably be done again, while deliveries over second quarter could probably be had at $41.50. On April 1 the freight from Baltimore to Pittsburg was restored to the old rate of $1.95, from which it was advanced to $2.30 on Jan. 1 last.

Steel—Some off lots of resale bessemer billets have gone at $27, mill, or possibly at less. Open-hearth billets are, if anything, stronger, when any special analysis or size is wanted. In general the market can be quoted unchanged at $27@27.50 for bessemer billets, $27.50@28 for open-hearth billets, $28.50@29 for sheet-bars, and $33 for rods, all f.o.b. maker's mill, Pittsburg or Youngstown district.

Sheets—Prices are better maintained than they were, concessions amounting to only $1 a ton at most, and then only on good sized orders. Regular prices are 2.40c. on black and 3.50c. on galvanized, with corrugated roofing at $1.70 for painted and $3 for galvanized. Blue annealed sheets on contract, for far forward delivery, go at 1.75c., but prompt deliveries command 1.90c. or even higher. The leading interest has begun booking sheet orders through the year, and so much of its business taken for delivery before July 1 is certain to run over into third quarter that it has little unsold tonnage for that quarter.

FOREIGN IRON TRADE

United States Foreign Trade—Exports and imports of iron and steel in the United States for the two months ended Feb. 28 are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1909.	1910.	Changes
Exports	$21,276,547	$25,093,856	I. $ 3,817,309
Imports	3,655,181	6,280,306	I 2,625,175
Excess, exp.	$17,621,416	$18,813,550	I. $ 1,192,134

The leading items were as follows, in long tons:

	Exports		Imports	
	1909.	1910.	1909.	1910.
Pig iron	5,962	7,640	20,643	39,237
Scrap	1,596	658	1,064	33,139
Billets, blooms, etc.	15,974	4,676	2,018	7,312
Bars	10,761	16,290	3,653	5,386
Rails	33,714	75,685	225	1,487
Sheets and plates	19,990	45,298	398	993
Structural steel	15,813	17,795	1,833	1,521
Wire-rods	2,142	1,876	1,834	2,749
Wire	20,115	22,634	.....	......
Nails and spikes	8,353	8,951	.....	.....
Tinplates	2,073	1,679	7,453	10,963
Pipe and fittings	16,982	25,008	.....	......

Imports of wire not given in quantities; values were $156,568 in 1909, and $208,550 this year.

United States Iron Ore Movement—Imports and exports of iron ore in the United States, two months ended Feb. 28, long tons:

	1909.	1910.	Changes.
Imports	166,982	455,250	I. 288,268
Exports	11,799	8,513	D. 3,286

Of the imports this year 245,150 tons were from Cuba, and 173,989 tons from Europe.

Imports of manganese ore for the two months were 35,060 tons in 1909, and 44,433 in 1910; increase, 9373 tons.

German Iron Production—The German Iron and Steel Union reports the make of pig iron in February at 1,091,351 tons, being 86,223 tons less than in January. For the two months ended Feb. 28 the production was, in metric tons:

	1909.	1910.	Changes.
Foundry iron	376,554	435,026	I. 58,472
Forge iron	114,732	110,108	D. 4,624
Steel pig	182,067	199,264	I. 17,197
Bessemer pig	72,671	76,972	I. 4,301
Thomas(basic)pig	1,225,364	1,447,555	I. 222,191
Total	1,971,388	2,268,925	I. 297,537

Total increase this year, 15.1 per cent. Steel pig includes spiegeleisen, ferromanganese, and all similar alloys.

METAL · MARKETS

New York, April 6—The metal markets generally show little change, and no special activity.

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin, lead, zinc and aluminum, was 127 for the month of January; 124 for February.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Feb. 1910	$ 2,937,134	$ 3,063,116	Imp. $ 125,982
" 1909	8,860,814	3,576,444	Exp. 5,284,370
Year 1910	9,100,266	6,194,473	" 2,905,793
" 1909	16,696,170	6,966,627	" 9,699,543
Silver:			
Feb. 1910	4,588,619	3,155,329	Exp. 1,433,290
" 1909	4,852,549	3,508,935	" 1,343,614
Year 1910	9,086,923	7,403,683	" 1,683,240
" 1909	9,394,643	7,173,687	" 2,220,956

Exports from the port of New York, week ended April 2: Gold, $104,816, to the West Indies; silver, $723,142, chiefly to London. Imports: Gold, $1,621,831, including $1,541,000 French coin in transit; silver, $71,943, from Central and South America.

Gold—There was a considerable demand for gold on the open market in London this week. The price of bars remained unchanged at 77s. 9d. per oz., but the Bank of England offered a premium on American coin, making the price 77s. 5½d. per oz. This resulted in the taking of $7,500,000 in New York for export to London and more is expected to follow.

Platinum—Business is steady and the market is firm. There is some expectation of an advance, but as yet prices are unchanged, dealers asking $29@29.50 per oz. for refined platinum, and $34.50 per oz. for hard metal.

Silver—The market has continued to show considerable strength on buying by India bazaars and China banks. The market closes steadv at 24 1/6d. in London.

SILVER AND STERLING EXCHANGE

Mar.-Apr.	31	1	2	4	5	6
New York	52½	52½	52½	52½	52⅜	52⅜
London	24 3/16	24⅛	24⅛	24⅛	24 1/16	24 1/16
Sterling Ex.	4.8750	4.8770	4.8775	4.8795	4.8785	4.8775

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to March 23, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India	£1,083,000	£1,375,500	I. £ 292,500
China	657,000	904,500	I. 247,500
Straits	82,800	......	D. 82,800
Total	£1,822,800	£2,280,000	I. £ 457,200

India Council bills sold in London at an average of 16.13d. per rupee.

The cable reports the gold production of the Transvaal in March at 615,000 oz., or $12,712,050. This makes the total for the three months ended March 31 this year 1,791,990 oz., or $37,040,433; an increase of $76,611 over the first quarter of last year.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Mar.-Apr.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
31	13⅜ @13⅝	13 @13⅛	57¾	33¼	4.37½ @4.40	4.22½ @4.25	5.42½ @5.45
1	13⅜ @13½	13 @13⅛	58⅛	33¼	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
2	13⅜ @13½	13 @13⅛	. . .	33¼	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
4	13⅜ @13½	13 @13⅛	58⅛	33⅛	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
5	13⅜ @13½	13 @13⅛	58	32⅞	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
6	13⅜ @13½	13 @13⅛	58⅛	33	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers. basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Some of the large sellers made a strong effort during the past week to stimulate business by offering further concessions. They succeeded to a certain extent in procuring some orders from domestic consumers and a fairly large business for export, but it is said that on the latter particularly the prices have been somewhat lower than expressed in the quotations. Lake has again been entirely nominal. The close is reported at 13⅜@13½c. for Lake copper, and 13@13⅛c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12⅞@13 cents.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¾c. base, carload lots at mill.

The London market has fluctuated within narrow limits throughout the week and closes steady at £58 2s. 6d. for spot, and £59 5s. for three months.

Refined and manufactured sorts we quote: English tough, £61; best selected, £61@£61 10s.; strong sheets, £70@£71.

Copper exports from New York and Philadelphia for the week were 2784 long tons. Our special correspondent gives the exports from Baltimore at 717 tons copper.

Tin—As was generally expected, the statistics for the month of March turned out to be very favorable. Notwithstanding the Banka sale which took place last month, the visible supply decreased over 900 tons. The market in consequence ruled very firm up to the beginning of this month, but weakened after the statistics became known. The high point of £152 10s. for spot and £154 10s. for three months was reached on March 31. The close is cabled as firm at £150 for spot and £152 2s. 6d. for three months.

In the domestic market a few purchases for near-by delivery were made by consumers, and there was some business in future tin among dealers, the sellers being prepared to quote somewhat below import prices. At the close, tin is quoted at about 33 cents.

Visible stocks of tin—including tin afloat—on April 1 are estimated as follows: London, 10,185; Holland, 3109; United States, excluding Pacific ports, 6909; total, 20,203 long tons, a decrease of 1085 tons from the March report.

Lead—The market is steady at the last quotations, 4.37½@4.40c. New York, and 4.22½@4.25c. St. Louis.

The London market for lead has been rather easier; the closing quotations are cabled lower at £12 13s. 9d. for Spanish, and £12 16s. 3d. for English.

Spelter—There has been sufficient business to take care readily of current offerings, and the market closes firm at 5.57½@5.62½c. New York, and 5.42½@5.47½c. St. Louis.

New York quotations for spelter, March 31 were 5.57½@5.60c.; April 1-6, inclusive, 5.57½@5.62½ cents.

The London market is unchanged at £23 for good ordinaries and £23 5s. for specials.

Base price of zinc sheets is $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Business is active in all lines. The market is strong at 23¼@23¾c. per lb. for No. 1 ingots in large lots, New York. Demand appears to be fully up to production.

It is reported that the Canadian Hydro-Electric Commission has placed an order with the Aluminum Company of America for 1,500,000 lb. wire, to be used in transmitting power from Niagara Falls to Toronto.

Antimony—The market is quiet, with only moderate sales. There has been a slight readjustment in prices, Cookson's being quoted at 8¼@8½c. per lb., while 7[illegible]@8c. is asked for U. S. and 7⅜@7[illegible]c. for outside brands.

Quicksilver—The market is easier and there has been a slight drop in prices. The New York quotation is $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for retail lots. San Francisco, $47@48 for domestic business; $2 less for export. The London price is £9 5s., but jobbers sell at £9 1s. 3d. per flask.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. Prices in Germany are 500@550 marks per 100 kg.—average 56.7c. per lb.—f.o.b. works in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, two months ended Feb. 28, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.	
Copper, long tons	55,438	22,998	Exp.	32,440
Copper, 1909....	36,542	21,401	Exp.	15,141
Tin, long tons....	60	9,221	Imp.	9,161
Tin, 1909........	70	5,944	Imp.	5,874
Lead, short tons.	15,440	18,108	Imp.	2,668
Lead, 1909......	13,839	18,473	Imp.	4,634
Spelter, sh. tons	224	717	Imp.	493
Spelter, 1909....	724	680	Exp.	44
Nickel, lb........	2,136,223	5,116,641	Imp.	2,980,418
Nickel, 1909....	1,490,116	2,163,266	Imp.	673,150
Antimony, lb....	....	1,337,767	Imp.	1,337,767
Antimony, 1909.	....	1,094,991	Imp.	1,094,991
Platinum, oz.....	... .	16,984	Imp.	16,984
Platinum, 1909.	.. .. .	21,841	Imp.	21,841
Quicksilver, lb ..	15,642	....	Exp.	15,642
Quicksilver, '09	8,878	....	Exp.	8,878
Aluminum, value	$43,706	.. ....	Exp.	$43,706
Aluminum, 1909	13,575	....	Exp.	13,575
Ores, etc.:				
Zinc oxide, lb. ..	3,908,222	....	Exp.	3,908,222
Zinc oxide, '09..	4,067,311	....	Exp.	4,067,311
Zinc dross, lb....	407,480	....	Exp.	407,480
Zinc dross, '09..	2,259,462	....	Exp.	2,259,462
Zinc ores, lg. tons	4,375	11,222	Imp.	6,847
Zinc ores, 1909.	....	13,242	Imp.	13,242
Antim'y ores, lb.	....	....	....	....
Ant. ores, 1909.	504	2,343,918	Imp.	2,343,414
Chrome ore, tons	20	8,121	Imp.	8,101
Chrome ore, '09	....	6,801	Imp.	6,801

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in 1910, were 8,570,935 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported this year, only metal contents being given.

Zinc and Lead [Ore Markets

Platteville, Wis., April 2—The base price of 60 per cent. zinc ore was $42@43 per ton. The base price of 80 per cent. lead ore was $50 per ton.

SHIPMENTS, WEEK ENDED APRIL 2.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point...	584,000	56,000	....
Highland...............	418,900	....	....
Platteville.............	320,800	....	470,660
Benton.................	251,050	....	....
Cuba City..............	174,385	....	... ...
Galena.........	88,000	......	....
Linden...	......	......	170,380
Total.....	1,837,135	....	641,040
Year to date..........	20,290,905	1,461,199	4,056,090

In addition to the above there was shipped during the week to the separating plants, 2,289,770 lb. zinc concentrates.

Joplin, Mo., April 2—The highest price aid for zinc sulphide ore was $46, the ase ranging from $43 down to $40 per on of 60 per cent. zinc. Zinc silicate old at $16@24 per ton. The average rice, all grades zinc ore was $39.44 per on. Lead ore sold all week at $50 per on for the best grades, with deductions or each 1 per cent. under 80 per cent., ut with no advances for ores assaying ver 80 per cent. lead. The average price, ll grades of lead ore, was $49.92 per ton.

Outputting conditions were generally air, though there is an increasing shortge of mine workers, as the men are rawn west by higher prices in those nines. The coal strike will not affect utputting to any serious extent immeiately, but if long continued will cripple he output in camps isolated from the atural gas supply. It will, however, pur stop to nearly all drill prospect work ll over the district.

SHIPMENTS. WEEK ENDED APRIL 2.

	Zinc, lb.	Lead, lb.	Value.
ebb City–Carterville	4,789,400	957,700	$122,125
oplin	1,692,080	301,150	43,485
uenweg	1,006,360	204,900	24,236
lba-Neck	600,930	10,840	14,092
alena	512,940	59,250	11,995
ranby	492,040	15,100	6,970
urora	306,140	49,850	6,252
purgeon	278,590	50,070	5,864
uapaw	267,800	7,050	5,528
arthage	184,810	......	4,065
Miami	336,330	11,650	3,984
arl Junction	141,080	......	2,962
adger	140,600	......	2,952
ave Springs	109,300	......	2,240
arcoxie	167,160	......	2,301
Totals	11,025,560	1,167,260	$259,051
4 weeks	151,571,820	22,981,190	$3,760,142

inc value, the week, $217,430; 14 weeks, $3,136,962
Lead value, the week, 41,621; 14 weeks, 623,180

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$11.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, April 6—There has been little change in the general market, which continues fairly steady, showing a good amount of business done.

Copper Sulphate—Business is steady and the market shows no change. Prices continue $4.10 per 100 lb. for carload lots and $4.35 for smaller orders.

Nitrate of Soda—Sales of spot nitrate continue large and the article holds firm at 2.15c. per lb. The prospect of large imports has weakened futures and they are rather soft at 2.05c. per lb. for the balance of the year.

Arsenic—Early in the week there was considerable activity but it subsided later. There is rather a wide range, quotations varying from $2.37½ up to $2.62½ per 100 lb. for white arsenic.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, two months ended Feb. 28:

	Imports.	Exports.		Excess.
Copper sulph. lb.	....	1,748,703	E.	1,748,703
Copper sul., '09	....	1,318,978	E.	1,318,978
Bleach, lb.	15,459,932	....	I.	15,459,932
Bleach, 1909	12,814,773	....	I.	12,814,773
Potash salts, lb.	107,579,742	804,221	I.	106,775,521
Potash salts, '09	57,491,844	1,108,105	I.	56,383,739
Soda salts, lb.	3,047,587	113,907	I.	2,933,680
Soda salts, 1909	2,005,224	94,002	I.	1,911,222
Acetate lime, lb.	....	10,203,111	E.	10,203,111
Acetate, 1909	....	16,725,160	E.	16,725,160
Nit. of soda, tons	96,769	1,790	I.	94,979
Nitrate, 1909	46,526	1,035	I.	43,491
Phosphates, tons	3,894	101,280	E.	97,386
Phosphates, '09	425	119,005	E.	118,580
Sulphur, tons	5,803	11,925	E.	6,122
Sulphur, 1909	5,737	6,537	E.	800
Pyrites, tons	132,756	....	I.	132,756
Pyrites, 1909	94,126	....	I.	94,126
Magnesite, lb.	37,352,402	1,348,602	I.	36,003,800
Magnesite, 1909	....	....		....

Exports include reëxports of foreign material. Figures for magnesite not reported separately prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 58,905 tons.

MINING·STOCKS

New York, April 6—The general stock market has been quiet and inclined to weakness. Prices, however, have been irregular, some stocks having taken a turn upward though not to any great extent, while others have reported lower quotations. The volume of trading was small throughout the week.

The Curb market was also dull and irregular. A few of the copper stocks came near holding their own, but the majority recorded lower prices. Trading was not at all active and such changes as were made were on small business.

At public auction in New York, March 30, sales were made of 200 shares Goldfield-Daisy Mining Syndicate, $1 par, at 8c. per share; 2500 shares Butte-New York Copper Company, $5 par, at 70c. per share. Ten shares Greene Consolidated Gold Company, lumped in with 20 shares Distilling Company of America and 100 shares Electric Vehicle Company, brought $121 for the lot.

Boston, April 5—Copper shares show little or no rallying power. One thing after another has happened to discourage holders of these stocks and although there is a ray of sunlight it is but faint as yet.

Arizona Commercial sought a low at $18 and has recovered but little from the sharp decline of above $52 only a few months ago. President Amster talks hopefully. The decline started when the company reported a floating debt of $385,000 as of Dec. 31 last, which has grown in the meantime.

Granby mining has steadied as liquidation has ceased. Utah Consolidated worked off to $24.50 today as a result of the issue of the annual report.

Lake Copper fell $11.50 to $52 over night and is off $16 net for the week as the result of the mill run for March. Indiana was carried off $6 to $26 and North Lake $2 to $14.25, although for the week the former has fallen $12 and the latter $2.75 net.

Calumet & Hecla has worked off $30

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	January.	February.	March.
Arizona, Ltd.	2,646,000	2,658,000	.....
Boleo (Mexico)	2,644,800	2,331,832	... .
Copper Queen	10,001,000	8,927,203	....
Calumet & Ariz.	2,331,000	2,024,000	....
Cananea (Mexico)	3,500,000	3,586,000	....
Detroit	2,166,156	1,486,400	... .
Imperial	850,000	750,000	....
Nevada Con. (Est.)	3,800 000	5,000,000	....
Old Dominion	2,130,000	2,035,000	2,674,000
Shannon	1,510,696	1 526,000	1,468,000
Superior & Pitts.	2,166 000	1,864,000	....
Utah Copper Co.	4,745,016	5,798,819	.. ..
Butte District	19,250,000	13,758 620	24,700,000
Lake Superior	19,260,127	18,250,000	.. ..
Total production	77 000,845	69,995,874	... .
Imports, bars, etc.	24,305,526	14,093,381	....
Imp. in ore & matte	7,053,522	6,063,764	....
Total	108,359,893	90,153,019	....

Butte district and Lake Superior figures are estimated: others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
IV, 1909	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	....	....	....

VISIBLE STOCKS.

	United States.	Europe.	Total.
IV, 1909	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	....	249,625,600	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

to $670 since the death of President Agassiz was announced. North Butte has steadied since broker Charles A. Clark of this city has sought to get proxies for a minority representation on the board of directors.

The weakness of Arizona Commercial brought sympathetic declines in Boston & Corbin and Shannon and the break in Lake caused recessions in South Lake, Bohemia and Oneco on the Curb. First National has broken to $2.62½ on the Curb. An assessment now seems imminent.

American Zinc, Lead and Smelting directors have declared a dividend of 50 cents, payable April 20, and have also authorized the sale of $750,000 in 6 per cent. five-year convertible debenture bonds which will bring the working capital up to $1,000,000. The bonds are underwritten.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.	Mar. 12	Apr. 7	$0.05
Belcher, Nev.	Mar. 9	Mar. 29	0.10
Brown Stone, Utah	Apr. 15	June 10	0.00½
Cardiff, Utah	Mar. 10	Mar. 28	0.00⅓
Central Eureka, Nev.	Mar. 13	Apr. 23	0.02½
Chollar, Nev	Mar. 8	Mar. 31	0.10
Columbus Con., Utah	....	May 11	0.25
Confidence, Nev.	Mar. 25	Apr. 15	0.20
Con. Imperial, Nev.	Apr. 19	May 12	0 01
Gould & Curry, Nev.	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev.	Mar. 9	Mar. 31	0.10
Hancock, Mich.	May 2	....	3.00
New Arcadian, Mich.	Mar. 10	....	1.00
Ojibway, Mich.	Mr.Oct.	....	2.00
Ophir, Nev.	Apr. 22	May 16	0.25
Oneco, Mich.	Feb. 15	....	1.00
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev.	Apr. 5	Apr. 28	0.10
Seven Troughs Mon., Utah.	Mar. 12	Apr. 2	0.00½
Sierra Nevada, Nev.	Apr. 7	Apr. 27	0 10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Utah, Nev.	Apr. 12	May 3	0 05
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52..38	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56	......	12.93	......	57.363	......
May	12.893	......	13.238	......	59.338	......
June	13.214	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	32.403	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Apr. 5

Name of Comp.	Bid.
Listed:	
Acacia	.05½
Cripple Cr'k Con.	.02¾
C. K. & N.	.12½
Doctor Jack Pot.	.07⅞
Elkton Con.	.69
El Paso	.68¼
Fannie Rawlins	.05
Findlay	.09¾
Gold Dollar	.09½
Gold Sovereign	.04
Isabella	.17
Mary McKinney	.46
Pharmacist	.03
Portland	1 10
Vindicator	.80
Work	.04½
Unlisted:	
Golden Cycle	1 50
United Gold Mines	.09

SALT LAKE Apr. 5

Name of Comp.	Clg.
Carisa	.59
Colorado Mining	.78
Columbus Con.	.30
Daly Judge	‡4.10
Grand Central	1.50
Iron Blossom	1.05
Little Bell	1 65
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	1.65
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.50
New York	.13
Prince Con	.87
Red Warrior	‡6.00
Silver King Coal'n	2.45
Sioux Con.	.45
Uncle Sam	.39½
Victoria	1.25

SAN FRANCISCO. April 5.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.14	Belmont	2.50
Belcher	.90	Daisy	.08
Best & Belcher	.25	Jim Butler	.18
Caledonia	.64	MacNamara	.33
Challenge Con.	.30	Midway	.31
Chollar	.22	North Star	.01
Confidence	1.05	West End Con.	.36
Con. Cal. & Va.	1.12	Atlanta	.14
Crown Point	.90	Booth	.10
Exchequer	.25	C.O.D. Con.	.05
Gould & Curry	.26	Columbia Mt.	.06
Hale & Norcross	.42	Comb. Frac.	.44
Mexican	1.27	Great Bend	.03
Ophir	1.15	Jumbo Extension	.36
Overman	1.25	Oro	.07
Potosi	.30	Red Hill	.04
Savage	.32	Sandstorm	.03
Sierra Nevada	.54	Silver Pick	.10
Union	.70	St. Ives	.16
Yellow Jacket	.90	Tramps Con.	.05

N. Y. EXCH. Apr. 5

Name of Comp.	Clg.
Amalgamated	76¾
Am. Agri. Chem.	45
Am.Sm.&Ref.,com	82⅛
Am. Sm. & Ref., pf.	106
Anaconda	47⅜
Bethlehem Steel	30
Col. & Hock. C. & I.	13⅜
Colo. Fuel & Iron.	40
Du Pont P'd'r, pf.	87½
Federal M. & S.	53¼
Great Nor., orectf.	67½
Nat'nalLead,com.	81
National Lead, pf.	108½
Pittsburg Coal	20½
RepublicI&S,com.	37
Republic I & S, pf.	100
SlossSheffi'd,com.	‡75
Sloss Sheffield, pf.	‡117½
Tennessee Copper	‡31½
Utah Copper	46¼
U. S. Steel, com.	85¼
U. S. Steel, pf.	120
Va. Car. Chem.	59

N. Y. CURB Apr. 5

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	18
Braden Copper	4⅞
B. C. Copper	6½
Buffalo Mines	3½
Butte Coalition	23¼
Chino Copper	14⅛
Cobalt Central	.15½
Combination Fra.	.48
Con. Ariz. Sm.	2½
Cumberland Ely	9
Davis-Daly	2⅞
Dominion Cop.	7
Ely Con	.68⅞
El Rayo	3
Florence	3⅛
Gila Copper	7⅛
Giroux	8⅛
Gold Hill	1½
Goldfield Con.	7⅞
Greene Cananea	9½
Guanajuato	1⅜
Guggen. Exp.	200
Kerr Lake	.08¾
La Rose	4 5/16
McKinley-Dar-Sa.	.96
Miami Copper	23¾
Mines Co. of Am.	48
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1⅛
Newhouse M. & S.	3½
Nipissing Mines	10⅛
Ohio Copper	4
Pacific Sm. & M.	¾
Silver Queen	.18
Standard Oil	620
Stewart	9/16
Tonopah	6¾
Tonopah Ex.	.78
Tri-Bullion	15/16
Utah Apex	‡3¾
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4⅜

LONDON Apr. 6

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	8	6
Esperanza	2	16	3
Tomboy	0	18	9
El Oro	1	8	3
Oroville	0	9	6

BOSTON EXCH. Apr. 5

Name of Comp.	Clg.
Adventure	6½
Allouez	46
Am. Zinc	26
Arcadian	5⅛
Arizona Com	20
Atlantic	7½
Boston Con.	17½
Butte & Balak	9½
Calumet & Ariz.	66
Calumet & Hecla.	580
Centennial	18¼
Con. Mercur	.10
Copper Range	71
Daly-West	9½
East Butte	8½
Franklin	15
Granby	45½
Greene-Can.	9¼
Hancock	20
Helvetia	3½
Indiana	28½
Isle Royale	18
Keweenaw	4⅛
Lake	57⅛
La Salle	14½
Mass	7
Michigan	5½
Mohawk	52
Nevada	21½
North Butte	35¼
North Lake	15½
Ojibway	8½
Old Dominion	38
Osceola	142
Parrot	16
Quincy	82½
Shannon	12
Superior	45¼
Superior & Bost.	12¾
Superior & Pitts.	13¼
Tamarack	55
Trinity	7
U. S. Smg. & Ref.	43
U.S.Sm. & Re., pd.	49½
Utah Apex	3½
Utah Con.	26½
Victoria	3⅞
Winona	8
Wolverine	128
Wyandotte	2½

BOSTON CURB Apr. 5

Name of Comp.	Clg.
Ahmeek	‡190
Bingham Mines	‡3½
Boston Ely	3¾
Calaveras	5 11/16
Champion	.09
Chemung	10
Chief Cons.	2
Chino	14¼
Cons. Ariz.	‡2⅜
Corbin	.08⅜
Cactus	3¾
Crown Reserve	‡3⅞
First Nat. Cop.	2 3/16
Gila Copper	6⅞
Indiana	‡34½
Inspiration	7¾
Majestic	.86
Nevada-Douglas	3
New Baltic	8
Oneco	4 1/16
Ray Central	3 7/16
Ray Con.	21½
Rawhide Coal	.36
Rhode Island Coal	9
San Antonio	‡10⅛
Shattuck-Ariz.	30
South Lake	9½
Superior & Globe.	.60
Trethewey	‡1⅞
Tuolumne Copper	‡3¼
Vulture	9½
Yuma	.99

‡Last quotation.

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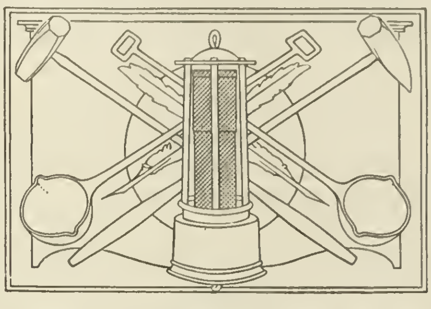

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April 2	11,000
April 9	9,500
April 16	9,500

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The Copper Statistics for March

The last report of the Copper Producers' Association was a disappointment, inasmuch as it showed that the world's visible supply had increased by about 12,000,000 lb. As we have previously pointed out it is now the European statistics that chiefly command attention. An increase here would be of no consequence if it were offset by a decrease on the other side. That indeed is almost the best to be hoped for, inasmuch as affairs have been brought to the state where we can no longer export copper except to fill demands for special shapes or by cutting prices, which latter the producers have apparently resolved to do.

There is no doubt that consumption is increasing both in Europe and America, and probably is now in excess of current production. The suspicion has been expressed that the invisible stocks have been drawn upon in greater proportion than the visible. This suggestion, which is plausible, may account for the maintenance of the visible stocks so far and may indicate a more rapid reduction of them later on.

The domestic deliveries in the first quarter of 1910 were 207,621,527 lb., against 202,736,991 in the previous quarter. We fancy that actual consumption increased in somewhat greater ratio, as we do not believe that manufacturers were so largely overbought on March 31 as they were on Dec. 31. Anyway the statistics prove that copper is being consumed in this country at an enormous rate, in spite of the slack demand for heavy wire, which has not experienced any revival since the set-back three years ago. The reappearance of this demand and a restoration of British consumption to normal rate will answer, in part at least, the question as to how the accumulation of copper is going to be absorbed.

An encouraging feature of the March statistics was a diminution of 152,302 lb. in the daily rate of production by American refineries, reflecting to some extent the lessened production of the smelters in December last. The average daily production of refined in February was 3,873,144 lb., against 4,025,446 in February. Reviewing the statistics of the last 12 months it appears that production has attained its climax for the present at a daily rate of a little over four million pounds. If this be so and if it be true that consumption is now outrunning production the chief requisites are confidence and patience.

Federal Mining and Smelting Company

The latest case of who is going to hold the bag seems to be that of the Federal Mining and Smelting Company. This concern is a consolidation of many of the lead mines of the Cœur d'Alene and is one of the large producers of lead in the United States. The company was organized with preferred and common stock. The latter was once owned largely by the American Smelters Securities Company, which thereby was reputed to control the Federal. Anyway the Federal was for a long time under Guggenheim management, but apparently is so no longer.

The Federal stocks, which are listed on the New York stock exchange, have lately suffered a severe decline. The preferred stock sold at 91@112⅞ in 1906, at 80@94 in 1909, and since Jan. 1, 1910, has been as low as 53. The common stock sold at 138@199 in 1906, at 55@95½ in 1909, and since Jan. 1, 1910 has been as low as 40.

The reason for this decline has not been explained. There has been costly litigation between the Bunker Hill & Sullivan and Federal companies over an apex question involving one of the latter's mines. There has lately been a proposal to compromise this by turning over the Last Chance mine to the Bunker Hill & Sullivan company, a large block of the stock of the latter being transferred to the Federal. This proposal now awaits the confirmation of the respective stockholders. The Last Chance mine is one of the most valuable of the Federal group, and the recent slump in the stock may hinge upon this settlement.

The Federal company is one of those mining companies which does not make a decent report to its stockholders, the latter being a bare statement of production and a few figures as to net earnings, etc., with never a word about operating costs or physical condition of the property. Not long ago the company was obliged to abandon its Tiger-Poorman mine as being unprofitable. All of these mines were old when the Federal company was organized. We are under the impression that the recent decline is due also to the fact that some others of the group are approaching the end of their productiveness.

The particularly interesting thing about the present situation is that in December last the American Smelters Securities Company made to the New York Stock Exchange a statement of all its possessions. Earlier in the year the American Smelting and Refining Company made a similar statement. In neither does there appear a single share of Federal Mining and Smelting Company. Nor does there in the official reports of the Guggenheim Exploration Company. It would be interesting to know when and how the ownership of the Federal stock was shifted, and who holds it now.

We have no reflections to cast upon anybody in this matter. In this case the management never made any pretence of telling the stockholders *in esse* or *in posse* more than an iota of what ought to be known for rational investment. If investors are such fools as to put their money into such companies they have no one but themselves to blame. The only other party to blame, that we can think of, is the governors of the New Stock Exchange, who permit the offering of stocks of mining companies which do not make adequate reports. The governors know what an adequate report is because they have been advised about it by the Mining and Metallurgical Society.

Production of Zinc Ore in 1909

The production of zinc ore in North America in 1909 is given in the accompanying table. The figures are compiled from reports of ore receipts by the smelters and oxide manufacturers, except in the case of New Jersey, and consequently represent closely the production of the mines. The figures for New Jersey represent mine production. This ore, averaging about 20 per cent. zinc, is separated primarily into willemite and franklinite. The former is used for the manufacture of spelter here and abroad. The latter is employed for the manufacture of zinc oxide. As to the remainder of the production, the statistics do not permit the division between blende and calamine, but it may be said with assurance that the major part is blende.

PRODUCTION OF ZINC ORE IN THE UNITED STATES.

(IN TONS OF 2000 LB.)

State.	1908.	1909.
Arizona	(*a*)	7,908
Arkansas	2,582	(*b*) 320
Colorado	85,052	90,288
Idaho	1,558	2,781
Kentucky	341	(*b*) 94
Missouri-Kansas	273,420	304,581
Montana	2,783	12,037
Nevada	1,445	4,609
New Mexico	2,290	19,163
New Jersey	399,232	479,699
Oklahoma	9,300	17,089
Tennessee	(*a*)	1,710
Utah	709	18,130
Wisconsin	58,135	69,000
Others	1,530	572
Totals	838,377	1,027,981
British Columbia	6,157	9,163
Mexico	66,383	90,707
Grand total	910,917	1,127,854

(*a*) Included in "others." (*b*) These figures may be a little too low, there being a possibility that some ore originating in these States has been credited to other States, especially Missouri and Kansas.

The production of zinc ore in 1909 was the largest on record. Another noteworthy feature of the statistics for 1909 is that each State made an increased production, which was due partly to the high price for zinc ore and partly to the development of new districts, which would probably have added to their production without the special stimulus that they received. This was the case with Butte, Miami (Okla.), Good Springs (Nev.), and probably Arizona. The larger production of New Mexico was due chiefly to the resumption of shipments from Magdalena.

A steadily increasing production is to be expected from Montana, Oklahoma and Wisconsin. Colorado will probably hold its own for a few years, after which it is likely to fall off, inasmuch as Leadville is understood to have no great reserves remaining, except in the Colonel Sellers mine. The future of Utah, New Mexico, Arizona and Nevada is uncertain, but probably they will maintain the tonnage of 1909 if spelter averages about 5.50c., St. Louis.

A remarkable development of 1909 was the large importation of ore from British Columbia and Mexico in spite of the tariff that went into effect shortly after the middle of the year. A great deal of ore was imported in anticipation thereof, but when the price for spelter rose so high in the fall, it became possible to bring in foreign ore and pay the duty.

Production of Lead in 1909

In our report of last week an unfortunate typographical error occurred, the correct figures having been given, but a shift in their position making the report an apparent absurdity, although, of course, it was obvious that an error had happened. The table should have been as follows:

PRODUCTION OF REFINED LEAD IN 1909.

(In tons of 2000 lb.)

Class	1908.	1909.
1. **Desilverized**	174,650	211,499
2. **Antimonial**	13,109	10,392
3. **Southeast Missouri**	113,103	126,784
4. **Southwest Missouri**	18,014	20,489
Total domestic	318,876	369,164
5. **Desilverized, foreign**	94,992	89,681
6. **Antimonial, foreign**	(*a*)	2,338
Grand total	413,868	461,183

(*a*) Included with antimonial reported as of domestic origin.

We reproduce the above table in order to perfect the record.

The decision in the Doctor-Jack Pot vs. Work case in Colorado last week, which is reported briefly by our Denver correspondent, is of an extraordinary character, so much so that in effect it resolves the ridiculous extra lateral rights of our mining law into a *reductio ad absurdum*. We shall discuss this case more fully in a subsequent issue.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Why Prospecting Is on the Wane in Montana

Reading the article by William Weston in the JOURNAL of April 2 on the lines of the above title with reference to Colorado, I am led to note a few observations gathered from two years' experience in Montana, just terminated, as mineral inspector of the General Land Office, this experience covering most of the quartz and placer camps of the State.

I have seen but one case where the existence of the forest reserve interfered in the smallest way with the prospecting of the land, and this case was that of a withdrawal for administrative purposes which could be readily adjusted by taking the matter up with the proper forest official.

Montana is handicapped to a considerable extent by the Northern Pacific railway grant in which, through the mineral commissions, much of the land has been classified as "agricultural." This is especially true where there are valuable forests on the land. This matter was taken up by the association of miners formed about three years ago, and much material has been furnished to the department at Washington and is "pending consideration." It is hoped that these lands, "erroneously" classified, will some day be properly returned to the public domain.

Now, as to the real cause for none or very few of the new "pans of cream" being found in Montana, I can say that there is a dearth of prospectors. The prospector of today is going over a field, itself pretty well skimmed of the easily discovered crops. To prospect today means work, intelligence and perseverance. As in Colorado, there is no doubt that many a reef is yet uncovered. This is being demonstrated by companies who are using capital and intelligent direction for the purpose of prospecting; going deep through drift, slide and timber to get at the outcrops of the veins. The other veins are gone—those that stood above the surface; the oldtimers overlooked no bets of that kind.

To make this new kind of prospecting attractive, the mineral laws of the United States will require some modification. The letter of the law says that to hold a location one must have a discovery as the basis of a mineral location. How is any person or company to protect itself under the present laws when doing this deep and expensive work? Say we are working in a well mineralized country where our judgment and the older workings, perchance, suggest extensive prospecting. We cannot tell just where the lead will be, what its strike may be or its dip. We begin our prospecting work on an extensive scale, and as soon as we are started a school of sharks locates on all sides—for what? Blackmail pure and simple. The question preëminent in the West is: Are we to get these changes from the antiquated mining laws now on the statute books?

The forest does not interfere at all, and to advertise so to the capital of the country is a detriment to the mining industry, and in most cases a wail, generally indirectly, from lumber and timber interests that have made their living from the property of the people. On the other hand, the small prospector is protected by the policy of the forest department in not making sales or permitting the cutting of timber contiguous to a group of claims or locations. Heretofore, when the small prospector had developed his prospect to mining proportions, he has been obliged to secure his timber, generally what was left, from some distant point and haul it to the mine at a much increased cost over what would have been the case had he been able to secure the timber that originally stood close at hand.

L. S. ROPES.

Helena, Mont., April 8, 1910.

Process Efficiency Index

In an article on "All Slime Treatment of Ore in Cyanide Plants" in the JOURNAL of Feb. 5, 1910, H. A. Megraw proposes a method for calculating mathematically the efficiency of any process, with factors of dollars and cents. He proposes to multiply the percentage left in the tailings by the cost of treatment, the resulting figure being the index of the process, and the smaller the index the more efficient the process.

While this seems to be a neat and convenient method of comparison it is not quite accurate as the following example will show: Process No. 1. Costs $4, extracts 80 per cent.; $4 \times 20 = 80$. Process No. 2. Costs $3, extracts 73.4 per cent.; $3 \times 26.6 = 80$. The efficiency index is the same in these two cases, but on treating ore of different value we find the profits from the two methods are not the same:

On $6 ore No. 1 extracts $4.80. Profit $0.80. No. 2 extracts $4.40. Profit $1.40. On $12 ore No. 1 extracts $9.60. Profit $5.60. No. 2 extracts $8.80. Profit $5.80. On $100 ore No. 1 extracts $80. Profit $76. No. 2 extracts $73.40. Profit $70.40.

The factor missing appears to be the difference, in the different cases, of the ratio of cost to value, and I would suggest that possibly this is one of the cases for which an exact formula cannot be constructed. For instance, I have in my possession a work which gives elaborate formulas for calculating the quantity of rock which will be broken by any quantity of powder, in any number of holes, of any depth, any distance apart, in any kind of rock, and—tut tut!

RALSTON BELL.

Edinburgh, Scotland, Feb. 21, 1910.

Coal Dust and Mine Explosions

I notice in the JOURNAL of April 2, under "Colliery Notes," the suggestion that a small amount of coal dust may be more dangerous than a large amount, and suggest that experiments be carried out to test the point.

I will venture the information that in a series of experiments I have been conducting for the past eight months in the laboratories of the Massachusetts Institute of Technology, it has come out very clearly that such is the case. I have proved that after reaching a certain point, any additional amount of dust renders the mixture more difficult to explode. In the course of several weeks, my work will be completed and I will be able to give definite figures.

J. A. GRANT.

Boston, Mass, April 8, 1910.

Automatic Zinc Dust Feeder

Permit me to set Charles S. Hurter straight as to the invention of the automatic zinc-dust feeder described in the JOURNAL of Feb. 26. That device is my own invention. He misunderstands me when he says that I am unable to give credit to the inventor. My meaning in the article was that I was unable to give credit to the inventor of the tripper or operating device. If Mr. Hurter is correct as to date it certainly was not Mr. Kiddie, as I used this arrangement as a sampler several years prior to 1905, the date he mentions.

JAMES S. COLBATH.

Santa Barbara, Mex., April 7, 1910.

Metallics

E. H. Riesenfeld has found 908 deg. C. to be the temperature at which the dissociation pressure of calcium carbonate is equal to one atmosphere. The heat of reaction between calcium oxide and carbon dioxide is calculated to be 40,500 calories.

The chief source of cerium, lanthanum and thorium compounds is monazite sand, deposits of which occur in this country in North and South Carolina. This sand is a mixture of minerals, 28 species having been identified in the American deposits.

Approximately 9000 stamps are in operation on the Rand today and it is estimated that the construction of 6000 more is contemplated. Probably in excess of £4,000,000 is invested in stamp mills on the Rand, exclusive of the money spent in cyanide plants.

According to J. R. Cowell, an acre of blue-gum eucalptus trees, averaged over 10 years, grows at a power-fuel rate of two continuous horsepower. At this rate a mining company using 100 h.p. would be able to draw its entire fuel supply from 50 acres, five years after planting.

A peculiar fact in connection with the cyanide treatment of ore in Queensland is described by Mr. Macleod. He states that wet slime as it comes from the mill gives, by two days' agitation with cyanide, a 45 per cent. extraction, whereas 85 to 90 per cent. can be recovered from sundried portions of the same slime.

South African metallurgists hold tenaciously to amalgamation. The Goldfield Consolidated, of Nevada, with much higher grade of ore and with equally high results from plate amalgamation, has discarded a complete set of plates. All the labor on the plates is saved, the theft of amalgam which occurs in every camp is avoided and the total extraction is reported to be slightly better.

Sand filling of stopes to save timbering and prevent caving is attracting attention throughout the mining world, and the work being done in this line in Germany is receiving deserved consideration. At Myslowitz, 2000 cu.m. of sand are washed into the mine per day at a cost of about 11c. per cu.m. Wherever tailings are a final result of milling, concentrating or cyaniding (except in all-slime plants) this method can be used to advantage, sometimes even at a lower cost than at Myslowitz, since at the latter place the sand must be dug especially and transported.

Rules posted for the guidance and safetly of miners are seen at nearly every mine, no matter of what size. The Federal Mining and Smelting Company, in the Cœur d'Alene district, has issued a set of rules which covers nearly every possible contingency in mine work, and a copy of which much be read and signed by each employee of the company. In case a man cannot read, he must report this fact, and the rules will be read and explained to him. This seems an improvement over the usual custom of having a large and varied assortment of wood, tin, paper or cloth signs distributed around the surface buildings and through the levels of the mine.

By the Way

The Ananias Mining Company has lately been incorporated. We trust this name is not descriptive. Anyway, the frankness of its nominators inspires us with a friendly feeling.

A corporation styled the "Worthless Securities Company" has been incorporated at Albany by James Westervelt, of New York, who says that the company is not a joke. It begins with a capital of $500. The incorporator of this company appears to be even franker than those of the Ananias Mining Company.

Those insiders and directors who publicly admitted several months ago that they were sacrificing a part of their holdings of Lake Copper Company in order to prevent a "runaway" market in the stock have now the opportunity to repurchase their property at a considerable profit. Disinterested action and self deprivation are thus suitably rewarded, says the *Evening Post.* The public ought not to have bought so high.

One item of information which will do no harm to any company to divulge in its report, is the geographical position of the property. It may be said that the annual reports of a company are for the stockholders and that the stockholders know where the mine is. But many a stockholder, when asked, will answer, "Why, I think it's somewhere in Montana." Further, these reports reach many people who are not owners of any of the stock and to whom some idea as to where the property in question is situated would be of interest.

One by one our old favorite sayings leave us: Mark Twain's (or was it Bill Nye?—anyway, someone who spoke with authority) useful definition of a mine as "a hole in the ground owned by a liar" attacked and improved upon by John Hays Hammond a few months since. We had scarcely said farewell to this old standby when a prospector, in response to the usual "Well, after all, gold is where you find it," dared to shout in reply, "No, by George. I've hunted it for 17 years, and it's where you can't find it." With two such old reliables as these gone from us, what chance has the ordinary man to look wise and join intelligently in a mining conversation? Kismet.

In a paper read before the Transvaal Institute of Mechanical Engineers, H. Bohle stated that in a certain village in Cumberland, England, lead ore is measured by the "bing" of 8 cwt.; blende, obtained at the same time from the same mines, is weighed in tons. The rough "bouse," from which both are extracted, is measured in shifts. A shift is supposed to be 4 tons. Miners are paid by the cubic fathom of 6x6x4 ft. Timber is invoiced thus: 1 st. 1 qr. 16 deals 4/6 at £16 a standard. A standard is 120 standard deals, each of which is 72x11x3 in. in England, and 144x9x3 in Ireland. Our heart goes out to the bookkeeper who not only has this to contend with, but then has to figure it all out in pounds, shillings and pence.

In the JOURNAL of March 26 is an instructive story on the distinction between name and signature, and we want to direct our contributors' attention to this item. But signatures and "chicken-track" writing are not the only handicaps to accuracy on the part of the members of our editorial staff. However much they hate to admit it, they are *not* infallible and are *not* mind readers, although some of the articles they evolve from abstruse and unintelligible manuscript would tend to credit them with both these attributes. One man gives the mesh of a screen as 10, and another calls it 100; often it is described both ways in the same article. Again, what are you going to do when one vein dips at an angle of 10 deg. and another at 10 per cent.; and are they measured from the vertical or horizontal? A manuscript not long ago gravely informed us that a certain hill was 250 m. high, 50 m. in diameter at the top and 250 m. in diameter at the base. This hill evidently rises 250 m. on a base length of 100 m.! There may be hills like this, far be it from us to say there are not; but they are granite, not iron ore. Another thing—we don't know the detailed geography of *every* mining country in the world and are quite incompetent to say whether Bear gulch is in Alaska or Queensland. Quite possibly there is one in each country. The Santa Rosa mines in Mexico are legion but to the man at any one of them the others seem to be in a different planetary system. Colonel Brown is another—we all know the Colonel, but which Colonel Brown? The trouble is we know so many of him. Therefore we ask: Will our gentle contributors please write, not necessarily plainly, but as plainly as they can? will they print proper names or otherwise allow us to distinguish between an "n" and a "u"? and will they please remember their writing is for readers far removed from the place of writing and to whom descriptive terms, to have meaning, must really describe. And then the millennium!

Copper Production of the World

In the accompanying table we give the estimate of the copper production of the world in 1909, as compiled by Henry R. Merton & Co., of London, who have sent out similar reports for many years past. Comparison is made in the table with the reports of 1908 and 1907. The figures are in long tons.

COPPER PRODUCTION OF THE WORLD.

	1907.	1908.	1909.
United States	392,520	423,300	490,310
Mexico	56,565	39,990	56,240
Canada	25,615	28,570	24,105
Newfoundland	1,730	1,430	1,380
Cuba	....	3,000	2,675
North America	476,430	496,290	574,710
Argentina	220	225	600
Bolivia	2,500	2;500	2,000
Chile	26,685	38,315	35,785
Peru	10,575	15,000	16,000
South America	39,980	56,040	54,385
Austria	920	1,575	1,615
England	700	700	700
Germany	20,490	20,200	22,455
Hungary	125	2,240	4,505
Italy	3,300	2,975	2,725
Norway	7,010	9,190	9,080
Russia	15,000	20,085	17,750
Spain and Portugal	49,675	52,585	52,185
Sweden	2,000	2,000	2,000
Turkey	1,250	1,050	800
Europe	100,470	112,600	113,815
Japan	48,935	43,000	47,000
Africa	6,800	6,880	14,945
Australasia	41,250	39,500	34,400
Total	713,865	754,310	839,255

Of the Spanish production in 1909 the Rio Tinto is credited with 35,370 tons. In Germany the Mansfeld produced 18,715 tons; in Norway the Sulitelma reports 4795 tons. The African estimate is made up of 6945 tons from Cape Copper and Namaqua; 8000 tons is the figure given for other mines, and this quantity is presumably from the Congo Free State in great part, although it is not so stated.

The estimated total for 1909 shows an increase of 84,945 tons, or 11.3 per cent., over 1908; and of 125,390 tons, or 17.6 per cent., over 1907. The production of 1909 was distributed as follows: United States, 58.4 per cent.; other North America, 10.1; South America, 6.5; Europe, 13.5; Japan, 5.6; Africa, 1.8; Australasia, 4.1 per cent. of the total.

The Granby Market

The stock tables of April 7 showed 100 shares of Granby at 40, net loss 72 points. This was not a net loss on one day, however, but a loss covering a much longer period than that in which the stock broke in two on the Boston exchange. The last previous sale on the New York board was, in fact, as far back as Jan. 5. It is a singular, and perhaps a significant thing, said the New York *Sun*, that while the stock was tumbling in Boston, not a share of it changed hands in New York until April 7. The circumstance demonstrates that the New York holders of the stock, who are many and wealthy, have not disposed of their holdings. They could not have done so in this market, and the sales in Boston were so few as to show that none of the holdings has been sold there.

Referring to the Granby incident, philosophizes the *Evening Post*, a mining capitalist with some transient experience as a banker, who has, off and on, been exposed to publicity of an undesirable sort, is believed to have said: "Now, if that had been anything of mine, what a scandal it would seem! It would be the limelight again for me." This discloses the value of a reputation.

Thomas F. Walsh

Thomas F. Walsh, one of the best known and most successful mining operators in the United States, died at Washington, April 8, after an illness of several months. He was born in Ireland in 1851 and came to this country when 18 years old. After working in the East a short time, he went to Colorado in 1871. His home had been in that State ever since, with the exception of two years which he passed in the Black Hills in South Dakota. His first successful venture was as a hotel-keeper at Leadville, where he came to know many mining men and spent much time in the study of mining; while there, he also acquired interests in many mining claims, some of which helped to lay the foundation of the large fortune which he acquired. Before long he gave his whole time to mining and occupied himself with prospecting and examining claims. He was not satisfied with the reports of others, but used his own judgment and became an expert in detecting the probable value of prospects. His greatest success was in the location of the Camp Bird mine at Ouray, and of this he told an interesting story in an address to the graduating class of the Colorado School of Mines, in 1908. This story, which was published in the JOURNAL of Aug. 1, 1908, was of interest not only in itself, but as illustrating his methods of work and the operations of his mind.

As time went on, he became perhaps the best known operator in Colorado, and gradually in the United States. Nearly all his ventures seemed to be successful and his wealth increased. In 1899 he was appointed Commissioner for Colorado to the Paris exposition, and there made a social reputation. He chartered a boat on the Seine, gave it resplendent decorations, supplied it in all the lavishness that his great wealth and the facilities of pleasure-loving Paris permitted, and he and Mrs. Walsh proceeded to give official entertainments that attracted attention and won a ready acceptance. Then he chartered a train *de luxe* which he made more luxurious on the scale he had set in his Seine steamer, and took a company of guests on a tour in Belgium, where, at Ostend, he met King Leopold and gave to the King a banquet that was as much talked of as had been the special private train and the boat. At this time also, he made arrangements to explore and operate the Katanga copper deposits in the Congo Free State.

In 1900 Mr. Walsh built himself a house in Washington where he afterward spent much of his time, though he still retained his residence in Colorado and continued his activites there. In 1905 he suffered a severe blow in the loss of his only son who was killed in an automobile accident at Newport.

Mr. Walsh was popular among the miners whom he employed, for whose welfare he always looked out. He was also generally popular in Colorado where he was best known, and his advice was eagerly sought. The governor of the State sent a special telegram of condolence to his widow. He left a widow and one daughter, who will inherit a fortune variously estimated at $10,000,000 to $30,000,000. His chief characteristics may be summed up as clearness of judgment, promptness in action, and independence. Without scientific training, he was undoubtedly an expert.

The Monopoly Cases

The announcement on April 11 that the Supreme Court would make no decision in the tobacco and oil cases until after reargument came as a relief to the overstrained nerves of all who had been awaiting this decision as a possible upset of the business structure of the country.

The present situation is best summarized in the words of a great lawyer, who has been quoted in the newspapers as follows:

"We are looking to the Supreme Court to lay down a broad line and say to the great industrials that they must not overstep this boundary. The managers of these big corporate enterprises want to be told under what conditions and along what lines of procedure they may continue to do business. That is why these two cases are so important and why the decision is awaited with so much concern.

"I do not think that any of us who are most interested care a straw whether the decision as settling a piece of litigation is for or against the Government, or for or against the two trusts. What is asked of the court is a clear and simple definition of principles that are now vague and an exploration of ground as yet uncovered by final judicial review and decision."

The general opinion is that the Supreme Court, with only seven active members at present, found itself unable to agree, and took the only fair and proper method to reach an agreement.

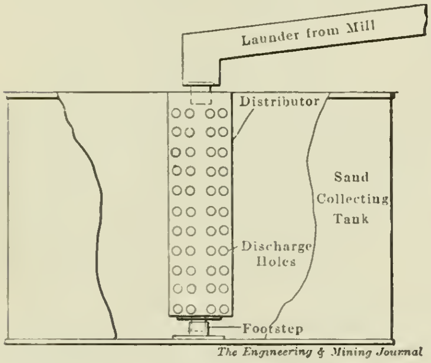
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Automatic Sand Distributer

By H. T. Durant*

The accompanying sketch shows a simple arrangement which has been used with success in cyanide and other similar plants for collecting sand in such a way that the point of delivery rises as the depth of the sand in the sand-collecting tank increases. Slime-exit doors, filters, etc., are purposely not shown in the sketch. The working of the arrangement is as follows: The pulp is delivered into the top of the distributer, which consists of a wooden box closed at lower end, where it is carried on a footstep. It is also centered and held at the uppper end by the pipe from launder discharge.



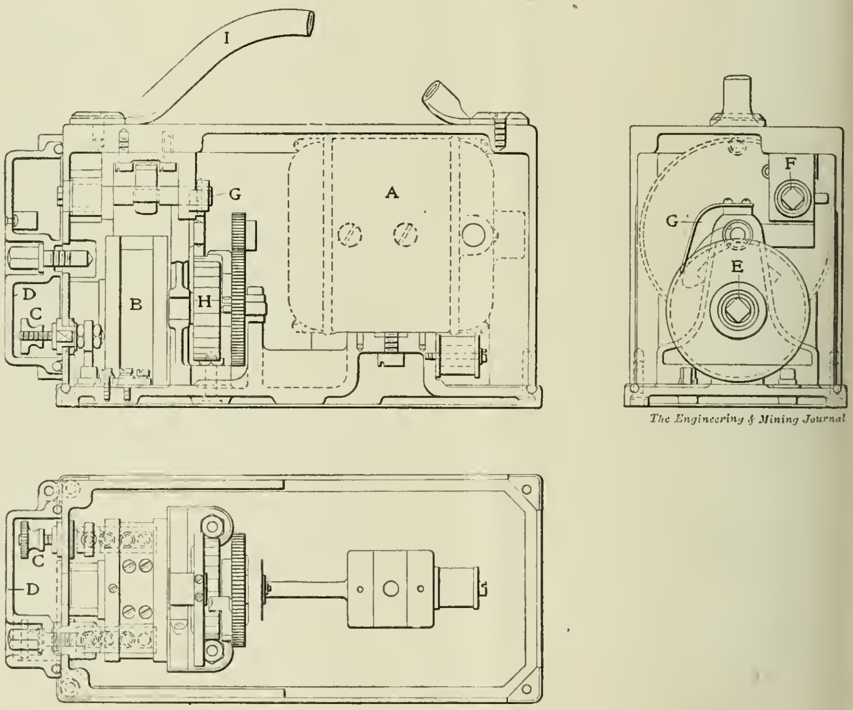
Sand Distributor

The distributer is rectangular in section, and is necessarily of the same vertical hight as the depth of the tank in which it is placed. It has about the same cross-sectional area as the launder which feeds it. All four sides of the distributer are bored with holes, as shown in sketch. The diameter of the holes will be from half an inch upward, according to discharge capacity required.

Starting on an empty tank at first all the sand and water are discharged from lower line of holes on all four sides, as the sand level begins to rise in the tank the lower line of holes will naturally block up and the discharge will then be from the next higher level of holes, and so on. When the tank is almost full of sand the sand and water will be discharged only through the top level of holes. When the sand has been discharged from the tank the distributer will remain full of sand. It is not necessary to empty it, as on starting up again, with the tank empty, the inflowing stream of sand and water will at once cut away all the material in the distributer.

A New Shot-firing Device

The French Minister of Public Works has lately authorized the use of a new shooting appliance in firedamp coal mines. It consists of a small continuous-current dynamo *A* driven by a spring located in a drum *B*, the whole being incased in an aluminum box, 235 mm. long, 125 mm. high and 95 mm. wide. The box is made tight by rubber joints and is fitted with a leather handle for convenience in transport.



Mine Exploder with Aluminum Casing

To put this exploder into commission, open the door *D* with a special key, wind up the spring of the drum with this key and connect the wires at *C*. The exploder is then ready to work. To cause the explosion, place the key in an opening marked *allumage* and turn it to the right. This raises the pawl *G* and liberates the spring, causing a very quick rotation of the dynamo which gives at once its maximum voltage. The machine is able to shoot 25 caps of about 1.5 ohms with a line resistance of approximately 17 ohms.

A Useful Mine Stretcher

A mine stretcher, consisting of a tubular frame to which a woven-wire mattress is securely laced, is described by the Australia *Mining and Engineering Review*. Interwoven with the mattress are adjustable cradle supports, all well padded, to take the head, body, arms and legs of a disabled person in such a way that the least discomfort is felt by the injured. Straps are attached to the stretcher to securely fasten the injured man. Stirrups are provided at the foot and a strap buckles around the groin, to assist in supporting the weight. Close study of the construction of the stretcher has been made to insure support in a vertical position, whatever the nature of the accident. The weight of the stretcher is only 50 lb.

The removal of a man from the bottom of a winze is readily accomplished. The construction enables the stretcher to be passed through a small opening where support to an injured man is otherwise impossible. The presence of loose stone on inclined tracks, should it be found necessary to lower the stretcher, is not felt by the injured, as the woven mattress prevents the sharp points of stone from penetrating. To ascend the shaft the stretcher can be strapped in the cage or on a bucket. The necessity for the first aid requisites is met by having attached to the stretcher a sealed box containing bandages and lint. This appliance was devised by D. W. Bayne, of Bendigo, Victoria, Australia.

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*[illegible] Glamorganshire, England.

Gate for Lump Ore Bin

By Guy C. Stoltz*

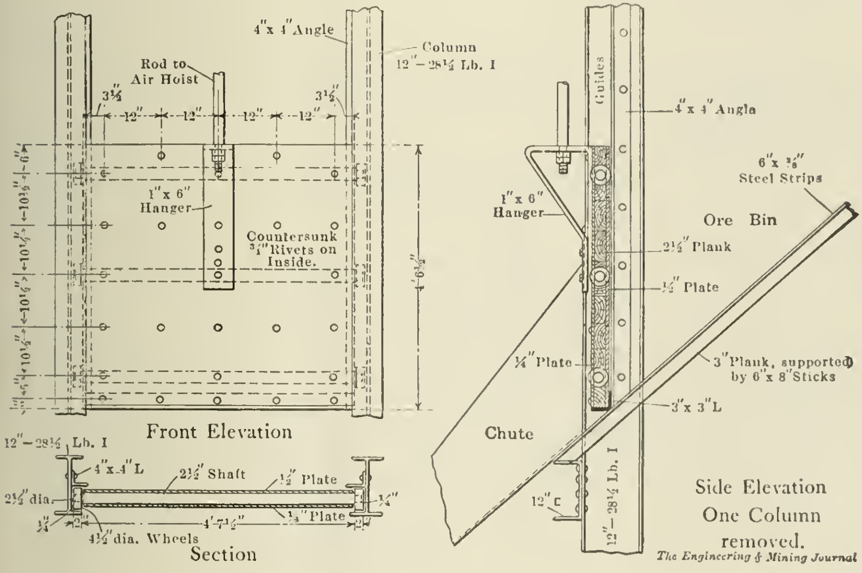
A gate commonly used on lump-ore bins at the iron mines, Mineville, N. Y., is shown in the accompanying drawings. The mine run of ore as hoisted from the underground pockets is distributed over a line of three grizzlies. The furnace ore, 3-in. size, is eliminated on the first two lengths of bars; a third grizzly removes the 3- to 6-in. size, which goes to a Gates crusher to be broken to furnace size, while the oversize from the last grizzly, made up of lumps 6 in. to 2 ft. in diameter, goes to a large storage bin.

Gate Operated by Two-way Air Hoist

To reduce the usual wedging of lump ore to a minimum, openings of 20 sq.ft. are provided. To control the discharge of ore when loading a gondola car, it is essential to have a heavy gate and one operated by a two-way air hoist. With a gate weighing approximately 1300 lb. operated by an air hoist under 60 lb. pressure, large lumps of magnetite are often crushed as the gate closes.

The gate is made of 2½-in. plank, with an outside steel plate, ¼ in. thick, 4½ ft. square, and an inside plate of same area and ½ in. thick. Three axles, 2½ in. square, turned to 2¼ in. diameter at the ends to receive rollers 4 in. diameter and 2 in. face, are bolted between the plates. The 2½-in. plank acts as a cushion, also gives weight and stiffness to the gate. The rollers run in the guides formed by riveting 4x4-in. angles to the two 12-in. I-beam columns. On the bottom of the gate a heavy 3-in. angle iron is riveted to the plates to protect them from wear.

The addition of two rollers to each side working at right angles to main rollers would improve the gate by lessening the friction due to side motion, for then any binding of the gate would be met by roll faces. The gate is fitted to a timber headframe by having, say, 10x10-in. posts take the place of I-beams and 4x4-in. hardwood strips bolted to posts to act as guides. This latter type is generally used at the underground storage pockets where it is essential to have a positive working gate which will close the instant the skip has been filled. S. L. Le Fevre, assistant general manager for Witherbee, Sherman & Co., designed the gate.



Air-hoist Gate for Coarse Ore

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*Mining engineer, Mineville, N. Y.

Stamp Tests in Cornwall

Recent tests in Cornwall of three styles of stamps gave an interesting set of figures as a result. The ore crushed was tin-bearing of low grade. The accompanying table shows that one pneumatic stamp has a greater capacity than 20 California stamps, though the latter must be of curious design not to permit more than 60 drops per min. Each style of battery was fitted with the same class of 20-mesh screen.

RESULT OF STAMP TESTS.

Number of Stamps.	Weight, Lb.	Drops per Min	Tons per Stamp Day.
264 Cornish	800	20	1.1
60 California	900	60	1.6
3 Pneumatic	1250	?	20.05

The initial cost, weight and power requirement of the pneumatic stamp is quoted as one-half that of 20 California stamps, with much less foundation and erection cost and one-third less requirement of water.

Endless Rope Haulage

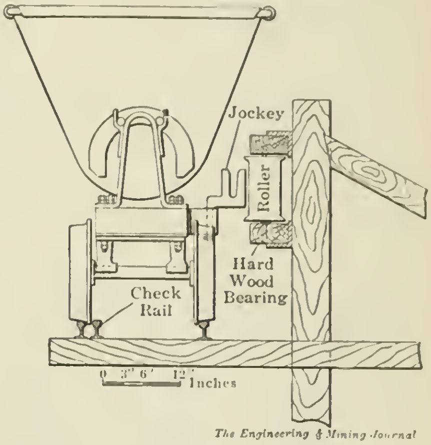

Fig. 1. Car for Tailrope Haulage

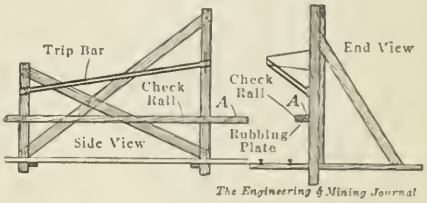

Fig. 2. Device for Dumping Car

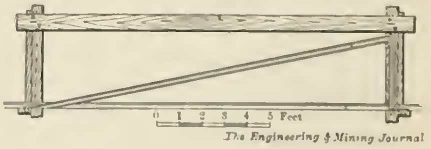

Fig. 3. Arrangement for Righting Car

A form of haulage suitable for tailings dumps consists in having the jockey fitted to the side of the truck carriage, Fig. 1., instead of on the body as is the usual practice. With this arrangement the truck can be tipped without being released from the rope, and consequently there is no time or labor lost in disengaging or rehooking. A haulage of this description is economical, as from the time the truck is filled at the bin and hooked to the rope there is no need to handle it again until it is returned to the filling bin, the tipping, righting, and disengaging all being done automatically. H. G. Kay (*Journal*, Chem., Met. and Min. Soc., of South Africa, Dec., 1909), states that the trucks will negotiate curves of 12 ft. radius or over by a series of rollers set about 2 ft. 6 in. apart and just on a level with the rope; these curve frames, Fig. 1, are held in position by ballasting with sand bags or stones, and can be easily shifted bodily forward as the dump extends.

TIPPING DEVICE

A serviceable truck tipper, Fig. 2, consists of a frame carrying a length of rail or pipe set at a hight to just catch the top of the truck body, this tipping bar s placed diagonally across the track with the on-coming end about 1 ft. outside the rails and the off-going end over the center line of the track; as the truck reaches the tipping bar, the body runs along it until it is overbalanced and tipped. A check bar *A*, is placed over the car wheels to prevent the carriage tipping over. The same principle is applied to the "truck righter"; a length of rail or pipe is bent into the form of an incline plane, Fig. 3 and set alongside the track so that the lower end of the incline will just catch under the down-turned lip of the truck body, and as the truck is drawn along the incline the body is raised until it regains its upright position.

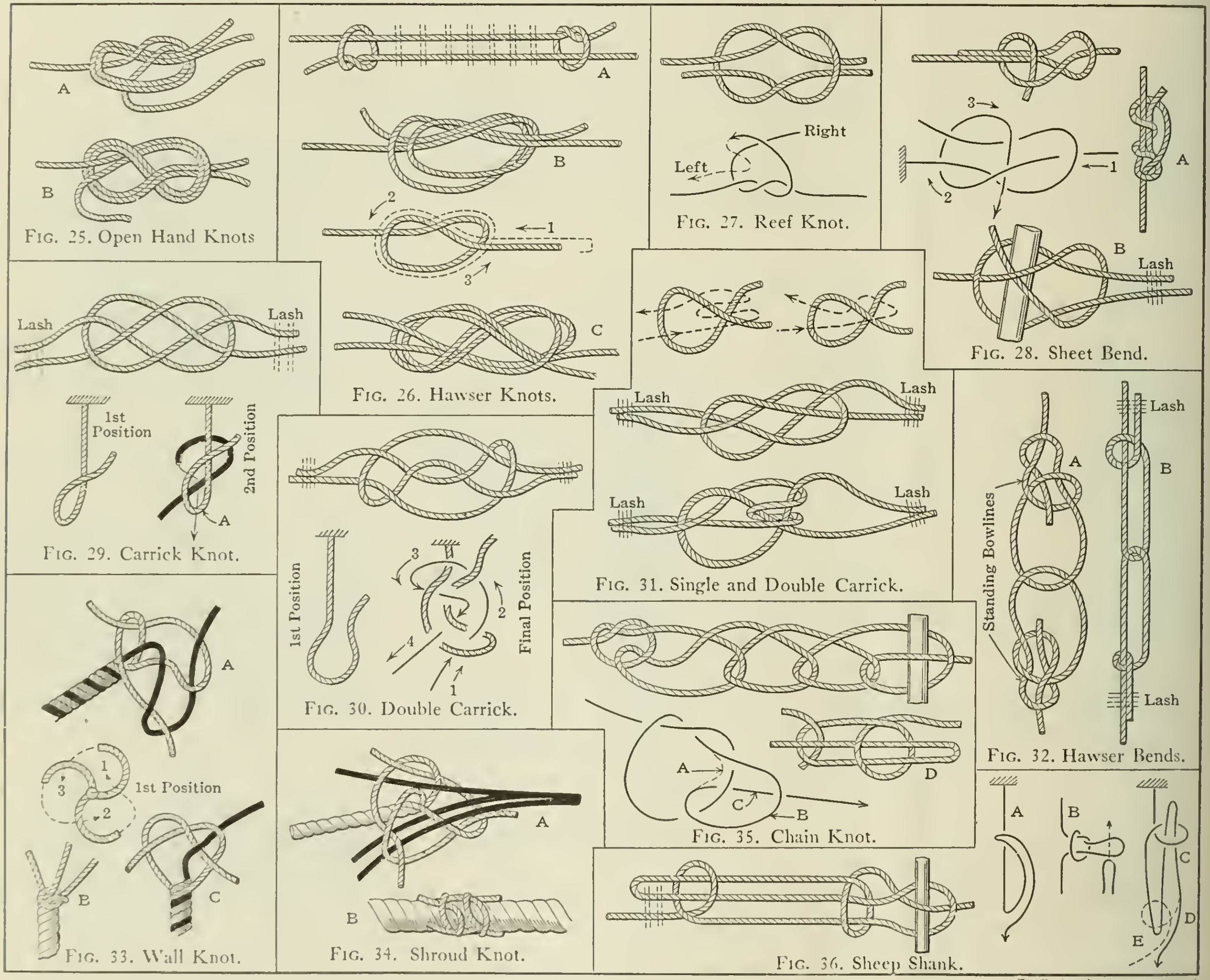

FIG. 25. Open Hand Knots

FIG. 26. Hawser Knots.

FIG. 27. Reef Knot.

FIG. 28. Sheet Bend.

FIG. 29. Carrick Knot.

FIG. 30. Double Carrick.

FIG. 31. Single and Double Carrick.

FIG. 32. Hawser Bends.

FIG. 33. Wall Knot.

FIG. 34. Shroud Knot.

FIG. 35. Chain Knot.

FIG. 36. Sheep Shank.

The Engineering & Mining Journal

KNOTS FOR JOINING, FINISHING AND SHORTENING ROPES

Useful Knots for Engineers—III

BY A. LIVINGSTONE OKE*

Fig. 25, *Open-Hand Knots*—These knots are useful for tying small ropes and cords together. *A* shows the two rope ends laid together and a simple knot tied in them. It is bulky and bad for the rope, and has nothing in its favor but the facility with which it can be tied. When tied with a Flemish knot *B*, the rope is not injured so much when strained, but the knot is even bulkier than the first form.

Fig. 26, Fisherman's and Hawser Knots—These knots serve the same purpose and are less bulky than the open-hand knots. *A* is mostly used for joining fishing lines, and it may be whipped or served as shown to prevent the ends coming together. *B* is suitable for large ropes. A simple knot is made on one end and the other end then taken around as shown by the dotted lines. It may also be made on a figure-8 knot as shown at *C*.

Fig. 27, Square or Reef Knot—This is the most commonly used knot for joining ropes of equal size when not of very large diameter. When properly tied it is fairly easily undone. The left-hand end is always placed over the one at the right, then passed under and once more over. The right-hand end is then brought around and the left-hand end passed over and under it.

Fig. 28, Sheet Bend or Weaver's Knot—The best knot for small cord, twine or fish line. This knot is also suitable for joining two ropes of unequal size where no great strain is expected. At *A* one of the ends is shown taken twice around the bight of the other rope to prevent jamming. *B* is a sheet bend with toggle to facilitate untying.

Fig. 29, Carrick Knot—Employed for joining heavy ropes. The ends must be lashed to prevent the knot pulling together and to facilitate untying. The otted line in second position indicates ow black is pulled *over* black and then nder white at *A*.

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*Mining engineer, Argentine and General Exploration Company, Ltd., Rodeo, San Juan, Argentina.

Fig. 30, *Double Carrick Knot*—Used milarly to the carrick knot, and suitable r equal or unequal ropes. When the nds are lashed it remains open under rain and is easily undone.

Fig. 31, *Other Forms of Carrick*—hese knots are especially adapted to eavy ropes.

Fig. 32, *Hawser Bends*—These bends e for joining heavy ropes. The bowline end shown at *A* is strong and reliable, ut takes considerable length of rope. he half-hitch bend *B* makes an excelnt permanent joint on heavy ropes.

Fig. 33, *Wall Knot*—For finishing off rope end. As shown in first position, the ree ends are bent round as shown and ien each in rotation is taken in the diection of the dotted lines. At *A*, the ot is shown started and ready for drawg tight; at *B* it is ready for crowning; d at *C* it is crowned and ready for ghtening to complete the knot.

Fig. 34, *Shroud Knot*—This is a useil method for joining rope ends to make sling or instead of a short splice. As own at *A*, a wall knot is started in the hite rope, then the strands of the black pe are passed through the loops; anher wall knot is then made with the ack strands, and the two knots tighted up. A further wall may then be ade on each side of the joint, or as any as may be desired.

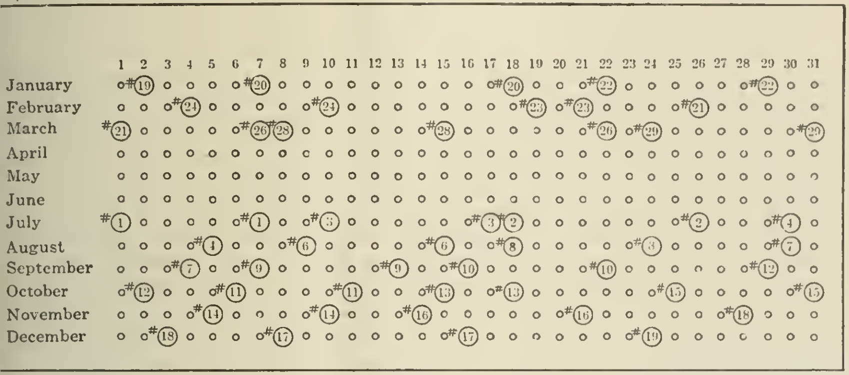
Fig. 35, *Chain Knot*—This method of iortening a rope has the advantage that hen the toggle is pulled out the rope itirely undoes itself under a slight rain. It is more injurious to the rope ian the sheep shank. In the diagram, e part marked *A*, shown dotted, is pulled rough the half turn to position *B*. *C* then pulled through to make the next op. An alternative method *D* is shown r use instead of a toggle.

Fig. 36, *Sheep Shank*—This is a quick d effective method of shortening a pe. No free end is required. Either half hitch or boat knot may be used, nd the loops may be lashed or secured y a toggle as shown. The first position *A* is as in making a bowline; the second position *C* shows one end finished. A half hitch is put in the end *D*, and the bight *E* is passed through it as shown. *B* shows the alternative method, employing a boat knot.

(To be concluded.)

A Method for Keeping the Date of Mine Surveys

The accompanying sketch illustrates a method of keeping the dates of surveys made in each of a number of mines.

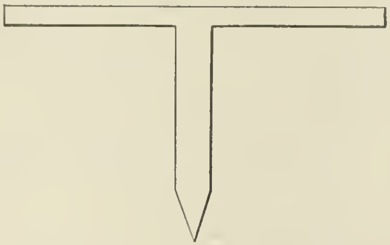


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
January	o	#⑲	o	o	o	o	#⑳	o	o	o	o	o	o	o	o	o	o	#⑳	o	o	o	#㉒	o	o	o	o	o	o	#㉒	o	o
February	o	o	o	#㉔	o	o	o	o	o	#㉔	o	o	o	o	o	o	o	o	#㉓	o	#㉓	o	o	o	o	#㉑	o	o	o	o	o
March	#㉑	o	o	o	o	o	#㉖	#㉘	o	o	o	o	o	o	#㉘	o	o	o	o	o	o	#㉖	o	#㉙	o	o	o	o	o	o	#㉙
April	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
May	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
June	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
July	#①	o	o	o	o	o	#①	o	o	#③	o	o	o	o	o	o	#③	#②	o	o	o	o	o	o	o	#②	o	o	o	#④	o
August	o	o	o	o	#④	o	o	o	#⑥	o	o	o	o	o	#⑥	o	o	#⑧	o	o	o	o	o	#⑧	o	o	o	o	o	#⑦	o
September	o	o	o	#⑦	o	o	#⑨	o	o	o	o	o	#⑨	o	o	#⑩	o	o	o	o	o	#⑩	o	o	o	o	o	o	#⑫	o	o
October	o	#⑫	o	o	o	#⑪	o	o	o	o	#⑪	o	o	o	#⑬	o	o	#⑬	o	o	o	o	o	o	#⑮	o	o	o	o	o	#⑮
November	o	o	o	o	#⑭	o	o	o	o	#⑭	o	o	o	#⑯	o	o	o	o	o	o	#⑯	o	o	o	o	o	o	#⑱	o	o	o
December	o	o	#⑱	o	o	o	o	#⑰	o	o	o	o	o	o	o	#⑰	o	o	o	o	o	o	o	#⑲	o	o	o	o	o	o	o

The Engineering & Mining Journal

Sketch Showing Method of Keeping the Dates of Surveys

It is a one-inch hardwood board, rectangular in shape. The numerical figures on the top row are the days in each month. The small circles are the holes in the board while the large circles are pegs in the holes. The pegs are either numbered or named, to correspond to individual mines. Each mine has two pegs. The first peg, which is at Jan. 2, shows that the survey was begun on Dec. 24. In the same way the survey of the No. 20 mine was begun on Jan. 7, and completed on January 18.



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Sectional View of Peg Used in Survey Board

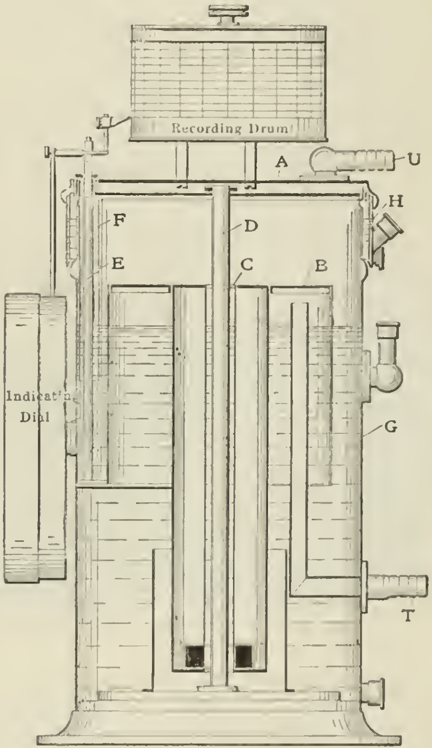
Convenient Office Record

The system is convenient for a mining engineer's office where each mine is surveyed at regular intervals, as it gives the past record as well as when the survey of a particular mine is due. The second figure shows the side view of a peg.

Device for Recording Velocity of Gases

The "Hydro" recording velocity gage supplies a means of measuring the velocity and volume of gases, and of recording same by a chart on a recording drum.

The construction of the apparatus is shown in the accompanying drawing. *Power*, Jan. 18, 1910, describes the device as consisting of a cylindrical vessel *G*, a cover *A*, which dips with its outer rim into a liquid contained within the annular space between the vessel *G* and cylinder *H*. This liquid acts as a seal for the gas within the vessel *G*. The working parts of the instrument consist of the bell *B*, to which is attached a float *C* guided upon a rod *D* and submerged in the operating fluid. Gas pressure is introduced under the bell through the nozzle *T* and above it through the nozzle *U*, the difference causing movements of the bell. These are carried to the recording drum containing the clockwork of the instrument by means of the rod *E* working through a tube *F* attached to the cover *A*.



Power

Details of Recording Gage

The construction is such that a differential pressure of 1 in. of water represents a movement of 4 in. of the bell, and this being obtained without the use of magnifying levers indicates extreme sensitiveness and accuracy of indications for the instrument. In order to make the indications plainly visible the rod *E* is further connected to a dial indicator magnifying the actual differential pressure 40 times.

NEW PUBLICATIONS

The Mining Manual for 1910, by Walter R. Skinner. 17s. Published by the author.

The Journal of the Iron and Steel Institute, Vol. No. II, 1909. Edited by George C. Lloyd. E. and F. N. Spon.

Ueber die Medizinischen Folgezustaende der Katastrophe von Courrières, by Eduard Stierlin. S. Karger.

Annual Report of the Director of the Mint. Fiscal year ended June 30, 1909. Government Printing Office, Washington.

Algunas Investigaciones Sobre los Petroleos Argentinos, by Ernesto Longobardi. Universidad Nacional de Buenos Aires.

Analyse Thermique et Métallographie Microscopique, by E. Rengade. Hachette et Cie, Paris.

Report of the Department of Mines of Pennsylvania, 1908. Part I: Anthracite. Part II: Bituminous. By Jas. E. Roderick, chief.

Informe Sobre la Costa sur del Peru, by V. F. Marsters. Boletin del Cuerpo de Ingenieros de Minas del Perú, No. 70. Ministerio de Fomento, Lima.

West Virginia Geological Survey: Reports and Maps of Marshall, Wetzel and Tyler Counties, by Ray V. Hennen. Published by I. C. White, State geologist.

Geologic Atlas of the United States: Trenton Folio, Field Edition. By F. Bascom, N. H. Darton, H. B. Kümmel, W. B. Clark, B. L. Miller and R. D. Salisbury. U. S. Geological Survey.

The University Geological Survey of Kansas, Volume IX. Special Report on Oil and Gas. Copies will be sent by Erasmus Haworth, State geologist, Lawrence, Kan., upon receipt of 32c. to cover postage.

A Geological Reconnaissance of the Region Traversed by the National Transcontinental Railway between Lake Nipigon and Clay Lake, Ontario, by W. H. Collins. Department of Mines, Ottawa, Canada.

Annual Report of the Iowa Geological Survey, Volume XIX, 1908, with Accompanying Papers, by Samuel Calvin, State geologist. James H. Lees, assistant State geologist. Published for Iowa Geological Survey.

The Cement Resources of Virginia West of the Blue Ridge, by Ray S. Bassler. Introductory Chapter on the Materials and Manufacture of Hydraulic Cements, by Edwin C. Eckel, Virginia Geological Survey, Bull. No. II-A. Published by University of Virginia.

Les Mines et les Explosive au VII^{me} Congrès International de Chimie Appliquée a Londres en 1909 avec Quelques Résultats Récents des Expériences de Frameries, by V. Watteyne and S. Stassart. Reprint from *Annales des Mines de Belgique*, T. XIV.

The Shot Firer's Guide: A Practical Manual on Blasting and the Prevention of Blasting Accidents. By William Maurice. $1.50. D. Van Nostrand Company.

This volume is the result of an attempt to place in the hands of the users of explosives practical explanations concerning approved methods of handling blasting apparatus. The author also outlines many precautions that are necessary in order to secure safety. Each stage of a blasting operation is described in detail, and every possible accident or mistake that can occur is referred to. Firing shots in dusty and gaseous mines is treated at length.

The Metallurgy of the Common Metals, Gold, Silver, Iron, Copper, Lead and Zinc. Second Edition, Revised. By Leonard S. Austin. Mining and Scientific Press.

This is an excellent general treatise upon its subject—one that gives the student an accurate, practical and uptodate knowledge of the principles and practice of metallurgy, which is more than can be said of the majority of works of its character. In the second edition Professor Austin has made important improvements over the first. If we should criticize anything it would be his failure to introduce the modern teachings of physical chemistry in his exposition of the general and thermochemical principles.

Lehre von den Erzlagerstaetten. By Richard Beck, 3d edition enlarged and revised, 2 volumns, Gebrueder Borntraeger, Berlin.

The first edition of Doctor Beck's "Ore deposits" appeared in 1900. Three years later a revision was put forth and now after a lapse of six years the third greatly enlarged and improved edition has appeared, whereas the second edition was in one volume of 732 pages, the third is in two, which together contain 1082 pages. The new work is therefore 50 per cent. larger than the old; while the second edition was illustrated with 257 figures, the third has 523, or more than double as many.

The arrangement has also been revised in some important particulars. In the older issues the ores of magmatic segregation were treated first and immediately thereafter the ores which formed in the sedimentary rocks. In the new the former are much more appropriately followed by the contact zone which are so intimately related to eruptive phenomena. The general features of veins are next discussed, followed by particular examples. In the treatment of this part of the subject the author shows the influence, of his environment and maintains the traditions of the Freiberg school of workers. i.e., the veins are classified on the basis of the mineralogical associations as has been done for so many years in the restricted area around the famous old mining academy. This line of treatment certainly enables one to compare a new discovery with a standard type, but it always raises the haunting question as to whether upon relations so largely fortuitous and so strongly variable it is best, to base fundamental classification. A reader familiar with the earlier edition will note the entrance of several new types. With this topic Vol. 1 closes.

The author has now set before his reader a long list of phenomena and in the opening pages of Vol. 2, he discusses various general questions affecting them, such as the changes in mineralogy with depth; variations of value in veins, influences of the wall-rock, of intersections, of feathering out, of folds, alteration of the walls; connection of certain ores with certain rocks, etc. All these are live topics and all have become very familiar to American readers by the abundant recent discussions. This theoretical portion concludes with a review of the geological age of views and of the methods of filling. In the latter several new topics appear, of which the source of thermal values is not the least interesting.

The epigenetic orebodies are next treated, meaning by the term those which appear in foliated or stratified rocks, as impregnations or replacements of introduction subsequent to the formation of the walls, yet not in the fissures which yield veins. They may appear in both metamorphic and in unchanged sedimentary rocks. They may also form stocks or stockworks. Fifteen or 20 new cases appear as against the earlier edition.

The superficial alteration of the ores or the "iron hat" phenomena are next reviewed and then the true sedimentary ores. Last of all the placers receive attention. All these topics are expanded in the new work. Finally, some good advice to observers in the field and some of the latest literature complete the volumnes.

Taken as a whole Doctor Beck's book is a monument of patient reading, observation and reflection, and will prove a valuable work of reference as well as a manual of instruction for all those who are specially engaged with the problems of ore deposits.

Copper Deposits of Globe-Kelvin Districts—II

Mining the Miami Orebody; The Auxiliary-raise and Sublevel Stoping Method, Combined with Top-slicing and Sublevel Caving Method

BY EDWIN HIGGINS*

Underground development at the property of the Miami Copper Company, near Globe, Ariz., is being centered on blocking out the ore in 50-ft. squares and rectangles 50x100 ft. This is being done on main levels and on intermediate levels, so that eventually the orebody will be blocked out in 50-ft. squares, or rectangles 50x100 ft., at 25-ft. intervals of depth. The exception to this will be above the main haulage levels, where 50-ft. blocks will be left until the ore above is mined. The 420 will be the first main haulage level. While mining is being carried on above the 420, the ground between the 420 and 570 will be similarly blocked out, preparatory to mining from the 570, which will be the second main haulage level. All drifts, cross-entries and laterals on every level and sublevel are being driven in the same vertical plane, so that the blocks of ore on all levels stand superimposed one above the other.

Main Working Shaft, Miami Copper Company

Site of the New Miami Mill

Method of Mining

The method of mining was worked out by Superintendent N. O. Lawton, who has had extended experience in the Lake Superior and other districts where some form of the caving system is in use. The method of attacking the Miami orebody will be by means of a system that Mr. Lawton calls the auxiliary-raise and sublevel-stoping method, combined with the Lake Superior top-slicing and sublevel caving methods. In other words, from 50 to 60 per cent., or possibly more, of the ore will be stoped by the auxiliary-raise and sublevel-stoping method, and the remaining pillars removed by the sublevel-slicing system. The raises and sublevels are the means of ingress and egress to the stopes. The miners work from them and are thus protected by the solid ground; later they are used in removing the pillars.

The accompanying sketches, prepared by Mr. Lawton, illustrate the application of this mining system. Starting with the orebody blocked out in 50-ft. squares and 50x100-ft. rectangles, raises are put up to the capping as shown. At 25-ft. intervals in these raises the sublevels are driven. Many of the sublevels have been already completed. The size of the rooms and pillars will depend somewhat on local conditions, but it is figured that the rooms will be about 60 ft. and the pillars 40 ft. Beginning at a main level the room will be cut to the desired width and length, a cut being taken from the back which will make the room about 14 ft. high. Work is then conducted from the sublevels above in succession. A cut is made through the floor of the sublevel, along the drift on the center line of the room, after which a side cut is taken from each side lengthwise of the room, uppers and down holes being drilled and shot as the men retreat toward the pillar. The operation is repeated until the room is cut the required width, when work is transferred to the sublevel above.

When the capping rock is firm, the ore can be drawn from the rooms as fast as broken, until the capping is reached, but the general rule is to keep the rooms full while stoping, as a protection to the pillars and to control any caving or running of the ore which might let the capping in before the stope or room is completed. Previous to stoping the rooms, one or more slices will be removed next to the capping and the top of the ore covered with plank or slabs to form a matte between the ore and capping rock to prevent them from mixing as the ore is being drawn. In some cases the pillar will be sliced as the rooms are being drawn. In other cases the pillar between two rooms will be left narrow, and after the rooms are stoped the pillar will be blasted and drawn with the rooms. In this latter case, two rooms and a pillar would amount to 80 per cent. of the ore, leaving every other pillar, or 20 per cent. of the ore, to be sliced.

In mining by the auxiliary-raise and sublevel-stoping method no timber will be required in the rooms, except possibly an occasional prop, and, as mentioned, a lining of slabs or plank between ore and capping. In slicing the pillars there will be required about 4 ft. (board measure) of timber per ton of ore sliced.

The method of mining as outlined is, of course, subject to slight modifications. Mr. Lawton claims for the combination of the two methods a flexible system, under absolute control, and one by which a large percentage of extraction may be obtained. To me the system seems entirely practicable and one that will operate economically and improve as practice indicates the proper size of rooms and pillars.

Handling the Ore

The main haulage levels are placed 50 ft. below the levels at which mining begins. Ore will be drawn off at these levels by a series of raises with inclined branches driven through to the bottom of the rooms. This is illustrated in an accompanying sketch, as is also the haulage plan of the 420 level. This latter sketch, also made by Mr. Lawton, is not intended to show the exact outline of the orebody on the 420, but to illustrate the haulage system. The drifts are all laid out directly under the levels above.

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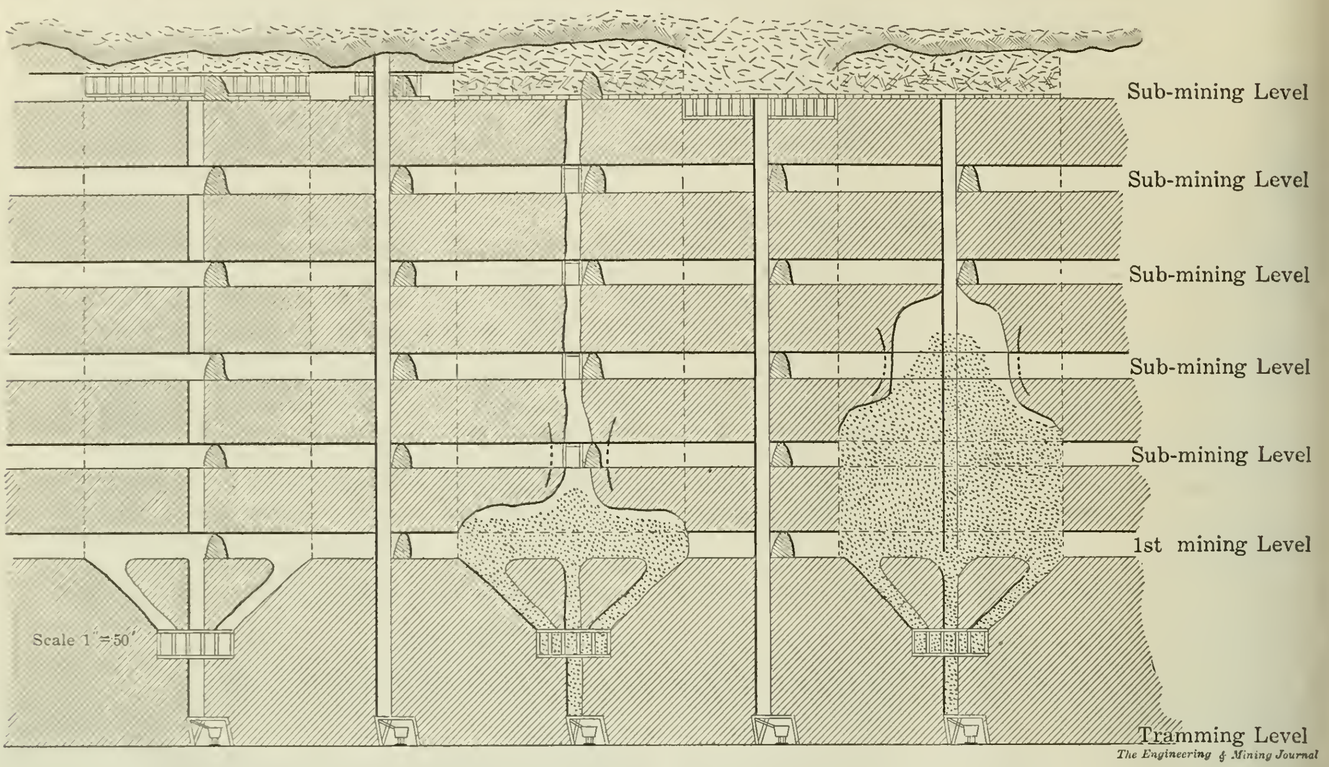
*Consulting mining engineer, Columbia Trust building, Los Angeles, Cal.



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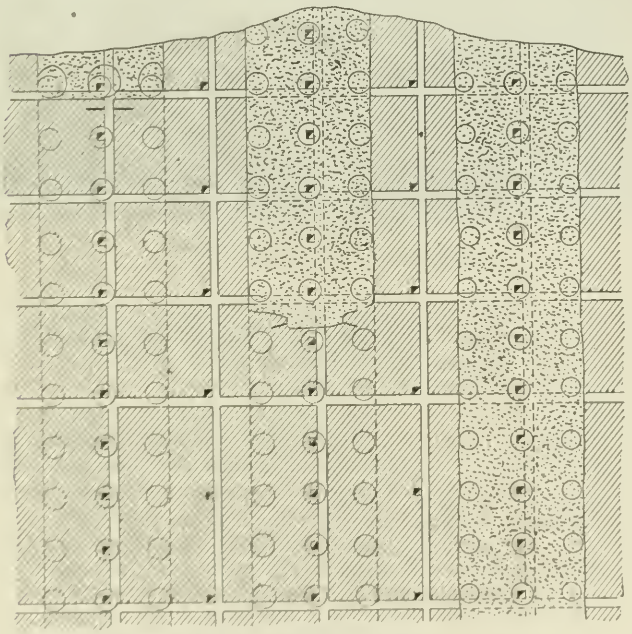
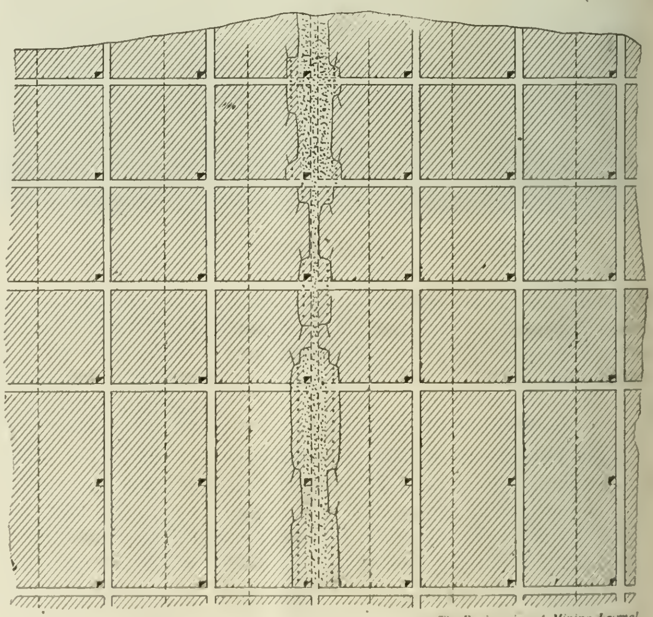
Cross-section through Rooms and Pillars, Showing Method of Mining the Miami Orebody



Plan of First Mining Level, Showing Method of Cutting Out Rooms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Plan of Sublevels, Showing Method of Stoping Rooms

Ore will be received from the raises in 2½-ton gable-bottom cars and hauled in trains by electric motors to the working shaft (No. 4), there to be dumped into a 1000-ton pocket. The sketch is almost self-explanatory, the arrows showing the direction of the loaded trains. From the pocket the ore will be loaded into 7½-ton skips working in balance. The skips will be loaded automatically, the movement of a lever releasing a skip-load of ore and closing the gate. This device will be placed 60 or 65 ft. below the station. The skips will dump directly into the bins of a crusher building at the surface. The mine will work two shifts. Tramming the ore to the pockets will continue on both shifts, and hoisting mostly on one shift.

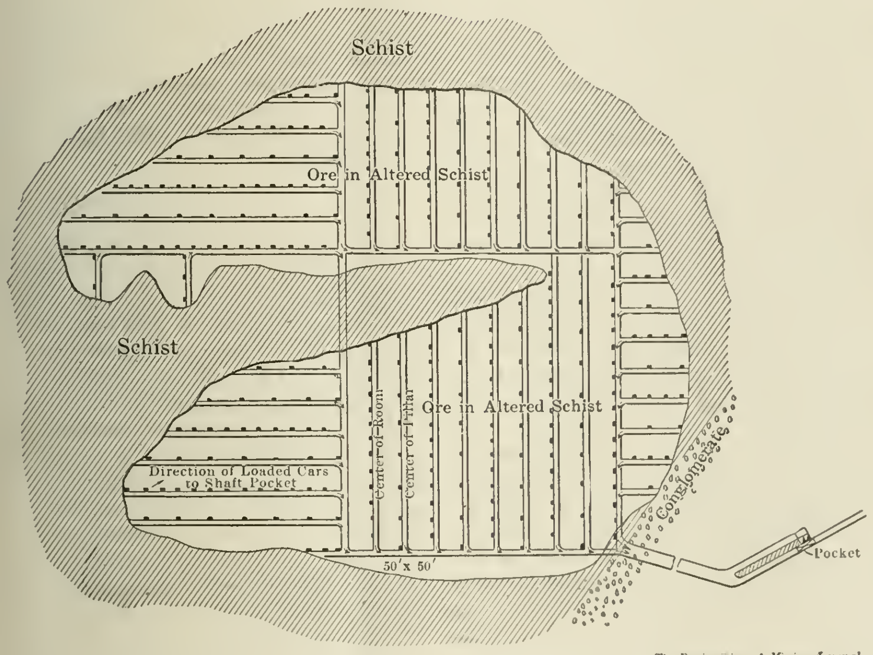
Working Shaft

The working shaft, No. 4, is 12x16 ft. inside timbers, and has two hoisting compartments, one large cage compartment and a ladderway, to be used also for air pipe, water column and electric cables. Sinking on this shaft, which will be used for the hoisting of all ore, was resumed on Jan. 2, 1910, on which date it was 450 ft. deep. It will be sunk another 250 feet.

In sinking this shaft four 3¼-in. machines are used. On the first shift the holes are drilled and blasted, muckers work on the second, and the timber crew on the third shift. A 20-cu.ft. bucket is used.

Down to the 450 level the shaft has cost $25 per foot, including all labor and supplies except timber. The average speed of sinking was over 100 ft. per month.

The size of pipes for carrying compressed air to the working places in the mine has been carefully worked out and it is expected that the percentage of loss of pressure at the drills will be small. A 10-in. pipe will carry the air down the shaft. On the main haulage levels, 420, 570, etc., an 8-in. branch will run along the haulageway to the branches of the rectangular haulage system. From this point 6-in. pipes will carry the air to the drifts, there delivering to 4-in. pipes; 2½-in. pipes will be carried up the raises, and the air will be delivered to the drills through 1½-in. pipes.



The Engineering & Mining Journal

RECTANGULAR SYSTEM OF TRAMMING LEVELS, 50 FEET BELOW FLOOR OF STOPES

The mine is making only about 125 gal. of water per day at present, but as the shaft gains depth this amount will be increased. Pumping will be done by electrically operated pumps.

LABOR

The men working underground are chiefly Americans, Italians and Austrians, with a few Swedes; for surface work Mexicans are generally employed. The wages for underground workers, per eight-hour shift, are as follows: Shift bosses, $4.50 to $5; jigger bosses, $4 to $4.50; shaft sinking below 100 ft., timbermen, pumpmen, $4; trackmen, $3.50 to $4; pipemen, $3.50 to $3.75; miners, muckers, trammers, shaft repairers, helpers on timbering, skip tenders, helpers on track work, ore sorters, $3.50; helpers for pipemen, and winchmen, $3 to $3.50.

Wages for surface work are as follows: Blacksmiths, $4.25 to $4.50; hoisting engineers, timber framers, carpenters, $4.25; tool sharpeners, $4; winchmen, hoisting (gasolene) engineers, $3 to $4; machinists, painters, tinners, $3.50 to $4.25; firemen, $3.50; helpers for blacksmiths, carpenters, machinists, pipe fitters, tinners, $3 to $3.50; toplanders, $3 to $3.25; assistant landers, trammers, ore sorters, teamsters (four-horse), $3; teamsters (six-horse), $3.25; laborers, $2 to $3. On the surface, hoisting engineers, winchmen and firemen work eight hours; laborers and others, nine hours.

MILLING

For some time the Miami company has had in operation an experimental mill. The results here have been satisfactory and the company has decided to build a mill of 2000 tons daily capacity. Work has been in progress on the new mill for some months. All grading has been done and some of the concrete foundation work has been completed. The accompanying illustrations give an idea of the status of the work early in January, 1910.

The mill will be built on the six-unit system, three of which will be installed at the time the mill is built, and the other three shortly afterward. Ore hoisted from the mine will be crushed in gyratory crushers to 2-in. size, passing thence through trommels for the removal of fines. Oversize from the trommels will be crushed in rolls to ½-in. size; this material will be raised by belt conveyer to the ore bins back of the different units of the concentrator. This belt conveyer will pass through the sampling mill where the ore will be automatically sampled.

From the ore bins at the head of each unit of the mill the ore will be conveyed by belts to fine crushing rolls, where it will be reduced to ⅛ in., passing thence to chilean mills. From this point the treatment will be entirely on some type of sand and slime table.

The Miami company owns and has developed two valuable water rights, one on Pinal creek and the other at the lower end of Miami wash. In addition to this the company has secured from the Old Dominion Copper Mining and Smelting Company 1,000,000 gal. of water per day, which by itself is more than sufficient to treat 2000 tons of ore per day. This water will be pumped through a 25,000-ft. line of 14-in. pipe direct to the concentrator. It is figured that it is cheaper to pump the water to the ore than to transport the ore, especially in view of the fact that excellent tailings room is available close to the mill.

The company does not contemplate the erection of a smeltery at this time. There will probably be produced about 100 tons of concentrates per day; this will be treated at one of the local smelteries and the resultant pig copper shipped to the East for ultimate refining.

POWER

A power plant, which will use crude oil as a fuel, is being erected for the purpose of supplying power to the mine and mill. Steam at 185 lb. pressure and 100 deg. superheat will be generated in three 600-h.p. boilers and used in three 4-cylinder triple-expansion engines, each direct connected with a 1000-k.w. alternating-current generator producing three-phase current at 6500 volts, 25 cycles. There will be two 4-cylinder, triple-expansion, 2-stage, 2-cylinder air compressors, each with a capacity of 4000 cu.ft. of air per minute.

The current generated will be used for pumping water, underground haulage, and driving the mill and machinery of the various shops. Compressed air will be used for operating drills underground and the hoisting engines at the main shaft. By the use of oil for preheating the air before its use in the hoisting engines, it is estimated that the most economical results will be obtained. Thus the generation of power will be concentrated in one plant; this will be situated about one-half mile from the mine and mill.

PRODUCTION AND COSTS

In the 40 acres so far developed by the Miami company, a conservative estimate assures the presence of close to 14,000,000 tons of ore carrying an average of 2.75 per cent. copper. On a basis of 2000 tons per day, this gives the property a life of about 20 years. This makes no allowance for probable additional ore in the orebody already developed, and in the 150 acres of unexplored ground owned by the company[1]. Much of this 150 acres holds forth promise of becoming productive. The management estimates a cost of $1.25 per ton for mining the present orebody. This is a liberal estimate; I should not be surprised if this figure is reduced to $1 or less when operations are fairly under way.

In the experimental mill, early tests indicated that the ore would concentrate 15 into 1, but later work has shown as good recovery at a rate of 20 into 1. The percentage of extraction will probably be somewhere between 70 and 75 per cent. Taking the lower figure and reckoning on a concentration of 20 into 1, there will be produced from 2000 tons of ore 100 tons of concentrates containing 38.5 tons, or 77,000 lb. of copper. This indicates a yearly production of 27,720,000 lb. of copper, provided that mining will be carried on at a rate of 2000 tons per day.

The management figures 9c. per lb. as the cost of producing and marketing copper. Even allowing $2 per ton for mining and milling, and 70 per cent. extraction from a 2.75 per cent. ore, the cost would be only 5.2c. per lb.; this would leave 3.8c. per lb. for transportation, smelting and marketing, in order to produce 9c. copper. I believe that the cost of producing copper at Miami will be closer to 8c. than to 9c. per pound.

In closing I wish to express my thanks to N. O. Lawton, superintendent of the Miami Copper Company, for assistance rendered in securing the notes for this article.

(To be Concluded)

Tin Production in Bolivia

A correspondent of the London *Mining Journal* gives the production of tin in Bolivia in 1909 as follows, in metric tons of *barrila*, or concentrates, in which form it is nearly all exported, as follows: Potosi, 24,051; Oruro, 9193; La Paz, 1812; Cochabamba, 510; total, 35,566 tons. As the *barilla* averages 60 per cent. metal, this is equivalent to 21,340 metric tons of metallic tin. For five years past the production, reduced to its equivalent in metallic tin, has been: 1905, 16,614; 1906, 17,624; 1907, 16,607; 1908, 17,963; 1909, 21,340 tons. The largest mine in Bolivia is the Salvadora at Uncia in the department of Potosi, which produces from 700 to 1000 tons of *barilla* monthly. monthly.

Alexander Agassiz

Alexander Agassiz, the eminent naturalist and president of the Calumet & Hecla Mining Company, died of heart disease, March 29 on the SS. "Adriatic," on the way from Southampton for New York. The news of Professor Agassiz's death came as a great surprise and shock to his friends and relatives, who believed him to be in the best of health. The following biographical sketch is taken from the *Evening Post,* save for a few trifling correstions:

Alexander Agassiz was born in the little city of Neuchatel, in the Jura mountains, Switzerland, in 1835. His father was Louis Agassiz, the naturalist and scientist, and his mother Cecile Braun, sister of Alexander Braun, the famous botanist and philosopher. The young Agassiz's early education was had in Europe. In 1846, the elder Agassiz had arrived in the United States, but the boy stayed with his mother in Neuchatel, and it was only after her death that he came to this country, at the age of 15 years. He then prepared for Harvard, and was graduated in 1855, numbering among his classmates Phillips Brooks. A college sketch of him at the time said:

"His classmates testify that his ability with the brush and pencil was often put to excellent uses during his college life;" and "he also inherited his father's wonderful persistence in accurate study and research."

On leaving college, he determined to study for a profession, and, choosing that of civil engineering, he entered the Lawrence Scientific School of Harvard, where he was graduated in 1857, with the degree of B. S. He then spent three terms in the chemical department, and during the same time was engaged as one of the teachers in Professor Agassiz's school for young women.

NATURALIST AND ENGINEER

In March, 1859, he went to California, where he was appointed an assistant on the U. S. Coast Survey, being assigned to work on the northwestern boundary. After the beginning of the rainy season, he returned to San Francisco, and, on the completion of the office work, resigned from the survey. His skill with the pencil was brought into service at this time by drawing speciments of the fish caught along the boundary. He also began to collect specimens for his father, and showed himself an adept to their study and preservation.

The greater part of the winter of 1859-60 was spent at Panama and Acapulco, collecting specimens for the Museum of Comparative Zoölogy at Cambridge. In the spring he again returned to San Francisco, where he was still occupied in obtaining specimens and in studying fishes, of which he made remarkably fine drawings. Later, he visited the interior of the State and examined the principal mines. In July, 1860, he returned to Cambridge, and was made agent of the museum. After a full course of study in the zoölogical and geological departments of the Lawrence Scientific School, he was appointed assistant in zoölogy, and during the absence of his father in Brazil, in 1865, had entire charge of the museum. Subsequently, during the same year, he became engaged in coal mining in Pennsylvania, in addition to his appointment in Cambridge.

In 1866 he went to Lake Superior, and became connected with the Calumet mine, as treasurer. Soon after he was engaged in the development of the adjoining Hecla mine, becoming, in 1867, superintendent of the combined properties. For 2½ years he worked on an average of 14½ hours a day. In 1869 he returned to Boston as the president of the Calumet & Hecla Mining Company. In the development of this mining property, Mr. Agassiz showed unusual ability as a mining engineer, solving difficulties in this field without precedent.

LIBERAL BENEFACTOR OF HARVARD

In the autumn of 1869 he went abroad, and examined the museums and collections of England, France, Germany, Italy and northern Europe. A year later he returned to Cambridge, and became assistant curator of the museum, which office he retained until the death of Professor Agassiz, in 1874, when he was selected to succeed him as curator. A contemporary scientific journal commented on this event as follows: "It is rare that the mantle of the father sits worthily on the son. Especially is this true when the father has been signally eminent in pure science. Happy, indeed, is it for America, and for biological science, that the vast plans of the late Agassiz are to be continued, as far as possible, on the grand scale upon which his great mind projected them."

He retained the executive office of the museum, and in 1887 was engaged in making extensive repairs and alterations in the building. Mr. Agassiz was a liberal benefactor of the museum. President Eliot said, in 1880, that since 1871 Mr. Agassiz had given fully $230,000 to a single department of the university. He had a peculiar way of giving. If he saw a need in one of the departments of the university, he supplied it, paid the bill, and said nothing more about the transaction. He thought this department needed more room. At once he contracted for a building, and erected it on the land of the president and fellows, without even communicating the fact that he proposed to erect such a building. His donations in all to Harvard University amounted to upward of $500,000. He was elected by the alumni one of the overseers of Harvard in 1874, and chosen by the corporan to be one of its fellows in 1878, but 1885 failing health compelled him to sign.

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[1] Since writing the above the probability of [illegible] greatly increased ore reserves has been demonstrated by churn drilling.

Goes Abroad for Research

In 1873 he became connected with the ection of the Anderson School of Natu- l History, on Penikese island, and after s father's death conducted that enter- ise, but differences between himself d Mr. Anderson led to the closing of e school. He made an expedition in 75 to the west coast of South America, r the purpose of examining the copper nes of Peru and Chili. During this ne he also made an extended survey of ke Titicaca, and with the aid of his sistant, Samuel Garman, gathered an mense collection of Peruvian antiqui- s, which are now in the Peabody Mu- um at Cambridge. These collections present the antiquities of the lake, of l Trahuanaco, and of the shore Indians Ancon.

In 1875 he was invited by Sir Wyville ompson to assist him in arranging and king up the collection of the great glish exploring expedition of the "Chal- ger." A portion of these collections he ought with him to Cambridge, and there ote his report on the sea urchins of s famous expedition, which ranks high a contribution to original research. s previous investigations on the Echin- erms gained for him, in 1873, the lker prize of $1000 from the Boston ciety of Natural History. This was the st bestowal of the Walker prize. In 78 he received the "Prix Serres," arded only once in 10 years, from the adémie des Sciences de Paris, and was first foreigner to secure this distinc- n.

From 1876 till 1881 Mr. Agassiz spent winters in deep-sea dredging, having l placed at his disposal, by the super- endent of the Coast Survey, the steam- p "Blake." These expeditions enabled n to explore the deep waters of the lf of Mexico and of the Caribbean sea. e success that attended his trips was y great, mainly, he said, owing to the erest shown by the commanders of the lake", but much more, scientists be- e, through his own great ingenuity l special familiarity with hoisting and ing machinery, which has enabled n to introduce new methods in place of old ways of deep-sea dredging.

Refused Carnegie Gift

His later years were even more full n the earlier ones. He retained the sidency of the Calumet & Hecla, and tinued his scientific researches. In 4 he summarily refused a gift from lrew Carnegie for an expedition to ke deep-sea soundings in the Pacific the coast of Southern and Lower Cal- nia and the Central American and th American coasts as far as Callao, u. He was accompanied by Professor Kofold, of the University of California, with a staff of 75 officers and men, in the U. S. ship "Albatross." He declined $75,000 offered for the purpose by Mr. Carnegie, because it was stipulated that the expedition should bear Carnegie's name, as the "Carnegie-Agassiz Expedition." The fund was offered through the Carnegie Institute. When it was finally stated that the acceptance of the offer involved the above stipulation, Agassiz immediately shut off negotiations and paid practically all the expenses himself.

A scientific estimate of him, written some years ago, said:

"He is an original investigator, and has substantially added to our knowledge of natural history. Simply to describe the original work done by him, and communicated to the learned societies of which he is a member, would take more space than is here given to the labors of his life. What distinguishes his investigations is that they strike into the very heart of pure science. He is no theorist. He ventures nothing in which the facts will not verify his inductions. He is certain as far as he goes, and his work today is substantially the same as that in which his father distinguished himself; but between the two there is a wide difference. Both have the merit of patient, original research, but the father had the poetry of science, in which the son does not share; the father was never more at home than before an audience with a crayon in his hand, and the son never faces an audience or makes a speech if he can help it; the father was so unconscious of the value of money, except for the purposes of science, that others had to keep his purse, while the son is one of the clearest-headed men of business to be found in Cambridge or Boston."

Superior & Pittsburg

The annual report of the directors of the Superior & Pittsburg Copper Company, Bisbee, Ariz., for the year ended Dec. 31, 1909, states that the work at the mines was satisfactory and that a good tonnage of new ore was developed. The ore mined and smelted amounted to 257,042 tons (wet weight), from which 24,623,339 lb. of blister copper were produced, or a yield of 4.754 per cent. The value of the gold and silver recovered during the year was $164,305. An average of 554 men were employed.

The operating expenses of the mines and smeltery are given as $2,113,880 ($8.22 per ton); construction, $13,673; general expenses, $29,888; freight, refining and marketing, $322,243; interest, $56,519; decrease in notes payable, $855,993. Liabilities: Accounts payable, $189,076; and notes payable, $570,561. Assets are in excess of the liabilities by $310,302, and consist of bullion on hand, $736,177; supplies at mines, $120,116; together with cash, accounts receivable and stocks of other companies to make age of 554 men was employed.

The total development work during the year was 26,027 ft. in drifts, winzes and raises from the Cole, Junction and Hoatson shafts. These shafts are 1500 ft. deep. The amount of ore developed is not stated.

Calumet & Arizona

The annual report of the Calumet & Arizona Mining Company for the year ended Dec. 31, 1909, states that during the year 13,815 tons of refined copper were produced from 327,807 tons of ore, or 83.93 lb. copper per ton of ore. The value of the gold and silver recovered was $211,760. The average number of men employed for the year was 1274. Of this number, 805 were employed at the mine and 469 at the smeltery. During the year four dividends were paid, making a total amount of $800,000 for the year.

The operating expenses at the mines and smeltery are given as $2,313,509; construction account, $161,588; salaries and general office expenses, $30,853; freight, refining and marketing, $363,315. The liabilities are given as accounts payable, $273,186. Assets in excess of liabilities, $3,155,494. These consist of bullion, $1,045,834; cash, $813,360; supplies, $549,775; and other items as notes and accounts receivable, making a total of $3,428,680.

At the mines at Bisbee, Ariz., development work was carried on at the Oliver, Irish Mag and Powell shafts, making a total of 27,562 ft. of drifts, winzes and raises. The Oliver shaft is 1375 ft. deep, or 50 ft. below the 1450-ft. level, which is counted from the Irish Mag shaft. The most satisfactory result of development during the year was the cutting of a large sulphide orebody on the 1350-ft. level, which has proved to be of larger dimensions and more uniform than on the upper level. This one has proved to be the largest sulphide orebody found in the Calumet & Arizona properties.

At the smeltery at Douglas, furnaces Nos. 5 and 6 were rebuilt during the year. The three large furnaces are 25 ft. x 44 in., and have a capacity of 500 tons each per day. The total capacity of the smeltery is 2400 tons per day. The report does not state the amount of ore developed, and detailed cost data are lacking.

In the United Kingdom there are two smelters of bismuth ore, namely Johnson, Mathey & Co., London, and Quirk, Barton & Co., London.

Goldfield Consolidated

At the Goldfield Consolidated, Goldfield, Nev., the preliminary report for March, 1910, states that the estimated value of the ore was $38.20 per ton; estimated recovery, $950,000; percentage extracted, 93.5; profit per ton, $27.43; percentage of profit, 71.8; total profit for month, $730,280. The details of production and costs are given in the accompanying tables:

MARCH PRODUCTION OF GOLDFIELD CONSOLIDATED.

	Dry Tons.	Approximate Recovery.	Per Dry Ton.
Combination	6,223	$167,200	$26.90
Mohawk	6,463	184,300	28.50
Red Top	6,273	185,500	29.55
Clermont	7,660	480,000	62.60
Total	26,619	$1,017,000	$38.20

The advances in the different mines in crosscuts, drifts and raises were as follows: Combination, 604 ft.; Mohawk, 585; Red Top, 1044; Clermont, 1479; total, 3712 ft. This amount is about 10 per cent. more than was done in February, and the results were even more satisfactory.

MARCH MINING EXPENSES OF GOLDFIELD CONSOLIDATED.

	Amount.	Per Ton.
Bullion tax and marketing bullion	$23,000	......
Administration, etc	21,400	......
Total general	$44,400	$1.67
Mining	90,000	3.38
Transportation	3,600	0.14
Milling and cyaniding	$62,500	
Marketing concentrate residues	15,000	
Total milling	$77,500	$2.91
Construction	4,400	0.16
Net cost	$219,900	$8.26
Loss in tailings	66,920	2.51
Total costs and losses	$286,820	$10.77

Ore was found in every mine and at nearly all levels from top to bottom. The ore found on main levels in drifts or extensions of sill floors was as follows: Combination, 230-ft. level, 306 tons @ 1.05 oz.; 280-ft level, 43 tons @ 1.48 oz.; Mohawk, 600-ft. level, 632 tons @ 1.44 oz.; Red Top, 265-ft. level, 122 tons @ 2.57 oz.; 330-ft. level, 784 tons @ 0.75 oz.; Clermont, 650-ft. level, 314 tons @ 6.30 oz.; 750-ft. level, 942 tons @ 0.98 oz.; 1000-ft. level, 378 tons @ 0.96 oz.; total main levels, 3721 tons @ 1.46 oz. Manager Finlay states that these developments put in sight in his judgment more than 60,000 tons of ore as good as that taken out during the month.

INTERESTING DEVELOPMENTS

Certain other developments are interesting. A raise through a flat orebody at the south end of the Red Top on the 330-ft. level went up vertically through 57 ft. of ore averaging 2.47 oz. per ton, indicating the presence of large amounts of ore not shown on the levels. In a number of other places in intermediate levels ore has been found that encourages belief in important further discoveries.

The cost of operating for the month was low. The total expenditures were larger than anticipated on account of certain considerable increases in the item of general expense, due partly to the high grade of the ore and partly to an accumulation of some occasional expenses.

March Oil Dividends

The accompanying table gives the amount of dividends paid by a number of California oil companies during March, 1910, together with their total dividends to date, as reported by the California Stock and Oil Exchange, San Francisco.

Name of Company.	March, 1910, Dividend.	Total Paid to Date.
Amalgamated oil	$50,000	$1,450,000
American Petroleum	126,735	1,056,695
Caribou	20,175	700,532
Claremont	10,000	325,000
Columbia	9,992	274,797
Euclid	3,500	124,000
Home	2,000	474,000
Illinois crude	2,000	88,000
Kern River	2,000	100,000
Linda Vista	3,838	72,931
Mexican Petroleum	85,616	3,477,243
Monte Cristo	50,000	390,000
Palmer	18,020	250,361
Paraffine	3,000	15,000
Pinal	14,992	887,101
Record	7,500	55,000
Rice Ranch	3,000	99,000
Royalty	6,666	15,467
S. F. & McKittrick	15,000	340,000
Sauer Dough	4,987	517,303
Section 25	10,000	10,000
Sterling	31,250	778,250
Traders	14,000	179,186
Union	124,813	6,368,255
United Petroleum	40,375	2,178,960
Wabash	3,000	120,000
West Coast (p'f'd)	20,816	82,264
Total for March, 1910	$683,675	

The Blackwater Mines, New Zealand

The Blackwater Mines, Ltd., which was formed in 1906 by the Consolidated Goldfields of New Zealand, has been making good returns and has recently declared a second dividend of 7½ per cent., the first having been one of 5 per cent. declared in September, 1909. The property of the company has been increased by the purchase of 200 additional acres which are deep-level claims of the mine, and an option to purchase other claims on the extension of the line of reef known as the "Prohibition Lease" has also been acquired. The main shaft is now 590 ft. deep and it has been decided to continue sinking to a depth of 1000 ft. with levels at every 150 ft. During the dry season there was a shortage of water power and the tonnage treated had to be reduced. To provide against a recurrence of this, a 136-h.p. suction-gas plant is being installed. The average tonnage treated is about 3000 tons per month, from which a working profit of £5100 is obtained, the costs averaging 15s. ($3.65) per ton.

Utah Consolidated

The Utah Consolidated Mining Company, Bingham, Utah, mined and shipped 280,637 tons of sulphide ore to the Garfield smeltery in 1909, from which a yield of 10,043,900 lb. fine copper, 298,167 oz. silver and 21,569 oz. gold was returned. The operating costs from the profit and loss account seem to be about as follows: Mining and operation of aërial tram, $1.68 per ton mined; development, $0.38 (8950 ft. of work having been done); smelting and transportation, $3.41; eastern office, refining, selling etc., $0.69; total, $6.16 per ton. The heaviest construction expense during the year was that of the new tramway, on which $128,706 were expended.

The profit for the year was $154,263, which, added to the accumulated surplus, permitted the declaration of $600,000 ($2 per share) in dividends, and the transferrance of $846,759 to smeltery realization account. The company exercised its option on 5000 shares of the International Smelting and Refining Company which yielded $15,000 in dividends in 1909.

The Highland Boy smeltery cost the company $972,676 and it was dismantled and sold in 1909 to the International Smelting and Refining Company which also purchased the smeltery site at Tooele. The entire proceeds from the sale of the Highland Boy equipment, less wrecking expense, amounted to $185,149. The company expects to complete its present smelting contract and start shipments to Tooele late in May. The new contract is reported to be so far more advantageous to the company that, had it been in effect in 1909, the year's profits would have been increased $307,010.

At the mine, the new orebody opened on No. 9 is reported large and valuable, and a new body of ore was found on No. 8 level late in 1909 which promises to yield a large tonnage. J. B. Risque, manager, states that No. 9, the lowest level of the mine, has penetrated a zone of secondary enrichment, and that work will be pushed at that point.

J. W. Finch, of Denver, was employed to report on the ore reserves, probability of future ore and the feasibility of outputting 1000 tons per day. He reported 981,680 tons of well assured reserves containing 2.36 per cent. copper, 0.064 oz. gold and 0.959 oz. silver per ton, together with an estimate of 139,680 tons containing 2.12 per cent. copper, 0.078 oz. gold and 1.209 oz. silver, this latter ore being indicated by the mine records but not accessible for observation although it is available for convenient extraction. Mr. Finch further states that there is every indication of the discovery of new ore both in extension and depth, and that, aside from some details of equipment, the mine is in condition to produce 1000 tons daily.

Treatment of Complex Zinc Sulphide Ores at Oker

The Pape-Witter-Babe Smelting Process Extracts Zinc Oxide from Slags of Copper, Lead and Zinc Ores; Wet Methods Unsuccessful

BY HERMANN PAPE*

Many attempts have been made to treat the so-called complex zinc sulphide ores that are world-wide in their distribution. A successful solution of this problem has been made in the new oxide works, which have been erected at Oker, Germany, by the International Metal Company, Ltd. At this plant are treated the slags containing zinc, which are produced by the lead and copper smelters of the Lower Harz.

The ores smelted in the works of the Lower Harz, as far as they come from the Rammelsberg, are produced from an orebody about 3900 ft. in length and 100 ft. thick in places. They are a mixture of pyrite, chalcopyrite, galena and blende, intimately associated with baryta. Besides the pyrite, there are small quantities of other gangue at the mines.

AVERAGE RAMMELSBERG ORES.

	Silver, Oz. per Short Ton	Copper, Per Cent.	Lead, Per Cent.	Iron, Per Cent.	Zinc, Per Cent.	Sulphur, Per Cent.
Lead ore	5.3	0.37	9.50	4.11	21.0	14.83
Mixed ore	6.0	4.75	8.80	11.89	22.98	24.60
Copper ore I	5.6	17.95	4.15	22.32	10.75	32.01
Copper ore II	4.3	9 69	1.83	31.39	6.06	38.42
Copper ore III	2.7	5.82	1.60	32.08	4.93	38.42
Kupferkniest	0.8	1.78	0.55	11.42	1.15	7.31

The ores are sorted into six classes as follows: Lead ores, mixed ores, copper ores I, copper ores II, copper ores III, copper-bearing country rock (the so-called *kupferkniest*). The first five classes are produced from the orebody proper, whereas the *kupferkniest* is the country rock impregnated with pyrites, chiefly chalcopyrite and pyrite. The analyses of the six classes are approximately as given in the accompanying table. The figures in these analyses are the average contents as taken from the books of the company. But the ores, of course, vary in composition. The lead ores are treated by the Juliushütte near Goslar, and the Sophienhütte near Langelsheim. All other ores, however, are treated at Oker.

ROASTING AND SMELTING

At Oker the lump portion of the mixed and copper ores is first roasted in a shaft furnace. The charge is ignited by means of a small wood fire. After this the roasting proceeds without further addition of fuel. Whenever necessary, this preliminary roasting of the lump ores is followed by a second roasting in order to eliminate the sulphur more completely. The ores, with sulphur contents of about 4 or 5 per cent., are then put in the blast furnace. The fines are next crushed to about 10-mesh size, and roasted in a muffle furnace which is of the Hasenclever type so generally used in Rheinland and Belgium, and fired with lignite. The gases resulting from the roasting are used for the manufacture of sulphuric acid.

The *kupferkniest* is crushed and roasted in the same manner as the lump ore. The proportion between the lump ore and the fines is adjusted so smelting can be carried on without briquetting the roasted fines. The copper ores and the mixed ores are smelted separate from the others, and the operations are so carried on that the final products of all the smelting are an impure lead bullion analyzing about 80 per cent. lead, and a matte containing about 70 per cent. copper.

The furnaces used for the smelting of the mixed ore are pentagonal in cross section, and the top of the charge is 17 or 18 ft. above the tuyeres. The upper width of the furnace is 70 in. and the lower width 50 in. The furnaces are operated under an air pressure of 12 oz. per sq.in. About 25 tons of roasted mixed ores are put through each furnace in 24 hours.

In the smelting of the mixed ores there results, besides the above mentioned bullion, a lead-copper matte containing about 30 per cent. copper. This matte is roasted, then smelted again in the blast furnace and finally smelted together with the matte produced from the copper ores, so that the final product is the rich matte mentioned above.

From the smelting of the copper ores, a low-grade matte is produced analyzing 35 to 40 per cent. copper. This, after the roasting, is smelted together with the concentrated lead matte to a high-grade matte containing 70 per cent. copper.

COPPER SLAGS USED AS FLUX FOR MIXED ORES

The slags from the smelting of the mixed ores flow into a cast-iron, conical slag pot, 28 in. in diameter at the top and 18 in. in depth. The overflow from the pot goes into a second pot of the same dimensions. The operation is carried on in such a way that the second pot is replaced four times before the first pot is tapped. The bottoms of copper matte contained in the first pot are separated from the slag, and these slags are returned to be melted over. Part of the slags from the second pot is thrown on the dump, and part is sent to the Juliushütte and Sophienhütte to be used as flux in the smelting of the lead ore. The slags resulting from the smelting of the mixed ores contain on the average about 17 per cent. zinc.

The further treatment of the above-mentioned lead bullion is by the well known Parkes process of liquation and desilverizing. The refined lead finally obtained assays 99.95 per cent. lead.

From the copper matte, anode plates are being produced by the usual method of refining in reverberatory furnaces. From these plates, 99.98 fine copper is obtained by the electrolytic process. The anode slimes, as well as the argentiferous zinc resulting from the desilverizing of the lead bullion, are treated by the usual methods for the production of fine gold and silver.

The slags resulting from the smelting of the copper ores contain a large percentage of iron oxide and are, therefore, an excellent flux for the smelting of the mixed ores.

The lead ores treated at the Juliushütte and Sophienhütte are first roasted and after the roasting analyze from 3 to 5 per cent. sulphur. In the roasting a part of the zinc contained in the ores is transformed into zinc sulphate which is leached out before the ores are smelted. From the solution, zinc sulphate is obtained by crystallization. A mixture is then formed consisting of 100 parts roasted ores, 22 parts Juliushütte slags, 22 parts slags resulting from the smelting operations of the mixed ore at Oker and five parts lime. This charge is being smelted in shaft furnaces and produces argentiferous lead bullion and zinkiferous slags. The lead bullion is shipped to Oker for refining.

Recently the slags resulting from the treatment of lead ores analyzing about 21 per cent. zinc, and the slags resulting from the treatment of the mixed ores, too high in zinc to be sent to Juliushütte and

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*Metallurgical engineer, International Metal Company, Ltd., Billwärder, Hamburg, Germany.

Sophienhütte, are also treated at Oker for zinc oxide.

WET METHODS FAILED TO EXTRACT ZINC FROM SLAGS

The total amount of ore treated at Oker per year is as follows: Mixed ores, 17,000 tons; copper ores, 3000; *kupferkniest*, 5000 tons. In the Juliushütte and Sophienhütte about 33,000 tons of lead ore are treated.

The zinkiferous slags resulting from the present smelting operations amount to about 30,000 tons in Juliushütte and Sophienhütte together, and about 12,000 tons in Oker; besides there are on the dumps at the plant mentioned considerable stocks of slags resulting from former operations. The composition of the slags is about as follows: ZnO, 22 to 27 per cent.; FeO, 30.5 to 16.25; BaO, 7.5 to 26; CaO, 3.7 to 4; Al_2O_3, 5.75 to 3; SiO_2, 23 to 9 per cent. It is not surprising that numerous proposals have been made for the extraction of the zinc from the slags of the lower Harz, and that thorough experiments have been made in various directions. In most cases the aim was to make a solution of the zinc and to precipitate it either as oxide or carbonate, or by crystallization as zinc salt, or to extract it in metallic form by electrolysis. All these attempts, however, have been unsuccessful. Wet processes are rarely practical or commercial.

The present process which is used on a large scale at Oker is strongly protected by the patents of the International Metal Company. This process, contrary to the former methods, is a smelting process. Before the commercial plant was built, the process was well tried out in a small though practical experimental plant. The present large-scale commercial plant has been running since April 2, 1909.

ONE EQUIPMENT TREATS WIDELY DIFFERENT SLAGS

The zinc-bearing slags are first crushed to a sufficient fineness and then mixed with reducing material such as coke screenings in such a way that this reducing material is brought into intimate contact with the crushed slag. This mixture is then charged into the oxide furnaces and there subjected to a high temperature. This volatilizes the zinc and forms a new slag which is practically free of zinc and flows from the oxide furnace. The operation of this furnace is continuous.

The works for the extraction of zinc at Oker was designed in such a way that it was made possible to treat the two different classes of zinkiferous slags, which vary greatly in their composition. It was a necessary condition that the plant should be able to extract the zinc from both these materials without a change in its operation. This was ascertained in the small experimental plant, erected at Oker, through tests lasting 18 months. It was thus proved that the process of the International Metal Company could treat with the same equipment, the slags from Oker as well as those from the Juliushütte and could produce zinc oxide at a profit. In this small plant, even copper-bearing zinc accretions from the blast furnaces (*ofenbruch*) were treated with the production of zinc oxide and a slag free from zinc. In this slag the copper is greatly concentrated and it can go back directly to the Oker smelting plant.

On the basis of the experience gathered in the operation of the experimental plant, plans for a large works were made which would be capable of treating the entire tonnage of slags from the smelteries of the lower Harz and produce zinc oxide from them. This large establishment has been erected near the works at Oker.

SLAG BRIQUETTED WITH COKE DUST

The zinkiferous slags are first passed through a crusher and reduced to 2-in. size. After this preliminary crushing they pass through a chain elevator and are delivered to two large ball mills. Simultaneous with the crushing of the slags, the coke dust, serving as reducing material, is prepared. This is too moist for immediate use, for which reason it passes through two drying drums which work continuously and dry the coke dust so that it contains on the average about 7 per cent. moisture as against 22 per cent. originally contained. After drying, the coke is raised to a trommel for screening. The fines passing through the screen can be used at once for briquetting purposes. The medium-size pieces are used as coke in the smelting.

The ground slags and the fine coke dust are kept in large bins overhead, from which they pass with the addition of ground pitch into a mixer which produces a homogeneous mixture of slag, coke dust and pitch. This mixture is raised by an elevator, warmed by superheated steam and briquetted in two presses of construction similar to the presses used for the manufacture of coal briquets. The briquets are stored in a suitable bin below an endless belt which transports them to their destination when needed. Next to the bin for the briquets is a bin for lump coke. Both are placed so that from either of these bins the slag briquets and the lump coke can be transported to the furnace building where the oxide furnaces are situated.

The oxide furnaces are constructed with slits in the bottom through which the necessary draft passes into the furnace and from which the slags, free of zinc, can drip. The operation, therefore, is a continuous one. In all other respects the furnaces have the same construction as those which were found to be suitable in the experimental plant. There are 13 of these furnaces, and in front of each there is room for slags, briquets and lump coke in sufficient quantity to operate the furnaces about 12 hours.

The slag, freed from zinc as it comes from the furnaces, falls into a long, narrow cellar running underneath the furnaces. Here it is cooled, loaded into dump cars and transported to an elevator which takes the slags to a cable tram by which they are carried to the dump.

HEAT OF GASES GENERATES STEAM

All the oxide furnaces are worked with as hot a top as possible. The hot gases pass into a large brick flue in which a part of the zinc oxide contained in them is found to be precipitated. From this brick flue the gases are conducted to 12 water-tube boilers. These answer the twofold purpose of cooling the gases and at the same time producing the steam required for the operation of the plant.

After passing through the boilers, the gases are cooled to about 280 deg. C. Their temperature on entering the boiler was on the average 1100 deg. C. The temperature of 280 deg., however, is still too high to allow the gases to enter the baghouse, and for the purpose of further lowering their temperature and distributing the gases properly, a wrought-iron economizer has been provided and connected with all the boilers. Four fans suck the gases through the economizer, a fifth being kept in reserve. The fans press the gases into a system of two wrought-iron chambers arranged in parallel. This arrangement is such that both chambers are directly connected with the fans, but, if desired, each chamber can be cut off from the fans. Usually both chambers are connected with the fans, but the connection of one of the chambers is cut off when it is desired to clean one of the chambers.

In these chambers the furnace gases are further cooled and a considerable amount of oxide is precipitated. Each chamber is connected with a larger chamber made of wrought iron in which the coarser and heavier particles of the oxide still contained in the gases are precipitated by arresting the flow of the gases. Thus the gases, after passing through this chamber, contain only the very finest and softest oxides suitable for the paint grinder's use.

FINEST OXIDES CAUGHT IN BAGHOUSE

From these pipes, which are in the open, the gases depart with a temperature which is still about 150 deg. C. Since this temperature is yet too high for the baghouse, a system of secondary fans has been provided near the pipes, the design of which is such that a considerable quantity of fresh air is introduced with the hot gases and, mixing with the gases, cools them considerably. There are four of such secondary fans, three in regular operation and one held as reserve. These secondary fans force the cooled gases containing only the finest oxide into the baghouse.

The baghouse consists of 16 sections, each 8 ft. 4 in. wide and 37 ft. 6 in. long. Between these are passageways to facilitate the emptying of the bag chambers.

The oxide accumulating in the chambers is either shoveled into barrels to be used for paint, or is thrown into conveyers which are arranged below the floors of the eight passageways between the individual chambers. These conveyers carry the oxide to a large conveyer running the entire length of the baghouse. From this conveyer, the oxide is carried by means of an elevator to the storage bin where it can be delivered to the packing machines. There are two packing machines for packing into sacks, and two others for packing into barrels. After the oxide has been packed, the barrels or sacks containing it go to the store room near the packing machines, or they can be loaded directly on the freight cars.

The works was started in full on April 2, 1909, and in the first six months' operation 5064 tons of oxide were made and shipped. Of this, 56 per cent. was obtained from the baghouse and the balance from flues and pipes between the baghouse and the oxide furnaces.

The reduction of the zinc oxide to spelter is now carried on at the zinc smeltery at Billwärder near Hamburg. It has been shown that the zinc oxide shipped from Oker can be treated with satisfactory results if it is intimately mixed with roasted blende and the reducing material in mixing machines, and the charge wetted and kneaded by powerful machines.

The cost of treatment is not excessive nor is the cost of the plant high. American rights for the process are controlled by strong hands and preparations are being made to build plants in the United States.

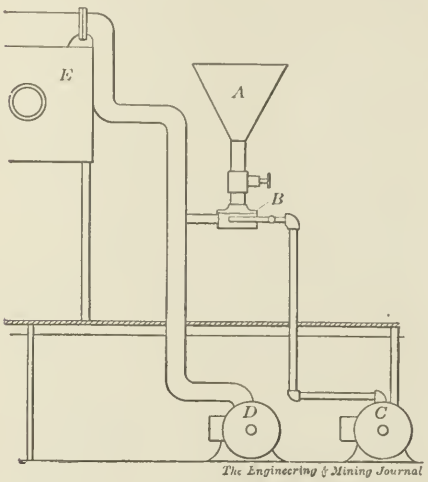
Removing Salamanders in Nodulizing Kilns

August Bräutigam, of South Orange, N. J., describes in U. S. Pat. 13,062, reissued Dec. 28, 1909, a method of disintegrating and removing annular salamanders in nodulizing kilns. The rotating kiln being stopped, a jet of compressed air at a pressure of 15 to 30 lb. is directed against the ring-shaped salamander as soon as it has formed large enough to be objectionable. The jet, preferably directed against the base of the hot ring, chills it, causing it to contract and shrink away from the brick lining. When the rotation of the kiln is resumed, a portion of the ring will become detached, and the remaining portion collapses in a manner similar to the falling of an arch when the keystone is removed. The fragments join the sintered ore passing through the kiln, and may, if suitable, form a part of the product.

Recovering Metals from Flue Dust

Nathan H. Livingston, of Globe, Arizona, in U. S. Pat. 943,752, Dec. 21, 1909, describes a process for recovering precious metals from the flue dusts of smelteries, doing away with the practice of pressing the dust into bricks and then smelting them in a furnace.

Referring to the figure, *A* is the dust hopper with a valve-controlled pipe leading to the chamber *B*. Into *B* projects a valve-controlled nozzle connected with the high-pressure blower *C*; *B* is also connected with a large pipe from a low-pressure blower *D*, this pipe discharging into the converter *E*.



Device for Delivering Flue Dust to Converters

The operation is as follows. The dust from the hopper falls by gravity into the chamber *B*, where it is ejected by the high-pressure pipe into the low pressure, carried by the latter to the converter, and there mixed with the molten matte.

North Star Mines Company

The North Star Mines Company, Grass Valley, Cal., in 1909 milled 91,610 tons of ore which yielded $13.59 per ton at a cost of $5.232 per ton for current operation and $1.189 per ton for development, a total operating cost of $6.421 per ton compared with $6.556 in 1908. The entire production came from the North Star mine.

The total earnings of the company were $1,245,078; total operating and development cost, $588,197; improvements and property purchase, $51,573; mine earnings, $605,307; interest and dividends earned, $40,098; sale of securities, $19,742; surplus for the year, $665,147. From this were paid $575,000 in dividends (23 per cent. on the capital stock), and the year was closed with cash or equivalent resources amounting to nearly 40 per cent. of the company's issued capital.

The upper or old workings of the North Star mine, on and above the 2700-ft. level, produced 21,819 tons of ore which yielded $14.39 per ton. The deep workings produced 69,791 tons, yielding $13.34 per ton. The upper levels contain an ore supply of about 25,000 tons, and the lower levels are stated to have several years' output developed. Exploration at depth has been discontinued for the present on account of the large reserve of ore already available.

The North Star companies from May, 1884, to Dec. 31, 1909, have produced 784,846 tons of ore which yielded an average of $14.368 per ton, and have paid $2,486,989 in dividends. The operations of 1909 were the most successful yet accomplished by the company, the tonnage, production and profit having exceeded those of any previous year of its history.

Tamarack Mining Company

The annual report of the Tamarack Mining Company for 1909 shows an operating loss of $128,546. This deficit is reduced to $28,546, however, by reason of a $4 dividend on the company's ownership of 25,000 shares of the Lake Superior Smelting Company.

There were 872,245 tons of rock broken, of which 183,146 tons were discarded. The operating costs were reduced under the Calumet & Hecla management, amounting to 14.3c. per lb. of copper in 1909 as against 15.24c. in 1908 on exactly the same grade of rock. Better yield is anticipated in 1910 as the company abandoned the Osceola lode in Tamarack ground on Jan. 1, 1910, separate crushing having shown it to yield only 13 lb. copper per ton.

RESULTS AT TAMARACK, 1910.

Tons of rock stamped	689,099
Cost of mining, transportation, stamping and taxes per ton of rock	$2.44
Pounds mineral obtained	20,286,174
Pounds refined copper produced	13,533,207
Per cent. refined copper in mineral	66.71
Pounds refined copper per ton of rock stamped	19.6
Cost per lb. at mine, excluding construction	12.41c.
Cost per lb. construction	0.33c.
Cost per lb. of smelting, freight, Eastern office, etc.	1.18c.
Cost per lb. interest paid	0.38c.
Total cost per lb. refined copper	14.30c.

A noteworthy feature of the report is the statement of President Agassiz that tests showed an increased extraction of 2 to 2½ lb. of copper per ton of rock could be made by treating Tamarack conglomerate rock in the Calumet & Hecla mill as compared with the Tamarack mill, while the Tamarack mill gave as good results from the Osceola amygdaloid rock. On Jan. 1, the system was inaugurated of sending Tamarack conglomerate to the Calumet & Hecla mill, while the Tamarack mill is used to treat Osceola amygdaloid from the Calumet & Hecla.

Ore Dressing in the Coeur d'Alene District—VIII

Wilfley Tables, Vanners and Launders; Excessive Use of Wash Water;
Buddles Efficient; Use of Pumps for Distributing Slime. Much Zinc Lost

BY EDWARD S. WIARD*

On the flow sheets which accompanied the second section of these articles in the JOURNAL of Dec. 4, 1909, were shown various modes of retreating or disposing of the products made by Wilfley tables. When the table was first introduced into the district only concentrates and tailings were made, the middlings being returned to the deck by way of the table elevator. Later the middlings from groups of machines were brought together and fed to what was called a middlings table. This must be regarded as a futile operation, the excuse for it arising from irregularities of feeding.

TABLE PRODUCTS

The arrangement of materials on a Wilfley table in the district is: First, a broad band of slimy water; second, a band of sand which is clean near where it borders the slimy band but becomes more contaminated with other sulphides than galena, including grains of gangue and galena, and finely divided galena as it approaches the concentrate band. The gangue in the sandy band is made up of grains of spathic iron, quartz and quartzite. At Wardner the bulk of the sandy area is spathic iron. Next to the sand lies the galena, frequently separated from it by a narrow but distinct band of pyrites or blende or both.

Of late years it has been the practice to send the barren portions of the sandy band to waste and collect the pyrites and blende for retreatment with a view to effect merely increased saving of the galena. The latest development is to collect the slimy water from the front of the table, thicken it and retreat on vanners. This is not the universal practice. To the eye the sandy band appears to be perfectly clean, but of the portion sent to waste the percentage of lead will vary from 0.8 to 3 per cent., depending on the richness of the feed and its fineness. Included grains are more numerous on the tables fed from the first plugs of the classifying tanks, and fine galena on the decks receiving fine feed.

The amount of wash water used on the tables varies widely. In extreme cases it reaches a maximum of 15 gal. per minute per table, possibly more. Where there is a division of the feed into slime, sand tailings, middlings and concentrates, the usual way of arranging the spouting about the table is to have a permanent partition in the front spouting at the normal point of division of the sand and slime, and a sliding cutter mounted on the spout for a nicer separation of the two materials. A short distance below the permanent partition there is a second one which separates the worthless sand from the richer sand. Finally, a third fixed partition in the spouting is placed in the concentrated portion near the corner of the table. To take advantage of this arbitrary arrangement of partitions the table must be tilted so that the middlings drop in their proper pocket.

The methods I shall now describe will, I believe, be found superior to the foregoing. To my mind there is no more pleasing mill picture than a long vista of well mounted and lighted Wilfley tables, yet only too often is it confused with a network of spouting, piping and belting. The piping can nearly always be run under the floor with risers for each table. Frequently the tables can be run from a countershaft below the floor. If the piping and belting are put in in this way it will allow a simple arrangement of the spouting and give the tableman greater freedom of movement.

The wash water should be introduced into a cone mounted alongside the table. The cone should overflow around its perimeter and the water for the table taken from some point below the surface of the water. The fluctuations in the water supply in most mills are usually too great to allow of nice work if introduced by a riser and valve from the supply main. It is useless to apply this refinement if there is much vibration of the table floor or if the linoleum covers have been improperly secured to the tables. If the linoleum be not applied so as to make a perfectly plane surface dry spots will form long before the wash water is cut down to a minimum.

Linoleum repels water, and if there be a hump in the deck there will finally come a point, by reducing the wash water, where the repulsion is greater than the weight of water on the crown of the high point; the water will fall away, leaving a more or less circular dry place on the linoleum. Around the borders of this area the mineral will rise to the surface of the film of wash water and float away. If the wash water contains sand or trash it will be difficult to make a reduction in the amount of wash water. The little cone will remove all the sand and trash and much slime. Where wash-water boxes have to be cleaned frequently it is almost certain that too much water is being used. All the holes in the water box should be kept free and a hole should be drilled in the blind space where the water pipe usually enters the box.

The table should be cut away, before applying the riffles, at the concentrate end along a slightly diagonal line instead of being left square ended as received from the manufacturer. This will dispense with the water-drip board provided with the tables, for every part of the end of the table will be reached by a direct flowage of water from the water box. The ridges formed by the linoleum around the end tack heads are another source of dry spots and it is largely on their account that the water-drip device must be used. If the linoleum be bent around a molding at the end of the table, and to the face thus presented an apron be affixed, this trouble will be entirely overcome. Under the best conditions 3 or 4 gal. of wash water per minute will be found sufficient.

TABLE ADJUSTMENTS

The table should be run as flat as possible and separation of the products made entirely by adjustable splitters. The logical place for the support of the splitters is the table and not the spouting. If the splitters rest on the spouting it will be found that while the lines of demarcation are often well fixed on the table they are confused and irregular in position by the time the ore has dropped to the edge of the spouting. By the intelligent use of splitters, other conditions being good, the tables can be run long periods without changes in the slope or wash water. I have not indicated the mechanical means of attaining these refinements—a little thought and ingenuity will readily supply this omission.

If new tables are to be set up it will be found advisable to prepare drawings for the spouting as well as the splitting devices. A greater range in the movement of the splitters can be obtained by hinging the partitions in the bottom of the spouting. Good classification for tables I regard as essential to making a high saving in the sand and slime department. I find the view prevails today that the evils of poor classification or lack of screening can be overcome by retreatment operations. While this is true to some extent, these operations

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*[illegible] Denver, Colo.

cannot take the place of proper preparation of the feed at the beginning.

The Use of Vanners

In the Coeur d'Alene district as in many others the vanner is the final concentrating machine. Plans for betterments in the slime department have always contemplated vanners. The chief advantage of the vanner is that a high-grade concentrate can be made and this is attained largely by the shake of the machine. The shaking involves complication of design and causes high tailings. In most mills both clean concentrates and low tailings are wanted. The proper way to secure them, in my opinion, is to use the machine in the first treatment of material too fine for successful separation on tables of the Rittinger type. The tailings from the vanner can then be led to convex revolving buddles, the low-grade concentrate made on the buddles being enriched on a vanner and the tailings from the latter returned to the buddle. For retreatment work of this kind I regard the buddle more favorably than vanners. Vanners might be run better than they are in most mills.

Owing to the great number of wearing parts, vanners require constant attention, and it has been my experience that the average vannerman is unable to render it. If anyone doubts this he should be at the average mill when these machines are being started independently of the rest of the mill. At such times the noise made by worn parts will be plainly audible.

In few mills are the factors for each vanner, such as slope, speed, wash water and consistency of pulp, thoroughly investigated. The usual practice is to put the feed on the belt as thick as the classifying or settling means permit, with the view of obtaining a "bed," the adjustments of the machine being considered of none or minor importance.

In the old Last Chance mill at Wardner the coarsest material leaving the jig classifiers was fed to a round table. This was the practice in the south Bunker Hill mill until replacement of the buddles by Wilfley tables. It is the practice today at the Morning mill. In the old Morning mill the finest material was not placed on vanners but upon round tables with linoleum covers. This was a successful plant, and while I have no comparative figures of its work as against vanners, it gave me a strong impression that in many cases the engineer would do well to conduct competitive tests with buddles and vanners to determine which is the more efficient. The disadvantage in the use of round tables arising from unclean concentrates has been mentioned. There is the further disadvantage of large floor space absorbed by each machine. To offset these there is the certainty of continuous operation and a small cost for power, repairs and lubricants. In the matter of surface I prefer canvas, but linoleum and reinforced concrete have been used successfully.

Launders

The launders in the district are rectangular wooden boxes and with the exception of sand and slime launders are lined with sheet steel or flat, chilled cast iron. The latter is used extensively in transporting ore to and from the jigs and in tail races. Sheet-steel side liners are generally used with the iron liners. The wear of the flat-bottom liners is generally greater in the center than at the sides. Where the wear is allowed to proceed to an extremity, relatively long narrow holes appear in the liners along the center line. This selective wear may be due partly to reactions from the sides of the launder which throw the bulk of the material being transported to the center. The greater velocity of the water in the center of the launder certainly causes more intensive rotating impacts of coarse pieces of ore or tailing.

The cast-iron liners are usually made in sections 2 ft. long. and this lack of continuity in the lining of a spout is responsible for greater wear than would prevail otherwise. The pieces of material in the spouts, striking the ends of the liners, fly up out of contact with them and land with a more or less rotational impact. A somewhat similar action can be observed on the tail boards of jigs which are provided with an inclined protective steel plate secured with wood screws. Below the screw heads will be found a depression scoured out by the tailings. The particles of ore, meeting the irregularities of surface at the screw head, tend to jump or rotate. If the slot of the screw head points downward the depression will be found directly below the screw head. If the slot point to one side or the other the depression will be found in the direction which the screw slot points.

It would be interesting to know if there is a critical slope in launder work at which the wear of iron and steel is a maximum. It would seem as though wear would diminish as the slope of a launder increased, but this may not be the case under practical conditions. The Last Chance mill tail race was 11 in. wide inside and lined in the bottom with chilled liners and on the sides with sheet liners. The average slope was ¾ in. in 1 ft. The material transported ranged in size from slime to 1-in. and sometimes larger and amounted to 300 or 325 tons per day. The water in this spout varied from 500 to 800 gal. per minute or a ratio by weight of water to tailings from 9:1 to 16:1. The smaller amount of water did very well if the tail race was in good condition, but even with the higher rate stoppages were not infrequent. The tail race would always begin to stop up at some point where there was a worn spot in the liner and the tailings would build back from this point.

Experiments with Concrete Liners

Under these adverse conditions I at one time introduced into the tail race a concrete liner 2x12x24 in., made in a 1:2:6 proportion. The sand for this liner was obtained from the fine jigs, and most of it would have passed a 20-mesh screen. The rock was obtained from the tailings of a coarse jig and the pieces would average about ½ in. in size. The constituents of the concrete were mixed dry and enough water added to make a thin mixture. The liner was molded in a shallow box with light tamping. The liner was set in the tail race with the bottom face up and exposed to wear. The liner behaved very well for a few hours but after that period it began to cause frequent stoppages and it had to be removed. On examination it appeared that the cement and sand had been gouged out from around the rock grains to a depth of ¼ in., leaving a rough and irregular surface. With greater slope or more water than was to be found in the Last Chance tail race a concrete liner might give satisfactory service. From the point of cost they are attractive. Liners of the size I made would cost not more than 5c. each if made of American cement, whereas a cast liner of the same length and width cost from $1.40 to $2 each.

Water Used in Concentration

One of the reproaches cast upon Coeur d'Alene mill practice is that large amounts of water are unnecessarily used to effect concentration. The same evil, however, exists in many of the northern mills. Wherever water is cheap and plentiful it will be used extravagantly and usually without any attempt at dewatering operations. The difficulty of dewatering increases with the amount of water to be handled. In the Coeur d'Alene the problem of removing water from various grades of ore would, in many cases, be serious as the bulk of the ore treated is coarse and a large amount of water must be in circulation.

In describing the diagram, I shall indicate where dewatering operations are lacking but might logically be used. The diagram shows the water-flow sheet of a Coeur d'Alene mill as it existed a number of years ago. Since then changes have been made in increased equipment, which I believe will not affect the main totals but merely the division of them. The consumption of water per ton of ore in this mill represents about the average use of water in the district. The over use of water is bad even when followed by dewatering operations, as I shall now give instances to show.

EFFECT OF WASH WATER

The ore in the Coeur d'Alene mills is first wetted in the spout below the No. 1 rolls. Forty gallons per minute are used at this point for transporting the ore into the elevator. The line of four trommels dilutes the pulp by 80 gal. of water per minute. The return water with the middlings from rolls No. 2 and 3 arrives at the jig classifiers, making a total flow of 368 gal. per minute. There is no dewatering apparatus at No. 2 rolls, and only partial dewatering by aid of a small V-tank at the No. 3 rolls. Much of this water as well as all of that of the feed-spout spray might be eliminated without affecting the discharge of the elevator at its head. It will be seen that the first three trommel oversizes consume 60 gal. of water for washing the jig feed to the dead boxes. There is apt to be an undue amount of water used on the trommels, because the jigmen find the more wash water that is used, the better the screening. They overestimate the beneficial effect of wash water. The harmful effect on classifying and settling operations more than offsets the gain.

On the coarse jigs large volumes of water are used to soften the suction and aid the plunger in lifting the deep heavy beds. In the section on jigging I showed that one of the factors in making rich tailings was the current of ore and water in the last compartment, and that the greater the current the greater the tendency of pieces of middlings to pass over the tail board of the jig. Here is a harmful effect that cannot be overcome by ordinary dewatering operations. With better-fitting plungers the necessity for the use of large amounts of water would disappear. Less water on these jigs in desirable in dewatering the tailings. The tailings water contains notable amounts of fine high-grade galena which can be recovered by proper settling. To the eye this water is perfectly clear. At one time in a 30-day period, with a crude settling tank, I recovered from two jigs four tons of ore assaying between 65 and 70 per cent. lead.

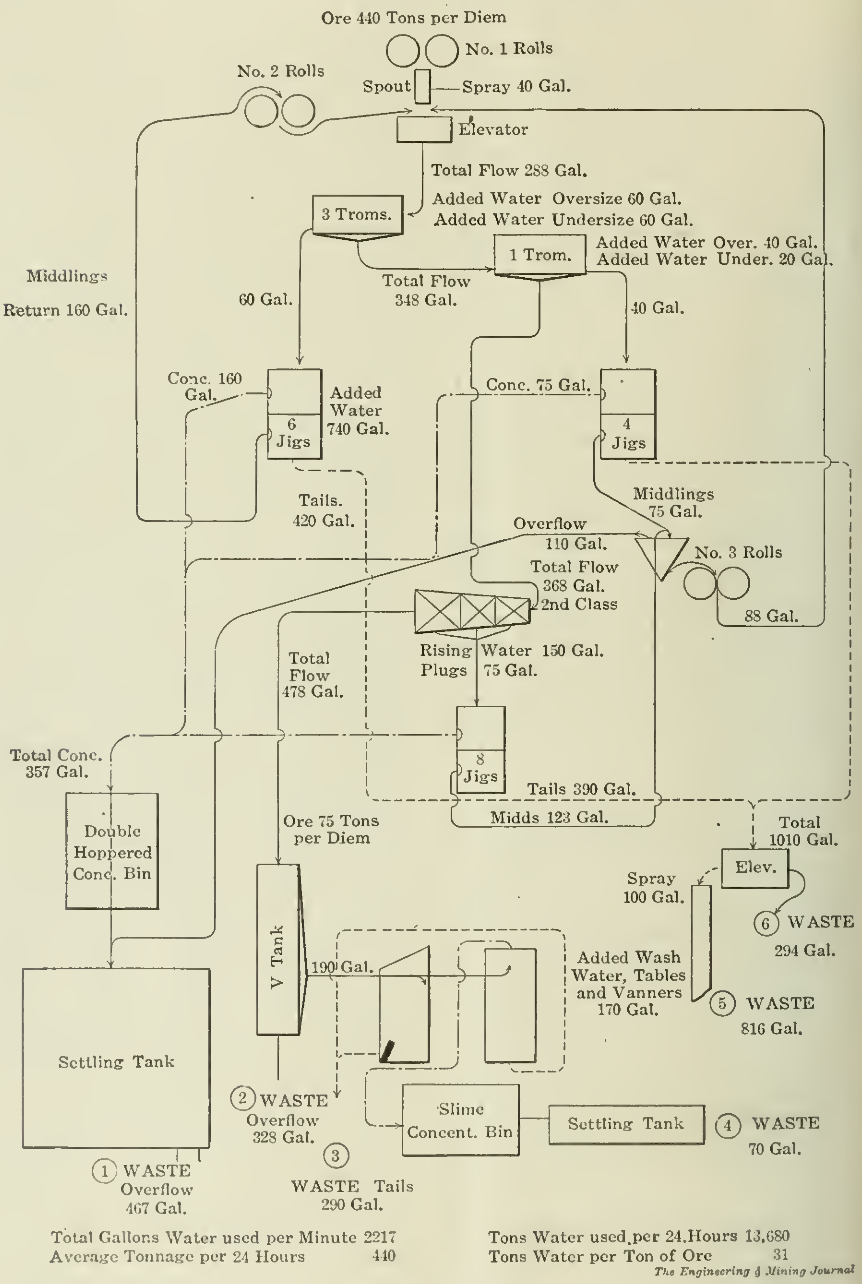
ELIMINATING EXCESS WATER

At the classifiers the sands suitable for the fine jigs could be removed by a mechanical device, the overflow passing to the slimes department, where before classification or screening it should undergo a thickening operation. On the diagram, Fig. 1, solid lines indicate original ore, middlings, or a mixture of the two. A dot and dash line indicates flow of concentrates and a dash line tailings. Six points of waste are shown:

(1) The overflow of the outdoor settling tank receiving the overflow of the jig-concentrate bin, and the overflow from the dewatering tank over the No. 3 rolls.

(2) The overflow of the long classifying and settling tank of the sand and slime department.

(3) The tailings from the Wilfleys and vanners.



FLOW SHEET SHOWING AMOUNT OF WATER USED, AND PLACES WHERE WASTE OCCURS IN A TYPICAL COEUR D'ALENE MILL

(4) The overflow from the settling tank receiving the overflow from the slime-concentrate bin.

(5) The jig-tailings tail race.

(6) The overflow of the boot of the elevator feeding the tail race.

Wash water is usually obtained by fluming into the mills at a point high enough to reach all the machinery by a gravity flow. In some of the mills power is developed from the flume water by Pelton wheels or turbines.

EFFICIENCY OF PUMPS

At the Last Chance the greater proportion of the wash water is raised by two centrifugal pumps, the smaller of which raises 500 gal. per minute against a head of 61 ft. The pump column had a total length of about 75 ft., with one sharp right-angle bend. The power required to drive this pump was 35 h.p. The second pump raised 1450 gal. against a head of 43 ft., the total length of pipe being as with the smaller pump, about 75 ft. There was one 90-deg. elbow in this column and the power required to drive was approximately 45 h.p. With these data the reader can figure out the efficiencies of these pumps. It is much lower than reported by the authorities on pumping.

I believe it worth while to call attention to the tests of W. O. Webber, making comparisons of plunger and centrifugal pumps, and a summary of which appears in the last edition of Kent's handbook. The highest efficiency, about 69 per cent., with centrifugal pumps was obtained with a head of about 17 ft. With reciprocating pumps the efficiency under this head was about 50 per cent. With a 10-ft. head the reciprocating pump had an efficiency of but 30 per cent., whereas the centrifugal pump had an efficiency of 64 per cent.; at 30 ft. the efficiencies were about equal, 66 per cent.; at 40 ft. the reciprocating pump had an efficiency of 71 per cent. against 58 per cent. for the centrifugal, and at 60 ft. 77 against 40 per cent. for the centrifugal pump.

ZINC

In my first article some figures on the ratio of zinc to lead were given. The ores containing large amounts of zinc come from mines in the vicinity of Cañon and Nine Mile creeks. At the Tiger-Poorman mine in this zone the mill feed averaged about 3½ per cent. zinc to 6 per cent. lead. Every effort was made in this mill, up to the time it was shut down, to reduce the content of zinc in the lead concentrates, as much zinky material being sent to waste as possible. The jig concentrates contained about 9 per cent. zinc to 53 per cent. lead. The slime concentrates contain about 11 per cent. zinc to 50 per cent. lead. At the Success mine in the Nine Mile region, zinc is separated on Wilfley tables and sold at a profit.

It is only of late years that the managers of Cœur d'Alene mines have taken much interest in the problem of making a salable zinc product. Prior to this the high cost of freight and treatment caused it to be given little consideration. A noteworthy part of the ore in the zinky zone consists of finely divided, intermixed masses of zinc, iron and lead sulphides, which offer great difficulties in treatment. Treatment of ores such as those at Wardner for the recovery of zinc is out of the question at present and probably for those of the Standard-Mammoth vein, where the amount of zinc is 2 to about 8 per cent. lead. For a brief period the Frisco-Consolidated mill separated galena and blende, magnetic machines being used to raise the grade of middlings.

(*To be continued*)

The question of the feasibility of manufacturing iron from titaniferous ores is receiving extended discussion on the Rand. Able men are on both sides of the question. To make the affirmative answer more certain, government assistance in the form of protective duties is urged, and the standard American protective arguments are used.

Hydraulic Mining in California

There is considerable activity in hydraulic mining in northwestern California where the California Débris Commission has no jurisdiction. The Caminetti law which created this commission to control hydraulic mining in certain portions of the State, only applies to the drainage basins of the Sacramento and San Joaquin rivers. The commission absolutely controls all hydraulic mining affairs not only on those navigable rivers but on the numerous nonnavigable tributaries in the foothills and the Sierra range. No man may start or operate a hydraulic mine in that region without a permit from the said commission and this permit may be revoked at the pleasure of the commission.

Before the operator can start he must make a satisfactory showing to the commission that his impounding works, etc., will effectually confine the débris. These works and dam must be constructed upon a plan approved by the commission and the miner must foot all the bills. Hearings of a public nature must be held at which the Anti-Débris Association and others opposed to hydraulic mining may bring such objections as they can devise to show that any particular mine should not have a permit to operate by hydraulic process. From beginning to end of proceedings the hydraulic miner is opposed. The commission itself is, as at present organized, popularly thought to be opposed to hydraulic mining, as having in view more the protection of the rivers than the mining industry. However this may be, it is a fact that the hydraulic-mining industry in the central portion of the State is not in a flourishing condition and comparatively few applications for permits to mine by that process are being made.

In those parts of California where the Débris Commission has no authority whatever, and where the drainage of streams is into nonnavigable rivers which flow directly into the Pacific ocean, the hydraulic-mining industry is flourishing. Siskiyou, Trinity, Humboldt and Del Norte counties, in the northwestern portion of the State, where the hundreds of tributaries flow finally into the Klamath river, are free from all restrictions. Those counties have immense beds of auriferous gravel which are not lava-capped, and therefore available for washing with hydraulic giants. The great drawback as compared with the central counties, is the lack of extensive ditch systems. In the counties named, individual mines have individual water-supply systems, and the necessity of making these and acquiring the water rights has kept back development. No matter how rich the ground may be in a property which must be operated by the hydraulic system, if it has not an abundant supply of water for washing the gravel, and a dump to dispose of the débris, the gravel cannot be utilized. There are still large tracts of gravel lying idle in the counties named, because the owners have not the capital to put in the reservoirs, ditches and pipe lines necessary to utilize the ground. The value of this ground depends largely on the cost of the water.

A Curb for Promoters

Lindon Bates, Jr., Assemblyman from the 29th New York District, has introduced into the Assembly of the State of New York, a bill which is intended to extend to investors in industrial, mining and other joint stock companies the same protection that is now accorded holders of railway and traction bonds and shares under the provisions of the Public Service Commissions act.

The bill is amendatory of the general corporation law, and is similar to a bill which passed the Assembly several years ago and failed by a single vote in the Senate. Its enactment is urged as a protection again irresponsible promoters and stockwatering manipulators, and the misrepresentation of stock values by them. It defines the term "promoter" and "promotion agreement," and puts the promoter in a fiduciary relation to the corporation whose stock he is engaged in promoting.

"Under the provisions of this bill the promoter must disclose his interest in any property sold to the corporation, and the amount he is to receive for his services.

Stock offered for sale must be accompanied by a certified prospectus, showing the material facts on which its valuation is based. The high-finance stock-watering schemes of obtaining money under false representations is under this bill made a crime, equally with the cruder methods now punishable under the criminal code.

This measure is based on the law in force in Great Britain, under which the notorious Whittaker Wright was condemned. It is now the law in Massachusetts. In effect it places all corporations in the class of those under the Public Service Commission act as regards the sale of stock. It would tend to prevent the sale of bogus mining stocks.

Manager Girault, of the San Rafael cyanide mill in Pachuca is treating daily 350 tons of silver ore, containing 10 oz. and more of silver per ton. The pulp is agitated with only 1.2 parts of solution to one of dry ore, and the arrangement of plant is such that only 2 tons of solution are precipitated per ton of ore treated.

Theoretical Notes on Reverberatory Furnaces

Wood an Acceptable Fuel under Certain Conditions; Coal vs. Oil; Producer-Fired Regenerative Reverberatory Likely to Be the Future Furnace

BY C. A. GRABILL*

Numerous attempts have been made at various times to construct wood-burning reverberatory furnaces for copper smelting. They have not, to my knowledge, been remarkable for their success. The fault is frequently laid to the fact that the length of the furnace did not bear the right relation to the length of flame produced by the combustion of the wood, or similar reasons the nature of which depends on whether they are given by the constructor or the operator.

An examination of the physical properties of the materials involved will show without much trouble that the fault is not so much in elements of design such as mentioned as it is in the nature of the fuel itself. Wood cannot be successfully used in the ordinary firebox reverberatory except in special cases where the slag produced is unusually fusible, or the charge is such that it will react with the production of considerable heat itself. Under usual conditions, smelting with wood is difficult, tedious, expensive and unsatisfactory, except as noted below.

Calorific Value of Wood

Wood, taking oak as an example, when artificially dried, is composed of: Carbon, 50 per cent.; hydrogen, 6; oxygen, 41; nitrogen, 1; and ash, 2 per cent (Kent). Foster states that when air dried for one year it contains from 20 to 25 per cent. moisture. Langton[1] gives determinations at Nacozari, Mexico, ranging from 9.67 to 25.21 per cent. moisture, the lowest being on wood dried in the open air for two years. This was, of course, in the dry climate of Mexico. Generally we may take Langton's average as representing ordinary conditions. It is low rather than high as few plants could carry a year's stock of material on hand as bulky and liable to fire loss as wood.

Calculating the calorific value of this wood by Dulong and Petit's law gives per kilogram of dried wood:

0.5 kg. carbon at 8,100 cal	4,050 cal.
0.00875 kg. hydrogen (net) at 34,500 .	302 cal.
Gross calorific value	4,352 cal
Less heat of evaporation, 0.79 kg. H_2O at zero deg	479 cal
Net calorific value	3,873 cal

It is assumed in the net value that the wood was air dried and contained 20 per cent. moisture, or 0.20 kg. of water to 1 kg. dry wood.

Combustion of this wood, air dried, produces 1.833 kg. CO_2, 5.385 kg. nitrogen, and 0.79 kg. H_2O. The *Reichs-Anstalt* gives the following formulas for the mean specific heat of these substances for temperatures from zero to 1600 deg. Centigrade:

$$H_2O \text{ vapor, Sp.ht.} = 0.4669 - 0.0000168\,t + 0.000000044\,t^2.$$

$$CO_2, \text{ Sp.ht.} = 0.2010 + 0.000072\,t - 0.000000018\,t^2$$

$$N_2, \text{ Sp.ht.} = 0.235 + 0.000019\,t.$$

Calculated from the above the heat capacity of the products of 1 kg. of wood is, $2.0047\,t + 0.000225\,t^2 + 0.00000004094\,t^3 = 3873$ cal. Solving this gives 1575 deg. C. as the maximum temperature of combustion. Using Mallard and Le Chatelier's figures as given by Richards yields a much lower result, but they are probably not so accurate and I have therefore used the above formulas even for the higher temperatures where the others are perhaps better. This I have done for the sake of comparative results. For other elements than those given I have used Mallard and Le Chatelier's figures. The calculations are in the metric system except where otherwise required for comparison with data in the English system.

Temperature of Combustion

This figure, 1575 deg., is then the maximum temperature theoretically possible in a reverberatory furnace using the above wood fuel. Practically it is not attainable owing to imperfect combustion, the use of more air than is theoretically required, radiation and other causes. Offerhaus in the Journal of June 20, 1908, gives the temperature of the Anaconda reverberatories at 1550 deg. C. If it be assumed that the wood was burned with 10 per cent. excess of air over that theoretically required the temperature of combustion drops to 1490 deg., from which it is evident that the temperatures of the modern reverberatory are impossible with wood containing 20 per cent. moisture as ordinarily fired.

By the above formulas carbon has a possible temperature of combustion of 2110 deg. C. and hydrogen 2050 deg. C., and coal will have a maximum combustion temperature of 2030 deg. C. if of the following composition: Carbon, 70 per cent.; hydrogen, 8; oxygen, 8; nitrogen, 1; sulphur, 1; ash, 7; and moisture, 5 per cent.

If it be assumed that the temperature attainable in practice for wood firing bears the same relation to the theoretical that it does in coal firing, then the temperature to be expected in a wood-fired furnace would be 1200 deg. Offerhaus states the temperature of the issuing slag is 1120 deg., which does not leave much margin for furnace efficiency with wood fuel. Ricketts[2] gives 2400 deg. F. as the temperature of the gases from the oil-fired reverberatory furnace at Cananea. That would be 1315 deg. C., or more than 100 deg. C. higher than the above estimated temperature of the wood-fired furnace. As the temperature of the issuing gases will, in general, never average much less than the temperature of the issuing slag, the efficiency of the fuel depends in large measure on the proportion of heat in the gases above the slag temperature or, in the case of wood, in the heat represented by the difference in the temperatures 1200 deg. and 1120 deg. and in coal by that between 1550 and 1120. Of course, these last figures are only qualitative and indicate how much more difficult it is to keep up a smelting temperature with wood than with coal and that a much greater proportion will be required.

Examination of the analyses of the two fuels shows that the air-dried wood contains but 40.7 per cent. of combustible as against 78 per cent. in the coal with practically the same dead weight of water vapor to be heated in both cases. This, with the open nature of the wood fire and the consequent excess of air supply, is the source of the trouble. There are several methods for improving conditions, among which would be kiln drying the wood, but with the amount required this would be a task, particularly on account of its inflammable nature.

Producer Firing Suggested

By producer firing is meant the firing of the fuel in such manner that complete combustion does not take place in the fire box, but is completed by inletting air at or near the fire bridge. Unfortunately this will not remove the water vapor from the products of combustion and that is the source of much of the evil. The total heat generated and the products of combustion are the same whether the process is completed in one stage or two. Practically there might be a small saving by the producer firing in that excess of air may be more easily avoided.

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*[illegible] Montana street, El Paso, Texas.

[1] "The Power Plant of the Moctezuma Copper Company," *Trans.* A. I. M. E.

[2] *Bull.*, I. M. M., Nov. 1, 1909.

If producers are used, the case is entirely different and much more satisfactory. They may be attached direct to the furnaces or as independent units with a regular equipment of scrubbers. Both methods have their advantages. Referring to Langton's description of the Moctezuma power plant, it may be seen that using wood of the composition of that described above in an independent producer with scrubber, gas was obtained of the composition shown in the accompanying table.

COMPOSITION OF WOOD PRODUCER GAS.

	Vol. Per Cent.	Cal. per Cu.M.	B.t.u. per Cu.Ft.	Products, Vol. Per Cent.
CO....	13.5	414	46.5	.....
H_2.....	18.5	484	54.4	.....
CH_4...	2.3	198	22.2	.....
C_nH_{2n}..	0.3	44	4.9	.....
CO_2....	14.5	....	.....	30.9
O_2.....	0.3	....	.....	.....
N.....	47.6	....	.....	128.8
H_2O...	2.9	....	.....	26.6
Total.	100.0	1140	128.0	186.3

The air required for combustion is 102.4 per cent. of the gas by volume. The analysis as given by Langton is based on the dried gas and contained no H_2O. He states that the scrubber water was 72 deg. F. and I have therefore assumed that the gas passing through was saturated at that temperature and corrected, or rather changed the quantities to correspond.

Computation shows that of the harmful combined water in the wood 10 per cent. is eliminated by condensation, over 80 per cent. is decomposed in the producers to useful hydrogen and carbon monoxide and less than 10 per cent. remains present as a harmful ingredient of the gas. There have, however, been heat losses in the producer and calculation shows that the temperature of combustion of this gas is only 1600 deg., a gain of only 25 deg. over the raw wood and apparently things are not any better off than they were before without counting the losses and expense of the producer.

Whether the omission of the scrubbers and the utilization of the sensible heat in the producer gas would be better is a question that would lead too far at present. Under the circumstances given, the fuel is in a state that its sensible heat can be easily increased by the use of regenerators and higher temperatures be attained than by the direct combustion of either coal or pure hydrogen. The constituents of the gas are such that there would be no serious decomposition in the regenerators and full advantage could be taken of both preheated air and gas. In a rough way it may be said that if the waste furnace gases are 1315 deg. C., the stack gases from the generator 300 deg., and there is a radiation loss in the regenerator equivalent to another 100 deg., the theoretical temperature of combustion would be 2200 or 2300 degrees.

The success of smelting a given amount of ore depends on the maximum temperature continuously producible in the furnace and on the price at which that temperature is sustained. As far as the first factor is concerned wood gas with regenerators appears to be better than coal without that equipment. In the second factor there are many other things to be taken into account. This is not a new idea and I refer those interested to an account[3] of a copper-refining furnace so equipped.

Oil-fired Reverberatories

In the article previously referred to, Dr. Ricketts gives much interesting information relative to the operation of the Cananea oil-fired reverberatory, from which I take the following:

Temperature of the gases leaving the furnace, 2400 deg. F.; barrels of oil per dry ton smelted, 0.968; specific gravity of oil, 0.9; weight of oil per barrel, 310 lb.; B.t.u. per lb., 19.550; temperature of gases leaving the boilers, 750 deg. F.; water evaporated in boilers per lb. oil to furnace, 6.74 lb. (212 deg.); steam used to vaporize oil, per lb. oil, 0.44 pound.

From this and some other information we can calculate: Temperature of gases leaving furnace, 1315 deg. C.; temperature of gases to the boilers, 1177 deg.; temperature of gases leaving boilers, 400 deg.; B.t.u. per ton of ore, 5,866,564; waste heat from furnace recovered in boiler per lb. oil, 6909 B.t.u. or 3838 cal. per kg., equal to 35.4 per cent.

The analysis of the oil is not given but as it does not vary much from Ohio oils it may be assumed as follows: Carbon, 85 per cent.; hydrogen, 14; oxygen, 1. The products of combustion of 1 kg. of this oil, including 0.44 kg. of steam, are: CO_2, 3.12 kg.; H_2O, 1.7; N_2, 12.95.

The heat contents of these at 1100 deg. and 400 deg. C. are 5627 and 1858 cal. respectively, leaving 3769 cal. capable of being absorbed between these two temperatures. This is based on ideal combustion and the supposition that the radiation losses in and around the boiler are equivalent to the difference between 1177 deg., the temperature at entrance, and 1100 deg., the one used above, an amount equal to about 7½ per cent. of the total. The radiation[4] of a Heine boiler at full load is estimated at slightly under 4 per cent. but owing to the connections is probably somewhat larger in this case. There is an amount of sulphur dioxide given off by the charge that is perhaps 3 per cent., and carbon dioxide about 1 per cent. of the products. Correcting for this we find that the heat in the gases checks the amount absorbed by the boilers within 2 per cent., and that 2 per cent. is on the wrong side of the ledger. In other words, the oil was burned with a little less than the amount of air theoretically necessary for complete combustion, which is within the limit of error of the data.

The temperature of combustion of this oil is nearly 2000 deg. C. Analysis of the gases leaving the furnace, entering the boiler and leaving the boilers would be interesting as showing the extent to which combustion had been completed, or was being completed. That the amount of air used was theoretically the amount required for perfect combustion is no proof that all the carbon was consumed.

Assuming ideal conditions, the gases leaving the furnace at 1315 deg. C. contain 6900 cal. per kg. of oil or 63½ per cent. of the total calorific value, leaves but 36½ per cent. for use in the reverberatory. It is to be noted that it is not important whether it is used for radiation, reactions, fusion or incomplete combustion. Allowance is made for the presence of 3½ per cent. by weight of SO_2 and CO_2 from the charge.

Efficiency of Wood Fuel

Taking up the case of the wood gas again, the products of the combustion of 1 cu.m. of gas are: CO_2, 0.309 cu.m.; H_2O, 0.266; N_2, 1.288; and SO_2, 0.03, with a heat capacity of 1061 cal. If regenerator losses are allowed at 20 per cent. there are left 849 cal. available for superheating the gas and air supply, which, added to the 1140 cal. due to the combustion of the gas, give a total of 1989 cal. Subtracting from this the heat in the gases leaving the furnace leaves 928 cal. available in the laboratory of the furnace or 81.4 per cent. of the heat of combustion of the gas as against 36½ per cent. in the case of oil. The efficiency here assumed for the regenerator is high but is warranted by the composition of the fuel and its combustion products. Under other conditions it might fall to 60 per cent. or less, as will be seen in the case of oil.

From Ricketts' data it was found that there were 5,866,564 B.t.u. per ton of charge produced by the combustion of the oil, of which 2,140,300 (36½ per cent.) were used in the laboratory of the furnace. Of the 128 B.t.u. per cu.ft. of wood gas 81.4 per cent., or 104.2, were found available for the same purpose. Dividing the former by the latter and adding 5 per cent. for losses in the regenerator valves gives 21,668 cu.ft. of wood gas required per ton of charge under the same conditions. One cubic foot of the gas contains 0.01034 lb. carbon; hence, one ton of charge would require the use of 558 lb. air-dried wood, exclusive of the carbon losses in the producer. Langton gives the weight of one cord of wood at Nacozari as 2200 lb., from which it is evident that but little more than a quarter of a cord of wood would be required per ton of charge, excluding the carbon losses in the producer. As to what these are Langton's data give no clue other than the statement that there was but little, if any, tar product formed. Continuing the omission of this quantity, the efficiency of the producer otherwise is 38.7 (the cubic feet of gas per pound of wood) times 128 (the calorific value of the gas) divided by 6971 (the calorific value of the wood), which is 71 per cent.

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[3] Peters' "Modern Copper Smelting."

[4] *Bull* No. 325 of the U. S. Geol Surv.

It is apparent that under certain conditions wood must be a possible and economical fuel for smelting practice. It is equally apparent that those conditions are confined to localities where it is cheap and plentiful or other fuel is abnormally expensive, such as exist in certain parts of Mexico and Canada. The installation is necessarily more expensive than a standard one and must be designed to suit the particular conditions for which it is erected. It is to be noted that although the percentage of the useful heat of the gas is 81.4, that of the wood is less than 71 per cent. of that amount by the percentage of the carbon loss in the producer.

At the Cananea reverberatory 36.5 per cent. of the total heat generated was used in the furnace and an additional 34.8 per cent. recovered in the boilers, making a total of 71.3 per cent. A little less loss between the furnace and the boilers and the installation of the economizers as recommended by Doctor Ricketts would bring it up to the amount recovered from the gas by help of the regenerators.

HEAT LOSSES WITH OIL FUEL

In the case of oil, the regenerators would not be nearly as satisfactory for recovering the waste heat. One kilogram of oil requires for ideal combustion 16.3 kg. of air, which at 1315 deg. C. have a heat capacity of but 5465 cal., while the products of combustion of the oil at the same temperature contain 6900 cal. Since a heated gas cannot rise to a higher temperature than its source of heat it follows that with ideal efficiency of the regenerators only 79 per cent. of the waste heat could be recovered. With a 20 per cent. loss in them the recovery would be but 63 per cent. In practice the temperature of the regenerators under these conditions would rise until the actual loss from radiation and waste gas would be much higher than 20 per cent., and the recovery would be correspondingly less than 63 per cent. This is, of course, exclusive of the difficulty of the application.

The stream of gas from the furnace might be divided and part sent to the boilers and part to regenerators or the regenerators placed after the boilers instead of economizers. The latter plan seems a good one and certainly should increase the capacity of the furnace by the amount of the increase of the temperature in the laboratory. The usefulness of these methods would depend largely on the demand for steam and somewhat on the fusibility of the walls and roof, and would be limited by the increased radiation. Steel furnaces are using higher temperatures than copper reverberatories, but it is well to remember that silica is liquid at 1750 deg. Centigrade.

FURNACES FIRED WITH BITUMINOUS COAL

The case of a coal-fired furnace is a much more complicated one. In it the coal may be producer fired and the air supply more or less heated. Or producers may be used with or without subsequent purification of the gas, and with both gas and air preheated. Offerhaus states that at Anaconda by the use of a bituminous coal containing 11 per cent. ash and 33 per cent. volatile matter, 4.34 tons of charge were smelted per ton of coal, and that 10 per cent. of the coal was recovered by jigging of the ashes, leaving a net result of 4.8 tons of charge per ton of coal. The temperatures were similar to those at Cananea. Assuming the calorific value of the coal at 1300 B.t.u. per lb. gives 5,408,000 B.t.u. per ton of charge smelted, which is not unlike that at Cananea.

For comparison we may take a blast furnace running with 12½ per cent. coke containing 80 per cent. fixed carbon. The heating value of this would be 11,680 B.t.u. per lb., which makes the heat units per ton of charge 2,920,000 with no waste heat recovery as against 2,140,300 used in the laboratory of the reverberatory. It seems as though the reverberatory is a more efficient furnace than it is given credit for being.

Professors Bone and Wheeler[5] give the results of some detailed experiments on the use of producers with a coal of 13,880 B.t.u. gross calorific value, or 13,340 cal., net. Burning this coal with a preheated blast, saturated with water at 60 deg. C., they obtained 135,000 cu.ft. of gas per ton of coal averaging 166.9 B.t.u. per cu.ft. The analysis of this gas was, by volume: CO_2, 5.1 per cent.; CO, 27.3; H_2, 55.5; CH_4, 3.05; and N_2, 49.05 per cent. This gas was cleaned in scrubbers. Therefore, assuming that it contained the same moisture as the wood gas, 2.9 per cent., the products of ideal combustion contain at 1315 deg. C. or 1085 cal. per cubic meter. Owing to the greater richness of the gas, regenerators would not be as efficient as with the wood gas. On the basis of the delivery of 75 per cent. of the heat units to the incoming gas and air, and 5 per cent. leakage, in order to deliver to the laboratory of the furnace 2,140,300 B.t.u. utilized at Cananea, it would require 12.2 per cent. of coal to the ore charge, a saving of nearly one-half of that in direct firing or a combined efficiency of the coal of 65.6 per cent. through producer and furnace. The gases from the regenerators under these conditions would still have a temperature of 300 deg. C. This is no greater efficiency than direct firing with boilers to absorb the waste heat and not as great as the oil-fired furnace and boilers. On the other hand, the higher temperature in the furnace would probably increase the capacity of the gas-fired furnace over one of the same size direct fired.

These figures explain why the regenerator furnace does not make the headway in copper smelting that it does in steel where higher temperatures are necessary; but the low costs now being attained in reverberatory smelting of copper ores will lead to a decreased proportion of blast furnaces and in some plants the demand for steam will be below the capacity of the furnaces, in which cases it is highly probable that the combination of producer-regenerator reverberatory will be the furnace of the future. It will also find a place for the utilization of fuels not otherwise available, as wood, coals high in ash, etc.

In the above calculation I have assumed that the operating temperature was in all cases zero deg. C., which has introduced a small error; but as the results are all comparative, it is of no importance and the uncertainties of the specific heats at high temperatures overshadow it. Many of the calculations were made with a slide rule for the same reason and are subject to the error of that instrument.

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[5] *Journal* Iron and Steel Institute, 1907 (No. 1) and 1908 (No. 3).

Tin in Nigeria

At the annual meeting of the Nigerian Tin Corporation, Ltd., at London, March 4, 1910, Oliver Wethered, the chairman, stated that this company is interested in one of the most important virgin alluvial tin fields that the world has ever seen. Development has heretofore been delayed by lack of means for economical transport. At present from 28 to 32 days are required to reach the tin fields, but even under this condition the cost of delivering tin at the coast is only about £45 per 2240 lb. The metal is of very high quality, fetching as a rule from £6 to £8 per ton more than Cornish tin. Completion of the projected railway will lead to great reduction in the cost of production, and will enable the exploitation of the lode mines as well as the alluvial.

On account of legislation in New Zealand on the question of miners' phthisis, the mine owners have established a custom of medically examining all persons over 18 years of age who are engaged in the mining industry. This examination is considered detrimental to the industry (from the miner's point of view) and bills prohibiting such forced examination will be submitted to the House.

How European Collieries are Safeguarded

Measures to Improve Hygienic Conditions, Thus Preventing Disease, and Precautions Tending to Eliminate Explosions and Increase Efficiency

SPECIAL CORRESPONDENCE

Owing to the terrible nature of the
iner's disease possessing the ponderous
me of ankylostomiasis, colliery people
Great Britain have been interesting
emselves in measures and precautions
at may be taken to combat the parasite.
appily the inquiries instituted on behalf
the "Royal Commission on Mines"
ve demonstrated the improbability of
ere being any considerable infection
esent as yet. In view of the danger,
wever, of men who have become in-
cted in tropical countries or on the
ntinent of Europe finding employment
British collieries the warning is given
at the risk of infection among miners
quires careful consideration.

Doctor Boycott, who made the investi-
tions, says that, "for the most part
al mines in England are too cold or
dry to allow the parasite to flourish,
neral experience seems clear that no
tensive prevalence of the disease is to
looked for in places that are dry, or
en the temperature does not exceed
out 70 deg. F. Increasing depth of
rkings or the introduction of watering
y, as in Westphalia, provide suitable
nditions."

Referring to the report of the com-
ssioners, it is ascertained that the most
ominent symptoms of the disease are
llor, loss of strength, and shortness of
eadth. These symptoms are caused by
dilution of the blood, owing to increase
its watery constitutents, caused in
me way not yet understood by the
esence of the worm in the intestine.
is satisfactory to learn that the worms
n be expelled by suitable treatment,
d that as a rule complete recovery fol-
ws rapidly.

Regarding the conditions necessary for
spread of the disease, it would seem
t the adult worms produce an enor-
us number of eggs, which being un-
le to develop inside the body, are dis-
arged in the feces. In presence of
isture and a sufficiently high tempera-
re, the eggs develop into minute larval
rms which live in the contaminated
t soil, mud or water. Professor Looss,
Cairo, has shown that these larods are
pable of easily penetrating the skin
d reaching the veins, in which they
e carried to the lungs. They then ap-
ar to be carried up the air passages,
d thence to pass down into the stomach
the esophagus. Passing into the in-
stines they attach themselves and de-
lop to the adult stages. As the presence
a large number of the worms is required in order to produce any symptoms, it is nearly always the case that where one person is definitely ill from the disease, many others are infected in the sense that a few of the worms are present in their intestines. The persons infected may indirectly propagate the disease if they contaminate the ground with their feces, when the requisite conditions of warmth and moisture are present within many mines.

Precautions Taken to Combat Ankylostomiasis

A British consular report by Consul-General Sir Cecil Hertslet, issued some time ago, describes the precautions taken to combat ankylostomiasis in Belgium and it may be appropriate to pass in review some part at least of the subject matter. The consul tells how the principal and best equipped mines of Belgium (such as those of Mairemont and Bascoup in the center district) are furnished with hot- and cold-water baths of sufficient number for the use of practically all the men employed at the pits. From a hygienic point of view these baths are an excellent institution, and are considered in Belgium to be of utility in combating ankylostomiasis. This disease has now been substantially controlled, proving that although it may not be possible to completely stamp it out, yet the system of dealing with it is highly efficacious, tending to the reduction to a minimum of the number of workmen infected.

Among the precautions taken against the disease in the Belgian mines, Sir Cecil informs that the owners place chests and buckets at the disposal of the workers, both on the surface and below ground, the latter being portable and having to be brought to the surface at least once every 24 hours. In order to encourage the men afflicted with the disease to make the fact known to the authorities and undergo suitable treatment at the hospital or institute, they are given a grant out of the provincial subsidy. This in many cases is augmented by a contribution from the owners, bringing up the amount $4.25 per week, for the maintenance of the family during the period of enforced idleness. To avoid cases of malingering, the mine authorities are informed by the doctor of the institute when a workman has been accepted for treatment when the allowance accorded to him is paid. Notice is also given when the patient has been discharged, and the allowance stopped from that time. So effective has the system been that the malady has been reduced beyond expectation. To avoid miners who change from one pit to another introducing the disease to uninfected centers, there is a system in force under which they are provided with a book stating their services in the mines in which they have been employed and giving various other personal particulars. In addition, in the Liège district, new hands are accepted only after examination. For this purpose several of the larger mines have hospitals or dispensaries of their own where workmen applying for engagement are examined by the mine doctor, and can also undergo treatment, but the consul-general says, in most cases the dejections are sent to the provincial dispensary for examination.

The precautionary measures recommended by the Provincial Medical Commission appointed in the Liège district are quoted as follows:

Precautions to be Taken by Workmen

1. Only drink pure water. Drink neither the mine water, nor above all stagnant water.

2. Do not place on the ground articles to be conveyed to the mouth (i.e., glasses, spoons, handkerchiefs, etc.), or food.

3. Never use any of these articles with dirty hands, in addition, before every meal, the hands should be washed in pure water (not mine water) and dried by shaking if towels are not available, and not on the clothes, which are usually covered with germs of the disease.

4. Become accustomed to retiring before leaving home or before descending the pit. This habit alone will be advantageous to the health. In cases of necessity the buckets provided for the purpose, which are brought to the surface daily and properly disinfected, should be used.

5. In order to avoid infection as far as possible the workman should change his garments and wash his entire body on his return home before taking his meals. The clothes should be boiled and washed.

Precautions to be Taken by Mine Owners

1. The use of portable buckets in the mines.

2. The placing at the disposal of the workmen of pure water for drinking and

washing purposes. The water should be placed in large barrels from which it can only be drawn by taps, and not by dipping tins or other receptacles in it.

3. Mines should be kept clean and mud removed after watering muddy and damp parts with lime wash. Props and woodwork should be washed with lime.

4. Directors should insist upon the medical examination for ankylostomiasis of all the workers in the mines, and the treatment of such as are infected, and all new hands should be examined previous to engagement.

The above suggestions approach the ideal, and in regard to them Sir Cecil Hertslet says the chief step to be taken should be to endeavor to persuade the men that they are for their own benefit, and leave it to themselves as far as possible to see that the rules are carried out. It must be admitted that a coal mine and a drawing room have very little in common, and in the pit there is but little incentive and perhaps less opportunity for men to consider the hygienic principles of their every action. At the same time it may be serviceable to emphasize a matter of which the Belgians are fully cognizant, namely that in the mines, especially in damp pits, pools of stagnant water are frequently found in which the larods remain alive for a considerable time, and the propagation of ankylostomiasis is largely caused by the men when taking food conveying these larval excrements to the mouth, whence they enter directly into the digestive organs.

Each Miner Produces Only 221 Tons Annually

Official documents show that the coalmining industry of Belgium finds employment for 142,699 persons, of whom 73 per cent. are underground workers. More than 10,000 of the hands are boys ranging from 12 to 16 years of age. Women are also largely employed on the surface, the number of females being 7972 in 1907, there being also 17 females employed below ground. The total coal output in 1907 was 23,705,190 metric tons, giving an average of only 221 tons per underground worker. The explanation of this low individual production is connected with the thinness of the seams, which only average 26 in. The Belgian miner works 292 days in the year, an average per week of $5\frac{4}{5}$ days, the average daily wage per worker under and above ground being about 96c. in 1907, that of the worker at the face being in the neighborhood of $1.23.

One most remarkable feature, having regard to firedamp being extremely prolific in Belgian mines, is the lowness of the death rate, which per thousand persons employed was 0.93 in 1904; 0.91 in 1905; 0.95 in 1906, and 1.04 in 1907. The Belgians may therefore claim to more nearly approach the minimum safety standard than even the British, and there may be a useful lesson in the survey of a second consular report by Sir Cecil Hertslet, on the "Coal Mining Industry in Belgium."

An Administration of Mines

Examining the report, it is seen that in Belgium there is an Administration of Mines, which may be said to be a government department under the ministry of industry and labor, delegated to superintend the mines and to carry out periodical examinations, and many other duties in regard to surveillance of machinery, cables, etc. The regulations of the Administration of Mines are carried out to the general welfare of the mining industry.

The authorities are permitted under the law of 1902 to take the necessary steps to insure that the mines are worked on hygienic principles, and the law of 1904 divides the mines of Belgium into four categories: namely, nonfiredamp mines in which the firedamp is only "slight;" mines in which the firedamp is "moderate;" mines in which the firedamp is "intense," and mines in which the firedamp may be subject to "instantaneous discharge." Even in mines free from firedamp, Sir Cecil says the law does not permit the use of candles, torches, etc., having an uncovered flame. In the firedamp mines the lighting is by means of safety lamps only, and they must be selected from standard types specified by ministerial decree, being fitted with a closing appliance approved by the minister. The lamps must not be opened in the underground works, and should one be extinguished, it may only be relighted at the surface, unless it is furnished with an "internal" lighting apparatus.

It is further ascertained that the Belgians look upon the question of the use of explosives as of extreme and grave importance, and Sir Cecil points out that great progress has been made in regard to the invention of so called "safety" explosives, many substances having been found which may be used with but relatively little danger in charges of proportions gaged in accordance with the atmospheric conditions of the mines.

At the Frameries testing station for explosives and lamps (in the province of Hainault), which is under the control of the Belgian Administration of Mines, it was ascertained that a number of explosives hitherto known as "safety explosives" were in reality not entitled to that term, and after many tests certain explosives only were authorized to be used, and these are described as "anti-firedamp" explosives. The experiments at Frameries are carried out with genuine firedamp of a degree such as is the cause of accidents in the mines, one of the mining companies gratuitously supplying subterranean reservoirs full of explosive gas, the supply of which appears to be inexhaustible. From these reservoirs the firedamp used in the experiments is drawn, making it possible, it is claimed, to determine the charge limit of various explosives under conditions equal, if not superior, to those which can be met in mines.

It appears that the required atmosphere is produced in a tube or gallery having the same section dimensions as an actual average mine drift, in order that the conditions may be as similar as possible to those offered in the mines. The actual description follows:

The gallery is an iron-hooped wooden tube 30 m. in length, with an elliptical section of 1 m. 85 cm. in hight, and 1 m. 40 cm. in width. One end is open to the air while the other is supported by a solid block of masonry in which is fitted the perforated steel block representing the borehole ; 5 m. of the gallery next to the masonry can be closed off, forming a hermetically sealed explosion chamber having a capacity of some 10 cu.m. into which the firedamp is introduced and measured with a gas meter.

The firedamp is then thoroughly mixed with the air contained in the chamber. This is done by introducing the firedamp through a long horizontal tube at the bottom of the gallery, which tube is perforated underneath with a number of holes of varying dimensions. The explosion chamber is connected at both ends with a tube fitted with a rotating fan which produces a churning of the gas and air contained in the chamber and makes the atmosphere in the chamber of absolute uniformity. The 10 cu.m. of the explosion chamber are isolated from the rest of the gallery with a paper disk, similar disks being used to close the safety vents in the tube. The charges are fired by means of electricity, and the fumes are afterward blown out of the tube with a fan. The explosion is caused by a No. 8 detonator and 15 cc. of sand are poured on the charge, which is tamped with clay lightly. The strength of the explosives is measured by observing the increased size of the interior capacity of leaden blocks under the action of the charge.

The strength as well as the ignition limit of explosives is taken into account in the experiments, but it is observed that however highly an explosive may be placed in the scale of safety explosives, it should be considered as a dangerous auxiliary and should not be made use of except in such places as it is ascertained have no surrounding atmosphere liable to explosion. The safety of explosives is always uncertain even when the maximum charge limit is used, and slightly different conditions from those under which the experiments were carried out may be the means of provoking an explosion.

Interest may center in the means to insure the protection of the lives of the rkmen on entering and leaving the nes of Belgium. One of the principal tures is the examination of cables. ese are examined at regular periods, rying from every second day to once veek, by experienced men whom the erators are obliged to employ. Then frequent intervals the mines are sub- t to the inspection of the representa- es of the Administration of Mines in ard to cables, hauling gear, machin- , etc. Further, representatives of the sociacion des Industriels de Belgique the cables both during and after ir manufacture, and also make a peri- cal inspection after the cables have n installed and during their working. addition to all these precautions, Sir il Hertslet says the cables are usual- guaranteed by the makers for 22 ths, after which period the mine own- calls in an expert on cables to make examination from time to time, as af- the expiration of the period of guar- e, the mine is solely responsible for accidents which may occur.

ectricity Supplants Steam Power

some of the mines, electricity has placed steam power as the motive e for extraction, pumping or ventil- n, and the consul general says it is itted that the manipulation of elec- engines is somewhat the simpler. Ex- ence has shown in connection with ting men and minerals that one of events most liable to cause accidents he possibility of the machinist fail- to stop the cage at the exact moment. momentary aberration or indisposi- of the engineman at a critical in- t might be the cause of a terrible dent.

working steam engines the attention he operator is divided between sev- controlling levers, whereas one of greatest advantages claimed for the tric machine in this connection is only one main controlling lever is iired. The consul general has seen electric machine at work with a safe- ontrivance attached, which, in the it of the machinist omitting to stop cage on its upward or downward rse, automatically brings the starting r to the zero position and stops the .

concluding this survey of the consu- reports prepared by Sir Cecil Hert- it may be interesting to note that mber of the mines in Belgium pay laborers on a sliding scale in a ner similar to the following:

e men are engaged at a certain fixed for so many hours' work a day, in order to encourage them to rapid- of labor they are granted a small or bonus on the amount of coal uced exceeding a certain minimum day. This bonus for quick work be calculated in various ways.

r instance, if a gang of men are engaged in mining and filling the cars with coal, this batch of men can have a special mark or medallion which may be affixed to the trucks filled, and when these trucks are checked by the foreman, he estimates the number of loads produced by each particular gang, and for each truck over and above a certain specified number, the gang receives so many centimes (or fraction of a centime, as the case may be), which bonus is divided among them. Quick workers, Sir Cecil says, can and thus often obtain a considerable increase of their daily wages while the owner gains through accelerated work.

Experiments with Sprayers in Coal Mines

Special Correspondence

At the last meeting of the North of England Institute of Mining and Mechanical Engineers, T. L. Elwen submitted a paper entitled, "Some Results of Experiments Made to Test the Effect of Sprayers Upon the Moisture of Main Roads at Brandon colliery." The depth of shaft was 411 ft. and the efforts of the author were directed by two considerations: (1) The establishment of wet sections in various parts of the main intakes, with the hope that these may prevent the extension of an initial explosion; and (2) an attempt to bring an air current into such a fully saturated condition as to prevent the desiccation of the coal dust. After trials with various types, "Saint" sprayers were used and gave every satisfaction. The water was thrown off in such a continued form as to resemble a "Scotch mist." The pressure of water varied from 112 to 179 lb. per square inch and each sprayer discharged from 170 to 260 gal. per day.

Before the sprayers were set to work a length of intake road of about 1500 ft. was watered every night from the service pipes laid along the engine plane. During the day this water was absorbed by the air current as shown by the increase in the humidity. In fact, so far as the coal dust was concerned, the effects of the watering ceased soon afterward, when the incoming air was very dry. About 1373 gal. of water was absorbed per day on the route, or say, one gallon per minute. Approximately 4580 gal. of water in the form of moisture were brought out of the seam per day, nearly the whole of it being absorbed by the air current from the surface of the main intakes. On the same route the air current passes through five sets of sprayers, but in the summer all these sprayers would probably not be required, although no alteration was made.

Power of the Sprayers

Illustrating the power of the sprayers, a set of four, acting on 36,000 cu.ft. of air per minute, gave the following results: Before entering the sprayers, the thermometers, dry- and wet-bulb, showed 48 deg. and 45 deg. respectively; humidity 79 per cent. After leaving the sprayers at a point 300 ft. further in, the thermometer, dry- and wet-bulb showed 46 deg. and 45 deg. respectively; the humidity was 93 per cent.

Mr. Elwen says that under the influence of a fully saturated air current the condition of the coal dust between the sections has undergone an advantageous change, while he does not feel justified in saying that he has solved the coal-dust problem, he has the conviction that the coal dust has been rendered to some extent less dangerous than under former conditions. Appended is a table of hygrometric observations taken in connection with the experiments, put in by Mr. Elwen.

TABLE OF HYGROMETRIC OBSERVATIONS.

Point of Observation.	No. of Experiment.	Distance from Down Cast Shaft.	Quantity of Air Passing per Minute.	Before Spraying.			After Spraying.		
				Thermometer.		Degree of Humidity. (Saturation 100).	Thermometer.		Degree of Humidity. (Saturation 100).
				Dry Bulb.	Wet Bulb.		Dry Bulb.	Wet Bulb.	
		Ft.	Cu.Ft.	Degrees F.	Degrees F.		Degrees F.	Degrees F.	
Surface in shade.......	1	......	....	40	38	84	46	42	73
Intake at down cast shaft. .	2	......	8,200	45½	41½	72	55	50	70
Intake on engine plane. .	3	900	62,000	49½	45	71	55½	52	78
Intake on engine plane . .	4	2,166	36,000	50	46	74	53	53	100
Intake on engine plane...	5	3,840	36,000	50	47	79	54	54	100
Intake on engine plane . .	6	5,560	24,000	52	50	86	55½	55½	100
Intake on engine plane . .	7	8,100	14,000	55	53	86	57½	57½	300
Intake on engine plane . .	8	11,700	8,000	60½	59½	93	61	61	100
At working face........	9	15,380	6,000	60	59	93	59	59	100
Return at upcast shaft.	10	......	106,000	57	55	87	58½	56½	87

The Use of Aërial Wire Rope Tramways

Prior to the Erection of One Tramway, the Cost of Transportation Was 29c. per Ton, while at Present Time It Is Only 6c. per Ton

BY HENRY M. PAYNE*

The use of wire-rope tramways is rapidly extending in this country, especially in the mountainous districts and where coal and ore must be delivered from mines otherwise inaccessible.

Among the installations noted in the engineering journals of recent years have been those of the Borderland and Vulcan coal companies in West Virginia, which were described by me in the *Scientific American* in August, 1905. These plants are typical of the average trans-river systems to be found throughout America, as at White Ash, Ky., over the Kentucky river, and near Morgantown, W. Va., over the Monongahela. But it rarely occurs to the average operator that such a system is not only applicable to distances of many miles, regardless of the configuration of the country traversed, but is usually installed with a view to reducing the cost of transportation, and increasing the output capacity.

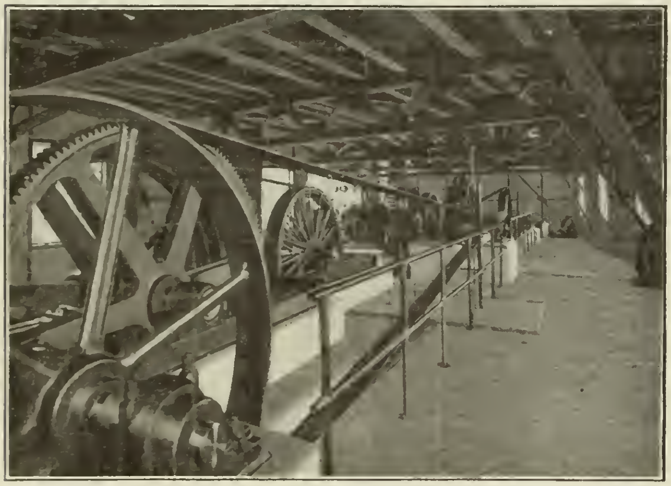
In the Taff and Rhondhha valleys in Wales, the district is so densely populated that no available area occurs for the disposal of gob or culm from the mines, so that at nearly every mine in the district, the aërial tramway is used to transport the waste to the tops of the mountains where it is deposited between the summits. The system is used also throughout Germany for the conveyance of coal from the tipple to the coke ovens and for carrying the coke to the storage yard. One of the largest-capacity tramways for this purpose is at Gelsenkirchener Actien Bergwerks Gesellschaft.

The style of tramway most used on the continent of Europe is made by the firm of J. Pohlig, A.G., Cologne, Germany, and is handled in America by the A. Leschen & Sons' Rope Company, of St. Louis. The German company claims over 1900 installations, including tramways of 10, 13, 22 and 27 miles in length. Some of them have spans 3660 ft. in length without any intermediate supports. What is beyond question the most interesting equipment on the continent and the longest in the world, as well as having the largest capacity of any aërial tramway now in existence, is the Otto tramway, built by the Pohlig company in 1904 for the Lorraine Smelting Company, Aumetz-Friede, of Kneuttingen, Lorraine, and having a capacity of 3½ million ton-miles.

The tramway was erected with the object of decreasing the cost of transporting the ores from their Aumetz shaft to the Kneuttingen works and also of dispensing with the reloading of the ore at the five furnaces at Friede.

The company operates 20 hours per day for an average of 300 working days per year, and for some time past has been averaging 1700 tons per day. The complete plant consists of the main tramway between the Aumetz shaft and the smeltery at Kneuttingen, and of two branch lines at the latter place, one to the ore depot and the other to the top of the furnaces.

The main tramway is 6¾ miles long and has a fall of 480 ft. in favor of the load. From the Aumetz shaft the line passes on a tangent, through the villages of Ludelingen and Havingen until it reaches the Fentsch woods, where there is a curve around which the buckets pass automatically. The balance of the line is a tangent to the lower terminal at Kneuttingen smelter. In this distance the tramway crosses three railways and nine public roads, each of which is protected from any possible pieces of falling ore by a bridge.



Driving Gear of the Aerial Ropeway

Aerial Ropeway Loading Station

The standing cable is of mild plow-steel lock-coil wire rope with a breaking strain of 110 tons per square inch.

To support the line 102 concrete foundations were built at intervals averaging 300 ft., although in several places, owing to irregularities in the ground, spans of 1000 ft. were constructed. On these foundations were erected pyramidal steel towers, many of which are between 100 and 130 ft. in hight.

The Loading Station

The loading station is on the ground level and the buckets are loaded by means of chutes, from a 1000-ton hopper. This hopper is filled from the mine cars which empty over three automatic cross-over dumps, and after leaving the kick-back are returned by a chain conveyer.

The unloading station at the smelting works is about 20 ft. high, and a branch tramway about 1100 ft. long runs from it to the storage hopper. The loaded buckets pass from the main line to the branch tramway direct, and empty automatically into the storage hoppers. The branch line passes lengthwise along the storage area and all buckets pass around a large horizontal sheave wheel at the farther terminal, so that no coupling or uncoupling is necessary to shift the position of the automatic tipper from time to time.

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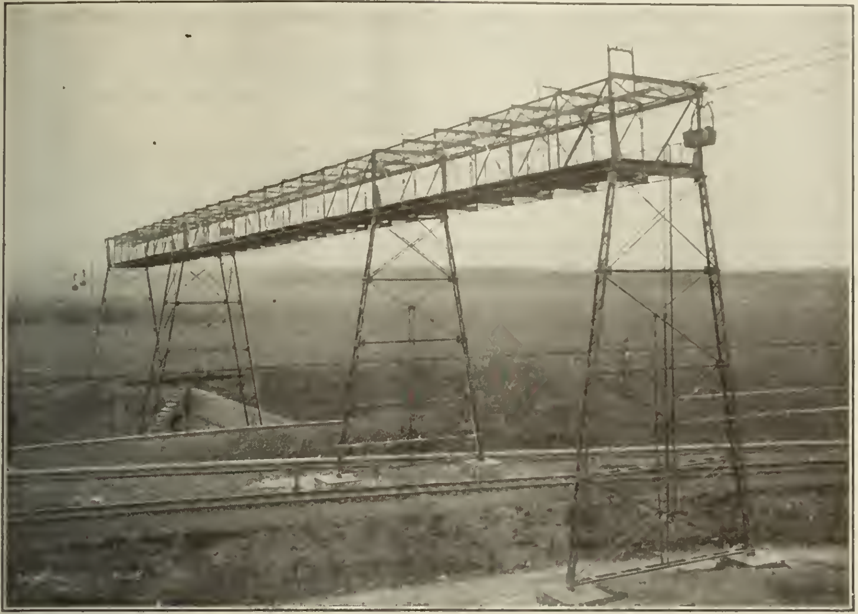
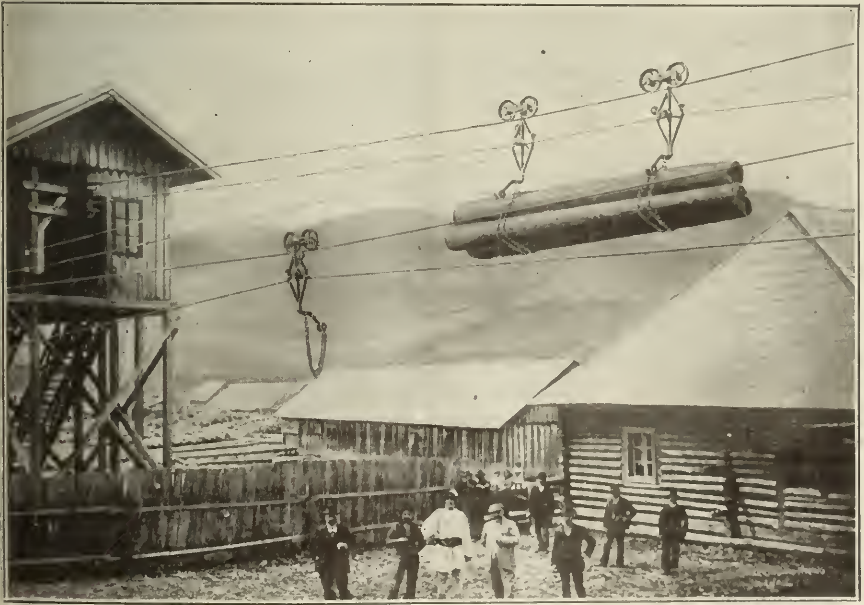
*Mining engineer, Morgantown, W. Va.

The ore in these storage hoppers, when required at the furnaces, was formerly drawn into furnace-charging trucks and raised by elevators in the usual manner, but to avoid this reloading a second ranch tramway was erected. This is bout 1000 ft. long and runs parallel to nd between the furnaces and the hot-last apparatus. This branch line, start-ng also from a station on the main line, s carried on lattice girders and uprights, nd rises from the station to a hight of 10 ft. to the charging platform of the furnaces. Each furnace has a charging hopper of 40 tons capacity, into which the carriers automatically discharge their contents, and then travel around the end station and back to the main line without uncoupling. Since this branch has been in operation, the elevators are used only for coke.



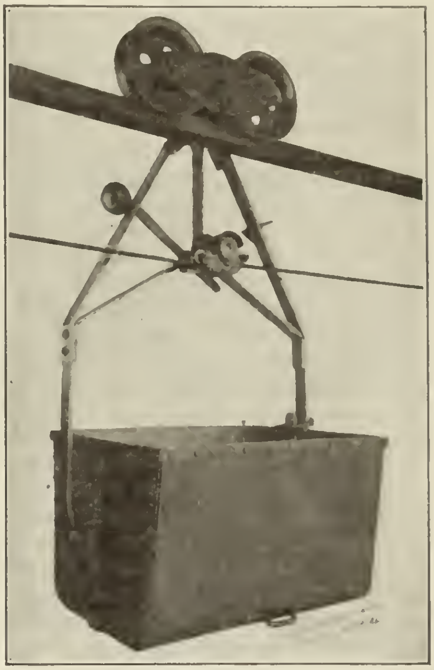
Aerial Ropeway Protection Bridge



The Transport of Logs with Aerial Ropeway

The main tramway and the two branch lines are operated by electric motors supplied from a central power station. The moving cable is 14 miles in length, but owing to the use of roller bearings for the bucket trolleys and the grade in favor of the loads, the amount of power required to drive the line is very small. It was originally calculated to be about 15 h.p., but in actual operation the line is almost automatic. Power is transmitted by belting from the motor to the driving gear of the main line at the unloading station at Kneuttingen, and at the same place tension weights are provided to keep the moving cable tight. Owing to the extreme length of the line, similar tension weights are also provided at the loading station.

The buckets have a capacity of 1300 lb. and are spaced 210 ft. apart. The speed of the moving cable is about 500 ft. per minute and the buckets are attached to it by the "Universal" friction grip, which has proved to be so thoroughly satisfactory at North Cape where the haulage rope is frequently coated with ice. This grip couples and uncouples automatically, the one man at the station having only to push the bucket to the proper position for coupling.



Showing Style of Bucket Used

A Great Saving in the Cost of Transportation

In addition to the fact that this is the longest wire-rope tramway in the world, and has also the largest capacity, it is also of special interest on account of the great saving effected in the cost of transportation as compared with previous charges for the same service by railway. Prior to the erection of the tramway the cost of transportation was 29c. per ton, while at the present time it is only 6c. per ton, including upkeep and renewal costs, so that in a few years the installation will have paid for itself.

Another interesting European tramway of the same type is at the Rombach Smelting Works and is 1¼ miles long.

This is used for carrying slag at the rate of 2000 tons every 10 hours.

The accompanying photographs show the intermediate driving station, the steel protecting bridge and the loading station of another heavy-capacity tramway of the Otto type built for the Deutsch-Luxemburgischen Bergwerks- und-Hutten Actien Gesellschaft at Oettingen-Differdingen, in Luxemburg. This tramway is 41,535 ft., or nearly 8 miles in length, and handles 700,000 tons of ore per year.

In almost every instance in Europe, the supporting structures are built of structural steel with first-grade masonry foundations, and the cost of repairs and maintenance becomes insignificant.

Napa Consolidated Quicksilver Company

The report of this California quicksilver company for the year 1909 gives the ore reduced for the year at 18,583 tons, from which 1605 flasks of quicksilver were recovered; an average yield of 0.32 per cent. The mining work for the year covered 1842 ft. of drifts and tunnels. Earnings for the year were $61,899; expenses, $55,686; net earnings, $6213. The expenses amounted to $3 per ton of ore reduced. The average receipts per flask of quicksilver were $38.57, and the expenses, $34.69. Adding the balance brought forward from 1908, the total surplus was $44,166 at the close of the year.

The report says: "Deeming further prospecting of no avail your trustees decided to close down the property, which they did early in the autumn, and have since been occupied in roasting the ore on hand and cleaning up around the furnaces, which work will probably take three or four months longer."

New Idria Quicksilver Company

This company is one of the few California quicksilver companies still paying dividends. Its report for the year 1909 shows that 67,247 tons of ore were mined and treated; the yield being 8900 flasks of quicksilver, an average of 0.496 per cent. The average earnings per flask of quicksilver were $39.85; expenses, $27.53; leaving $12.32 net earnings. Development work done was 2005 ft. of drifts and adits.

The earnings for the year were $354,690; expenses, $245,051, or $3.64 per ton; leaving a profit of $109,639, or $1.63 per ton. The balance carried over from 1908 was $162,436, making a total of $272,075. From this dividends amounting to $120,000 or 24 per cent. on the stock were paid, leaving a surplus of $152,075 at the close of the year. The report says that the ore in surface workings has averaged of fair grade during the year. At east end of outcrop there is a large territory to be worked yet; at west end it has been more worked off. Above No. 1 level there is a good deal of ore to the east. On No. 10 level the drift on the vein has been run nearly 1000 ft., colors showing at both east and west ends, and colors and ore all along the drift, and two stopes have been started in the east end. Ore developments have been satisfactory during the year. San Carlos is being retimbered preparatory to further work. During the year two furnaces were run continuously, and part of the time three, No. 2 having been closed for repairs in the spring. The price of quicksilver has been fair during the year. The operation of the eight-hour labor law in California materially increased expenses.

Broken Hill South Silver Mining Company

In the six months ended Dec. 31, 1909, the Broken Hill South Silver Mining Company, N. S. W., reports that 167,022 tons of ore with an average content of 14.6 per cent. lead, 12.3 per cent. zinc and 5.8 oz. silver were mined. The average rate of production was 1019 tons greater per week than during the preceding half-year. The concentrating plant treated 167,265 tons with the results shown in the accompanying table:

BROKEN HILL MILL PRODUCTS.

		Assay.			Recovery.		
	Tons.	Lead, Per Cent.	Zinc, Per Cent.	Silver, Ounces.	Lead, Per Cent.	Zinc, Per Cent.	Silver. Per Cent.
Concentrates	24,531	72.7	5.2	20.7	73.0	6.2	52.1
Tailings—Zinc	69,095	4.2	17.9	3.4	11.8	59.7	24.2
Tailings—Quartz	50,785	2.4	9.0	1.9	4.8	22.0	10.0
Slimes	22,854	11.1	10.8	5.8	10.4	12.1	13.7
Totals	167,265	14.6	12.3	5.8	100.0	100.0	100.0

During the half-year, the recovery of zinc in the tailings to be retreated in the DeBavay plant was notably increased, nearly 60 per cent. of the zinc in the ore passing into this product. The De Bavay plant treated 6440 tons of zinc tailings during the period, but proposes to handle 3000 tons per week commencing about March 1, 1910.

The working costs were heavier than in previous periods, due to heavier timbering and filling expense. They were as follows: Mining, 9s. 8d. ($2.25) per ton; filling, 11.2d. ($0.23); development, 7.9d. ($0.16); concentrating, 3s 7.9d. ($0.98); total, 14s. 11d. ($3.62) per ton.

The revenue in the period was £193,480, from which a profit of £52,088 was realized. Dividends to the amount of £40,000 were paid, and a balance of £28,617 was carried forward.

National Lead Company

The net earnings of the National Lead Company for 1909, after charging to the current expense of operation all cost of maintenance and repairs, amounting to $325,340, were $2,993,419, and show an increase over the preceding year of $90,667. After the payment of regular quarterly dividends on both the preferred and common stock of 7 and 5 per cent. respectively, aggregating $2,738,502, the surplus at the close of the year was $4,713,372.

BALANCE SHEET. NATIONAL LEAD COMPANY, DEC. 31, 1909.

Assets.	
Plant investment	$24,403,760
Other investments	13,765.162
Stock on hand, manufactured, in process and raw	6,776.509
Cash in banks	1,072,917
Notes receivable	919.330
Accounts receivable	3,043,369
	$49,981,047

Liabilities.	
Capital Stock—Common	$25,000,000
Unissued	4,344.600
	$20.655,400
Preferred	$25,000,000
Unissued	632.400
	$24,367.600
Surplus on Dec. 31, 1909	4,713.372
Accounts payable	244.675
	$49,981.047

The National Lead Company is the largest individual manufacturer of lead products in the United States. The report of the company states that the volume of business showed a notable increase over that of the preceding year and exceeded in tonnage anything in the history of the company. This increase was apparent in all the varied branches of the business, and was uniformly distributed over the whole country. In the last half of the year all raw material entering into the finished products advanced in value, and measurable increases were made in the price of manufactured goods. During the year the company acquired an interest in a well established business making a specialty of the manufacture of ammunition.

The Transvaal University College has started a course of lectures for those who are unable to attend the regular college lectures. This has been welcomed by the mechanics and beginners in mining, and is being attended by large numbers. This is an excellent field for the correspondence schools.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

H. V. Winchell, of Minneapolis, is visiting New York.

S. E. Bretherton has returned to his office in the Mills building, San Francisco.

T. A. Rickard has been appointed lecturer on mining geology in Harvard University.

A. E. Bendalari, of Joplin, Mo., of the firm of Bendalari & Cook, mine operators, is in Panama.

Philip Argall, of Denver, has gone to Mexico on a mine examination, and will return early in May.

Frederick Close, agent in Denver for the Elmore oil concentration process, is on his way to Parral, Mexico.

A. A. Hassan has been in New York buying mining machinery to be shipped to the Cobalt district in Ontario.

F. W. Denton, general manager of the Copper Range company, is in Florida, recovering from an operation for appendicitis.

L. G. E. Bignell, sales manager for the Denver Engineering Works Company, has just returned to Denver from a trip to Salt Lake City.

John Knox, Jr., who is in charge of the underground work for the Calumet & Hecla, is improving after an operation for appendicitis.

James MacNaughton, general manager of the Calumet & Hecla, has returned to the mines from Boston, where he was in attendance at the funeral of the late President Agassiz.

Frank Hutchinson, former secretary of the Zinc Ore Tariff Club, of Joplin, Mo., has accepted the position of consulting engineer for the J. C. Barr Construction Company, at Webb City.

Reginald C. Pryor, president and general manager of the Lake mine in the Lake Superior district, resumed active charge after an absence of nearly five months caused by sickness.

George G. Blackwell Sons & Company, Ltd., have issued a warning against a person calling himself G. E. Blackwell and representing himself to be a member of the firm, with which he is not connected in any way.

G. H. Ashley has been appointed director of the new Geological Survey of Tennessee. He has had much experience in connection with the geological surveys of Arkansas and Indiana, and the United States Geological Survey.

Quincy A. Shaw has been elected president of the Calumet & Hecla Mining Company, to succeed the late Alexander Agassiz. Rudolph L. Agassiz, son of the late president, has been chosen a director and vice-president of the company.

Thomas L. Livermore, first vice-president of the Calumet & Hecla, with which company he had been connected for many years, has resigned. He has been especially in charge of the sale of the company's product. It is understood that Colonel Livermore expressed a desire some time ago to retire, but consented to remain at the solicitation of Professor Agassiz.

OBITUARY

William W. Ruley died in Philadelphia April 4. For many years he had acted as statistician for the anthracite coal companies, compiling and publishing their reports of shipments and production.

George Valentine, an iron maker of the old school, died March 26 at Ruxton, Md. He was born in 1834 and after being graduated from Harvard, became one of the managers of the Bellefonte iron works of Valentines & Co., one of the most widely known of the old-time Pennsylvania iron concerns. He retired from active business 20 years ago.

Thomas F. Rowe died at Etzatlan, Mexico, April 1, aged 60 years. He was born in the Isle of Man, but had been a resident of Mexico for many years and was widely known among mining men in that country. He had at various times been in charge of mines at Pachuca and Real del Monte; at Charcas; at Etzatlan and Huauchinango in Jalisco; and for several years was manager of the Bonanza mine in the Ixmiquilpam district.

Alfred Kimber, of New York, died April 7 of heart disease at Roosevelt Hospital. He leaves a wife, who was Henrietta Andresen of New York, two sons, H. A. Kimber, a gas engineer of New Rochelle, and John A. Kimber, of Westport, Conn., and four daughters. Mr. Kimber was born in England 66 years ago and was a graduate of King's College, London. He had a seat on the Stock Exchange for 18 years. He was director in a number of coal and ore mining companies, as representative of Ladenburg, Thalmann & Co., whose mining interests were supervised by him, and among other interests he was in charge of the affairs of the Continental Zinc Company.

John Campbell, a pioneer of the coal-mining industry, died at McKeesport, Penn., April 3, aged 85 years. He was born near Irwin, Penn., and over 60 years ago opened and worked a coal mine on his father's farm, which antedated any of the mines of the Westmoreland Coal Company or the Penn Gas Coal Company, the oldest companies in the western part of Pennsylvania. Some 10 years later he moved to Turtle Creek and opened the first mine there, and about 1871 he opened a mine at Saltsburg, which he operated for a number of years. He retired from active business 20 years ago, but retained considerable mining interests. He left four sons and three daughters.

Henry H. Porter, who died in Chicago, March 31, aged 75 years, was born in Maine and went to Chicago when a young man, engaging in railroad work. In 1885 Mr. Porter purchased the plant of the Union Steel Company at Chicago, now the Union Works of the Illinois Steel Company. Four years later he, in coöperation with other financiers, was interested in the consolidation of this company with the Joliet Steel Company and the North Chicago Rolling Mill Company in the Illinois Steel Company, and he was elected a director of the company, a position which he held until 1896. He was actively interested in the building of the Duluth & Iron Range Railroad, which provided shipping facilities for the Vermillion range in Minnesota.

SOCIETIES and TECHNICAL SCHOOLS

Canadian Mining Institute—At the recent meeting of the Western Branch at Vancouver, B. C., the retiring chairman, Thomas Kiddie, made an address on the progress of mining in British Columbia. Resolutions were passred requesting the Dominion government to take off the duty on rescue apparatus for mines. The meeting discussed Mr. Kiddie's paper on "Cause of Variation in Ore Sampling," and S. C. Castleman read a paper on the "Classification of Nicola Valley Coals," which caused a long discussion. Mr. Kiddie also read a paper on "Metal Losses in Copper Slags." W. F. Robertson was elected chairman for the ensuing year, and E. Jacobs was reëlected secretary.

West Virginia University—The Mining Engineering Department at Morgantown has been completely reorganized since Professor Brinsmade took charge on Jan. 1. The schedule of studies has been changed, with the idea of preserving a uniform sequence of subjects in the four-year courses and of introducing the solution of actual mining problems by mathematical methods in the senior year. More attention will also be given to the study of the many mines and works near the town. In the new mining laboratory chain and pick coal-cutters, rock-drills, etc., have been placed. For these the electric current will be furnished by a Westinghouse 250-volt, generator motor set run by a 100-h.p. Parsons steam-turbine and the air by a Blaisdell, belt-driven, cross-compound compressor. For ventilation experiments, there is a 2x4½-ft. Buffalo steel fan belt-driven.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

April 9—The operations of 1909 of the North Star Mines Company, of Grass Valley, the most productive gold mine in California, showed the most successful results yet obtained, the tonnage, profit and production exceeding those of any previous year. The income came from 91,610 tons of ore milled with an average yield of $13.59 per ton, which is $2 per ton higher than the year before. This was due to more careful extraction rather than to higher content of the ore. The lower levels continue to supply plenty of good ore, while some also remains above the 2700 level.

In March the oilfields of the State made a larger production by about 600,000 bbl. than in any previous month. The total output for the month was 5,700,000 bbl. The most productive field is the Midway of Kern county, where the rate of daily production is about 70,000 bbl. A great deal of San Francisco capital is now being invested in the oilfields of the State and many persons connected with gold mining are becoming interested in oil. At Bakersfield an oil exchange is being organized and 150 persons have signed the rolls of membership to start with.

The most noteworthy fact in connection with the oil industry, aside from the present large daily production, is the organization of a company which proposes to build, at an expense of $8,000,000, a 700-mile pipe line to the mines and smelters of Arizona, and probably extend it to Cananea, Mexico. This is supposed to be the best method to solve the problem of overproduction of the oilfields of the State. In fact, oil from all the counties of the State may be put into this pipe line and carried to new points of consumption. The company has been organized in Los Angeles and is called the California-Arizona Pipe Line Company, with a capital stock of $25,000,000. The incorporators are E. L. Doheny, C. A. Canfield, Thomas A. O'Donnell, S. W. Morsnead, W. L. Stewart, Norman Bridge, J. S. Torrance, L. W. Andrews, J. M. Manziger, and Charles Wellborn.

Oil wells are now being drilled as far north as Humboldt county and the ground in Glenn and Colusa counties, which was prospected without success some years since, is again being explored. On the former attempt, much gas was found, but no oil of any amount. It is now thought that the wells bored were not deep enough so that a new trial is being made. In Alameda county also deeper drilling is going on in fields which were tried some years ago. The success resulting from finding productive wells lately in "wild-cat" ground or outside of proven territory has encouraged men to begin prospecting on cheaper lands than those in proven territory in well known fields.

The new "dry-land" dredger now at work experimentally at Oroville is built on what is virtually a large sled and is moved by tackles when desired. The dirt is brought to the machine by an excavator and dumped into a hopper supplied with water for washing purposes. The tailing is dumped at the side of the machine.

The long litigation between William S. Kendall, of Fair Oaks and the Natomas Consolidated, of California, over his farm in the Folsom dredging field appears to have come to an end. The injunction suit which Kendall had pending to stop the gold-dredging company from operating near an irrigating ditch supplying water to his orchard has been dismissed and he has agreed to sell his property to the company. This agreement to sell brings to an end the damage and injunction suits fought by both sides to the controversy for many months.

The California quicksilver producers are wondering what will happen to them when the new Nevada companies begin working ore assaying much higher in mercury than anything California possesses. The installation of furnaces at the Nevada mines will soon begin. Most of the California mines are compelled to handle ores carrying about 1 per cent., and in the larger ones the average ores do not even run as high as that.

Denver

April 10—The Newhouse tunnel company having acquired the Gunnell mine is driving ahead again, and expects to reach the Gunnell workings in another thousand feet. The total length of the tunnel now from its portal in Idaho Springs to the breast is about four miles, and its depth at the breast 1200 ft. below the surface.

The Doctor-Jack Pot Mining Company, of Cripple Creek, has won its suit against the Work company, for extracting ore from a vein belonging to the latter company but having its apex in the ground of the former company. The apex question only has been decided, however, and the amount to be paid by the defendants has to be determined by another suit. The amount claimed by the Doctor-Jack Pot as damages will be in the neighborhood of $1,000,000. In the course of the trial, a new and important question came up, which was a contention by the Work company that the Doctor-Jack Pot company could not show that its Lucky Corner, from which the ore had been extracted, had a discovery vein with a course through both end lines. The judge ruled, however, that the United States patent on the Lucky Corner granted it extralateral rights, unless it should be shown that the discovery vein of that claim crossed the side lines. This the defendant company was unable to do. The Doctor-Jack Pot is a well defined and regular zone of fissuring on Raven hill, and has been followed on the Doctor level 14 for 2900 ft. The country rock is indurated and altered breccia. Total output of the Doctor-Jack Pot and the Work companies is about $5,000,000.

The projectors and builders of a large irrigation enterprise in Routt county, in their application to the Government for segregation under the Carey Act of some five or six townships out of the total they desire to reclaim, are up against the statement that they "contain placer gold," and it is a question, therefore, whether it can be segregated for agricultural purposes. There is hardly a township in Colorado that does not contain "placer gold," if by that is meant "colors." But where the line ought to be drawn is at whether the land is more profitable for pastoral and agricultural purposes than for the production of gold. As this gold has been known to exist there for 23 years, and many unsuccessful attempts have been made to work it at a profit, it would seem fair to assume it is more valuable for agriculture.

The regular quarterly dividend of 2c. per share, amounting to $60,000, has been declared by the Portland company, payable April 15, making a total sum of $8,677,080 paid to the stockholders. It is said that the new cyanide mill at the mine in Victor will be in operation some time in May.

Measurements by the engineer of the Cripple Creek deep drainage tunnel April 1 give the total distance driven as 12,948 ft. The breast is said to be in hard, dry, Pikes Peak granite.

Salt Lake City

April 9—The closing of the Salt Lake Valley plants and general adverse mining conditions in 1908 are shown statistically in the figures on gold and silver production for 1908 by Waldemar Lindgren and H. D. McCaskey, published by the U. S. Geological Survey. The mines of Utah yielded $3,946,700 in gold, a decrease of $1,420,259 as compared with the output of 1907. The decrease was general and affected all the producing camps. Tintic and Bingham were the largest producers of gold from smelting ores. The Tintic ores produced $1,307,464, those of Bingham yielded $1,248,221. The cyaniding ores of the Mercur district contributed $861,891. These three districts furnished 92 per cent. of the gold production of the State. The silver production was 8,451,338 oz., showing a decrease of 2,538,738 oz. as compared with the figures of 1907. This reduced Utah from the second to the fourth in rank among the silver-producing States. Nearly one-half of the silver was derived from the lead-copper ores of Tintic, which produced 4,118,440 oz. The lead ores of Park City produced 2,463,735 ounces.

The suit of the Silver King Consolidated vs. the Silver King Coalition is still in progress.

Goldfield

April 9—The annual report of President T. G. Lockhart, of the Florence-Goldfield mines, has been sent to the stockholders with checks for the 10c. dividend declared in February. The annual report for 1909 shows a net profit of $232,050 of which $210,000 was paid out in dividends. During the year the company treated 34,824 tons of ore of an average yield of $18.42 per ton in the mill, and shipped 173 tons averaging $287 to the smeltery. The approximate cost of ore handled was $9 per ton, including mining, milling and development.

The total recovery in the mill was 92.12 per cent. of the assay value of the ore treated. In this connection it is significant that while the recovery for January was only 68.13 per cent., in December a saving record of 95.05 is shown. Speaking of the ore treated the report says: "During the last year every character of ore ever encountered in the property has been thrown into the mill. Not only has the ore mined by the company, from all points from the 100- to the 500-ft. level, been milled, but also ore from the dumps of every lease which has produced. Oxides and sulphides of all characters, hard ore, soft ore and, in fact, every kind of ore, have been treated readily, and practically all of the metal extracted."

Bisbee, Arizona

April 8—The annual report of the Calumet & Arizona Mining Company states that the development work at Courtland, Cochise county, amounted to 10,457 ft. during 1909. The Germania shaft was sunk 201 ft., or to the 500-ft. level. Drifting was done from a number of levels. The April Fool shaft is 500 ft. deep and some work was carried on from the 290- and 400-ft. levels. Most of the work at this shaft was done from the 500-ft. level. The work at the Germania shaft above the 500-ft. level consisted principally in blocking out the known orebodies and other preparatory work for stoping this ground. Work at the bottom level of both the Germania and April Fool shafts was done with a view of finding extension of orebodies, but so far this has not been successful. A small shaft was put down on the Miami claim during the year and drafts driven from the 318-ft. level. The development here, however, did not show any commercial ore and was discontinued. During the year 4070 tons of ore were shipped from the stock pile at the Germania shaft to the smeltery at Douglas. No additional ground will be purchased in the Courtland district, as ore has not been discovered upon any except the claims already owned outright by the company. From the ore developed on these properties it is hoped that the company will be reimbursed for the expenditures made.

Wallace, Idaho

April 11—The reported consolidation of all of the leading lead-silver properties of the Cœur d'Alene camp has apparently no real basis. The idea was built up around the fact of the purchase by a large stockholder of the Federal Mining and Smelting Company, of a block of stock in the Hecla Mining Company, held by the late J. R. Smith, of Chicago.

The large producers of the district at the present time are the Bunker Hill & Sullivan, the Morning, the Standard-Mammoth, the Last Chance, the Hecla, the Hercules, all lead-silver properties, and the Snowstorm copper mine. There are many minor properties that are shipping a thousand tons a month or more, including the Success zinc mine, the Caledonia, the Alice, the Gold Hunter, the Monarch and the Bear Top, all lead-silver except the Success.

Of these properties the Federal owns the Morning, Last Chance and Standard-Mammoth mines. The Tiger-Poorman and Frisco mines, also belonging to the Federal, have during the last year been worked out after a long term of production. The policy of the Federal company, directed by Charles Sweeney, of New York, and the Standard Oil interests, has been to add gradually to its holdings to keep up the normal output and earnings. Hence the purchase of the control of the entire holdings of one, two or three of the outside producers would not prove a surprise nor would it indicate an intention to gain the control of the camp. In fact it would be practically an impossibility for the Federal to get such control for from two to six new producers are added annually to the list and the owners invariably value their holdings at double or treble the figure at which the mine is appraised by expert engineers. Take, for instance, the Hercules mine at Burke, one of the richest of the district. The mine is appraised at about $3,000,000, but it is asserted by certain of those interested in the property that it would take $10,000,000 to buy it.

A feature that may weaken the Federal holdings in the district is the deal on with the Bunker Hill & Sullivan. For several years the Bunker Hill and the Federal have been engaged in litigation over ground claimed both for the Bunker Hill and for the Last Chance mine of the Federal. The annual expenditure has reached a half-million dollars to carry on this tremendous war and both parties have decided that if an amicable agreement can be reached, it would suit the stockholders somewhat better. The compromise being considered is the purchase by the Bunker Hill of the Last Chance mine for a consideration approaching $1,500,000, the payment to be in stock in the Bunker Hill and the Federal company is to give up all claim to the contested land in which lie very valuable orebodies. The Bunker Hill directors have the proposition up for consideration.

Duluth, Minn.

April 9—All the iron-mining companies operating in the Lake Superior region have announced increases in wages, effective April 1, from 6 to 8 per cent., and in all cases they are voluntary. The companies are looking forward to a season when they will reach their greatest activity. Shipments are starting unusually early, some ore already having been forwarded to the docks.

Birmingham, Ala.

April 10—The action of the executive committee of the Alabama Consolidated Coal and Iron Company in declaring the office of general manager vacant, followed by the board of directors ratifying this action, ousting Guy R. Johnson, who has been with the company for a number of years, caused much surprise in the Birmingham district. Harrison Stuart Matthews, recently elected as vice-president of the Alabama Consolidated, is in charge of the affairs of the company as far as the operations in Alabama go. The appointments of C. P. Ludwig, Birmingham, as manager of transportation, and J. B. Hudson, in charge of blast furnaces, will be the arrangements for a while.

The Anniston Iron Company, a new corporation composed of Lynchburg, Va., capitalists, has taken over the properties of the Woodstock Iron Company, of Anniston, Ala., which consist of a furnace, coal and ore mines, coke ovens and quarries. The Woodstock Iron Company's affairs are being cleared of the bankruptcy troubles.

The pig-iron production in Alabama during March went above 180,000 tons, the highest output, save in November last, during any one month in more than two years.

Cobalt

April 11—A prominent engineer says: "I have met several friends from Porcupine and they report well of the district. The country is schist with big quartz veins which on the surface at least shows good values in native gold. I should say from what I have heard and seen of the ores that the district is well worth investigation. Some large interests have already taken options at big figures on many properties. With few exceptions the best part of the gold belt is in the southern half of Tisdale township."

Another sensational gold rush has started. This time it is to a point 10 miles west of Bourke's siding, which is 30 miles south of Matheson. The ore is stated to be a gold telluride in quartz and some samples brought in from the new district gave some remarkably rich assays. There is some molybdenite reported from that section and it is possible that some of the prospectors may have been unable to differentiate between the two. However, there are a great number of men going in and more authentic details will shortly be available. The rush started so quickly that a special train left Haileybury Thursday, to enable some of those interested to be first in the field.

During March, 18 mines shipped a total of 2601 tons of ore, or 84 cars, 43 being high-grade and 41 medium and low-grade. This is more than 400 tons in advance of the February production, and is also considerably in excess of the amount shipped for the same period a year ago. There were three new shippers in the list, these being the Chambers-Ferland, the Hargraves and the Waldman.

Toronto

April 9—The Ontario Bureau of Mines has received a sample of the mineral supposed to be coal, large deposits of which have been found on the Metagami river in Northern Ontario, which on examination, proved unquestionably to be lignite. Reports indicate that the lignite fields in this region are much more extensive than is generally supposed. Opinions as to the commercial value of the deposit for exploitation on a large scale are divided.

The Temiskaming Mine Owners' Association has issued a statement protesting against assertions contained in an article by Dr. Eugene Haanel, Director of Mines, in the February number of *Industrial Canada*, reflecting disparagingly on the conduct of the mining and metallurgical industries of Cobalt region.

Mexico

April 9—The reported successful solution of the ore treatment problem which for several years has confronted the British-owned San Francisco del Oro company, operating near Parral, Chih., is of far-reaching importance in the Mexican field where the usual and difficult metallurgical problem of handling complex zinc-lead sulphide ore is also involved with the market condition imposed by the high tariff on the products into the natural market for them—the United States.

The results are set forth in a company circular of recent date reviewing the investigations made in the past two years.

A short time ago a satisfactory solution of the problem was thought to have been found in a dry process. A 50-ton mill, with rolls was put up and an attempt to concentrate the ore dry on modified Sutton-Steele tables was made but without satisfactory results. Attention was then turned to wet concentration, a method which the finding of additional water in the mine made more promising than formerly.

Chemical and smelting processes were also examined and the investigations reached such a pitch of completeness that the London directors were able to inform the shareholders, at the end of 1908, that the question of treatment was no longer a serious problem and that the only difficulty was to come to a decision as to which process was the most efficient and economical. In order to make up their minds on this point a further £50,000 was asked for and obtained by a reconstruction of the company.

The circular referred to above describes the tests that have been made and the final decision of the directors. It is accompanied by a report, signed by Percy Tarbutt & Co., consulting engineers. W. S. Harrison, manager, and James Wilding, metallurgist. After an interesting historical account of metallurgical experiments on these ores, a definite system of treatment is recommended.

This decision was based on tests made on a large shipment of ore, 500 tons, which was sent to South Wales and treated at the Emu works with the aid of two roasting furnaces, one zinc furnace and a unit of a flotation plant. The flotation process was condemned on account of the high consumption of acid and low extraction of mineral. The smelting of the concentrates, however, was quite successful, as an extraction of 69½ per cent. of the zinc, 84½ per cent. of the lead and 86¼ per cent. of the silver was obtained. The company saw its way to be independent of zinc smelteries but the independence required the expenditure of £50,000 is zinc works.

At this stage European zinc smelters, working a new electric smelting process on a large scale, offered to contract for roasted zinc middlings on terms that would give the company a net profit of £1 per ton of crude ore and it was this offer that decided the system of treatment, namely, wet concentration at the mine to produce a lead concentrate salable locally and a zinc middling or concentrate which, after roasting, was to be shipped to Europe. A wet concentration plant to treat 300 tons per day is to be erected at a cost, including power plant, of £36,000 and £10,000 is to be spent on a railway from Molino to the mill site with zinc at £20, lead at £13 and silver at 2s., the products are estimated to realize 37s. 6d. per ton of crude ore and to give a profit of 21s. per ton.

London

April 1—At the annual meeting of the Rio Tinto company reference was made to the heavy engineering work that is being carried on in the removal of the overburden from two large bodies of ore which are to be worked by the open-cast method of mining. One of the excavations was stated to be larger than any single section of the Panama canal. The overburden removed during the year amounted to 3,500,000 cu.m. or about 7,000,000 tons. A great deal of the work is done by steam shovels, of which there are twelve at work, most of which weigh 95 tons each. Attempts are being made to hasten the oxidation of the ores and thus recover the copper locked up in the ore heaps sooner than formerly and the trials are meeting with success. Attention was called to the fact that Rio Tinto produces two classes of ore. One, and that which occurs in greatest abundance, is a heavy sulphide ore, which is mostly exported and sold to the sulphuric acid manufacturers; the other is a silicious porphyry ore which is treated locally. A revenue is obtained from copper, sulphur and iron.

With regard to the copper market the chairman said that its future rested entirely in the hands of the large American producers who, controlling the low-cost as well as the high-cost mines, might be expected to so regulate production as to secure not only reasonable profits for all the copper the mines contain, but the repayment of capital before final exhaustion. The chairman did not consider the present stocks as a very serious menace to the market, as they were in the same proportion to consumption as 10 or 20 years ago, and said that he did not think that consumption would be harmed if moderately higher prices were obtained by a regulation of the American output. The sulphur business, which was an important feature as regards Rio Tinto, was in a healthy condition, the chemical trades of the world, and especially those making chemical fertilizers, being in a progressive condition.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

Cordova—The mining property of Harris & Graham on Knight's Island has been sold to Alfred King and others, of New York. New machinery will be shipped at once, and the mine opened on an extensive plan.

Penn-Alaska—This company, Juneau, is completing a 700-ft. tunnel. George Dull has charge.

Alaska-Juneau—This mine will be worked on a much larger scale than heretofore.

Alaska-Treadwell—The March crushing was 27,104 tons and total yield $102,178. The net operating profit was $33,210 and yield per ton $3.77.

Arizona

COCHISE COUNTY

Shattuck-Arizona—This mine is shipping nothing but high-grade ore, no attempt being made to mine the low-grade. The present rate is about 160 tons per day running 17½ per cent. copper.

Wolverine-Arizona—The company continues making shipments of a good grade of oxide ore to Douglas.

Bisbee Extension—The shaft has reached 800 ft. There is one drift running on the 400 level. Drifting will be commenced in several directions when the shaft reaches the water level.

Calumet & Arizona—Hoisting at the Oliver shaft has been resumed. At this shaft development work has been confined mainly to the Gibraltar claim. In this claim on the 1250 level there are large leached areas which are being prospected on the 1350 level.

Superior & Pittsburg—Thompson, Towle & Co. report large interests are enthusiastic over the new underground ore conditions. In the Junction property a large body of sulphide has been cut on the 1500-ft. level, which averages about 11 per cent. copper, and is the same orebody encountered on the 1300-ft. level and later on the 1400-ft. level. A favorable feature is that the water is steadily decreasing, and is only about one-half what it was a year ago.

GILA COUNTY

Cordova—The third drill hole now being put down on the Eureka group is 235 ft. and has passed through rock carrying chalcocite from 45-ft. point.

Warrior—On the 300-ft. and the 250-ft. intermediate levels about 105 tons of chrysocolla ore averaging about 9.5 per cent. copper are being stoped daily for shipment. The second drill hole being sunk on the Montgomery claim, not far from the main orebody, is 230 ft. At this depth schist has been encountered underlying the dacite overburden.

Superior & Boston—The company is shipping 80 tons of 9 per cent. copper carbonate to the Old Dominion every day. Most of this ore is mined in the 6th-level stopes of the Great Eastern. The winze from the 400-ft. level of the Gardner workings is 40 ft. and has been continuously in ore averaging 8 per cent. copper and containing some native copper.

MARICOPA COUNTY

Mammoth—This gold property 20 miles north of Mesa has been bonded to G. U. Young, Phœnix, for $150,000. It has not been operated since 1897. Electric power will be used from the Roosevelt transmission line.

California

CALAVERAS COUNTY

Utica—This company at Angels, is removing 40 stamps of the 100-stamp Stickle mill to the Gold Cliff mine.

Lightner—Work will soon be resumed on this mine at Angels.

COLUSA COUNTY

Abbott—This quicksilver mine at Sulphur creek will be reopened by A. A. Gibson. The mine has been idle 10 years, owing to litigation.

MARIPOSA COUNTY

Ferguson—George S. Barber, of Oakland, has started work on this property near El Portal, adjoining the Original and Golden Rule mines.

Peñon Blanco—A. H. Ward has sold this mine near Coulterville to J. C. Wilson, who has started work.

Tyro—This mine near Coulterville has resumed.

MODOC COUNTY

Fort Bidwell Consolidated—On the Sugar Pine mine of this company, Hoag district, 600 ft. of work has been done and several thousand tons of ore is ready for the mill.

Round Mountain - Champion—Work may be started on this mine again as the result of finding good ore in the Independent Thought, Rudger's Star and Guiding Star mines, near by. The Elsie A. mine, also close by, may be started again.

Woodberry—This claim, Grass Valley district, has been bonded to Mark Daniel in the interest of the Sultana company.

SHASTA COUNTY

Balakala—The smeltery at Coram is operating two blast and one reverberatory furnace. About 900 tons of ore from the company's mine is treated per 24 hours. At the mine nearly 350 men are employed underground, and almost 100 on the tramway, sawmill and surface work. About 80 per cent of the ore output is coming from the Weil workings, the remainder from the Windy Camp. The proportion from the latter will be increased as soon as the tram line from the bunkers to the open cut is completed. F. L. Sizer is mine superintendent.

Mountain Copper—More than 100 men are employed at the Iron Mountain and Hornet mines, and the daily output of the mine is between 200 and 300 tons. All ore except some pyrites from the Hornet, is shipped to the company's smeltery at Martinez. R. L. Cole is in charge.

Mammoth—This company is working about 400 men in the mine, and 110 on top, and maintaining a daily output of about 1400 tons. The smeltery is running four of the five blast furnaces regularly.

Bully Hill—Over 300 tons per day is being smelted by this company. The ore is from the Rising Star, the Bully Hill and Copper City. H. R. Hanley is in charge in the absence of J. B. Keating, general manager. Lawrence May is mining engineer.

SISKIYOU COUNTY

Grouse Creek—Welch & Sons are operating this hydraulic mine day and night and handling a great deal of gravel while the abundant water lasts.

Bonally—This hydraulic mine at Forks of Salmon, is operating day and night with three large giants. The top gravel is 35 ft. deep and is being washed away to get at bedrock gravel.

SONOMA COUNTY

Culver - Baer — This company has bought a 24-ton Scott furnace from the Sonoma Consolidated quicksilver mine and will start up its mine again.

TRINITY COUNTY

Globe—This quartz mine in the high mountains near Dedrick, has been started up for the summer.

TULARE COUNTY

Brushy Ridge—This mine near Badger is being worked by a Visalia company.

TUOLUMNE COUNTY

Moffitt—In this river-bed claim, Superintendent Huston intends building a concrete dam so that the entire river can, in the dry season, be carried in a canal through the cañon, laying the river bed bare for working.

Clio—As soon as the papers are signed for the transfer of this mine near Jacksonville, work will actively commence.

Tarr—This company at Smartsville will start work on the Paddy Campbell gravel mine. The 28 miles of ditch have been repaired and the old tunnel flume is being reconstructed.

Ellen Winton—This mine near Groveland has been leased to Samuel Browning and William McGuire.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Lucania—This tunnel, now 4209 ft. into Bellvue mountain, will be continued for 500 ft. further. John McCall is manager.

Reliance—This new company has acquired the Sporting Times claims at Georgetown.

Golden Glory—Machinery will be installed at this Saxon mountain tunnel proposition.

Saxon Extension—This company, on Saxon mountain, is planning to build a mill to treat the ore from the Scepter mine. Arthur Robert is in charge.

LAKE COUNTY—LEADVILLE

Ella Beeler—Operations on this group, which comprises the Ella Beeler, Clear Creek and Little Troubadour, are to be started soon by Colorado Springs men.

Long and Derry—It is also reported that another tunnel is to be driven in Long and Derry hill, east of the Weston fault, for the purpose of cutting the known oreshoots at great depth.

Penn—One of the most active properties on Breece hill is the Panphier lease on the Penn, which is shipping about 200 tons of iron ore *per diem* to the smeltery. Other lessees on this mine are also doing well.

Miller—Work has been started on this group in Lackawanna gulch, with a small force, and the property will be worked extensively this year. The ore in the Miller carries high gold content, with some silver and copper. Forty per cent. of the ore being free-milling, will be treated by the mill on the ground, which will be repaired.

SAN JUAN DISTRICT

Shenandoah—A winze has opened up gray copper ore high in silver.

Gold Bug—This mine at Bear Creek has been developing all winter.

Kittemac—The east drift on the Clark vein continues to open up lead-copper ore of milling grade.

Frank Hough—This property has been compelled to store its product during the winter. Several hundred tons of bornite ore running 40 per cent. copper wait the opening of the trail. The compressor is at the foot of the road over Engineer mountain and will be taken to the new tunnel soon.

Golden Edge—Discovery of free gold on this property last autumn has resulted in creating much interest in the Pole Creek region. A rush will be made for this place next month, Sheep mountain being the center of the excitement.

Big Bull—A strike of unusual richness has been made by Andrew Falk upon the Big Bull lode on Hazelton mountain, near the Aspen mine, within two miles of Silverton.

Yukon—A carload of ore has just been shipped to the Contention mill for testing.

New Gold King—This property shipped 2200 tons of concentrates from the mill at Gladstone to Durango, which, it is reported, will average $50 per ton.

Delano—This prospect, a mile and a half up Cement creek from Silverton, has opened up a vein of hüebnerite from 2 to 6 in. wide, for a distance of 1300 ft. This ore will run 25 per cent. tungstic acid.

TELLER COUNTY—CRIPPLE CREEK

Work—The annual report of the Work company shows gross earnings of $44,210, but litigation with the Doctor-Jack Pot, the cost of which amounted to $11,717, appears to have eaten up the profits. They will take the late decision of the court against them, in the suit brought by the latter company, to the United States Court of Appeals. M. F. Stark is manager.

Isabella—A strike of importance is just reported from the Smuggler mine of this company on the 200 level. From the assays already taken, it is believed the ore will run from 2 to 3 oz. The width of the vein is 4 feet.

Golden Cycle—This mine is said to be shipping ore which carries from 1 to 4 oz. gold per ton, from the 1400 level.

Idaho

CŒUR D'ALENE DISTRICT

Caledonia—This new producer has developed a promising oreshoot on the 300-ft. level and is shipping regularly. The company will pay its first dividend April 30 and expects to install a mill this year.

Snowstorm—The mine is now shipping 8000 tons of copper per month. The No. 4 tunnel, the deepest level in the mine, will encounter the vein in 500 feet.

OWYHEE COUNTY

Banner—This property, about one mile south of Silver City on Florida mountain, has completed a mill and is now carrying on an extensive program of development, driving on the Banner vein from the crosscut tunnel. W. S. Steel is in charge.

SHOSHONE COUNTY

Capital—This mine at Osburn, will install a compressor and make other improvements this summer.

Kansas

The production from the Kansas zinc district for March was 5,438,010 lb. of blende, and 377,260 lb. of lead ore with a total value of $126,024.

Moss—This company on the Lockport land, Galena, has nearly completed the mill. The mine will be worked by the open-cut method.

Boston—The company is building a mill on the Rogers forty, southwest of Galena.

Michigan

COPPER

Ojibway—At the 1250-ft. level tributary to No. 1 shaft a diamond drill has encountered an amygdaloid formation well charged with copper. The disclosure is probably the same lode as is being opened in the levels above.

Hancock—The erection of the steel shaft house at No. 2 shaft will be started at once. In the coming fall this property will be in shape to handle about 500 tons of rock daily. The erection of a stamp mill will probably be started during the coming summer.

Lake—Returns from the mill run from Feb. 20 to April 1 showed a mineral yield of about 28 lb. to the ton, or about 20 lb. of refined copper. During this period of 34 days, 3828 tons of rock were stamped, or at the rate of about 112 tons daily. The falling off in the mineral yield from the previous runs has no particular significance due to the fact that the rock is coming entirely from development and was shipped to the mill without any assorting.

Section 12—This property has encountered what is believed to be the Baltic lode in its No. 4 drill hole at 650 ft. The core shows the formation to be 40 ft. in width, with copper throughout and the last 15 ft. of it highly mineralized.

New Baltic—The exploration has passed through a copper-bearing formation in its No. 3 hole thought to be the West Baltic lode.

Bohemia—This company has encountered amygdaloid formation in No. 1 hole showing copper.

Keweenaw—This mine has a drill in operation at the 16th level of its Medora shaft, going down perpendicularly to the Medora lode, which recently entered an amygdaloid lode carrying some copper at 820 ft. Drilling will be continued to strike the Calumet conglomerate, and the

Osceola amygdaloid lodes, which are known to traverse this tract. Another drill outfit has been added, and the Kearsarge lode will be tested at various points. The shaft sinking on this lode is down 100 ft., and the copper contents of the rock being exposed are encouraging.

Minnesota

The Canisteo district—the western Misabe range field which the Steel Corporation has been developing several years—will be a heavy shipper this season. It will send out in excess of 1,500,000 tons, possibly in excess of 2,000,000 tons. The bulk of the ore will come from the Canisteo, Hill-Walker, Holman and Hill properties. Much will be shipped directly from the mines to the docks, and the remainder will be treated at the Steel Corporation's concentrator or washer, which is expected to be in commission in June.

Morton—The concrete shaft at this iron mine, near Hibbing, has been completed after very difficult work on account of the quicksands.

Missouri

The production from the Joplin district for March was 47,974,145 lb. of blende, 6,233,835 lb. of calamine and 6,781,850 lb. of lead ore, total value, $1,284,845.

The new camp at Toms, north of Joplin, is having a number of strikes of fine bodies of ore at the depth of 180 feet.

The new Neck City camp is making a good production from the Quick Seven forty.

The Kitty Mack and Grace Ping mills, Joplin, were burned to the ground and the Winslow mill at Webb City had a close call.

The West Joplin sheet-ground district has three new properties that are to start operations—the Muskingum, Falls City and the Empire Zinc Company.

New York & Western—This company has purchased for $25,000 a 40-acre lease on the Knol land at Porto Rico on which is the Millard mine.

Coahuila—This company at Porto Rico will build another 150-ton mill.

Montana

BEAVERHEAD COUNTY

Calumet & Montana—This property in the Dark Horse district is now being operated by a Minneapolis company. Development operations are under way, and plans are being made for a concentrator to treat the copper, silver and gold ore. P. J. Whitty is superintendent.

BUTTE DISTRICT

North Butte—This mine is hoisting about 1200 tons of ore per day, which is between 200 and 300 tons less than some time ago. While the ore grade on the 2000- and 2200-ft. levels is not as good as on the 1800-ft. and higher levels, still the ore runs between 5 and 6 per cent. copper. Charles A. Clark, of Boston, is soliciting proxies to be used at the forthcoming annual meeting of the company to elect if possible one or more directors to represent "the minority stockholders."

Tuolumne—This mine produced in March 1,103,895 lb. copper, 20,350 oz. silver, from 3340 tons of ore.

Butte Coalition—An effort is being made to make a protest against the sale of Red Metal stock in the Butte Coalition treasury, or the exchanging of it for Anaconda stock.

CHOUTEAU COUNTY

August Mining Company—The cleanup after a two-weeks' run of the mill near Landusky, netted $35,000. A Lindig, Landusky, is in charge.

DEER LODGE COUNTY

Oro Fino and Black Hawk—The Thompson-Montana Investment Company, of Butte, has recently sold a half interest in the claims to Charles Bostrom, who has been working the Oro Fino under lease for two years. The winze is now down 150 ft. below the tunnel level, or about 250 ft. below the surface. Benson & Beck have contracted to sink the shaft an additional 100 feet.

LEWIS AND CLARK COUNTY

Drumlummon—This famous property has been sold by the court for $150,000 to the St. Louis Mining and Milling Company. Operations will be resumed.

LINCOLN COUNTY

Lincoln—This company has started work on a tram and mill at Sylvanite camp near Libby.

MADISON COUNTY

Clipper—James Wilkie, Harry Poland and E. Smith are working the property under a lease. A 15-stamp mill is in operation, and five more stamps will soon be added.

Nevada

ESMERALDA COUNTY

Commonwealth—A crosscut on the lower tunnel level of the Knickerbocker has revealed the continuation of the oreshoot lost in the workings above.

Goldfield Consolidated—The mill was damaged by fire April 9 and a shut down will result. The fire started from an explosion of distillate in the refinery. Twenty of the stamps were destroyed. A H. Howe, secretary, said: "I might state that the fire at the mill, while very provoking and distressing, is not so vital as one might assume at first blush. Our property loss, estimated at $200,000, represents only about a week's normal mill run. One of our quarterly dividends would build two new mills complete. The temporary stoppage of all operations, although annoying and inconvenient, is hardly more than trivial. While the accident will necessitate some curtailment of mining operations and a temporary reduction in the amount of ore produced, there will be, naturally, an immediate effort in the direction of mill reconstruction which will tend to increase the force at the mill, and to a large extent offset any reduction of force which present conditions might necessitate in the mines."

LINCOLN COUNTY

Capital—This Eldorado mine reports a rich strike from the 100-ft. level. Timothy Nay is superintendent.

NYE COUNTY

Tonopah Extension—The company has acquired the Red Rock, Consolidated, and McKane claims, 200 acres in all, contiguous to the company's present holdings. Development will be undertaken underground from the extension workings.

Montana-Tonopah—The company has purchased two-thirds of the Miriam, Afterall and North Star claims, adjoining on the north.

WHITE PINE COUNTY

Boston-Ely—This company is sinking an inclined winze on the contact between the limestone and the vein encountered in the crosscut on the 1127-ft. level of the Emma shaft.

Oklahoma

The Oklahoma district produced during March, 3,392,010 lb. of blende and 581,795 lb. of lead ore with a total value of $79,849.

While the water question at Miami is not difficult, the ground is so porous that the deepest mine pumps for the whole camp and this has resulted in the closing down of the deeper mines until some arrangement is made for all to carry the expenses.

The Miami-Yankee and Turkey Fat have sunk to a deeper level and are all ready to start production again. The Tom Lawson has installed crusher and rolls and is operating with hand jigs. The Emma Garden tailing has increased its capacity and the Old Chief and New State tailing mills are also running. The King Jack mill is being remodeled into a tailing mill. L. C. Church is sinking two shafts to the deeper ore level north of the Emma Gordon, also on the north twenty, the farthest north of any development in the Miami field.

Oregon

BAKER COUNTY

The smeltery at Sumpter will soon be in operation again with F. W. Schofield in charge. The new company is known as the Northwest Smelting and Refining Company.

JOSEPHINE COUNTY

New Deal—This property under the direction of G. W. Broderick, Grants Pass, is in good condition. It will install machinery.

Pennsylvania

The breaker of the Salem Coal Company at Carbondale collapsed on April 6. The Salem company will rebuild the breaker as soon as arrangements to that end can be effected.

Cochran Coal and Coke Company—This company has completed a shaft and tipple on its property on Jacobs creek, near Chaintown in the Dawson or lower Connellsville field, and is planning further developments. The mine is 2¼ miles from Laurel Run, on the Baltimore & Ohio. Grading for a branch road is completed.

Shannon Coal and Coke Company—The mine at Lower Tyrone, which has been closed for two years, has been reopened and is now shipping coal.

South Dakota

Phoenix—The owners of this mine are preparing to resume. There is a 100-ton cyanide mill on the property.

Black Hills Development and Financial Corporation—Robert Bunce, who organized this company, is preparing to carry out a general plan of developing 40 or more gold mines in eight camps. The company is capitalized for $3,500,000; 1,000,000 shares are set aside for purchasing properties by the exchange of stock. The remaining stock is for developing purposes. One of the first districts that will be operated is Carbonate camp where the company has a number of old mines including the Iron Hill.

Tennessee

Tennessee Copper Company—Part of the addition to the sulphuric plant is working, and by July it is expected that the entire plant will be in operation. The total acid output will then be about 200,000 tons yearly, with 250,000 tons placed as the maximum capacity. At the present time the International Agricultural Corporation is using at the rate of about 50 per cent. per annum of the acid product of the company, with an option on practically the entire ultimate output

Utah

BEAVER COUNTY

Moscow—A new body of lead carbonate ore has been developed on the 400-ft. level for 165 ft. along the strike. The ore has been followed by a winze 60 ft. below the level and has been raised on for 70 ft. It averages about 4½ ft. in thickness. During March, ten cars of ore were shipped, which netted $1100 per car. Since Jan. 1, the company has shipped 39 carloads of ore.

Horn Silver—The last annual report shows that 11,189 tons of ore were mined during the year. The ore receipts were $120,189. During the year considerable milling ore was broken and stored in the mine. Ore is being broken on the 400-ft. level and down to the 900-ft. level. A new body of copper ore, carrying a small amount of silver, has been developed on the 750 level. From September to December, 1909, the company was unable to market its ore, owing to the closing of the Tintic smeltery. A new contract has been made with the American Smelting and Refining Company for two years.

Cupric—This property, adjoining the Horn Silver and under the same management, has installed power drills. A shaft has been sunk 400 ft. through an iron capping and is reported to have opened a body of copper ore on the 300-ft. level.

Peacock—This property is about 1¼ miles west of the Horn Silver on the western slope of the San Francisco mountains. New surface indications of a body of low-grade silver-lead ore are reported. This ore occurs in limestone between two porphyry dikes.

Cedar-Talisman—A carload of zinc ore has been shipped, mined largely from the 100-ft. level. Silver-lead ore has been opened on the 400; and development work is being carried on on the 220- and 500-ft. levels. The drift on the 500-ft. level, north fro mthe main incline, is reported to be breaking into ore.

JUAB COUNTY

Tintic ore shipments for the week ended April 1 were as follows: Scranton, 6 cars; Bullion Beck, 2; Chief Consolidated, 7; Gemini, 7; Uncle Sam, 3; Eagle & Blue Bell, 6; Eureka Hill, 1; Centennial-Eureka, 38; May Day, 1; Yankee, 1.; Grand Central, 4; Gold Chain, 2; Opohongo, 1; Mammoth, 2; Lower Mammoth, 3; Dragon Iron, 21; Beck Tunnel, 3; Black Jack, 1; Iron Blossom, 13; Colorado, 16; Sioux Consolidated, 23; total, 161 cars.

Gold Chain—This company is shipping two carloads of ore a week at present, and is doing development work in new ground. Ore on the 300-ft. level of the old Ajax mine has been followed into Gold Chain territory. It is expected that the Gold Chain and Opohongo vein systems will meet in Gold Chain ground.

Opex—The new diamond drill which was recently installed on the 2147-ft. level is working smoothly. The drill will enable prospecting work to be carried on below the water level, without installing pumps.

Iron Blossom—A strike of rich gold ore was made in the south or No. 1 shaft. The strike is on the 500-ft. level in new ground. Two carloads have been shipped.

Tintic Standard—The winze below the 700-ft. level was started on a fissure carrying 18 in. of quartz. This is reported to have widened to 3½ ft., and carries silver and gold. Drifting is being done on the 700-ft. level. The southeast drift has opened a body of quartz similar to that in the winze.

Carisa—A large open fissure has been encountered on the 500-ft. level. It is approximately 100 ft. in length, and up to 12 ft. wide. Its vertical extent above and below the 500-ft. level has not been determined.

Eagle & Blue Bell—The orebody encountered on the 1200 level has been opened for over 70 ft. and is 6 ft. wide in places. During March, the company shipped 18 cars of ore with a gross value of $16,000.

Bullock—Work has been started sinking the shaft from the 218-ft. level. Three shifts are employed. A shipment of ore made recently brought good returns.

IRON COUNTY

Southern Utah Iron Company—This company recently incorporated for the purpose of acquiring 600 acres of iron-ore land in Iron county proposes to build a blast furnace and mill and to construct 25 miles of railroad. The president of the new company is Thomas T. Kelley, of Chicago, vice-president, Patrick Ryan, of Salt Lake City; treasurer, Eugene M. Kelley, of Chicago; secretary, Edward M. Gurrin, of Salt Lake City.

PIUTE COUNTY

Sevier-Miller Coalition—A new company has been formed to develop the low-grade gold properties of the old Sevier Consolidated Company in the Gold Mountain district near Kimberly which includes 25 patented and 30 unpatented claims. A 100-ton mill is on the ground. The Sevier Consolidated Company, over a year ago, went into the hands of a receiver, and the Salt Lake Hardware Company and associate interests secured the property at receivers' sale. The new company is capitalized at $2,000,000, 400,000 are preferred, and 1,600,000 shares, common stock. F. T. Tilton is president.

West Virginia

CLAY COUNTY

Elk Manor Coal Company—At Durfee this company has arranged to reopen the mine long idle.

MERCER COUNTY

Development is active around Bluefield. A. D. Harrah has bought 4500 acres on Camp creek with the idea of building a branch from the Virginian railroad and of developing the coal and timber. The Island Creek Coal Company has started four new mines, while the Shawnee Coal Company will soon erect a steel tipple to handle 1000 tons daily. The Rowen Red-Ash Company has leased 750 acres of coal land, has let contracts for three miles of railroad and expects soon to be able to ship 1500 tons daily.

McDowell County

S. W. Patterson, manager of the Bottom Creek Coal Company, will soon construct a coal tipple at Vivian and develop enough new ground to bring the output to 4000 tons daily. At Leckie, an 800-ton mine will be started by the Virginia-Pocohontas Coal Company.

Nicholas County

The Landsdowne Coal Company, of Craigsville, has just been incorporated to develop a 500-acre coal tract.

Raleigh County

Mines will soon be started in Jarrold's valley by the Clear Fork Splint and Gas Coal Company, of Coal Creek.

Canada

British Columbia

British Columbia Copper Company—This company has just placed the order for materials to be used in the reconstruction work of the blast furnaces, two out of three of which are being enlarged 10 ft. in length. The additional capacity which will be derived from this enlargement is to provide for the smelting of the New Dominion ores. This enlargement of the furnaces should increase the smelting capacity of the plant 33⅓ per cent.

Ontario

The shipments from Cobalt for the week ended April 1, are as follows: La Rose, 334,479 lb.; Kerr Lake, 356,040; Crown Reserve, 245,950; Nipissing, 183,234; McKinley-Darragh, 88,220; Coniagas, 83,039; Right-of-Way, 65,977; City of Cobalt, 64,671; Temiskaming, 58,300; Cobalt Central, 39,900; Hargraves, 41,800; Lucky Godfrey (Elk Lake), 54,000; total, 1,615,610 pounds.

Three important deals have lately been made in the South Lorraine, in the Ox Bow Lake section. The Mitchell-Brocklebank was sold for $25,000 to Buffalo people. Philadelphia and New York parties have bought claim H. R. 33 for $30,000, and claim H. R. 227 has been sold for $15,000.

The rush into the Porcupine district has assisted in the development of the gold properties of Munroe township, 30 miles to the east. Detroit people have purchased the Chance property, and have contracted for two small shafts. The Painkiller Lake claim in the same locality is being steadily developed with Belgium capital.

McKinley - Darragh — During March, 200,000 oz. of silver were produced, the highest monthly production ever made.

Peterson Lake—This company will sink a shaft on an island in the lake. This is the first work undertaken by the company for itself, although 14 leases have been given.

Hargraves—The No. 1 shaft, near the Drummond line, has been sunk to 125 ft., and in a crosscut the vein was cut. The vein varies in width up to 6 in., and carries high silver.

Laurentian—This mine, in the Manitou region, western Ontario, will soon resume, in charge of new interests. A. Blum has retired from the company.

Quebec

The exploring expedition of the Chibougamou district, undertaken by the Quebec provincial government, has set out. An advance party carrying the necessary supplies and equipment has started for the district and will be followed in a few days by Doctor Barlow, of Montreal, and Professor Gwillim, of Queen's University, Kingston. An influx of prospectors into the region is anticipated.

Mexico

Chihuahua

Naica—Engineers presumably in the interest of the United States Smelting, Mining and Refining Company have just completed a several weeks' examination of the mines of the Compañia Minera de Naica.

Grand Central—Regular shipments of high-grade lead-silver ore are being sent to the El Paso smeltery. New orebodies have lately been uncovered. Edward Selverson is in charge. The property is near Villa Ahumada.

Manta—Shipments of lead-silver ore have been started at this Santa Eulalia property.

Baltimore—Arrangements have been perfected by New York stockholders represented by P. L. Kent, for the resumption of work at this Santa Eulalia mine which has been idle for several years.

Perros Bravos—Regular shipments are being made from this Parral mine, under management of P. B. Butler.

Princessa—New York men have lately acquired this property of 20 pertenencias in the Cusihuiriachic section and will begin developments under directions of L. Maurice Cockerell. The mine has been a large producer of high-grade silver ore.

Rio Tinto—The work on doubling the capacity of this smeltery at Terrazas is under way.

Durango

Husted Mining Company—This company has control of the Indé Consolidated claims at Indé and the Santa Lucia and La Montana groups at El Carmen. A 50-ton cyaniding plant is proposed at El Carmen. F. H. Husted is president; New York office, 78 Broad street.

Guerrero

Mitchell Mining Company—The Washington, D. C., court has confirmed L. C. Stridger and C. E. Emig as receivers for the company owning La Dicha mine and extensive property near Chilpancingo.

Jalisco

Almoloya—An experimental plant, three stamps and concentrators, is in commission at these mines in the Ameca district, the property of the Almoloya Mining Company, of Mexico City.

Tajo—Machinery for trebling the capacity of the 30-ton plant in the San Sebastian district has reached the railroad terminal at San Marcos, and will be at once taken to the mine.

Puebla

Teziutlan—All arrangements have been made for blowing in the smeltery of the Teziutlan Copper Mining and Smelting Company before the end of April.

Sonora

Moctezuma—Hand drilling has almost entirely been supplanted by machines, 5 3-in., 6 2¼-in. machines, 7 pluggers and 19 stopers being constantly in use. The San Juan shaft, which has not been worked for several years, is in process of reopening, an electric pump having been ordered to drain the heavy flow of water. All boilers are being equipped with stokers and conveyers to bring the coal from the bins. Plans to increase the water supply for the concentrator are under consideration.

Tepic

Rich silver-gold ores has been opened in mines owned by J. B. Mulhall and partner in the Amatlan de Cañas district. A reduction plant is proposed.

Purisima-Mezcalitos—The Pan-American Investment Company has undertaken the development of the Purisima and Mezcalitos mines in the Amatlan de Cañas district.

Africa

Transvaal

The corrected statement of gold production in the Transvaal in March shows a total of 607,119 oz. fine; being 31,497 oz. more than in February, but 381 oz. less than in March, 1909. For the three months ended March 31, the total was 1,787,831 oz. in 1909, and 1,784,109 oz.—or $36,877,533—in 1910; a decrease of 3722 oz., or $76,933, this year.

Asia

Korea

Oriental Consolidated—The result of the March cleanup was $120,500.

Europe

Russia

The production of copper in the Russian Empire in 1909 is reported as follows: Ural district, 530,778 poods; Caucasus, 391,200; Altai, 2940; Siberia, 150,582; recovered in chemical works, 57,984; total, 1,126,584 poods, or 18,065 long tons. The total is an increase of 101,140 poods, or 1630 tons, over the preceding year.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, April 13—The anthracite trade in the East is steady as usual. Shipments keep up under the stimulus of the discount given in April, and a good quantity of anthracite is moving westward to the Lakes.

The seaboard bituminous trade is beginning to feel the effect of the suspension of mining. As noted last week, a number of companies which employ non-union labor have given increases. In the Central Pennsylvania district, which ships largely to tide and which is not covered by the Interstate agreement, many mines have shut down. Negotiations are going on over the rate but nothing has been settled, though a conference began in Philadelphia yesterday, the result of which is uncertain. The miners ask an advance of 3c. per ton, with allowances for day work, and for outside labor which will bring the increased cost of mining up to 10c. per ton. The operators claim that they cannot afford to pay this and compete with West Virginia coal; but they are not united and a compromise will probably be made.

In the West the suspension is general from the Pittsburg district to Oklahoma. Industries are running on stored coal, but how long this will last is uncertain. Little progress has been made toward a settlement, though some districts have come near an agreement. The Hocking Valley and No. 8 districts in Ohio have actually reached a compromise, the operator agreeing to the advance of 5c. per ton and 5½ per cent. for day work, and the agreement will probably be signed this week. In the Indiana block coal district a compromise has been reached; but the Indiana bituminous district is still unsettled. In the Pittsburg district no terms have been made and Illinois is still in the air as far as any agreement is concerned. It is quite possible that the suspension of mining may continue for some time.

Nothing is being done toward a strike settlement in most of the districts. Operators and miners in Illinois are apparently well satisfied and are making no efforts to have a joint meeting called. The joint meeting held in Indiana between operators and miners was adjourned by the miners without any attempt to get together. Miners in Illinois have all made big money for the past three months and as a consequence are very well satisfied to have holidays. They realize that if they all stay out for 60 to 90 days, business will be much better and that they will have steady work for the rest of the season, whereas if they go to work at once there will be practically no work and the average mine will run only two or three days a week in summer and with many shut down altogether. Consumers have plenty of coal at present, but in another 10 days a number of buyers will be in the market for some outside coal.

Coal Traffic Notes

Coal production in Texas for the year is reported by the Bureau of Economic Geology as follows, in short tons:

	1908.	1909.	Changes.
Coal....	1,047,407	1,144,108	I. 96,701
Lignite.............	847,970	715,151	D. 132,819
Total.............	1,895,377	1,859,259	D. 36,118

The average value of the coal at mine was $2.10; of lignite 86.6c. per ton.

Coal tonnage originating on the Southern Railway in January was: Tennessee district, 117,124; Alabama district, 249,301; total, 366,425 short tons, an increase of 47,096 tons over last year.

Coal receipts at Boston, three months ended March 31, as reported by Chamber of Commerce, long tons:

	1909.	1910.	Changes.
Anthracite..........	362,541	402,523	I. 39,982
Bituminous.........	788,633	983,014	I. 194,381
Total domestic....	1,151,174	1,385,537	I. 234,363
Foreign.............	76,835	69,011	D. 7,824
Total........	1,228,009	1,454,548	I. 226,539

The foreign coal comes chiefly from the Nova Scotia mines.

Anthracite shipments in March were 5,174,166 long tons, being 142,382 tons more than in February, but 1,158,308 tons less than in March, 1909. For the three months ended March 31 the shipments were, in long tons:

	1909.	1910.	Changes.
Reading..........	3,328,314	3,035,011	D. 293,303
Lehigh Valley...	2,627,560	2,672,321	I. 44,761
N. J. Central......	1,971,000	1,892,366	D. 78,634
Lackawanna......	2,330,993	2,282,051	D. 48,942
Del. & Hudson....	1,635,700	1,558,154	D. 77,546
Pennsylvania	1,429,588	1,571,499	I. 141,911
Erie...............	2,032,334	1,830,847	D. 201,487
N. Y., Ont. & West.	736,334	670,319	D. 66,015
Total............	16,091,823	15,512,568	D. 579,255

The total decrease was 3.7 per cent. Two companies only—the Lehigh Valley and the Pennsylvania—showed increases; the others had decreases. The tonnage in 1908 was large, in March especially, a heavy output having been made in anticipation of a possible stoppage in April.

New York

Anthracite

April 13—The anthracite market is quiet and steady, with the usual trade going.

Schedule prices for prepared sizes are $4.25 for lump and $4.50 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes prices are unchanged and are for pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor according to grade.

Bituminous

Users of coal seem to be beginning to realize that there is a strike on, and that it may affect the seaboard market to some extent. There is more inquiry for coal, and a better disposition to take supplies. Prices have advanced 10 or 15c. per ton. For the better grades of steam coal $3@3.10 New York harbor is done and even $3.15 has been paid for lots wanted in a hurry. From that point sales are made down to $2.75@2.80 for lower grades.

Contract making still hangs fire. A number of yearly contracts have been closed, but many are still pending. Some large consumers, it is understood, have decided not to make contracts, but to take the risks of the open market.

Car supply has improved, especially on the Baltimore & Ohio, which has put a number of new locomotives in service. Transportation is fair, coal coming through to tide in good time. All-rail trade is steady.

In the coastwise-vessel market rates have settled down to a summer basis and there are plenty of boats to be had. Going rates from Philadelphia are 85c. to Boston, Salem and Portland; 90c. to Portsmouth; 95c. to Lynn; $1 to Newburyport; 95c. to Providence and the Sound. From New York boats can be had at 60@65c. to Boston, Salem and Portland; 75c. to Bangor.

Birmingham

April 11—No change is to be noted in the coal-mining situation in Alabama or in the Southern territory. The mines are operating with but little hesitation and the output is large. There is a need for all the coal that is being mined. The home consumption is heavy, the railroads especially demanding a large tonnage. Other large interests are consuming great quantities of coal. The outside shipments, too, are steady with prospects of keeping up through the summer.

Chicago

April 12—Very little coal is being sold in Chicago, but neither dealers nor the public manifest anxiety over conditions.

Most of the big steam plants have large stocks of fuel, and the dealers are satisfied to await results of the labor situation. Little coal is coming in, except from the smokeless mines. Illinois and Indiana mines are cleaning up their surplus stocks, but the scant receipts from these sources bring practically no premiums over previous prices.

Illinois and Indiana lump is nominally quoted at $2.25@2.75; hardly any is being sold, for the market demands fine coals on the light sales now possible. Run-of-mine remains at $2.20@2.50 and screenings sell for $2.15@2.30. Smokeless is in overabundant supply and sells for $3.05@3.55 for lump and egg, with run-of-mine holding to $2.75@3.05. Hocking is one of the steadiest of the staple coals, bringing $3.15 and having a large sale. Anthracite buying is light, few retailers or consumers appearing to appreciate the advisability of April buying.

Indianapolis

April 11—The end of the first week of suspension of work at the coal mines in the State has brought no agreement to resume operations. The miners of district No. 11 met in executive session at Terre Haute, April 8, and after considering the proposition offered by the operators, refused it and adjourned. The operators accepted all the terms of the Cincinnati agreement, but on condition that the miners should go to work on April 11 and continue working pending a settlement. The miners voted against working until the contract is completed. The operators say they will not meet with the miners again until the men are at work. Many miners are seeking other employment and quite a number have returned to the old country to spend the summer in their native lands. The earnings of the Indiana miner in the last four months has been greater than ever before. The cold winter, followed by the demand for storage coal, kept all mines at full time.

Pittsburg

April 12—Several of the Ohio districts have signed wage scales and have partially resumed operations. The last meeting between miners and operators in the Pittsburg district left the sides far apart, the miners' position being the 5-c. advance on the rate for screened coal, the conversion of this into a mine-run basis at the old ratio of 65 and 35 per cent., and the furnishing of the new explosives at the same cost as black powder, while the operators' position was that of giving the 5-c. advance, with no other changes. In either case, of course, there would be corresponding advances for day labor, etc. The miners' convention meets in Pittsburg today; tomorrow the operators and miners meet again. The operators absolutely refuse to agree to any terms based upon the Charleroi experiment. In substance their position is (1) that either of the new explosives, properly used, will involve little if any greater expense to the miners than black powder, by reason of less being required, and that by such sparing use coal need not be broken up more than with black powder: (2) that to go on a mine-run basis would result in the miners so breaking up the coal as to lose this district its Lake trade, which is in screened coal and at a season when the resultant slack does not bring any fair price.

A few consumers are short of coal and it is barely possible that some small plants may have to close within a few weeks, but there is no prospect of general hardship. There is trouble in some of the nonunion districts, and little coal can be had from them, except in the case of Connellsville, which is prepared to furnish large tonnages. It is difficult to quote prices precisely, but on the basis of sales and offers mine-run can be quoted at $1.25@1.50 and slack at $1.20@1.40, for prompt delivery.

Connellsville Coke—The market has had a sharp break, about 25c. per ton on either prompt or contract, but transactions have been very light, the chief buying being of April coke by some Buffalo furnaces. The break in prices came simply through a weakening in operators' prices, which may have been induced by the failure of a large demand for raw coal to materialize by reason of the coal-mining suspension. We quote the market about 25c. lower as follows: furnace coke, prompt, $1.75@2; second-half contracts, $2@2.25; 72-hour foundry coke, prompt, $2.35@2.50 at ovens.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended April 2 at 455,273 tons, an increase of 1000 tons from the previous week, and shipments at 4840 cars to Pittsburg, 7877 cars to points west of Pittsburg and 755 cars to points east of Connellsville, a total of 13,472 cars.

St. Louis

April 11—The coal that was held at the mines at the beginning of the strike has about been cleaned up and outside of a few straggling cars there is nothing on the market. In spite of the fact that the strike has now been on for 10 days prices are just the same as they were the last few days of March. The one exception is screenings, which have advanced materially, and the few cars that are on the market are bringing readily $1.25 per ton, mine, or $1.77 per ton, St. Louis.

A small amount of coal which was held on track at mines in Indiana has come into the St. Louis market. Also a small amount of Kentucky coal has come into the St. Louis market, but the prices it brought were so unsatisfactory to the operators that it will not be repeated very soon until the market gets much stronger. The Kentucky mines are holding their coal at about 90c. per ton at mines. This takes a rate of $1 per ton to East St. Louis, which takes care of no switching. This makes Kentucky coal cost $1.90 per ton, East St. Louis, or $2.10, St. Louis, with a 15c. switching charge to be added to nearly all industries. This is from 25 to 40c. per ton more than the market will bear under present conditions.

Prices in the St. Louis market are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	1.70	2.22
2-in. lump	1.60	2.12
Mine-run	1.50	1.82
2-in. nut	1.40	1.92
2-in. screenings	1.25	1.77
Pea and slack	1.00	1.52
Staunton, Mt. Olive & Springfield:		
6-in. lump	1.75	2.27
3-in. lump	1.65	2.17
Mine-run	1.30	1.82
2-in. nut	1.40	1.92
2-in. screenings	1.25	1.77
Carterville:		
6-in. lump or egg	1.60	1.27
3-in. nut	1.60	2.27
Mine-run	1.25	1.92
1½-in. screenings	1.25	1.92
Franklin County:		
6-in. lump or egg	1.75	2.42
3-in. nut	1.70	2.37
2-in. nut	1.50	2.17
1½-in. screenings	1.20	1.87
Trenton:		
6-in. lump	2.25	2.77
6-in. egg	2.25	2.77
3-in. nut	1.75	2.27
Pennsylvania Anthracite:		
Nut, stove and egg		6.15
Grate		6.20
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	2.50	5.30
Gas house		4.40
Smithing coal	1.65	4.15

The anthracite business for the season has opened up fairly well, though the buying is not as heavy as usual. This is easily accounted for by the fact that all dealers have stored as much soft coal as possible on account of the strike and are consequently unable to take care of their usual quota of hard coal in April. This will probably make an unusually large May and June tonnage.

FOREIGN·COAL·TRADE

Italian Coal Trade—Imports of coal and coke into Italy, year 1909, were 9,264,311 long tons; an increase of 811,991 tons, or 9.7 per cent., over the previous year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices as follows on April 2: Best Welsh steam, $4.08; seconds, $3.96; thirds, $3.84; dry coals, $3.90; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.40; seconds, $2.16. All prices are per long ton f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, April 13—The iron and steel markets are still waiting developments. While there is really a considerable business and large shipments, the capacity of the mills is not taxed and new orders are slow. The coal strike in the West has had a sympathetic effect on the iron market and has tended to keep it quiet.

Pig iron is rather weak, and consumers seem to be approaching the time when their waiting policy will bring the concessions they want. Quotations for third-quarter delivery are visibly weaker and furnaces are more inclined to take business at lower prices. The chief business reported this week is in basic pig. Foundry is not active, though same Southern is reported placed in eastern territory at low prices.

In finished material some contracts have been placed for bars, and a few structural contracts have been let. Outside of these matters have been quiet. The railroad buying seems to be over for the present, though some contracts for cars and bridges are reported to be pending.

Pig Iron Production—The monthly returns of the furnaces on April 1, as collected and published by the *Iron Age*, show that on that date there were 313 coke and anthracite furnaces in blast, having a total daily capacity of 84,600 tons; an increase of two furnaces, but a decrease of 250 tons capacity, as compared with the report for March 1. Making allowance for the charcoal furnaces the total production of pig iron in the United States in March was 2,651,000 long tons; for the three months ended March 31 it was 7,727,500 tons. Of this total 5,133,000 tons were made by furnaces owned and operated by steel companies.

Baltimore

April 12—Imports for the week included 2535 blooms Swedish charcoal iron and 311 coils wire rods from Hamburg; 530 tons manganese ore from Antwerp; 15,200 tons iron ore from Cuba.

Birmingham

April 11—While pig-iron quotations in the Southern territory are still rather weak, there is a better demand, and sales are being booked that promise well. The furnace companies are still hopeful of a better condition; in fact, two or three are declining to accept business at prevailing quotations. The lowest price of the larger furnace companies in the Southern territory is $13, with $13.50 being asked for iron to be delivered during the last quarter of the year. There is some iron selling under $13 per ton for No. 2 foundry, but the companies willing to make concessions have not a very large quantity to sell. The production in the South is holding up well. The output, however, is not much greater than the demand, which means that there is not a great deal of iron going to the furnace yards. The steel activity noted recently continues and promises to keep up. Charcoal, too, is holding a strong price.

The home consumption in pig iron is about the same as it has been for the past few months, the cast-iron pipe concerns in particular are melting large quantities of iron.

Chicago

April 12—Sales of pig iron continue to be light and considerable weakness is evident in Southern iron. The price of Southern No. 2 iron remains $12.50 Birmingham as a minimum, or $16.85 Chicago. Northern iron also shows weakness, though in less degree, and sells for $18@18.50. Foundry business in general is good and promises to continue, but melters cannot be persuaded to buy pig iron liberally ahead. The bulk of the business is in sales for the second and third quarters; last-half business in general is not being done. A few sales run up to 2000 or 3000 tons; most, however, are of lots of less than 600 tons. That a good deal of iron will be contracted for as soon as the market shows a decided turn upward seems to be generally believed in the trade. The demand for Lake Superior charcoal iron is rather light also, $19 being the minimum price.

For iron and steel products there is not in general so good a demand as in previous weeks, though structural material continues to have a fair sale. Coke is quiet.

Cleveland

April 11—No transactions in iron ore are reported. The ice is practically all out at the Sault, and navigation opens in a few days.

Pig Iron—A dull market and light sales are noted. Quotations are $16.75@17 for No. 2 Northern foundry; $16.35@16.85 for No. 2 Southern; $16.25@16.50 for forge, all Cleveland delivery. There is a tendency to weakness in prices.

Finished Material—But little new business is reported, except in bars; and contracts for iron bars are said to have been taken at lower prices. No structural contracts are noted.

Philadelphia

April 13—About all the business in pig iron which has been placed excepting for special brands, has been done at a little below the usual asking prices. Liberal offers of Southern iron continue to be made but as no concessions are accompanying the offers little business has been done. There are, however, some negotiations in hand today which will result in Southern pig coming this way at slightly less than current asking prices. Pennsylvania makers are conservative and are not soliciting late delivery business by tempting concessions. Additional blocks of basic pig have been contracted for mainly at outside prices. Some reticence is manifested in quoting actual selling figures. No. 2X foundry has been moving more freely, much of it for midsummer delivery and at about $18. Gray forge is quiet, no large sales being noted, with Southern offered at $16. Malleable is retailing in small lots at full prices and it is said that prices are firmer than a month ago. The tone of the entire market is strong rather than weak.

Steel Billets—Billets are active but in small lots, as the prices quoted are looked upon as a trifle above a level that can be maintained. There is a continuous though light demand for forging billets.

Bars—A good deal of business would be done at this time were it not for the notion that a general cut in bars is inevitable. The retail iron stores filled their racks full during March and have enough iron to see them along for same time.

Steel Rails—Eastern mills have secured a few fair-sized orders for export and have made bids on more which will probably come this way. Small orders are the rule just at present.

Scrap—Dullness prevails in the entire scrap market as all the larger consumers have fully supplied their present requirements. The dealers cleaned up most of their desirable scrap on their own terms and the yards are empty except for the cheaper grades.

Pittsburg

April 12—The iron and steel market presents a more discouraged appearance this week. There has been a distinct break in Connellsville coke prices, scrap shows no demand at all, the pig-iron market is almost dead, with prospects of some merchant furnaces blowing out in the next few weeks, while finished steel products have not shown as largely increased a movement as the progress of the season was confidently expected to bring out. At the same time there is a note of cheerfulness in the structural and plate departments, based upon the large business already booked and the present rate of booking, which is nearly up to shipments and promises full operation in these lines through the year. The steel-car shops are running absolutely full, with actual business on books to carry them through August, while current orders are at a rate to run this full operation into next year. The agricultural steel-bar business, for the year beginning July 1, has been hung up for the time, and it is said that this is due to the publication of untrue statements that some mills had made a concession of $1 a ton, to 1.40c. on this business. The mills insist that no concession will be given.

Pig Iron—Stocks of pig iron in merchant furnace yards have been accumulating, as production has, if anything, increased, although the steel works have slightly decreased their pig-iron output. It has become a settled fact that merchant pig-iron production in the Central West will have to be curtailed by a large percentage. Already some half dozen furnaces have decided to blow out before July 1 unless pig-iron prices advance, and two or three of these will go out within the next fortnight. Based on the highest prices paid for Connellsville coke for this half year and the new prices for Lake ores, pig-iron prices are substantially at cost, but coke has suffered a large drop and there may be room for a profit. No definite basis can be found for the persistent rumors in the trade that Lake ore prices will be adjusted. The ore interests have sold about 75 per cent. of their ore, and ask why they should make a concession on the whole tonnage in hope of selling the remainder. It can be stated with assurance that there is no guarantee on ore prices other than that each seller has protected its customers against reductions made by the individual seller. Bessemer remains quotable at $17.50, Valley, but is not over strong at this figure. Basic, at the former price of $16, Valley, seems fairly strong, some producers asking $16.25. Foundry iron is quotable 25c. lower, at $15.75@16, malleable remaining at $16, Valley.

Ferromanganese—The market has been very quiet. There are inquiries for carloads and lots of 100 to 300 tons, but none for large lots. The market is weak owing to speculative holdings which the owners wish to close out, and remains quotable at about $41, Baltimore, for prompt, and $41.50 for delivery over the next three months. The freight, Baltimore to Pittsburg, was put back to $1.95 April 1, as already noted.

Steel—Bessemer billets and sheet-bars are easier, but open-hearth billets, if anything, are scarcer, and prices of bessemer and open-hearth steel show a wider divergence than for a long while. Bessemer steel is quotable at $27@27.50 for billets, and $27.50@28 for sheet-bars, open-hearth being quotable at $28.50@29 for billets and $29@29.50 for sheet-bars, small open-hearth billets bringing over $30. These prices are f.o.b. maker's mill, Pittsburg or Youngstown district.

Sheets—Business is not especially heavy, but keeps up well, with prices subject to slight shading, regular quotations remaining at 2.40c. for black and 3.50c. for galvanized, with painted corrugated rofing at $1.70 and galvanized at $3. Blue annealed sheets are 1.90c.@2.05c. according to delivery.

FOREIGN IRON TRADE

Newfoundland Iron Ore—The two Canadian companies operating the mines on Wabana island, Newfoundland, in 1909 shipped 1,110,049 short tons of iron ore; 697,068 tons going to the Dominion Steel works at Sydney, Cape Breton, and 412,981 tons to the United States.

Canadian Steel—The production of steel ingots and direct castings in Canada for the year ended Dec. 31 was, in short tons:

	1908.	1909.	Changes.
Open-hearth........	452,493	550,001	I. 97,508
Bessemer..........	136,270	204,718	I. 68,448
Total..............	588,763	754,719	I. 165,956

The open-hearth steel was all basic. The direct castings—included above—in 1909 were 15,016 tons.

METAL · MARKETS

New York, April 13—The metal markets remain quiet, and in some lines are inclined to depression.

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin, lead, zinc and aluminum, was 127 for the month of January; 124 for February; 118 for March.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Feb. 1910..	$ 2,937,134	$ 3,063,116	Imp. $ 125,982
" 1909..	8,860,814	3,576.444	Exp. 5,284,370
Year 1910..	9,100,266	6,194,473	" 2,905,793
" 1909..	16,696,170	6,966,627	" 9,699,543
Silver:			
Feb. 1910..	4,588,619	3,155,329	Exp. 1,433,290
" 1909..	4,852,549	3,508,935	" 1,343,614
Year 1910..	9,086,923	7,403,683	" 1,683,240
" 1909..	9,394,643	7,173,687	" 2,220,956

Exports from the port of New York, week ended April 9: Gold, $7,431,200, chiefly to London; silver, $798,610, to London and Paris. Imports: Gold, $122,808; silver, $121,971, both chiefly from the West Indies and South America.

Gold—The price of gold on the open market in London continued at 77s. 9d. per ounce for bars; but 76s. 5½d. per ounce was offered for American coin. A total of $8,150,000 gold has gone from New York to London, and more is expected to go out.

Platinum—Business is steady and prices are unchanged, dealers asking $29@29.50 per oz. for refined platinum and $34.50 per oz. for hard metal.

Our Russian correspondent writes from St. Petersburg under date March 31 that the market is rather strong. The demand is good and an increase of prices is to be noted. The metal is quoted at Ekaterinburg at 6.20 rubles per zolotnik —$23.32 per oz.— of crude platinum, 83 per cent. In St. Petersburg at 24,500 24,750 rubles per pood—$24.33 per oz.

Silver—The market has experienced a sharp advance in price the past week, closing at 24 9/16d. in London. This improvement has been caused by good buying for the India bazaars, on bear covering, and also on the feeling that purchases may be resumed soon by the India mint.

SILVER AND STERLING EXCHANGE

Apr.	7	8	9	11	12	13
New York....	52⅛	52¼	52½	53	53⅛	53⅜
London .	24	24 1/16	24 3/16	24⅜	24 7/16	24 9/16
Sterling Ex..	4.8770	4.8765	4.8770	4.8780	4.8770	4.8770

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to March 31, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£1,094,600	£1,431,500	I. £ 336,900
China........	925,600	1,088,500	I. 162,900
Straits.......	82,800	......	D. 82,800
Total......	£2,103,000	£2,520,000	I. £ 417,000

India Council bills in London sold at an average of 16.09d. per rupee.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Apr.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
7	13⅛ @13⅜	12⅞ @13	58	33⅛	4.35 @4.40	4.20 @4.22½	5.40 @5.45
8	13 @13⅛	12¾ @12⅞	57½	33	4.35 @4.40	4.20 @4.22½	5.40 @5.42½
9	12⅞ @13	12⅝ @12⅞	....	33	4.35 @4.40	4.20 @4.22½	5.37½ @5.42½
11	12⅞ @13	12⅝ @12¾	57	32⅞	4.35 @4.40	4.20 @4.22½	5.37½ @5.40
12	12⅞ @13	12⅝ @12¾	57⅛	32⅝	4.35 @4.40	4.20 @4.22½	5.35 @5.40
13	12⅞ @13	12⅝ @12¾	56⅞	32¾	4.35 @4.40	4.20 @4.22½	5.35 @5.37½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The chief events of last week were the appearance of the American statistics for March, which had an unfavorable effect upon sentiment, and the reduction, on April 9, by the Calumet & Hecla of its price to 13c. With Lake copper offered at that figure there was, of course, no alternative for the producers of electrolytic but to come down correspondingly with their price, and in fact a number of the larger sellers took the bull by the horns and a drastic reduction was the consequence. The action of the Calumet & Hecla was evidently inspired by its unfavorable interpretation of the statistics of April 8, but electrolytic copper had previously been pressed for sale by one of the agencies whose course had been followed to more or less extent by some of the others. Upon the cut by the Calumet & Hecla these agencies continued their previous policy and sold some large blocks of copper at 12.65@12.70c. In the aggregate a large amount of copper was sold during the week of April 7-13, sales running to many millions of pounds, but it is difficult to indicate closely the total. The larger part of the business was for foreign delivery. The European buyers appear to be inclined to take hold on a liberal scale at the current level of prices, but buyers in this country seem to be more influenced by the statistical position than by any consideration of the intrinsic value of the metal. The business done during the last week was for shipment in April, May and June. The market closes unsettled at 12⅞@13c. for Lake copper and 12⅝@12¾c. for electrolytic in cakes, wirebars and ingots. Casting copper is quoted nominally at 12⅝@12¾c. as the average for the week.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been reduced ½c. and is now 14¼c. base, carload lots at mill.

The London market was under pressure throughout the week, there being a steady liquidation of tired-out bull accounts owing to the discouraging statistical outlook. The close is cabled as barely steady at £56 17s. 6d. for spot, and £57 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £60; best selected, £60 10s.@£61; strong sheets, £69@70 per ton.

Copper exports from New York and Philadelphia for the week were 2365 long tons. Our special correspondent gives the exports from Baltimore at 1107 tons copper.

The Old Dominion Copper Mining and Smelting Company reports the sale of 34,519,301 lb. of copper in 1909 at average of 13.01c. per lb. Calumet & Arizona, 27,630,050 lb. at 13.047c. Superior & Pittsburg, 24,325,667 lb. at 13.047 cents.

Tin—The London market remained barely steady until the beginning of this week, when heavy liquidation and lower prices for copper exerted an adverse influence on tin. Demand from this country was entirely lacking and this, coupled with the report of an increase in the production of Banka tin for this year, were additional disturbing factors. The market closes weak at £147 10s. for spot, and £149 10s. for three months.

Dealers in this market are offering the metal at below the import basis. Consumers are not taking hold to any extent for future delivery and continue their hand-to-mouth policy. At the close, spot tin can be had at about 32¼ cents.

Messrs. Robertson & Bense report receipts of Bolivian tin ore (concentrates) at Hamburg, Germany, in March at 806 tons; 494 tons direct and 312 tons through other ports.

Lead—There appears to be offering right along a little more lead than the market can readily absorb and prices are slightly easier at 4.35@4.40c., New York, and 4.20@4.22½c. St. Louis.

The London market has declined slightly, the closing quotations being cabled at £12 12s. 6d. for Spanish lead, and £12 15s. for English.

Spelter—Offerings, which have been made on a liberal scale in the St. Louis market, have not found ready takers during the week. Both galvanizers and brass manufacturers appear to have supplied their wants for the time being. The market, therefore, declined from day to day on relatively insignificant transactions, and closes weak at 5.50@5.52½c. New York, and 5.35@5.37½c., St. Louis.

New York quotations for spelter, April 7, were 5.55@5.60c.; April 8, 5.55@5.57½c.; April 9, 5.52½@5.57½c.; April 11, 5.52½@5.55c.; April 12, 5.50@5.55c.; April 13, 5.50@5.52½ cents.

The London market is also lower, the close being cabled at £22 10s. for good ordinaries, and £22 15s. for specials.

Base price of zinc sheets is $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The property of the Lanyon Zinc Company has been sold at sheriff's sale at Iola, Kan., and bid in for $265,550 by a representative of the bondholders.

Other Metals

Aluminum—Business continues active and sales are good. The market is strong at 23¼@23¾c. per lb. for No. 1 ingots in large lots, New York delivery. The foreign market is strong, and makers expect an advance.

Antimony—The market continues quiet and unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands

Quicksilver—The market is steady, but not active. New York quotations continue $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for retail lots. San Francisco, $47@48 for domestic sales; $2 less for export. London price, £9 5s., but jobbers have sold down to £9 1s. 3d. per flask.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland. Ohio. Prices in Germany are 500@550 marks per 100 kg.—average 56.7c. per lb.—f.o.b. works Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, month of January, reported by *Revista Minera*, in metric tons:

Metals.	1909.	1910.	Changes.	
Pig and manuf. iron	3,287	1,940	D.	1,347
Copper	1,632	1,291	D.	341
Copper precipitate	1,463	1,320	D.	143
Lead	9,698	12,744	I.	3,046
Zinc	74	128	I.	52
Quicksilver	....	213	I.	213
Minerals.				
Iron ore	479,077	805,567	I.	326,49
Manganese ore	......	416	I.	41
Copper ore	63,697	96,474	I.	32,77
Lead ore	84	406	I.	32
Zinc ore	7,249	12,209	I.	4,96
Pyrites, iron	97,712	113,877	I.	16,16
Salt	45,905	45,647	D.	25

Imports of phosphates, 4945 tons in 1909, and 9537 in 1910; nitrate of soda, 2840 tons in 1909, and 7049 this year.

Zinc and Lead Ore Markets

Platteville, Wis., April 9—The highest price paid this week for zinc ore was $43 per ton; the base price, 60 per cent. zinc, was $42. The base price of 80 per cent. lead ore was $50 per ton.

SHIPMENTS, WEEK ENDED APRIL 9.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	593,700	....	....
Platteville	223,900	....	369,800
Galena	235,030	....	....
Benton	167,300	....	80,500
Highland	125,000	....	....
Cuba City	83,575	....	....
Linden	52,200	....	....
Shullsburg	....	80,000	....
Total	1,480,705	80,000	450,300
Year to date	21,771,610	1,541,199	4,506,390

In addition to the above there was shipped during the week to the separating plants, 1,505,680 lb. zinc concentrates.

Joplin, Mo., April 9—The highest price reported paid for zinc sulphide ore was $46.50, the settling price being $40@43 per ton of 60 per cent. zinc, with purchases made for next week's delivery on a base price of $44. Zinc silicate ore sold on a base of $20@25 per ton of 40 per cent. zinc. The average price, all grades, was $39.24. The highest price paid for lead ore was $50 for grades of 80 per cent. or better, with reductions for ores grading under 80 per cent. lead. The average price, all grades, was $49.96 per ton.

Excitement was caused on Friday by a spirited demand that ran the bid price of zinc ore for next week's delivery to $43.50 and then to $44. It was wholly unexpected, and the universal drop to a $42 base as the highest offering on Saturday is also unexplained, except it be interpreted as a scare flurry. This price will, however, have a bearing on sales for the coming week, having established a precedent of a base price of $44. Outputting was less active during the week and did not exceed the shipment.

SHIPMENTS, WEEK ENDED APRIL 9.

	Zinc, lb.	Lead, lb.	Value.
'ebb City-Carterville	3,894,110	1,325,160	$112,958
)plin	1,682,070	193,410	40,999
alena	826,610	45,470	17,677
uenweg	794,530	57,660	17,250
adger	640,170	......	13,443
ranby	802,050	2,660	12,880
lba-Neck	411,500	17,780	9,898
iami	481,860	163,640	9,391
urora	471,820	......	8,669
irthage	241,680	. ..	5,316
)urgeon	274,900	12,350	3,325
ırcoxie	183,650	......	3,237
ıapaw	145,490	......	2,844
ott City	123,040	......	2,645
ıve Springs	100,360	......	2,057
ırl Junction	75,910	......	1,670
Totals	11,149,750	1,818,130	$264,259
weeks	162,721,570	24,709,320	$1,024,401

nc value, the week, $218,826; 15 weeks, $3,355,788
ad value, the week, 45,433; 15 weeks, 668,613

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
nuary	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
bruary	36.94	40.69	34.37	39.47	50.50	53.64
arch	37.40	43.60	34.71	39.71	50.82	51.26
ril	38.63	......	37.01	......	55.63	......
ay	40.06	......	37.42	......	56.59	......
ne	44.15	......	40.35	......	57.52	......
ly	43.06	......	41.11	......	53.74	......
gust	48.25	......	44.54	......	57.60	......
ptember	47.70	......	44.87	......	56.11	......
tober	49.50	......	45.75	......	55.02	......
vember	51.31	......	48.29	......	53.94	......
cember	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two col- ins give base prices for 60 per cent. zinc ; the second two the average for all ores d. Lead ore prices are the average for ores sold.

CHEMICALS

New York, April 13—The general mar- t is quieter than it has been recently, d little new business is reported.

Copper Sulphate—Business is steady d the market shows no change. Prices ntinue $4.10 per 100 lb. for carload s and $4.35 for smaller orders.

Sulphur—Parsons & Petit, New York, port on April 7 the importation by em of 600 tons crude Sicilian sulphur.

Arsenic—The range of prices is slightly s, quotations being $2.40@2.60 per 100 for white arsenic. Sales amounted to out 100 tons for the week.

Nitrate of Soda—Sales of spot nitrate ntinue large and the article holds firm 2.15c. per lb. This has had a reflex luence on futures, which are quoted at 7½c. per lb., a slight advance.

Mortimer & Wisner, New York, re- rt the position of nitrate in the United ites on April 1 as follows, in long tons:

	1909.	1910.	Changes.
cks, Jan. 1	9,140	14,000	I. 4,860
ports, 3 mos	104,800	117,080	I. 12,280
otal supplies	113,940	131,080	I. 17,140
iveries, 3 mos	99,990	121,580	I. 21,590
tocks, Apr. 1	13,950	9,500	D. 4,450
at for U. S. ports	60,000	92,000	I. 32,000

Quantities afloat include all cargoes reported which are due to arrive at United States ports by July 15 next.

Petroleum

Productions and shipments of petroleum for the month of March, reported by the *Oil Investors' Journal*, in barrels of 42 gal. each:

	Production.	Shipments.
Oklahoma	3,994,512	3,958,082
Southeast Texas	656,470	1,107,852
Louisiana	338,081	267,989

Stocks of Oklahoma oil reported on April 1 were 55,102,440 bbl. Shipments of Texas oil have exceeded production for several months. New wells reported in Oklahoma in March, 255 oil and 3 gas; southeast Texas, 43 oil; Louisiana, 13 oil and 2 gas wells.

MINING · STOCKS

New York, April 13—The general stock markets were dull and depressed early in the week. The announcement on Monday that the Supreme Court had decided on a rehearing in the Tobacco Trust and Standard Oil cases brought about some activity and advancing prices. The market is still largely a professional one.

The Curb was also quiet with prices heavy. The rise on the Exchange brought about more activity, especially in the copper stocks, and sales increased. While there was an advance generally, there was nothing like a boom, however, and the close is inclined to be dull and lower.

One sale of Homestake, of South Dakota, is reported, 100 shares changing hands at $86.50 per share.

In New York, April 7, the following mining stocks were reported sold at public auction: 250 shares Daly West Mining Company, $20 par, $9 per share; 879 shares Right-of-Way Mines, Ltd., $1 par, $261 for the lot; 210 shares Virginia Iron, Coal and Coke, $100 par, $55.25 per share; 1500 shares Hidalgo Copper Mining and Smelting preferred, $10 par, $50 for the lot; 600 shares United Copper common, $100 par, $6 per share.

Boston, April 12—Copper shares have been demoralized but now show a steadying tone. In the decline everything was carried down, the good and bad alike. The greatest pressure has been in Arizona Commercial and Utah Consolidated. The former broke over $5.50, making a low at $14.50. A floating debt of $450,000 incurred in building the new smeltery and the installation of equipment for handling the large flow of water added to the loss from the suspension of mining on account of this water flow brought about this debt. The company's directors have decided to clear this all up by the issue of $1,000,000 in 6 per cent. bonds at 95, convertible into stock at $20 per share. These bonds have been underwritten at a 5 per cent. commission. The stockholders' meeting to take action on this issue has been called for April 29 next.

Utah Consolidated had an extensive decline of $6.50, touching $20. Enforced selling came after the issue of the annual report. Both Granby and North Butte have steadied. The latter is not a market factor in the least degree now. The soliciting of proxies for use of the minority interest at the annual meeting continues.

The new Lake stocks have been conspicuous and the drop in Lake Copper was quite severe, from $57.50 to $46,

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	January.	February.	March.
Arizona, Ltd	2,646,000	2,658,000	2,886,000
Boleo (Mexico)	2,644,800	2,331,832	2,148,383
Copper Queen	10,001,000	8,927,203	10,801,488
Calumet & Ariz	2,331,000	2,024,000	....
Cananea (Mexico)	3,500,000	3,586,000	3,700,000
Detroit	2,166,156	1,486,400	....
Imperial	850,000	750,000	....
Nevada Con. (Est.)	3,800,000	5,000,000	5,600,000
Old Dominion	2,130,000	2,035,000	2,674,000
Shannon	1,510,696	1,526,000	1,468,000
Superior & Pitts	2,166 000	1,864,000	....
Utah Copper Co	4,745,066	5,798,819	8,190,000
Butte District	19,250,000	13,758,620	24,000,000
Lake Superior	19,260,127	18,250,000	19,250,000
Total production	77,000,845	69,995,874	....
Imports, bars, etc.	24,305,526	14,093,381	....
Imp. in ore & matte	7,053,522	6,063,764	....
Total	108,359,893	90,153,019	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report for March includes for the first time the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
IV, 1909	113,774,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767

	Visible Stocks.		
	United States.	Europe.	Total.
IV, 1909	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,216,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

although the recovery has been a good part of the decline. It would not be surprising if a contest should be waged for Eastern representation on the Lake Copper board at the next meeting. North Lake was carried off $3.75 to $13.25, and Indiana $4.25, but the former recovered to $17 today.

In the weakness, Copper Range was carried off $5 to $66 and Calumet & Arizona about the same amount, although the former recovered very quickly. Osceola fell $11 to $132, recovering to $140. Amalgamated sold off $4.75 to $71.75, but has recovered a good part of the loss.

Prices on the Curb also suffered in the general decline; Bohemia and South Lake were both carried down to much lower levels. A $1.25 assessment on First National Copper stock caused a decline to $2.50, while Davis-Daly also declined.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev	Mar. 12	Apr. 7	$0.05
Brownstone, Utah	Apr. 15	June 10	0.00½
Central Eureka, Nev	Mar. 13	Apr. 23	0.02½
Columbus Con., Utah	......	May 11	0.25
Confidence, Nev	Mar. 25	Apr. 15	0 20
Con. Imperial, Nev	Apr. 19	May 12	0 01
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal	....	....	1.25
Gould & Curry, Nev	Mar. 14	Apr. 6	0.10
Hancock, Mich	May 2	....	3.00
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	....	2.50
New Arcadian, Mich	Mar. 10	....	1.00
Ojibway, Mich	Mr.Oct.	....	2.00
Ophir, Nev	Apr. 22	May 16	0.25
Oneco, Mich	Feb. 15	....	1.00
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Seven Troughs Mon., Utah	Mar. 12	Apr. 2	0.00½
Sierra Nevada, Nev	Apr. 7	Apr. 27	0 10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Utah, Nev	Apr. 12	May 3	0 05
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52. 38	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23 743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13 893	13 620	14 280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12 826	13.586	56 231	59 214
April	12.56	......	12 93	......	57.363	......
May	12.893	......	13.238	......	59.338	......
June	13 214	......	13 548	......	59.627	......
July	12.890	......	13 363	......	58 556	......
August	13 007	......	13 296	......	59.393	......
September	12 870	......	13 210	......	59 021	......
October	12 700	......	13 030	......	57.551	......
November	13 125	......	13.354	......	58.917	......
December	13 298	......	13.647	......	59 906	......
Year	12 982	......	13.335	......	58 732	......

New York cents per pound Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton standard copper

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	32.403	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Apr. 12

Name of Comp.	Bld.
Listed:	
Acacia	.06
Cripple Cr'k Con.	.02¾
C. K. & N.	.12½
Doctor Jack Pot.	.08
Elkton Con.	.69¾
El Paso	.68¼
Fannie Rawlins	.05
Findlay	.08
Gold Dollar	.10½
Gold Sovereign	.04
Isabella	.16¼
Mary McKinney	.46
Pharmacist	.02¾
Portland	1.05
Vindicator	.82
Work	.04
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.07¼

SALT LAKE Apr. 12

Name of Comp.	Clg.
Carisa	.50
Colorado Mining	.84
Columbus Con.	.30
Daly Judge	3.95
Grand Central	1.60
Iron Blossom	1.05
Little Bell	1.50
Little Chief	.45
Lower Mammoth	.50
Mason Valley	....
Maj. Mines	2.32½
May Day	.19½
Nevada Hills	.57
New York	‡.13
Prince Con	.85
Red Warrior	6 00
Silver King Coal'n	2.40
Sioux Con	.42
Uncle Sam	.39½
Victoria	1.30

SAN FRANCISCO. April 12.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.13	Belmont	2.65
Belcher	.89	Daisy	.08
Best & Belcher	‡.25	Jim Butler	.17
Caledonia	.55	MacNamara	.33
Challenge Con	.30	Midway	.31
Chollar	.22	North Star	.04
Confidence	1.00	West End Con	.35
Con. Cal. & Va.	1.07	Atlanta	.13
Crown Point	.95	Booth	.15
Exchequer	.20	C.O.D. Con	‡.05
Gould & Curry	.30	Columbia Mt.	.06
Hale & Norcross	.43	Comb. Frac.	.46
Mexican	1.27	Great Bend	.03
Ophir	1.22	Jumbo Extension	.31
Overman	1.40	Oro	.07
Potosi	.45	Red Hill	.04
Savage	.32	Sandstorm	.03
Sierra Nevada	.55	Silver Pick	.09
Union	.73	St. Ives	.15
Yellow Jacket	.94	Tramps Con	.05

N. Y. EXCH. Apr. 12

Name of Comp.	Clg.
Amalgamated	73¾
Am. Agri. Chem.	‡45
Am.Sm.&Ref.,com	82⅛
Am. Sm. & Ref., pf.	106⅛
Anaconda	44⅞
Bethlehem Steel	‡30
Col. & Hock. C. & I.	13⅛
Colo. Fuel & Iron.	40⅜
Du Pont P'd'r, pf.	‡87½
Federal M. & S.	‡53¼
Great Nor., ore ctf.	67½
Nat'nal Lead, com.	82
National Lead, pf.	108
Pittsburg Coal	20½
Republic I&S, com.	37½
Republic I & S, pf.	101
Sloss Sheffi'd, com.	78
Sloss Sheffield, pf.	117½
Tennessee Copper	31½
Utah Copper	47
U. S. Steel, com.	85⅜
U. S. Steel, pf.	121¾
Va. Car. Chem.	58¾

BOSTON EXCH. Apr. 12

Name of Comp.	Clg.
Adventure	6½
Allouez	44½
Am. Zinc	26
Arcadian	6
Arizona Com	16¾
Atlantic	8
Boston Con	‡17½
Butte & Balak	9⅛
Calumet & Ariz.	62½
Calumet & Hecla	590
Centennial	19
Con. Mercur	.10
Copper Range	69¼
Daly-West	8¾
East Butte	8½
Franklin	14
Granby	43
Greene—Can.	9⅝
Hancock	20
Helvetia	3½
Indiana	26½
Isle Royale	17
Keweenaw	4
Lake	53¾
La Salle	14¼
Mass	6½
Michigan	6½
Mohawk	52
Nevada	21½
North Butte	35
North Lake	15¾
Ojibway	‡8½
Old Dominion	36
Osceola	138
Parrot	16
Quincy	85
Shannon	12
Superior	45
Superior & Bost.	12¼
Superior & Pitts.	12¾
Tamarack	58
Trinity	6¾
U. S. Smg. & Ref.	43
U.S.Sm. & Re., pd.	50
Utah Apex	‡3½
Utah Con.	21¾
Victoria	3½
Winona	8
Wolverine	124
Wyandotte	2

N. Y. CURB Apr. 12

Name of Comp.	Clg.
Bonanza Creek	‡3
Boston Copper	17
Braden Copper	4¾
B. C. Copper	6
Buffalo Mines	‡3½
Butte Coalition	21¼
Chino Copper	13½
Cobalt Central	.13
Combination Fra.	.47
Con. Ariz. Sm.	$2\frac{5}{16}$
Cumberland Ely	‡9
Davis-Daly	2⅜
Dominion Cop.	‡7
Ely Con	‡.68⅞
El Rayo	‡3
Florence	‡3⅛
Gila Copper	6¾
Giroux	8⅜
Gold Hill	1½
Goldfield Con.	7½
Greene Cananea	9⅜
Guanajuato	‡1⅜
Guggen. Exp.	‡200
Kerr Lake	.08¾
La Rose	4⅛
McKinley-Dar-Sa.	90
Miami Copper	23¾
Mines Co. of Am.	48
Montezu. of C. R.	‡2½
Mont. Shoshone	‡⅞
Mont.-Tonopah	‡.70
Nev. Utah M. & S.	$1\frac{1}{16}$
Newhouse M. & S.	‡3½
Nipissing Mines	10⅛
Ohio Copper	3¾
Pacific Sm. & M.	$\frac{15}{16}$
Silver Queen	‡.18
Standard Oil	635
Stewart	‡$\frac{9}{16}$
Tonopah	6¾
Tonopah Ex.	‡ 78
Tri-Bullion	$\frac{15}{16}$
Utah Apex	3¾
W. Va. Wyo. Cop.	‡$2\frac{1}{16}$
Yukon Gold	$4\frac{5}{16}$

BOSTON CURB Apr. 1

Name of Comp.	Clg.
Ahmeek	170
Bingham Mines	3
Boston Ely	3
Calaveras	5
Champion	.09
Chemung	10
Chief Cons	1
Chino	13
Cons Ariz.	2
Corbin	.07
Cactus	3
Crown Reserve	3
First Nat. Cop.	2
Gila Copper	6
Indiana	34
Inspiration	7
Majestic	.82
Nevada-Douglas	2
New Baltic	8
Oneco	4
Ray Central	3
Ray Con	‡21
Rawhide Coal	32
Rhode Island Coal	8
San Antonio	10
Shattuck-Ariz	25
South Lake	8
Superior & Globe	‡ 60
Trethewey	1
Tuolumne Copper	3
Vulture	9
Yuma	95

LONDON Apr. 13

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	8	6
Esperanza	2	16	0
Tomboy	0	18	9
El Oro	1	8	3
Oroville	0	10	6

*Last quotation.

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April 2	11,000
April 9	9,500
April 16	9,500
April 23	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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**Illustrated.*

The Alaska Coal Cases

We have previously ridiculed an article that appeared in one of the popular magazines charging enormous frauds in connection with the location of coal lands in Alaska, and have also published sound evidence as to the actual value of those lands, showing that the muckrakers and tyros in mining were indulging in gross exaggeration. We were not sure that there had been no significant fraud in the location of the Alaska coal lands. Our laws for the location of coal lands are of such antiquated and incompetent character that they put a premium upon fraud. We have urged repeatedly that Congress amend the laws so as to make them conform to modern knowledge and conditions.

We have no desire to condone or ameliorate frauds that have been perpetrated upon the Government under the existing laws, no matter how absurd be those laws. There should be strict compliance with the letter of the law. Anyone who has evaded it by deceit or fraud should suffer the consequences.

In this issue we publish an article about the Alaska coal cases by H. V. Winchell, which comes with peculiar authority. Mr. Winchell stands among the front rank of our mining geologists and is a man whose personal integrity and professional standing are recognized as of the highest. He shows in his present contribution that there was no intentional fraud in the Cunningham cases that have been creating such a stir. We will confess frankly that previously we had not taken the trouble to inform ourselves as to the identity of the Cunningham claimants. Now that Mr. Winchell has published the list, we recognize from our own knowledge many of them as men of standing, and have no reason to doubt that all of them are such as Mr. Winchell says.

The action of the Government appears to be another example of bureaucratic injustice to citizens of the United States, wherein the laws of the land are overridden. This case may be even more flagrant than some others. In the zinc-ore case the Treasury Department could at least stand upon a misinterpretation of the law. The maladministration of the Post Office Department probably has some basis in law. We imagine that the Department of Justice in putting the Anaconda Copper Mining Company to unnecessary expense over the pending smoke suit has also some color for action. These examples of bureaucratic assumption of power are all injustices to the citizens of the country. It appears, however, that in the Alaska coal cases the bureaus have acted in direct contravention of the law. How long are the people going to stand such assumption of authority by the bureaucracy?

Consistency with Good Business Management?

The secretary of the North Butte company is reported to have made the following statements:

1. "The abuse heaped upon the company and the management is entirely unwarranted, and the cry that has been going forth that the company would not

furnish information is untrue, for there has never been a time that any stockholder could not get information when applying for it."

2. "It is very true that we have not given out information regularly to the general public; for it stands to reason that such a policy would not be consistent with good business management."

3. "The lower levels of the mine have not shown up such large and consistent bodies of ore as appeared on some of the upper levels, yet we have opened up stopes of commercial ore."

Referring especially to the second statement, we beg to ask, Why not?

George W. Perkins, who ought to be recognized as an authority, said recently in a public address that "Corporations would not be a menace, but a great public benefit, if managed under laws that would compel proper publicity and punish officers for improper methods."

The North Butte company has just published its report for 1909, which contains estimates of ore reserves not only by its own manager, but also by an independent engineer. As to the fullness of detail with which the condition of the mine is now described, this report leaves nothing further to be asked. The manager and the engineer agree that the reserves of the mine amount to about 880,000 tons, which is about two years' supply at the rate of production in 1909. The petering out of the orebody below the 2000 level is frankly admitted. Upon that level the orebody appears to be of about the same size as on the 1800, but the grade of the ore is extremely irregular. High-grade ore shows for short distances and then drops to second class, the orebody at this level being mostly second class. On the 2200 level, "Most of the ore has been too low in grade to be considered a part of the ore reserves."

This experience confirms the opinion expressed by some good geologists in the early days of this mine, namely that the class of vein upon which the North Butte is opened, possesses rich lenses of ore that do not extend continuously to great depth (as depth in Butte is measured). North Butte may find another orebody below the 2200 level, or may not. A good deal of prospecting will probably be required to determine this, and in the meanwhile the life of the mine cannot be safely estimated beyond two or three years.

The Porphyry Coppers

The porphyry coppers are going to make good (of course we refer only to those that have been properly engineered). There is no question about this, Utah and Nevada having amply demonstrated their possibilities. Nevertheless, there are going to be disappointments among them, as we have previously indicated. This is going to result from overestimates of grade of ore, extraction of copper, and cost of mining.

One of the absurdities of porphyry promotions is the uniform assumption that their copper is going to cost 9c. per lb. Mr. Channing announced this estimate for Miami, in which case there appears to be an excellent probability of realization, and ever since the same has been adopted by nearly everyone else without consideration in all cases.

Now, it is manifestly unlikely that all of the Arizona porphyries are going to realize the same figure. For one thing this does not recognize the effect of difference in grade of ore. For example, take two mines of identical physical characteristics, permitting a mining and milling cost of $2 per ton in each case, whereof one yields 30 lb. and the other 40 lb. of copper per ton. The cost per pound of copper up to this stage will be respectively 6⅔ and 5c. per ton, which is a material difference. As between any two mines, this difference may, of course, be reduced by some condition favorable to mining and milling, but on the other hand, it may be increased. So we look for some of the new porphyry copper to cost 10, 11 and even 12c., instead of the 9c. that looks so well in promoters' prospectuses.

In the steam-shovel mining of these thick orebodies, covered usually by a thick overburden, many problems have had to be solved and conditions have developed that were not considered in the first estimates. Thus, what was simpler than to estimate that in the mining of an orebody 100 ft. thick covered by 100 ft. of overburden, one ton of the latter must be removed per ton of ore. How many paused to think that a pit could not be dug 200 ft. deep with vertical sides, and that, in fact, the ratio of overburden would be a good deal more than 1:1 when the necessary slope of the sides was provided?

The sloping of the slides, the extraction of ore in the corners at the bottom, and the raising of the ore from deep pits are important considerations, and all tend to increase the cost of mining over what the promoter estimates in his office and over what may be realized in taking the first slice near the surface. Reflection upon these points, and several others also, will raise the doubt whether the cost-factor that is taked about for a mine possessing ore reserves for 20 years will apply over that whole period as well as to the initial operations.

The average daily rate of the production of refined copper, according to the statistics of the Copper Producers' Association, during the last 12 months is given in the following table.

3,785,809	3,890,233	3,800,924
3,814,714	3,934,104	3,759,589
3,885,583	4,021,216	4,025,446
3,815,406	4,053,612	3,873,144

It appears from the above figures that production increased progressively, with the exception of a single month, up to November, when the climax was reached. Since November there has been no marked tendency toward further increase.

The world's visible supply on Dec. 1, 1909, was 390,000,000 lb., as a round number. On April 1, 1910, it was 373,450,000 pounds.

Upon the face of the returns, therefore, deliveries in the last four months have exceeded production. The same is probably true, with respect to actual consumption.

The producers of copper, lead and zinc are inquiring why the prices for those metals do not inflate if it be true that the increasing production of gold is responsible for the general rise in the commodity indices?

The promoters of oil companies are coming to town. Already are their literary productions to be observed in the papers and their voices are heard on the curb. Now, indeed, does the sucker need to keep his hand on his pocketbook

---

The Goldfield Consolidated is to be congratulated upon its energy in getting 70 of its 100 stamps into operation so soon after the fire, which it was reported at first would tie up the mill for several months. Without doubt the management of the company has exercised great ingenuity in overcoming difficulties to avoid the delay that was anticipated.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Flue Gas Losses

In a recent discussion regarding stack losses at smelteries and refineries the question arose, are the metals lost as dust (solid matter), or as vapor, or as both. I maintain that the losses are due to both dust and vapor.

Assume that we have a stack handling 30,000 cu.ft. gas per minute at 273 deg. C. How much silver will this gas carry as metallic vapor? Prof. J. W. Richards in his "Metallurgical Calculations," Vol. III, under the metallurgy of silver and gold, gives a method of calculating this, provided we determine some value for the vapor tension at moderate temperatures.

By interpolation of the table given in the above reference between 729 deg. C. and absolute zero —273 C. (at which point all molecular action ceases), about 0.0001 mm. of mercury is the vapor tension of silver at 273 deg. C. One cu.ft. of hydrogen weighs 0.00559 lb. at zero degrees C. and 760 mm.; therefore

One cubic foot of silver vapor weighs 0.00559 lb. $\times \frac{108}{2}$ or 0.30186 lb. at zero degrees and 760 mm.

One cubic foot of silver vapor weighs 0.30186 lb. $\times$ 14.583 $=$ 4.402 oz. Troy at zero degrees and 760 mm.

One cubic foot of silver vapor weighs 4.402 oz. $\times \frac{273}{546} =$ 2.201 oz. Troy at 273 degrees C. and 760 mm.

If at 273 degrees C. the vapor tension of silver vapor is equivalent to 0.0001 mm. of mercury and the gas is saturated, the silver vapor supports $\frac{0.0001}{760} \times 100 =$ 0.0000131 per cent. of the total pressure or is equivalent to 0.0000131 per cent. of the total volume. Therefore, one cubic foot of gas carries 0.000000131 cu.ft. of silver vapor at 273 deg. C. and 760 mm. and as one cubic foot of silver vapor at 273 deg. C. and 760 mm. weighs 2.201 oz., we have 2.201 $\times$ 0.000000288 oz. silver vapor per cu.ft. of gas.

Assuming this to be an approximately correct figure, we have for a daily total 30,000 $\times$ 60 $\times$ 24 $=$ 43,200,000 cu.ft. giving a silver loss of about 12 oz. per day due to metallic vapor.

Treating lead in a similar manner, assuming the vapor tension to be approximately 0.0001 mm. mercury at 273 deg., we obtain for our daily stack losses as lead vapor, about 1.6 lb. lead. We could consider gold, bismuth, copper, arsenic, antimony and oxides of these metals in the same manner, and prove that there are certain amounts of metals lost as vapors at such a moderate temperature at 273 deg. Centigrade.

Applying this reasoning to a baghouse where the average temperature is, say, 80 deg. C., we would still have some vapors present in the gases. Less than at 273 deg. C., but still a relatively large amount. This vapor will, in all probability, go through the bags and be lost, the dust being trapped in the bags. Air can and does carry moisture or water vapor. If air carrying small amounts of water vapor is drawn or forced through bags, the amount of vapor extracted by the bags is practically nothing, therefore, why should bags remove metallic vapors or vapors of metallic oxides?

The above calculations are qualitative rather than quantitive.

W. C. Smith.

Grasselli, Ind., April 11, 1910.

Efficiency Index in Milling

The contribution by H. A. Megraw in the Journal of Feb. 5, entitled "All Slime Treatment of Ore in Cyanide Plants," is suggestive and offers numerous points of departure for interesting lines of speculation and experimentation.

His suggestion to treat sand and slime separately, though each is to be air agitated, gives rise to the question of relative required time of treatment for sand leaching and sand agitation. If six days are required to obtain a 90 per cent. extraction when leaching 100-mesh sand, what period of air agitation will attain the same result? If the sand is separated practically free from slime, the loss of time and dissolved metals and cyanide in washing will be much less than with slime, said washing being done by agitation and decantation or by arranging a filter on the cone bottom of the air-agitation tank.

His "efficiency index" AY, where A equals cost of treatment and Y equals the per cent. loss in tailings, is applicable in only a limited number of cases, and even then is not an index as it is not proportional.

In the comparative example given, the two processes cost $4 and $3 and give 85 and 70 per cent. extractions respectively. It is stated that the smaller the index the more efficient the process. Taking the above costs and extractions and applying to ores of different grades, it will be found that for ores over $7 the statement "the smaller the index, the more efficient the process" is true, but for ores containing less than $7 the converse is true.

Again, taking for comparison costs of $5 and $4 on a $7 ore for 80 and 75 per cent. extractions, the index in either case is 100 while the process costing $4 and giving a 75 per cent. extraction results in twice the net profit secured by making an 80 per cent. extraction at a cost of $5. This efficiency index needs more factors and I think it is up to Mr. Megraw to provide the missing ones, as such an index certainly will be interesting and useful if it can be simply presented.

Mark R. Lamb.

Milwaukee, Wis., April 17, 1910.

Wildcatting in California Oilfields

In the Journal of March 26, under heading "Special Correspondence" from California, and discussing the oil situation, wildcatting, etc., a direct misrepresentation is made concerning the prosecution or exposure of "wildcat" oil operators in this State by "certain State officials." The shoe apparently fits me, so I shall wear it.

Statements were made by me to the press a short time ago that the California State Mining Bureau proposed to expose or prosecute the fake oil operators wherever sufficient evidence was secured to warrant the same. It was not assumed by me that a "wildcatter" was necessarily a faker or a swindler, and it was distinctly stated and published in the press that it was *not* the "wildcatter" who was spending money legitimately in an unproved field that we were after, but the "wildcatter" who incorporated a company on wind and transferred the money of the stockholders into his own pocket instead of spending it in a legitimate endeavor to find oil. California is again suffering from the presence of men of the latter class who have been drawn here by the great opportunities which the present oil excitement offers for swindling the unwary.

The East is being flooded with worthless stock in companies which purport to operate in California, and a full investigation of them is now being made by the Bureau with as much rapidity as our appropriation will allow. Evidence is being collected for the exposure or prosecution of the swindlers. In the meantime, Eastern and foreign investors will do well to scrutinize and investigate every oil proposition offered.

L. E. Aubury, State Mineralogist.

San Francisco, Cal., April 1, 1910.

A Far Sighted Corporation

The United States Steel Corporation has not been deterred by the abuse showered upon it by Mr. Gompers and other union leaders from taking an advanced and admirable position in regard to Sunday labor, says the *Evening Post*. Of their own accord, the officers of the Corporation have curtailed the hours of weekly labor at all steel works, rolling mills, shops, quarries and docks controlled by them. As they have no less than 200,000 men on their pay-roll, the far reaching character of this change is obvious. Most of this Sunday labor has heretofore been defended as unavoidable, and it is not yet to be wholly done away with. But there is so much just criticism of corporations in their various capacities that it seems to us only proper to draw especial attention to an unselfish and enlightened act like this one of President Gary and his subordinates.

The Steel Corporation managers really seem to understand the truth that the more contented their labor is, the more efficient it is certain to be, and that contentedness depends upon proper hours of work and sound physical condition. A year ago its finance committee voted to recommend to all subsidiary corporations that Sunday labor be "reduced to the minimum." Now Mr. Gary has notified the heads of all companies that "all of us expect and insist that hereafter the spirit of the resolution will be observed and carried into effect." After this authoritative warning, it is accepted that, wherever possible, there shall be "no construction work or loading or unloading of materials" on Sunday, for Mr. Gary says: "I emphasize the fact that there should be at least 24 continuous hours' interval during each week in the production of ingots." This means an immense easing of life for thousands of men.

The Steel Corporation has taken another noteworthy step forward by instituting a voluntary "employers' liability relief system" for its workmen. The payments the Corporation plans to make will be quite irrespective of its legal liability. During temporary disablement single men will receive 35 per cent. of their wages and married men 50 per cent., with an additional 5 per cent. for each child under 16 and 2 per cent. for each year of service above five years. In case of death of the wage-earner the widow and children will receive one and one-half years' wages, with an additional 10 per cent. for each child under 16 and 3 per cent. for each year of service of the deceased above five years. The Corporation announces that for some years past it has been paying more than a million dollars a year to injured employees and to their families. Its new scheme will be tried for a year to see how it works, and the Corporation announces that "it is intended by this plan to treat employees fairly and generously, even under the most enlightened view of the employer's responsibility." It also announces that it has under consideration the pensioning of disabled or superannuated employees. To all this must be added the fact that on April 13 the Corporation voluntarily increased the wages of its 200,000 employees by about nine million dollars per annum. The official announcement is as follows:

"The subsidiary companies of the United States Steel Corporation have decided to make substantial increases in wages. Notwithstanding that the subject matter has been under careful consideration for the last 60 days the exact amounts have not yet been fully determined, except as to the ore companies and the coal companies, which already have announced advances.

"As to the other companies, the figures will be definitely arrived at in time to become operative on May 1, except the Tennessee Coal, Iron and Railroad Company and the transportation companies, which may not be able to arrange the increases until a later date."

The Corporation is deserving of the widest praise for its admirable attitude toward its workingmen. Such an example as it sets is bound to have a tremendous effect on other industrial corporations throughout the United States.

Daly-Judge Mining Company

The total receipts of the Daly-Judge Mining Company, Park City, Utah, in 1909, were $437,631; total expenditures, $347,590, leaving a cash balance of $222,038 at the close of the year. The surplus was increased by $90,041, while the construction account was unusually large, $15,117, owing to new compressor installation. The receipts from the operation of the zinc plant were $100,918, and this plant has been demonstrated a success.

The mine produced 51,309 tons of ore, of which 3437 tons of crude were sold. Two orebodies of shipping grade were opened during the year, and one of milling grade, and since Jan. 1 a new bed of milling ore has been opened on the Contact vein above the 1200 level, of over 30 ft. in width. The thickness has not yet been determined. Exclusive of prospecting in ore, 5165 ft. of dead work was done during the year.

The mill was in service 351 days of eight hours each, and treated 47,872 tons, from which 9243 tons of lead concentrates, 3032 tons of iron middlings and 5510 tons of zinc middlings were made. The accompanying table gives the tonnage and composition of the products sold during the year.

DALY-JUDGE PRODUCTS SOLD IN 1909.

	Tons.	Oz. Silver.	Oz. Gold.	Per Cent. Lead.	Per Cent. Copper.	Per Cent. Zinc.	Per Cent. Iron.	Sold for
Crude	3,437	31.10	0.031	23.00	1.39	13.90	9.03	$23.81
Concentrates	9,243	16.30	0.059	32.60	0.28	9.40	18.90	24.23
Zinc middlings	17,652	4.80	0.02	1.00	0.00	29.00	14.70	5.88
Iron middlings	3,032	8.08	0.041	12.90	0.27	12.00	26.00	9.06

The accompanying data as to operating costs are available from the report.

COSTS AT DALY-JUDGE.

	Total.	Per Ton.
Mine Account (51,309 tons):		
Labor and salary	$106,145	$2.06
Repairs	803	0.01
Supplies	10,246	0.20
Explosives	5,021	0.12
Timber and lumber	21,927	0.43
Fuel	6,685	0.13
Rails and cars	1,568	0.03
Piping	757	0.01
Insurance	2,202	0.04
Sundries	295	0.00
Total	$155,649	$3.03
Mill Account (47,872 tons):		
Labor and salary	$24,136	$0.51
Repairs	4,954	0.10
Supplies	6,322	0.13
Assay office	1,619	0.03
Fuel	6,734	0.14
Insurance	1,112	0.03
Sundries	719	0.01
	$45,596	$0.95
Dead work (51,309 tons)	$89,756	$1.75
Marketing (33,364 tons)	25,496	0.76
General expense (51,309 tons)	12,635	0.25
Total operation (51,309 tons)	$329,132	$6.41

Zinc Mining in Wisconsin

By J. E. Kennedy*

The shipment of zinc ore from the Wisconsin district during the first three months of 1910 aggregated 10,145 tons. These figures represent commercial "spelter" and "oxide" ores and are computed on a different basis than the figures showing a shipment of 11,889 tons for the corresponding period of last year. In the statistics of this year the tonnage of roasted or "spelter" ore sent from the roasting plant of the Mineral Point Zinc Company, at Mineral Point, Wis., to its smeltery, at Depue, Ill., is substituted in place of the "separator" ore shipped from the mines to the Mineral Point roasting works. Computed upon the old basis the shipment so far this year would show a gain of 7000 tons over the shipment of the same period of last year. Due to the snow blockade in January and the subsequent decline in ore prices the stock of raw concentrates in bins has remained at about 7000 tons since the first of the year.

---

*Platteville, Wis.

Operations of Various Companies

Fifty-two mining companies, operating 60 concentrating plants, have contributed to this year's shipment. Fifteen other companies have begun or will shortly resume milling operations, eight of which have finished construction of new or second-hand mills since January. Highland, Platteville and Benton have evidenced greatest activity in prospecting and new development. At Highland a 100-ton mill is under construction by the Wallace Mining Company and a 25-ton plant by Frank Kroll. Imhoff & Williams have struck a rich deposit of lead and jack east of the No. 1 mill of the Highland Mining Company. The Kennedy west eighty and the old Clemenson farm, east of the village, are showing up good zinc ore. Nearly every mine and prospect in this camp is slated to operate steadily hroughout the summer season and niners are in good demand.

At Platteville the Wisconsin Zinc Company has developed a big body of heavy sheet jack on the Longhenry land; this company is also developing the Grant county property under option contract. Milling plants are completed on the Kohinoor and Dickson-Oettiker properies. The Seitz land, east of the Klar-Piquette, has been proved by churn drill and will be opened up by shaft. The Klar-Piquette, Cruson, Homestead and Lyght are new properties which are making a good record in output; the St. Rose olds first place in ore grade, turning ut a raw concentrate assaying 59 per ent. zinc.

Development at Benton

The territory around Benton will be e scene of the greatest amount of deelopment work during the coming sumer. The Field and Lucky Twelve comanies have opened up orebodies at New iggings, thus extending the zinc-producg area to the southeast. The Winskill, nder option to the Wisconsin Zinc Comany, the Coon Branch, under option to e Vinegar Hill Zinc Company and the edgwick, owned and operated by the rontier Mining Company, are showing strong runs of zinc ore by churn drill d shafts and undoubtedly will be supied with mills during the early summer. e Wisconsin Zinc Company is equipng the Drumm lease and developing the nd of the LaFayette Land and Mining mpany, comprising 1900 acres. The ifflin-Linden Mining Company, the ming branch of the Mineral Point Zinc mpany, has reopened the Fox and will so start work at the Winnebago, both which were recently acquired. The negar Hill Zinc Company is cometing a 100-ton mill at the Midway aft. south of Hazel Green. The Clevend Mining Company has contracted for avy Smedley pumps and will resume aft sinking on the Witherby land. The Wilkinson has worked into rich jack ground below the lead run and will build a concentrator. The Little Bennie, newly equipped with mill, has resumed operations under sublease.

Ground has been broken at Cuba City by the Campbell Ore Separating Company, of Boston, for the erection of a roasting and magnetic separating plant. The Mineral Point Zinc Company is increasing the capacity of its oxide plant one-third. At Galena, Ill., the Interstate Light and Power Company, with a capital of $750,000, has completed its central power station of 5000 kw. capacity and extended the main transmission line to Platteville. Approximately 26 miles of primary power lines and 16 miles of secondary lines will be built to furnish electric motive power to mines throughout the district.

Chinese Iron Ore for the United States

The Western Steel Corporation of Seattle, Wash., has published a statement with regard to its contract for iron ore and pig-iron imports from China, from which the following extracts are taken:

"The contract calls for a minimum of 36,000 tons each of ore and pig iron for the first two years, and after that for the full amount of 200,000 tons a year. We have the option of renewing our contract at the expiration of 15 years.

"The Chinese ore is a hematite, containing 66 per cent. of iron, with just a trace of sulphur and phosphorus. This ore, mixed with equal amounts of British Columbia and Washington iron ores, will give us a product equal to the best made by any steel plant in the world. The pig iron will be mixed with the pig iron made at Irondale, and used in making high-grade steel of all kinds.

"During the next two years, the Western Steel Corporation will build a new blast furnace at Irondale, with a capacity of 300 tons of pig iron a day, as well as new rolling mills, a tube plant and tinplate mills. This, together with the 300 tons of pig iron a day, received from China, and with the scrap steel used to mix with the pig, will give Irondale two years hence, a total daily output of 700 tons of steel.

"This will mean the erection of new plants at Irondale, with six times the capacity of the initial plant, which is about to begin operations . . . .

"It should be clearly understood that this contract will not hamper in the slightest our development of our Washington and British Columbia ore deposits. Our present blast furnace will handle these American ores, and a new blast furnace will at once be built.

"The handling of the Chinese ores will simply mean that our rolling mills will be kept equally busy, that our capacity will be at once vastly increased, and that a great steel plant will be built up at Irondale many years sooner than could be done had we been unable to get this contract.

"It will be our policy neither to advance nor cut the standard tariff of steel prices. Plants will be built in British Columbia to take care of the steel business originating there."

New York Curb Requirements

The New York Curb agent, E. S. Mendels, has posted the following new listing requirements:

"Statements of assets and liabilities, earnings and expenses, signed by an officer of the company, with seal attached, and sworn to before a proper court officer or notary public.

"Engineer's report, certified and sworn to.

"Certified copy of the charter.

"Maps of the property.

"All matter printed or otherwise relating thereto.

"A list of the officers and directors, with their addresses, and an individual reference for each.

"Transfer office and registrar must be in New York.

"Certified copy of the leases.

"Confirmation of the titles, etc., certified.

"A check to cover fee of agent for examining papers."

The Bureau of Mines Bill

Special Correspondence

Senator Dick, chairman of the Senate committee on mines, has about concluded a canvass of the Senate undertaken for the purpose of ascertaining how the vote on the proposed Bureau of Mines bill will be likely to turn out. He reports that in his judgment the bill will have a safe majority if allowed to come up for debate and vote. This opinion is confirmed by other investigators not connected with the agitation for the bill.

Enforcing Dust Allaying Regulations in Australia

The various States in Australia have for some time had laws on their statute books requiring mine managers to provide water sprays where necessary to allay the dust from drills or other sources in order to prevent miner's phthisis. These regulations have not been strictly enforced of late, with the result that the spread of the disease has been alarming, and steps are now being taken to insure the proper observance of the law in all cases.

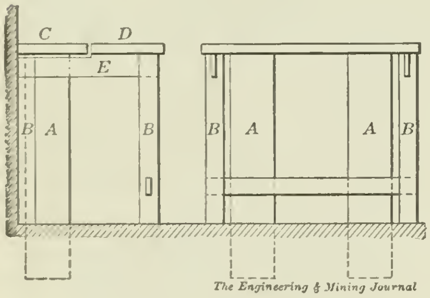
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Table for Assay Balance

By Stuart H. Ingram.*

The accompanying illustration shows a balance table that I use in my office. I have not seen it in use at any other place, except in the University of California. The advantage of this table is that it provides a firm base for the balance which is not affected by the assayer resting his arms upon the table, or otherwise jarring it. It is made in two separate and distinct parts. The first is composed of the top *C*, on which the balance rests, supported by the posts *A A*. These posts are 8x8 in. and are set in a concrete base. The second part is the top *D*, supported by the legs *B B*. The cross piece *E* is cut away under *C*, so that the second part does not touch the first anywhere.



The Engineering & Mining Journal

Assay Balance Table

Saving Power on Paddle Agitators

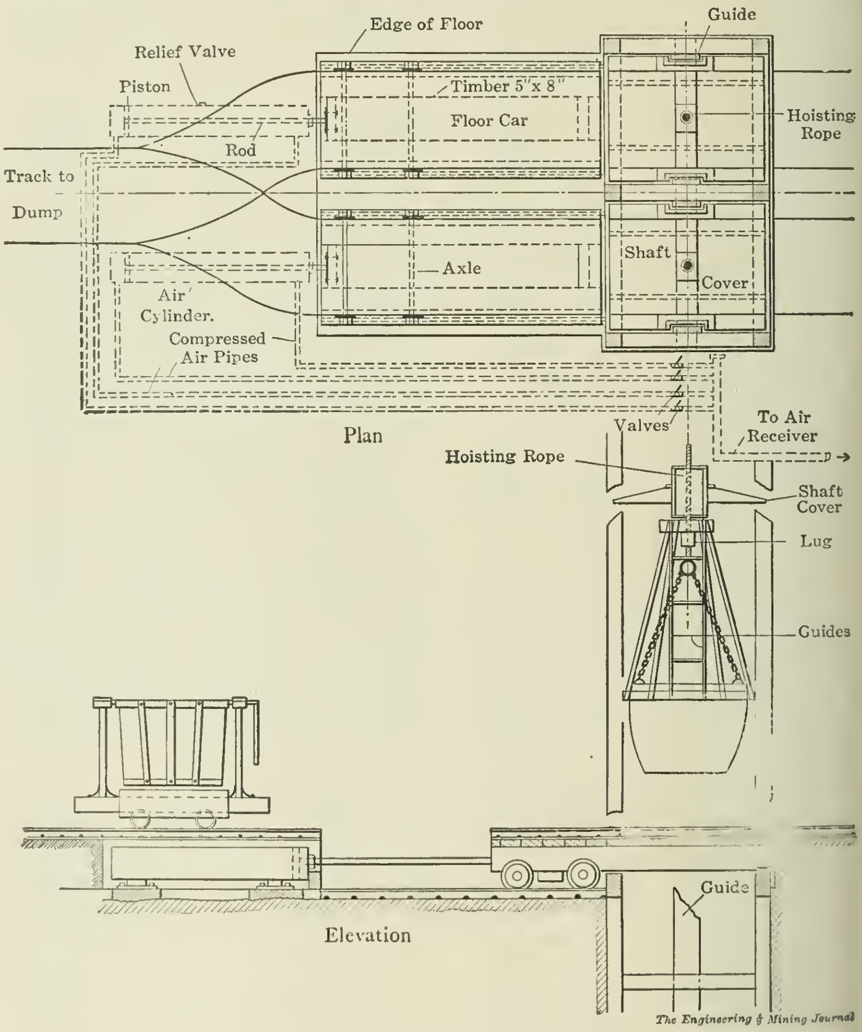
At the Florence-Goldfield mill, by the simple device of hanging a piece of track iron from one blade of the stirrer used in the pulp tank, the power consumption was found to be reduced one-third. The piece of iron is suspended from the paddle blade by two chain links so that as the paddle revolves, the iron drags over the surface of the settled slimes, leveling it off so the paddle blades do not scrape along. The play allowed by the links keeps the iron from having to dig deeply. It is merely the weight of the dragged iron that presses against the settled pulp. It has been found that by using this device no trouble is experienced from stirrer arms getting broken on account of the excessive strain from digging packed, settled slimes.

Method of Handling Sinking Buckets

By W. B. Baggaley.*

The accompanying illustration shows the method of removing buckets from the cage at one of the newer Lake Superior copper properties, which is still in the development stage. A vertical, five-compartment shaft is being sunk to an ultimate depth of 4000 ft. Two compartments are being used for hoisting rock and water and lowering timber, etc. A floor plan and elevation of part of the shaft house are shown in the illustration.

On nearing the surface the cage slows down sufficiently to pick up the shaft cover, and then proceeds to an elevation of 15 ft. above the floor of the shaft house. Chairs are used in the shaft to prevent the cage descending. The floor car, operated by the compressed-air cylinder shown, and having the bucket car upon it, is run over the shaft. The cage is not attached to the hoisting rope, but rests upon a lug, while the bucket hangs from chains which are permanently fastened to the end of the rope itself. Consequently, when the bucket is lowered the cage remains on the chairs. The full bucket is then lowered to the car below, which has a mounted and pivoted frame into which the bucket fits. The floor car is then pulled back to the normal position, and as it stops suddenly, sufficient impetus is given the car to materially assist the trammers, who push it to the dump. It will be noted that the



The Engineering & Mining Journal

Surface Arrangement for Handling Sinking Buckets by Compressed Air am car is of such dimensions that it ould not drop down the shaft if any accident should occur.

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*[illegible] engineer, Guaymas, Mexico

*Houghton, Mich

An empty bucket is now placed on the ope, and hoisted until the lug lifts the age from the chairs. The latter are then rawn back, allowing the cage to be lowred slowly until the shaft cover comes rest on the first set of stringers at the evel of the floor. The shaft cover has hole in the center through which the oisting rope runs. The cage is necesary to act as a guide for the bucket, hich contains about 2 tons of rock, and hich is hoisted at the rate of 3000 ft. er minute.

This arrangement, which keeps the aft covered at all times, not only preents anyone falling in at the surface, ut also safeguards the miners working elow, from having anything dropped on em when the cage is being loaded with rill steel, etc. The loading of shaft bers which are swung under the cage, greatly facilitated. Also the substiion of a bailer in place of the cage is de easier and safer.

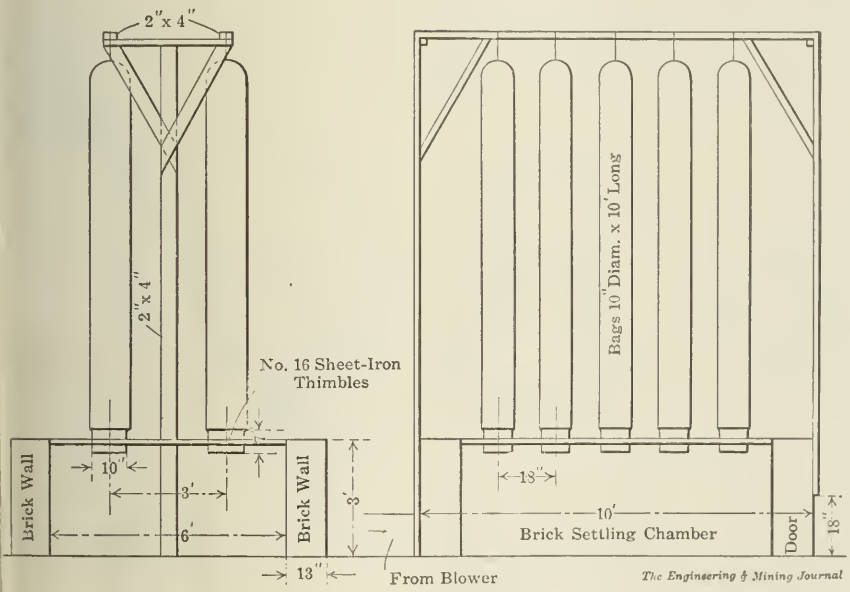
The services of two men are saved derground, by having the cage rest on the lug, as the latter comes to rest chairs at the lowest level and the ket continues to the bottom of the ft. Ordinarily, an auxiliary hoist is talled at the lowest level, which, being rated by compressed air, is much less cient.

Referring to the rivalry at Broken Hill ween the respective advocates of tube ls and of grinding pans, Mr. Poole s that owing to being able to get donite at a nominal cost instead of ts for the tube mills, grinding with tube is is cheaper than with pans in a n case where the results of grinding the same.

Determining Dust Losses from Roasters

By C. C. Hoke*

In order to determine the dust losses from roasters, lead and calcining furnaces, converters and the like, the Compañia Minera de Peñoles, at Mapimi, Durango, Mex., installed an experimental bag house consisting essentially of a gas-tight settling chamber opening into filtering bags suspended vertically from supports above. The gas to be filtered is drawn from its source by a fan blower and discharged into the settling chamber, whence it escapes through the bags. Upon cutting off the pressure from the bags and shaking them, the fume falls into the settling chamber and may be removed through a door provided for the purpose. The size of the bag house and number of bags required will depend on general conditions, such as the fume density in the gases to be treated, volume of gas driven through the bags, etc.



Experimental Dust Catching Plant

In making a quantitative test it is necessary to provide an anemometer to measure velocities in the fan suction or discharge, and in the flue or source from which the sample is drawn. Care should be taken that the cross-section of the pipe in which the velocity is measured be such that the velocity will not exceed 1000 ft. per min., and a lower velocity (say 600 to 800 ft. per min.) will be desirable. The ratio of the fume recovered by the bags to the total will be as the volume of gas delivered to the bags to that passing through the source from which sample is taken, both volumes being reduced, of course, to an equivalent pressure and temperature. The interval between shaking the bags obviously depends entirely on the fume density in the gases, and should be such that no great reduction in volume delivered by the fan will result. In treating 25 lb. of fume per hour, the interval between shaking the bags would probably be about 1½ hours.

Construction

This installation, which can be cheaply constructed and is simple in operation, has proved entirely satisfactory and is suggested in reply to the inquiry of M. W. von Bernewitz in the Journal of Feb. 26, 1910. It should commend itself to anyone desiring to carry on investigations of like nature. The construction of the plant is as follows:

The settling chamber is 3 ft. high, 6 ft. wide and 10 ft. long; the walls are built of brick—two bricks thick—and the top or thimble floor is of matched flooring made air-tight by cementing over. The thimbles are 10 in. in diameter, made of sheet iron about 1/16 in. thick, with an expanded rim at the top to fasten the bags more securely, and are fitted tightly into holes cut through the thimble floor. They are further retained by lugs riveted on the sides. There are 10 bags of a fair quality of drilling, running about 50 strands to the inch, and measuring 10 in. in diameter by 10 ft. long. They are secured to the thimbles by tying tightly, and are suspended (not too tightly) from a wooden framework above the thimble floor. A fan blower, suitable for delivering about 1000 cu.ft. of gases per min. at a pressure of ½ in. of water is used, delivering to the fume chamber through a 9-in. pipe. A cleaning door, 18x24 in., is provided at one end of the chamber. This apparatus is capable of handling about 25 lb. of fume per hour, if the bags are shaken at frequent intervals.

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*Mapimi, Durango, Mexico.

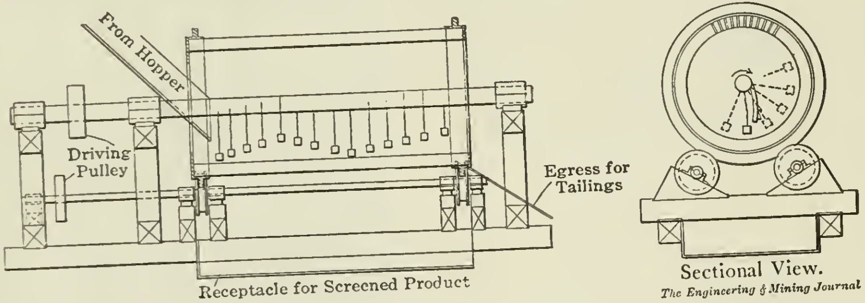
Ore Extraction at Miami

The Miami Copper Company intends to adopt the auxiliary-raise and sub level stoping method, and the mining officials of the company are confident that this will be a great success. As mining progresses the width of the rooms may be increased, or a great many of the pillars may be broken and drawn with the rooms, thus increasing the percentage of the ore mined by this method. At the same time the mine is being blocked out so that a change to the top-slicing or sublevel caving methods may be effected without great trouble, if such a change be at any time desired.

The management is of the opinion that the auxiliary-raise and sublevel stoping method affords the greatest safety to the men and will give a large tonnage per man, besides securing a high percentage of extraction and clean ore. At the same time there will be complete control of the mining operations, and the danger of losing blocks of ore by caves or admixture of capping will be eliminated.

A Dry Pulverizer and Separator

The machine shown in the accompanying drawing was devised by M. Quinner and is successfully used in the Altar district placer region, near El Tiro, Mex. The construction is based on the trommel screen; being cylindrical in form and surfaced by steel bars ⅛ in. apart. The cylinder is usually about 6 ft. long and 3 ft. in diameter, and revolves not faster than 25 r.p.m. on flanged wheels set under it. A shaft, operating on its own journals, runs through the center of the machine and to it are attached about three dozen chains set spirally and at uniform distances from each other. Iron slugs are welded to the ends of the chains. These are about 6 in. long, square-shaped, about 2½ in. thick, and are placed so that the sharp edges strike the material fed through. The shaft turns in an opposite direction to that of the trommel, at an approximate speed of 375 r.p.m. The spiral arrangement of the pendants carries the rocks and pebbles through rapidly; the pulverized cement, black sand and gold falling between the bars into a receptacle placed beneath. While the chains are forced to practically a rigid position when running, they rarely break when a substance too hard to shatter is encountered—an advantage over rigid rods.


From Hopper
Driving Pulley
Egress for Tailings
Receptacle for Screened Product
The Engineering & Mining Journal

Sectional View.

Quinner Dry Pulverizer and Separator

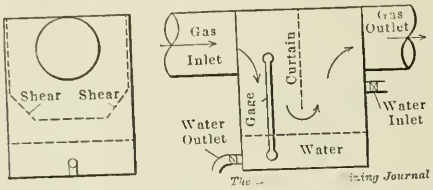
One machine will handle 500 tons of suitable ore per day. The chief elements in favor of this apparatus are that it requires no water, except for steam operation, and discards the bulk of valueless pebbles and rocks without crushing them into the material that is later dry-washed for gold.

Foresight in Shaft Timbering

When sinking a shaft, if there is any possibility of another compartment being added at a future date, much labor and time will be saved by merely sawing off the outer end of the tongue at the end of each wall plate thus leaving the tongue one-half its original length. A block is lightly spiked in the opening thus left and in case of adding another compartment to the shaft, this block can be knocked out, leaving a ready space in which to fit the wall plate of the new compartment.

A Gas Valve That Cannot Leak

A simple application of the ordinary water seal as illustrated in the accompanying sketch makes an efficient and easily regulated gas valve. It consists of a cylinder of metal closed at both ends, the gas entering on one side near the upper end of the cylinder and leaving on the other. Inside the cylinder and at right angles to the entry and exit pipes is set a metal curtain connected gas tight to the upper end and to both sides of the cylinder. The curtain has a shear cut on each side to permit delicate adjustment. The area of the gasway below the curtain must be rather more than the area of the gas entry or exit and the top of the gasway must, of course, be lower than the lower side of the gas entry or exit pipes. By regulating the water level the gas can be wholly or partly cut off.



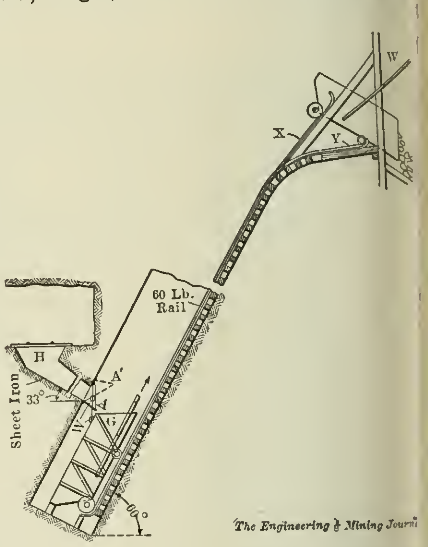
Water Seal Gas Valve

This water-valve arrangement has been found extremely useful in many cases where slide dampers were useless because never tight, and with noxious gases that destroy valves. In certain cases, on account of temperature, oil should be used as the regulating liquid instead of water.

South African mining companies have spent much time and money experimenting with air drills. Most of such drills are designed for 90-lb. pressure, while the pressure carried in the mines where the tests are being carried on falls as low as 40 lb., and averages 60 lb., never exceeding 80 lb. What is the answer?

Skip for Hoisting Coal

A skip, as illustrated by the accompanying sketch, is peculiarly adapted to hoisting coal on the heavy pitch of the slopes which prevail in the southern anthracite coalfield of Pennsylvania. An economical operation of this system requires, first of all, the concentration of the coal mined in the different levels at a main level where the coal is dumped into the hopper, as indicated by *H* on the sketch; then the coal slides down the chute which is lined with sheet iron and has a pitch of 33 deg. At the end of the chute is an apron *A*; a counterweight *W* is in the loading position, and when not in operation it takes the position *A'*. The skip *G* is shown in the loading position at the foot of the slope. The overall dimensions of the skip or "gunboat" are; length, 16 ft.; width, 6 ft.; hight, 6 ft.; and its capacity is 7 tons of coal



Skip for Hoisting Anthracite Coal I
Pennsylvania

The skip is hoisted in the usual manne
and when it reaches the head of breake
or its dumping place, the hind wheel
take the track *X*, while the fore wheel
take the track *Y*; thus the contents o
the gunboat are automatically dumpe
The tread of the fore wheels is 3 in
while that of the hind wheels is fro
7 to 8 in. The skip is constructed o
¼-in. to 5/16-in. iron plates rivete
on the frame work; the plates are rein
forced by the angle irons; 60-lb. rail
are used on the slope. The pitch of th
slope varies from 20 to 70 deg., but i
all cases the foot of the slope is grade
to about 60 deg. for 10 to 12 ft., whic
is considered as the proper loading ang
The economy effected by the self-dum
ing property of the gunboat is that
about 4 men as compared with the o
dinary slope, hoisting the cars. Ca
cannot be hoisted economically up
slope having a dip over 30 deg., hence t
"gunboat" hoist.

A Useful Bank of Lamps

By L. Earle Brown*

Nearly every electrician has the usual "five-lamp bank" and knows how much ordinary trouble can be located with it. In fact, he would be at a loss without it. There are circuits and testing conditions where the magneto cannot be used, as it gives a ring when in reality there may not be any metallic circuit at all. It is for just such purposes that the bank of lamps is of the greatest value. With the ordinary "five-lamp bank" with the lamps in series on 500 volts, there is a great deal of annoyance in changing the connections for the various other voltages that it is desired to test. The threads of the screws become stripped, making trouble when one is in a hurry and needs the lamps most. To overcome these objections and to have an ever-ready bank of lamps, a simple apparatus can be constructed, and the resultant voltage connections obtained, as per Figs. 1, 2 and 3:

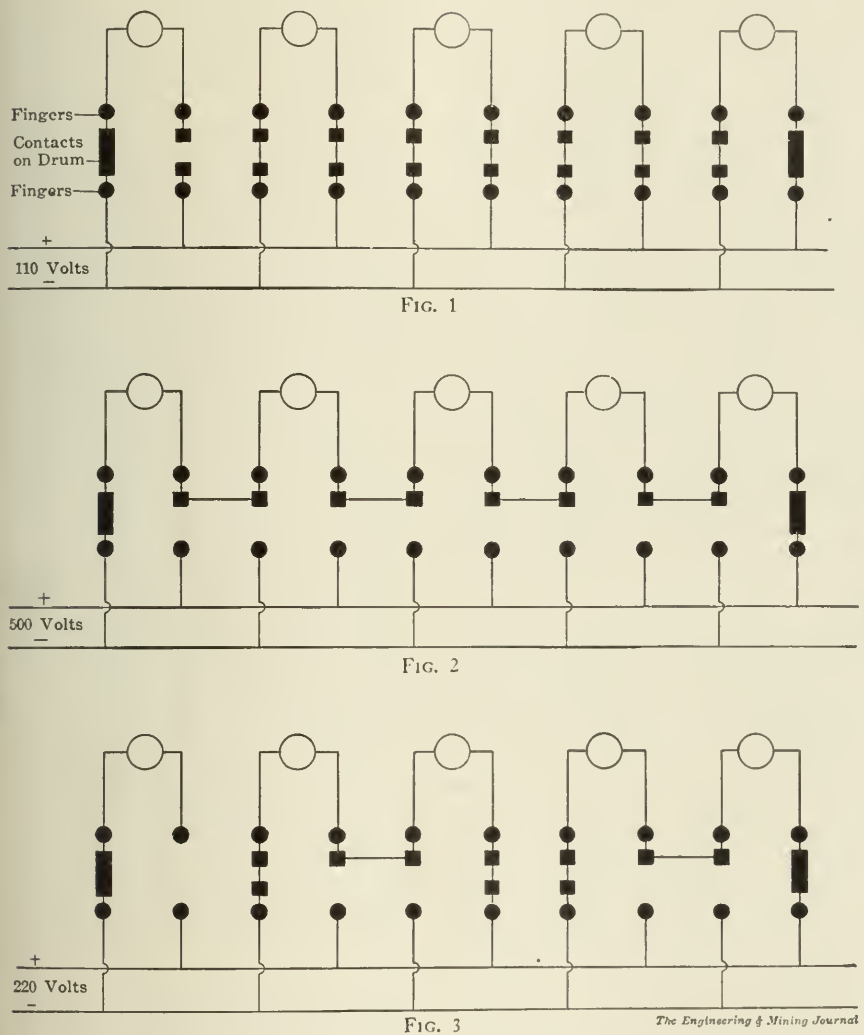


FIG. 1

FIG. 2

FIG. 3

ARRANGEMENT OF A BANK OF LAMPS FOR DIFFERENT VOLTAGES

A hardwood box 6 in. high, 6½ in. wide and 9 in. long, inside measurements, is sufficiently large when it is not desired to use 32 c.p. lamps. A bottom or top, as the case may be, can be left off. A hard rubber, fiber or vulcanite cylinder about 5¾ in. long and 2 in. in diameter should be used for a drum to carry the contacts, making connections with the fingers, as shown in the diagrams. A small nurled hand wheel and ratchet is placed upon the drum shaft to set and lock the drum in position for the different voltage connections. A small pointer is placed upon the top of drum to indicate at what voltage it is set.

Anyone can construct the entire apparatus for a few dollars and its value will be appreciated the more it is used. The drum and lamps should be placed upon the bottom of the box, so that in removing the top of box the lamps will be outside where the light can be of service.

Fig. 1 shows the connections for the lamps when used on 110 volts, giving all the lamps in parallel. Fig. 2 shows the connections for lamps when used on 500 volts, giving all the lamps in series. Fig. 3 shows the connections for lamps when used on 220 volts, giving a multiple-series connection. It is evident that connections for lamps when used on 440 volts will be the same as for 500 volts, with the exception of the second or third contact on the drum from the left hand in Fig. 2, which must make contact with both fingers. It will be noted from the diagrams that the contacts on the end of drum are one continuous contact for the entire circumference.

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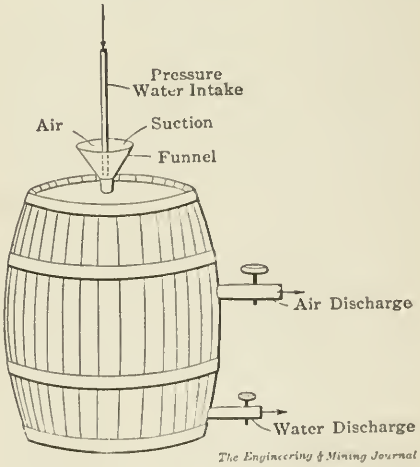
*Roundup, Montana.

A Hydraulic Air Blast

A hydraulic air blast is easily rigged up where water under high head is available, and serves quite satisfactorily for affording ventilation, supplying the blacksmith shop, etc. Three holes are bored into a tight, strong barrel, one in the top and two on the sides, as indicated in the accompanying drawing. Into the one in the head of the barrel a funnel is inserted and fitted tightly. Pipes are tapped into the other holes and preferably some sort of valve or spigot arrangement provided on each. A smaller pipe connected with the water supply opens into the funnel, the end of the pipe being set a couple of inches above the throat of the funnel.



CONVENIENT AIR BLAST

On turning on the pressure water, air is entrapped and forced into the barrel. The lower pipe serves for an outlet for the water and the upper one as an air discharge. By regulating the valves on the discharge pipes so that the water is let out as rapidly as it enters, and setting the end of the pressure-water pipe at the proper hight above the throat of the funnel, a strong air blast can be maintained. The amount and pressure of the water admitted regulate the amount of blast obtained. On the 800-ft. level in the Pittsburgh mine near Nevada City, Cal., such an arrangement is used with great success, water being taken from the pump column to operate the blast.

The Alaska Coal Cases

BY H. V. WINCHELL *

PREFACE

For many years I have been personally acquainted with the Northwest, including British Columbia and Alaska, and have been impressed by the importance of the fuel question upon the Pacific coast. Without ample supplies of good fuel no great independent development can be attained. With it, and with an adequate supply of iron ore there is no reason why the West may not some day equal the marvelous East in manufacturing and industrial prosperity, and even in population.

Through my familiarity with the other natural resources and the demand for high-grade fuel throughout the entire Pacific region, I have since 1903 been led into a study of Alaskan coals. Becoming thoroughly convinced of the value and high grade of these coals, and the necessity for their exploitation for use up and down the coast from Alaska to California as well as for naval supplies on the Pacific, I have conceived it no unworthy task to aid in that development.

To this end, after careful investigation and competent legal advice I became financially interested in some of the properties embraced within what are called the "Cunningham claims." Under all the hue and cry of misinformed public clamor I have remained silent as long as my sense of outraged decency will permit; and I now make an appeal for fair play through an organ of my profession where those who know me will have an opportunity on the one hand to judge best to what extent my views are tinged by self-interest and on the other hand to decide how far they portray a tendency upon the part of certain bureaus of the Government to assume authority and exercise discretionary control with which they were not intended to be endowed by the founders.

A DEMAND FOR FAIR PLAY

In the name of fair play and common decency is it not about time to utter a protest against all of this snap judgment in the Alaska coal matter? In the name of respectable journalism is it not time for someone to investigate the facts before charging reputable citizens with frauds against the Government? Is it only a pleasing American fiction that every man is presumably innocent until he is proved guilty? If not, what justification is there for the attitude of many magazines and newspapers toward what is known as the "Cunningham coal cases." In view of the fact that this matter is now being investigated by a special commission of the Department of the Interior and by at least one Congressional committee, and since the only verdicts thus far rendered have discredited only the authors of the charges instead of sustaining the charges themselves is it not rather undignified and suggestive of sensationalism to prejudge the matter as has been done? Granted that the subject is a large and interesting one, and that it permits of the use of dazzling figures; is there any justification for misrepresentation or hasty conclusion? And if it ultimately develops that many honorable men have been maligned, in what way shall they receive compensation for their damaged reputations and outraged feelings? And how much confidence will the public then place in the lurid proclamations of those writers who have uttered such unfounded calumnies? Let us consider the facts as they have been presented in undisputed sworn testimony and documents on file in the case; let us leave entirely out of consideration the Ballinger-Pinchot controversy and take up the facts as to the coal entries themselves. The truth will perhaps prove as interesting as many of the newspaper "stories" with which the public is familiar, and may be even more surprising.

Let us concede at the outset that the Government in the past may have been too liberal with its lands and mines, let us admit that it may be desirable to amend the laws, so as to provide for different disposition of our natural resources, so far as they still remain in the possession of the Government. Let us pronounce with utmost emphasis in favor of the *sound* principles of conservation. And having done this let us state as our first proposition the admitted principle that those properties which the Government has sold by due process of law, those lands which have been disposed of at the price and under the terms fixed by the Congress, are no longer the property of the Government nor under its control.

Let us remark in the second place that Congress has no right or disposition to enact retroactive legislation of such nature as to impair or arbitrarily modify the terms of contracts already entered into in good faith between the Government and individuals, nor to take away a man's property without due process of law. This is claimed to be the fact regarding the Cunningham claims. The Government has parted with its equitable title under the law of 1904, and this title can only be revoked or cancelled by clear proof of fraud on the part of the entrymen.

THE LAW OF 1904

The law referred to reads as follows: [Act of April 28, 1904, (33 Stat. 525).]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person or association of persons qualified to make entry under the coal-land laws of the United States, who shall have opened or improved a coal mine or coal mines on any of the unsurveyed public lands of the United States in the district of Alaska, may locate the lands upon which such mine or mines are situated, in rectangular tracts containing 40, 80 or 160 acres, with north and south boundary lines run according to the true meridian by marking the four corners thereof with permanent monuments, so that the boundaries thereof may be readily and easily traced. All such locators shall, within one year from the passage of this act, or within one year from making such location, file for record in the recording district, and with the register and receiver of the land district in which the lands are located or situated, a notice containing the name or names of the locator or locators, the date of the location, the description of the lands located and a reference to natural objects or permanent monuments as will readily identify the same.

Sec. 2. That such locator or locators or their assigns, who are citizens of the United States, shall receive a patent to the lands located by presenting, at any time within three years from the date of such notice, to the register and receiver of the land district in which the lands so located are situated, an application therefor, accompanied by a certified copy of a plat of survey and field notes thereof, made by a U. S. deputy surveyor or a U. S. mineral surveyor, duly approved by the surveyor-general for the district of Alaska, and a payment of the sum of $10 per acre for the lands applied for; but no such application shall be allowed until after the applicant has caused a notice of the presentation thereof, embracing a description of the lands, to have been published in a newspaper in the district of Alaska published nearest the location of the premises for a period of 60 days, and shall have caused copies of such notice, together with a certified copy of the official plat of survey, to have been kept posted in a conspicuous place upon the land applied for and in the land office for the district in which the lands are located for a like period, and until after he shall have furnished proof of such publication and posting, and such other proof as is required by the coal-land laws; *Provided*, That nothing herein contained shall be so construed as to authorize entries to be made or title to be acquired to the shore of any navigable waters within said district.

Sec. 3. That during such period of posting and publication, or within six months thereafter, any person or association of persons having or asserting any adverse interest or claim to the tract of land, or any part thereof, sought to be purchased, shall file in the land office where such application is pending, under oath, an adverse claim, setting forth the nature and extent thereof, and such adverse claimant shall, within 60 days after the filing of such adverse claim, begin an action to quiet title in a court of competent jurisdiction within the district of Alaska, and thereafter no patent shall issue for such claim until the final adjudication of the rights of the parties, and such patent shall then be issued in conformity with the final decree of such court therein.

Sec. 4. That all the provisions of the coal-land laws of the United States not in conflict with the provisions of this act shall continue and be in full force in the district of Alaska.

HOW THE FIRST LOCATIONS WERE MADE

This law is practically an invitation to citizens of the United States to make locations of coal lands in Alaska. It has never been repealed; it stands upon our statute books today and under it during the last six years, hundreds of perfectly honest men have undergone peril and hardship searching for and attempting to acquire coal claims in Alaska, and yet there is no single one of them who has yet received the patent solemnly promised by this great government.

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*Mining geologist, Minneapolis, Minn.

Nay, more, those who have attempted in all good faith to benefit by it now find themselves branded as thieves and land grabbers and tools of soulless corporations. First in order of application, first to locate properly, first to make the payments required by the law, first to receive final certificates of purchase, and therefore first to be considered by the executive officers of the Government, were these Cunningham claimants. The history of their operations is briefly as follows:

In the '90s, thousands of prospectors were attracted to Alaska by the gold discoveries of the Klondike, Cape Nome, and other districts. Title was by location and possession; and local rules and regulations prevailed. In 1900, Congress passed an act extending the mining laws of the United States to Alaska. In 1903 Clarence Cunningham, while prospecting for oil, first visited the Controller Bay coalfield. Returning to Washington and Idaho he told several friends of his discovery and asked them to "grub-stake" him in the usual manner so that he might return to the north and locate a claim for himself and one for each of his friends.

These locations were to be made in the customary and entirely proper manner, by power of attorney from each individual to Cunningham. In accordance with his agreement with these individuals Cunningham returned to Alaska, bought out the rights of certain squatters already on these coal lands and staked out claims. When he attempted to file on these claims, the officials of the land office refused to accept the filings because there were at that time no base lines or meridians established and the law was not considered sufficient to authorize coal ocations.

By the act of April 28, 1904, Congress passed a new law providing especially for the location of coal claims as quoted above. This new law said nothing as to he number of coal claims that might be ocated by one man. They were to be in racts of 40, 80 or 160 acres each; and for the sole use and benefit of the locator.

By its terms and the interpretaion placed upon it by the Land Office, here could be no joint ownership of a group of claims nor prior to perfecting of entry any agreement to sell or consolidate after title was acquired, nor could the lands be located by any corporation. But there is no contention that after acquiring title the locator was restricted in any way as to the disposition of his claim.

The Cunningham Claimants

Cunningham and his friends proceeded to make locations of claims under this new law, each man giving to Cunningham a new power of attorney and agreeing to pay the necessary expenses including a salary to Cunningham for his services. In this way were located 33 claims of 160 acres each, in the names of the following individuals:

Andrew L. Scofield, Los Angeles, Cal., retired capitalist; Francis Jenkins, Moscow, Idaho, registrar State University; Charles J. Smith, Seattle, Wash., banker; Horace C Henry, Seattle, Wash., banker and railroad contractor; Ignatius Mullen, Port Townsend, Wash., merchant; Henry White, Wallace, Idaho, banker and merchant; Henry W. Collins, Rockford, Wash., banker; Fred C. Davidson, Oakesdale, Wash., merchant and lumberman; Michael Doneen, Rossland, B. C., miner and land owner; Frank F. Johnson, Wallace, Idaho, banker; John G. Cunningham, Spokane, Wash., physician and surveyor; Clarence Cunningham, Seattle, Wash., prospector; A. B. Campbell, Spokane, Wash., capitalist; Henry Wick, Youngstown, O., iron and steel manufacturer; Hugh B. Wick, Elyria, son of the foregoing; Fred H. Mason, Spokane, Wash., hardware merchant; Wm. E. Miller, Elyria, capitalist; Chas. Sweeney, Wallace and New York, mining man; Byron C. Riblet, St. Louis, Mo., Riblet Tramway Company; Fred Cushing Moore, Wallace, Idaho, mining engineer; Alfred Page, Wardner, Idaho, mine owner, State Senator; W. W. Baker, Walla Walla, Wash., banker; Frederick Burbridge, Wallace, Idaho, mine manager, Federal Mining and Smelting Company; Reginald K. Neill, Spokane, Wash., mine manager; Jos H. Neill, Spokane, Wash., mine manager; Miles C. Moore, Walla Walla, Wash., banker and ex-governor; John A. Finch, Spokane, Wash., mine owner and business man; Walter B. Moore, Walla Walla, Wash., banker; Arthur D. Jones, Spokane, Wash., real estate and loans; Orville D. Jones, Wallace, Idaho, business man; W. H. Warner, Cleveland, O., Warner Coal and Coke Company; Frank A. Moore, Walla Walla, Wash., banker; Nelson B. Nelson, Seattle, Wash., merchant.

The Applications For Patents

These are the men called "dummies" by Glavis and the yellow press, which makes the assertion in all seriousness that the Cunningham locators are stevedores off the docks at Seattle and tramp miners from Butte and the Cœur d'Alene. The names of these men are not only enough to refute such outrageous falsehoods, but are in themselves a proof of the sincerity and character of Clarence Cunningham, who was implicitly trusted by each one as a friend and agent, and in whose hands they placed whatever funds he told them were needed for development of their claims as required by law.

Having proceeded to explore and survey their claims, they desired to know something more about them than could be learned by mere outcrops and surface openings. It was apparent that this information would be useful and valuable to every one of the locators, no matter where or on whose claim the work of exploration was prosecuted. In fact, such information would be needed before the value of any of the claims could be demonstrated.

Desiring then, to run a tunnel which would crosscut the coal measures and disclose the character of the various coal seams at depth, a letter was addressed to the Commissioner of the General Land Office at Washington, inquiring whether there was anything in the Alaskan coal land prohibiting the doing of such work at the joint expense of all the locators in the Cunningham group. To this letter an answer was received stating that there appeared to be no objection to such an arrangement.

Much is made of the common development fund by Glavis, et al., as an indication of an agreement on the part of Cunningham and his friends to consolidate after patent. But the critics never call attention to this correspondence as evidence of good faith and a desire to comply strictly with the law.

Having done all that the law required Cunningham and his associates in due course made application for patent. The matter was investigated in the usual manner, and a final certificate of purchase was issued to each entryman who thus became the equitable owner of a coal claim under the laws of the United States and entitled to patent unless charged with and convicted of fraud. The amount paid for the 33 claims aggregated about $52,000, which money has been in the treasury of Uncle Sam for the last two or three years, but no patents have been issued yet nor has any other coal claim in Alaska received as a final receipt.

We now come to the reason why.

Conservation of Resources

When in the course of the last preceding administration the infant Conservation was born it leaped full-panoplied to its feet and declared that many former practices although sanctioned by law and custom were wrong and must be discontinued. This sturdy and strenuous youth was introduced to the people so suddenly and with such eclat that the people, always ready to follow and crowd around a new prodigy, forgot that "Conservation" was only a son of Mr. Roosevelt and hailed him as the son of the sovereign people. They even approved Mr. Roosevelt's arbitrary setting aside of the law of the land, and considered his "principles" as more forceful than the unrepealed statutes.

To be more specific it may be stated that the President withdrew "temporarily" from entry all coal lands in Alaska, and they have not been again opened to entry although the law of April, 1904, is unrepealed and still in force. Then, long after the entry of the Cunningham claims a forest reserve was created which threw its sheltering arms around half of them; and finally the Secretary of the Interior, Mr. Garfield, declared that it was not the intention of the administration to issue any patents to coal claims in Alaska *until the law was modified*. Admitting that there was nothing whatever against some of these claims and only vague suspicions as to others, yet he decided to place his own interpretation upon the law which states that "locators shall receive patent" and introduces the ultra conservative word "not."

The Law of 1908

In May, 1908, Congress enacted a law which reads as follows:

> *Be it enacted, etc.*, That all persons, their heirs or assigns, who have in good faith personally, or by an attorney in fact, made locations of coal land in the territory of Alaska in their own interest, prior to Nov. 12, 1906, or in accordance with circular of instructions issued by the Secretary of the Interior, May 16, 1907, may consolidate their claims or locations by including in a single claim, location or purchase not to exceed 2560 acres of contiguous lands, not exceeding in length twice the width of the tract thus consolidated, and for this purpose such persons, their heirs, or assigns, may form associations or corporations who may perfect entry of and acquire title to such lands in accordance with the other provisions of law under which said locations were originally made: *Provided*, That no corporation shall be permitted to consolidate its claims under this act unless 75 per cent. of its stock shall be held by persons qualified to enter coal lands in Alaska.
>
> Sec. 2. That the United States shall, at all times, have the preference right to purchase so much of the product of any mine or mines opened upon the lands sold under the provisions of this act as may be necessary for the use of the Army and Navy, and at such reasonable and remunerative price as may be fixed by the President; but the producers of any coal so purchased who may be dissatisfied with the price thus fixed shall have the right to prosecute suits against the United States in the Court of Claims for the recovery of any additional sum or sums they may claim as justly due upon such purchase.
>
> Sec. 3. That, if any of the lands or deposits purchased under the provisions of this act shall be owned, leased, trusteed, possessed or controlled by any device, permanently, temporarily, directly, indirectly, tacitly, or in any manner whatsoever so that they form part of or in any effect any combination, or are in anywise controlled by any combination in the form of an unlawful trust, or form the substance of any contract or conspiracy in restraint of trade in the mining or selling of coal, or of any holding of such lands by any individual, partnership, association, corporation, mortgage, stock ownership or control, in excess of 2560 acres in the district of Alaska, the title thereto shall be forfeited to the United States by proceedings instituted by the Attorney-General of the United States in the courts for that purpose.
>
> Sec. 4. That every patent issued under this act shall expressly recite the terms and conditions prescribed in sections two and three hereof.
>
> Approved, May 28, 1908.

The Bureaucracy Overrides the Congress

After the passage of this law Secretary Garfield offered patents under it to the Cunningham entrymen. To this offer they made the very natural and proper reply that they were not concerned with a law passed after their entries were perfected under an earlier law and that they would stand upon their rights already acquired. The answer was: "This law or no patents," and a dead-lock ensued. No Alaska coal claims have gone to patent under the law of 1908.

From time to time frequent inquiries were made by these entrymen as to the date when they might expect their patents. A new special agent appeared who told them that while there were indications of much irregularity in the matter of coal land applications in Alaska, yet there was no apparent reason why they should not have their patents and he was willing to assist them in securing final papers of title. This agent, whose name was L. R. Glavis, drew up various affidavits skilfully designed to convey an impression of fraud when interpreted in connection with his own ideas; but sufficiently accurate to warrant the signatures of some of the entrymen. These affidavits are almost the only evidence *against* these claims, and they were made for the purpose of procuring patent.

Not receiving their patents, and not knowing of the arbitrary stand taken by Secretary Garfield in the matter, various entrymen called at Washington to find out the reason for delay. In no case could they gain any satisfactory information. The matter was always "under investigation." After a year or two it was learned that certain charges had been filed by special agents; but as to the nature of these charges, they were kept in absolute ignorance and given no opportunity to meet them. The former Commissioner of the General Land Office, Mr. Ballinger, a personal friend and acquaintance of several of the entrymen, was asked to see what he could learn as to the real reason why patents were withheld, and to urge upon Secretary Garfield the injustice of such delay. He could learn very little.

Ballinger, Glavis and Pinchot

When the present administration was seated, one of Mr. Ballinger's first acts as Secretary of the Interior, was to decline to act upon the matter of the Cunningham claimants for whom he had acted as an attorney, and to turn the whole matter over to Assistant Secretary Pierce. Mr. Pierce, upon being appealed to, said he could see no reason for further delay, and ordered an investigation before a special commissioner appointed to hear all charges against the claims. Mr. Glavis was also ordered to file his charges. To this he demurred, saying more time was needed in which to obtain evidence. This seemed hardly necessary, since he had already been investigating for nearly two years and the only "evidence" he had found was furnished freely by the claimants themselves. Upon being urged to prepare his charges, Glavis then went to Forester Pinchot and reminded him that part of these claims are within a belated forest reserve. Pinchot then, in his zeal for the interests of the poor prospector, asked the Land Office to delay the hearing all summer so he might send forest rangers to look over these coal claims and see how many trees are on them. Of course, there is no reservation by the Government of trees on coal claims, nor any reason in law why coal or mining claims may not be located within a forest reserve. But if anybody wants to know what trouble can be caused by Government employees in their efforts to defeat the operation of the laws, just let him try to make such a location. He will see a few side lights on conservation.

The hearing before Commissioner McGee was finally begun in Seattle on Nov. 18, 1909, and was completed in Salt Lake about the first of April, 1910.

Testimony was taken in Seattle, Spokane, Cleveland, Salt Lake, Washington, Paris and Rome, and the coal claimants have been put to the expense of employing attorneys and stenographers, paying traveling and other expenses half around the world in meeting charges and refuting the insinuations of Glavis and the sensational press. The testimony has been published, and 31 of the entrymen have appeared and under oath cleared themselves of the charges of fraud. The other two are dead, but their record is clear without any such testimony.

The Guggenheims

The only thing remaining to be discussed is the connection of the Guggenheims with these claims. It is almost unbelievable that the public have been brought by misrepresentation and positive falsehood to the conviction that there is in some mysterious way an improper and illegal connection between the Guggenheims and the Cunningham claims.

It will hardly be denied that a man has a right to sell or otherwise dispose of his own property. The right of the Guggenheims or anyone else to buy property will likewise be conceded.

Now it appears from the evidence *that after the issuance of the final receipts* the entrymen began to wonder what they were going to do with their coal claims in Alaska. Some 18 of them held a meeting in Spokane and after consulting an able attorney as to the entire legality of their action, appointed a committee of three to devise some plan for consolidation or development of the coal claims. This committee went to Salt Lake and there entered into a tentative contract with representatives of the Guggenheims looking to the foundation of a corporation to take over the claims. By the terms of the contract, the Guggenheims were to build a railroad to the coal and to advance $250,000 for development and were to have one-half the stock of the corporation, and a contract for the coal at a certain figure. This contract was subject to ratification by Daniel Guggenheim and by a majority of the individual entrymen. It was not so ratified; not a cent was ever advanced for development, and the contract was never consummated in any way. From that time to the present, the Guggenheims have had no connection with or interest in these claims, and this tentative arrangement which fell through was the only connection they ever did have, and in it there is nothing in any way improper, illegal or contrary to public policy.

Summary of the Facts

The facts here stated may all be found in the volumes of published testimony. From them we may single out a few as follows:

1. Although there has been for six years a law specifically providing for the location and sale of coal lands in

Alaska at $10 per acre, there has not as yet been one acre patented.

2. Instead of controlling all the coal lands in Alaska, the Cunningham claims comprise only 5200 acres. (U. S. Geological Survey estimates about 40,000 acres in this particular field, and many times as much in other Alaskan fields).

3. The Guggenheims have no interest in the Cunningham claims, and negotiations looking to that end fell through almost immediately.

4. The Cunningham claims were not located by "dummies," but by respectable citizens under the law.

5. If justice is rendered they will probably be the first Alaskan coal lands patented and developed.

6. The interests of Alaska, of the Pacific coast and of the general Government require the opening of coal mines in Alaska. The policy of obstruction and delay has already resulted in dwindling of population and the stagnation of enterprise and all kinds of development.

7. "Conservation" does not mean obstruction and positive violation of the laws in force. Insofar as it does it is not sound nor to be commended and practised.

Notes from the Lake Superior Iron Ranges

BY DWIGHT E. WOODBRIDGE *

While no definite schedules have been received by the various Lake Superior iron-ore railways, the probabilities of the season are about as follows in shipments: Duluth, Missabe & Northern, 16,000,000 gross tons; Duluth & Iron Range, 10,500,000; Great Northern, 10,000,000; Minneapolis, Sault Ste. Marie & Atlantic, 150,000 tons. This makes, say, 36,000,000 tons from Minnesota, of which all but 2,000,000 tons will be from the Mesabi range. The probabilities for the Michigan ranges are for the shipment of about 14,000,000 tons, of which the chief shipper will be the Menominee, with something more than 5,000,000 tons; the Marquette will have nearly as much; indeed it is not impossible that the Marquette may lead. The proportionate shipments of these three Michigan districts will vary a little from last year, to the advantage of the Marquette range. Last year these ranges shipped as follows: Menominee, 4,875,385; Marquette, 4,256,172; Gogebic, 4,088.457 tons.

The Cuyuna Range

For the first time the Soo line figures as a shipper from Minnesota, this being ore expected to be forwarded from the Kennedy mine of the Rogers-Brown Ore Company on the new Cuyuna range. This ore will, during 1910, be sent from the mine by rail to Ashland, and there transferred to ship. So far the Soo has made no move toward the construction of ore shipping piers, other than to secure room for them on the harbor of Duluth. Such piers will doubtless be erected during the winter of 1910-11. This shipment from the Cuyuna is a notable occurrence, marking the advent of a new district, the possibilities of which are great.

New Work on the Vermillion

Another eventful occurrence of the year will be the beginning of shipments from a new mine on the Vermillion, the first of its kind opened since 1888. Many millions have been expended in fruitless exploration there, and the section 30 property is the only one that, to date, is a mine. About 50,000 tons of exceedingly high-grade bessemer hematite will be sent forward. It is understood that part of this ore has been sold, Lake Erie ports, at better than $7 per ton, or $2 above the average price for bessemer ores.

The year is witnessing remarkable exploratory activity on this range, and tremendous developmental activity on two more. The success of one exploration on the Vermillion has stimulated many speculative companies on that range, and a large amount of deep drilling is in progress, two old shafts are being pumped out and one or two working shafts are being sunk. So far as I know no workable iron orebodies have yet been discovered, but I do not pretend to definite information as to all the explorations. The installation of a machinery plant suitable for handling 1000 tons a day and the sinking of a concrete shaft should mean that ore has been found in quantity. G. A. St. Clair, who made a mine of section 30, is pumping out the old 120-ft. shaft of the McComber prospect, on Armstrong lake preparatory to examination and further sinking, and I am doing the same at the 100 ft. shaft on the old Anderson property near Ely. These are two old workings that really showed ore under preceding explorations. Drilling and testpitting are in progress at various places; on Pine island in Vermillion lake, at Mud lake, which is at the northeast corner of the Vermillion, at various places around Robinson lake, at the McCue property in town 62-14 where old-shaft workings brought out ore and on sections 30 and 19, 62-11. With the advance of knowledge as to the Vermillion it is reasonable to expect favorable results from some of this work.

Explorations on the Cuyuna

The second district of remarkable exploration activity is on the new Cuyuna, where probably 50 drills are at work and where some excellent ore is known to be found. Those of us who were skeptical of this district have been proved in the wrong. It is an iron district and is showing a few holes of as high-grade ore as one could ask for. It will be a valuable addition to the available iron-ore tonnage of Minnesota and may be a very large addition.

New Work on the Old Ranges

For two or three years, and until now, exploration on the Menominee has been fruitful in results. Old mines are being enlarged, new ones are being found, and the end is not yet. The same is true of the Marquette; a shipper since 1855, it is today a greater district than ever before, and its future looks most promising. In the Negaunee and Princeton sections the recent finds have been really magnificent

Developments on the Mesabi

To be sure, so far as the development of new mines is concerned, the Mesabi range leads. It must, in order to maintain a production equivalent to 68 per cent. of the Lake region, as it is scheduled for this year. The Hill Ore Lands, so called, will come in for a production this year and efforts will be made to reach as near the agreed minimum for 1910 as possible. It is probably no secret that these lands have proved somewhat disappointing to the Steel Corporation, both as to tonnage and grade developed. Still, they contain much ore. This year will see the beginning of concentration of sandy ores of the Trout-lake section, by the Oliver company, as the first sections of its 10,000-ton concentrating works are nearly ready.

As of late, the drift toward steam shoveling ore continues. It was accentuated the other day by the beginning of work on a mass of overburden at Hibbing, that lies 120 ft. thick. I have no doubt the time will soon come when mine managers will no longer attempt to build long and costly approaches to their deeper shovel pits on grades economical for locomotives, but will adopt stationary hoisting plants of capacity to pull loaded

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*Mining engineer, Providence building, Duluth, Minn.

50-ton standard-gage cars out of their mines. The economy of this innovation ought to be apparent today.

Lake Rates on Ore

Vessel rates are better by 10c. a ton to the ship than in 1909; that is, there is a 5c. advance in freight, and a 5c. drop in unloading charge, which charge the vessel pays. The gross rate is still 5c. under the 1907 rate of 75c. from the head of Lake Superior, while the net rate is the same—60c. I recollect that not very many years ago, James J. Hill, speaking of rail and water competition, stated that the time was not far distant when the railroads could so reduce their rates that they would drive waterborne commerce from the Great Lakes. Today, a 2240-lb. ton of iron ore is carried down the lakes, an average distance of 880 miles, at a freight that nets the carrier but 0.062c. per net-ton-mile; and the ship pays dividends on that rate. A railroad that averages a cost ten times as high, is to be congratulated for economy.

Ore Shipments

Simultaneously with the beginning of underwriting on April 15, the procession of ore-laden ships began to move. By May 15 it will be in full swing, and this is nearly a month earlier than usual. Ore pockets were full, mines were ready, railways were waiting. All are prepared to reach the totals indicated at the beginning of this article. They will be reduced only by severe labor troubles or an unexpected slackening in the demand for iron and steel.

Lucky Tiger-Combination

The report of the Lucky Tiger-Combination Gold Mining Company for the year ended Dec. 31, 1909, states that during the year 47,130 tons of ore were mined, of which 1911 tons were shipped to smelteries at Douglas, Ariz., and El Paso, Texas; 37,721 tons were milled, averaging $24.65 per ton; dividends paid, $409,500; development work, 8161 ft.; total development work now amounts to 34,759 ft.; ore reserves increased 79,445 tons, making a total of 259,861 tons; in addition to this there are 150,000 tons of probable ore; also 48,000 tons of tailings containing $9.96 per ton.

Plans are being made for enlarging the mill from 100 tons to 250 tons capacity, and also for the construction of a 250-ton cyanide plant. Work has begun on a 1000-h.p. steam power plant and electric transmission line 31 miles long from Yzabel on the Nacozari railroad to the mine. The mine is 55 miles southeast of Douglas, Arizona. James W. Malcolmson is consulting engineer.

The Coalinga Oil District, California

A report[1] on the geology and oil resources of the Coalinga oil district, in the western part of Fresno and Kings counties, California, covers a district which is about 15 miles wide and 50 miles long, stretching along the northeast base of the Diablo range. It includes a band of productive oil land 3 miles wide and 13 miles long at its north end and a narrow strip of oil land along its southwestern boundary.

The region includes about 550 producing wells, which range in depth from 600 to 4000 ft. and penetrate from 20 to 200 ft. of oil sand. The product ranges from a black oil of 15 deg. B. to a green oil of 35 deg. B. The yield of single wells differs greatly, ranging from 3 to 3000 bbl. per day.

Production and Resources

The district is the leading producer in California and one of the most productive in the world. Its production in 1907 was 8,871,723 bbl., in 1908 it was 10,386,168 bbl., and in 1909 it was probably 15,200,000 bbl. or more.

The total quantity of oil thus far taken from the ground in the district to the end of 1909 was about 63,000,000 bbl. of 42 gal. each, leaving available a vast store of oil which has been roughly estimated as 2,737,000,000 bbl. Even if this great quantity of oil is in the ground it is not possible to state whether all of it can ever be obtained.

Pipe lines connect the district with the seaboard at Monterey, 110 miles away, with San Francisco bay, 200 miles away, and with other points.

Broad Questions Discussed

The discussions of the oil zones, of the factors affecting the accumulation and the gravity of the oil, of the relations of oil and water, and of the origin of the oil are of broad general interest. The maps and diagrams and the detailed accounts of the geology of the wells and the character of their various products are of decidedly practical, immediate value.

Nabesna-White River Copper District, Alaska

The Copper River basin and the adjacent parts of the Yukon basin contain two known mineral-bearing zones, lying respectively on or adjacent to the southern and the northern slope of the Wrangell mountains. The southern belt has been called the Kotsina-Chitina region and contains chiefly copper-bearing lodes with some gold placers, and is about 100 miles from the coast. The northern belt, termed the Nabesna-White[1] region, contains both auriferous and copper-bearing lodes, and is 70 to 100 miles farther inland. A railway up Copper river, now under construction, has greatly stimulated mining activities in both fields but will provide transportation only for the southern district.

Occurrence of the Copper

The important economic conclusion is that the copper deposits are associated with amygdaloidal basalts of Carboniferous age—an association like that in the Chitina region. The presence of some primary native copper in the amygdaloids is significant, for in the Chitina region only secondary deposits of native copper have been found. Copper sulphide deposits and auriferous quartz veins were also found in such relations as to indicate that the orebodies in this field originated in the same way as those in southeastern Alaska.

Exports of Crude Oil from California during 1909

The following statistics of exports of crude oil from the San Francisco customs district during 1909 are interesting as

Destination.	Barrels of 42 Gallons.	Value.
Canada	15,476	$16,500
Guatemala	25,000	15,500
Salvador	40	50
Panama	532,619	339,750
Chili	422,119	268,535
Peru	35,960	30,690
French Oceanica	72	180
German Oceanica	79	99
Total exports	1,031,365	$671,304
Total production	58,250,300	

showing that nearly all the California crude oil is consumed in the United States, either as fuel or in the manufacture of refined products.

Pipe Line from Southern California Oilfields

The 8-in. pipe-line system of the Producers' Transportation Company from the Coalinga, Kern river, McKittrick, Sunset and Midway oilfields to Avila, Cal., the port of San Luis Obispo county, has been completed, and has a length of a little over 200 miles, in addition to the gathering systems in the district referred to. The lines from Sunset, Midway and Kern river fields merge at McKittrick, and a single line runs to Junction, where the Coalinga line joins it. The line is expected to handle about 26,000 bbl. daily. At Avila are wharfage facilities to load the oil into tank steamers. The problem of storage at the coast line is a serious one now under consideration.

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[1] *Bull.* 398, U. S. Geol. Surv., by Ralph Arnold and Robert Anderson.

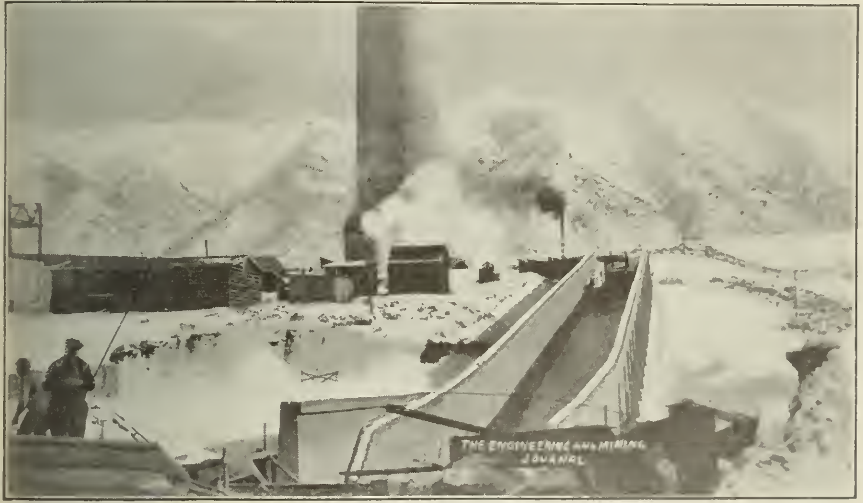
[1] *Bull.* 417, U. S. Geol. Surv., by F. H. Moffit and Adolph Knopf.

The New International Smeltery at Tooele, Utah

Plant Designed by Anaconda Engineers to Smelt the Utah Consolidated and Custom Ores; Will Blow in during the Coming Summer

BY JOHN TYSSOWSKI

The Tooele smeltery of the International Smelting and Refining Company, now under construction, is eight miles from Tooele Junction on the San Pedro, Los Angeles & Salt Lake Railway and 34½ miles southwest of Salt Lake City, Utah. The maximum grade on the line from the junction to the smeltery is 2.4 per cent., and it is the ultimate intention of the company to electrify this as well as the transportation system about the plant. In this particular the equipment will differ from that of the Anaconda smeltery, after the pattern of which it is designed. The Western Pacific Railway line also passes within a few miles of the smeltery, so that excellent railroad transportation facilities are assured.



MAIN FLUE AND STACK, TOOELE SMELTERY

SITUATION OF SMELTERY

As the Tooele smeltery is being built by the Cole-Ryan interests, primarily to treat the ores from the Utah Consolidated's Highland Boy mine, the situation with respect to the delivery of this ore is of the greatest importance. The Highland Boy mine is only about four miles across the Oquirrh range from the smeltery. Ore will be transported by a Bleichert aerial tramway having a carrying capacity of 100 tons per hour. Owing to the character of the Highland Boy ore, the excess of iron it carries, and the advantageous situation of the smeltery, it will be in position to handle a large amount of custom work, and the layout of the plant shows that this is in the mind of the designers.

The new smeltery is on the slope of the Oquirrh range just below where it breaks into the gradual incline of the Salt Lake basin. The smeltery faces to the west and on both the north and south are cañons that will give ample space for slag and waste dumps. There is also plenty of room on each side of the plant to allow for the addition of extra units. Great elesticity is a feature of the general design of the plant. By taking advantage of the nature of the site the necessary amount of excavation was reduced to a minimum and amounted to only 200,000 cu.yd. When complete it is estimated that 30,000 cu.yd. of concrete and about 6,000,000 common bricks will have been placed.

The main-line railroad branches into three tracks at the plant, these branches corresponding to the three main divisions of the industrial transportation system and the horizons of the smeltery, viz.: the high, power house, and low lines. There are seven miles of standard-gage track in the industrial system, and although the curves are too sharp to allow the use of a heavy engine about the plant, a standard box car can be run over all the tracks. This system will be operated with electricity.

The high line will distribute the ore from the receiving bin of the aërial tramway, and also deliver custom ores to the main orebins. The power-house division will handle material from the McDougal roasters to the reverberatories; it will also transport dust from the chambers to the reverberatories. The blister copper product from the casting house will be transported by the low line, over which supplies will be brought to the store house and shops.

ORE BINS

At the terminal of the aërial tramway from the Highland Boy mine all ore will be weighed by the smelting company. A check among all departments will be a feature of the operations. It is interesting to note that it is estimated that 100 h. p. will be developed in braking the last section of the Bleichert tram. The receiving bins have a capacity of 3000 to 4000 tons and are to be constructed of steel with a base 30 x 300 ft. and 32 ft. high. The ore will be conveyed from the receiving bins by means of belt conveyers to the sampling mill and crushing plant, where it will be crushed and screened to size, either for the roaster ore bins or blast-furnace ore bins. After screening and sizing it is conveyed to these bins by means of belt conveyers. The receiving bins are made with double compartments, so that material can be delivered into the bins and from thence directly to the tramming system and conveyed to either blast furnaces or reverberatories. There is also in connection with these receiving bins a silica grinding and crushing plant, where material will be prepared for converter lining. The roaster ore bins have a base 27x180 ft., and the blast-furnace bins have a base 27x100 ft. The fine ores from the roaster bins will be delivered to the roaster furnaces by means of conveyers. In all, there are about 24 conveyer belts used for the transportation of ore.

SAMPLE MILL AND CRUSHING PLANT

The sample mill is of the Brunton type, arranged in two parallel units. From the receiving bin at the mill, ore will be conveyed on 30-in. belts to two shaking grizzlies, feeding two 12x24-in. Blake crushers, making a 2-in. product. Two 20-in. belts capable of transporting 100 tons per hour will each deliver the ore to the No. 1 elevator with 10x20-in. buckets, traveling 350 ft. per min. From the elevator ore will pass to the No. 0A sampler, making a 20 per cent. cut (20 tons per hour). The sample portion of this ore in each unit of the mill will pass to a No. 1 shaking feeder and then to the 10x20-in. crusher, making a 1-in. product. This will go to a No. 1A sampler, again taking a 20 per cent. cut (4 tons per hour). The reduced sample will pass to a No. 2 shaking feeder, then to a 12 x 48-in. roll, crushing to $^1/_4$ in., and thence to a No. 2A sampler, reducing the amount of the sample to 1600 lb. per hour. The sample will then pass to a No. 3 shaking feeder and then to a 15x26-in. roll, grinding to 1/16-in. size and the final sample of 320 lb. per hour taken by a No. 4A sampler, cutting, as in all cases, 1/5 of the stream.

The reject from the No. 0A sampler in each unit will go to 4x14-ft. revolving screens with 3/8-in. and 1-in. perforations; the oversize to two 15x9-in. crushers, thence to another 4x14-ft. screen with 3/8-in. perforations, the oversize passing to two 12x48-in. rolls; a 20-in. belt conveyer will deliver the material to No. 2 elevator discharging on 20-in. belt delivering to bins. The coarse material from the second screens will be re-elevated in No. 3 elevator, with 8x16-in. buckets delivering the material to a 16-in. belt conveyer, which carries it to the blast-furnace storage bin.

Power to operate the mill is supplied from two Westinghouse 175-h. p., 2000-volt, 60-cycle, three-phase induction motors. The lift outside the mill is run by a General Electric 35-h. p., 60-ampere, 500-volt, 975-r.p.m. motor.

Roasters and Dust Chambers

The roaster building comprises two units each of 16 McDougal roasters set in rows of eight. The roasters are 16 ft. diameter and of 45-ton capacity. The dust chamber connected with the McDougals is 120x140 ft. long and 45 ft. high. The flat-arched brick roof of this chamber is carried on I-beams spaced 5 ft. apart, trussed and supported on steel columns. An important feature in this construction is the inclosing of the steel columns in brick, an air space being left to protect the steel work. Dust is to be delivered from three lines of hoppers to cars which will convey it to the reverberatories. The calcines from the McDougals will be taken in cars and charged hot to the reverberatories. The dust chamber is connected by a short flue to the main stack.

Stack and Flue

The stack is 350 ft. high, having an inside diameter of 25 ft., tapering from 4 ft. 6 in. thick at the base to 13 in. with a 2-ft. flare at the top. The pressure at the base of the complete stack is figured as five tons per sq.ft.; two million bricks were used in the construction of the stack.

The main flue will be 1300 ft. long, 20 ft. wide and 18 ft. high. The accompanying photographs show the construction of this flue. The concrete walls taper from a thickness of 4 ft. at the base to 2 ft. at the top. They are reinforced by fifteen 7/8-in. steel rods placed horizontally and 1 1/4-in. vertical rods spaced at 3 ft. centers. The walls are supported on a footing of concrete 9 ft. wide and 2½ ft. thick. The inside brick walls are 16 in. thick. A 4-in. air space is left between the brick and concrete walls. I-beams placed at 5 ft. centers will carry the flat-arched brick roof of the flue. Brick walls will support the I-beams. Side pressure will be taken up by pilasters spaced 10 ft. apart.

Reverberatories

Five reverberatory furnaces are now being constructed and room is provided for two more. These are to be of the Anaconda type, 19 ft. wide and 102 ft. long, inside hearth measurement. Slag will be drawn from the reverberatories into cast-iron launders delivering directly to slag-pot cars running in a tunnel beside the main flue. Boilers to utilize the waste heat will be set over this tunnel. There are to be four 750-h.p. Stirling boilers utilizing waste heat, and three 350-h.p. hand-fired boilers, developing in all about 4050 h.p. with steam at 180 lb. pressure. This will furnish steam for generating all the electricity needed for the plant, and also run blowing engines.

Matte from the reverberatories will flow 60 ft. in launders directly to the converter building. The converter house and casting shed are to be under one roof, and directly below the reverberatory building; five converter stalls will be built and accommodation provided for a sixth. The converters will be 96x150 in. and electrically operated.

Converter slag will be skimmed in pots and will be picked up by a 25-ton crane and dumped hot into the reverberatories. In the converter building there will also be a 60-ton crane, and a 40-ton crane in the casting shed; also a 30-ton wrecking crane above all others in the converter building.

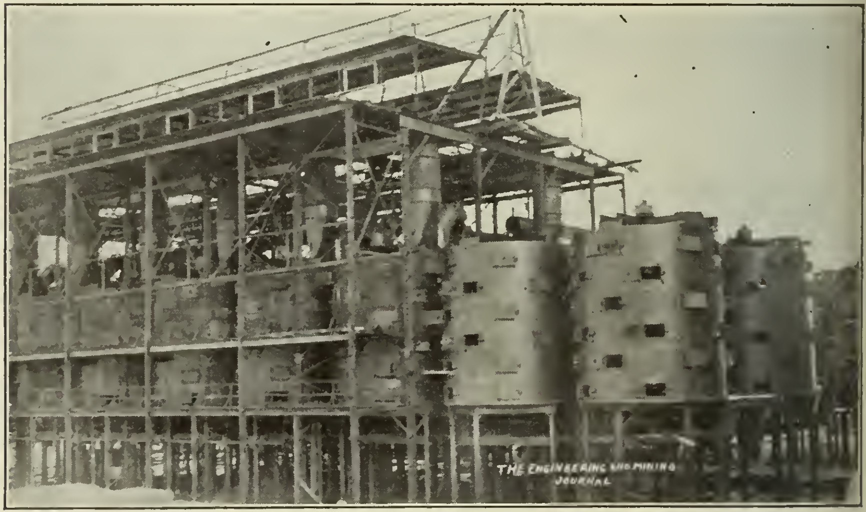
The blast furnace to smelt the first-class ore will be 56 in. x 51 ft. Two 16-ft. settlers are provided for the furnace. The foundations are completed.

Warehouse and Machine Shop

Below the casting shed are the warehouse and machine shops. They were constructed from material brought from the old Highland Boy smeltery at Murray. Other material from that plant, McDougal furnaces, etc., is being used in the construction of the new plant.

Power Plant Construction

The steam for the plant will be generated in the boilers mentioned, mostly by waste heat from the reverberatories. The other power-plant equipment comprises two direct-current generators (E 1 and E 2) for supplying current for the transportation system, cranes, etc.; two alternating current generators (E 3 and E 4) for running motors.; two blowing engines (C 1 and C 2) to furnish converter air, and two pair compressors (A 1 and A 2) to supply air for miscellaneous purposes. Space is provided for the installation of rotary blowers for providing blast-furnace air.



McDougal Roasters, Tooele Smeltery

The details of the various engines and machines which they operate are as follows: (E 1) steam cylinders, 16x32x36 in., 100 r.p.m., Nordberg; generator 250 k.w. 550 volts, d.c., Westinghouse; (E 2) steam cylinders 15x30x36 in., 120 r.p.m.; generator as above; (E 3 and E 4) 18x26x40x24 in., 180 r.p.m. Union Iron Works; generator 750 k.v.a., 2200-volt 3-phase, 60-cycle Westinghouse; (C 1) steam cylinders 15x30x42 in., air cylinders 36x36x42 in., Nordberg; (C 2) steam cylinders 26x52x48 in., air cylinders 52x52x48, Rarig Engineering Company; (A 1) Laidlaw-Dunn-Gordon cross compound engine 15x26x36 in., tandem connected with a two-stage compressor, 13½x26x36 in.; capacity 3500 cu.ft. free air per min.; (A2) 26¼x15¼x18-in. Ingersoll Rand compressor operated by 176-h.p. Westinghouse motor. There is also a 290-h.p., 2200-volt, three-phase, 60-cycle, synchronous motor, and a 200-kw., 550-volt, direct current, 1200-r.p.m. Westinghouse generator. The exciters for E 3 and E 4 are: (Ex. 1) Steam cylinder 10x12, 300 r.p.m., Skinner Engineering Company; Westinghouse direct connected generator 50 kw., 125 volts; (Ex. 2) mo-or 74½ h.p. 2200 volts, three-phase, and

SAMPLING AND CRUSHING MILL, TOOELE SMELTERY

enerator as above. There are also in the quipment: two pumps (feed pump No.), an 8-in., 12x7x10, 332 gal. per in., Knowles; (feed pump No. 2), a 46-gal. Worthington of the same dimenions; a fire pump 16x9x12 in., 750-al., Worthington; a centrifugal pump or E 1 and E 2, with 8x8-in. steam ylinder and 1600-gal. pump capacity unning at 300 r.p.m.; a condenser for 1 and E 2, 16x24x24 in., built by the eane Steam Pump Company.

PROGRESS OF CONSTRUCTION

There is no doubt but that the Tooele meltery will be a great asset of the ole-Ryan forces. The situation is ideal nd, with the experience of the Anaconda lant to draw upon, successful operation hould be obtained almost at the outset. he engineering department began work ec. 10, 1908, and the Tooele Valley ailroad, connecting with the San Pedro ne at Tooele Junction put cars upon the melting site June 15, 1909. The mahine shop and store house are complete, s is the sample mill and power plant. he McDougals are placed, stack completed, dust chamber and flue nearly nished. The concrete foundations for e reverberatories are in and the steel ork is all erected for the converter and sting building and is now being erected r the reverberatory building.

The tramway is expected to be comete by the time the smeltery is ready r operation, which will be about May, 1910. C. H. Repath, formerly mechanical superintendent at Anaconda, is chief engineer. At Tooele, J. B. McIntosh, formerly with F. J. Bride as assistant engineer at Anaconda, is in charge of construction. E. E. Thum is engineer on the works. E. P. Mathewson is general manager.

Manganese Deposits of the Blue Ridge

By L. G. Lackey*

It is generally known that the most important manganese deposits of the United States occur in the Blue Ridge district of Virginia, this region having produced the principal tonnage mined in this country for many years, and the entire output of this class of ore for 1908 and 1909. It does not seem to be generally known, however, that only a few of the deposits found in Virginia have ever been thoroughly prospected or developed. In most cases this has been due to the fact that sufficient capital has not been available.

MANY SMALL POCKETS

In many cases small pockets near the surface have been worked out and operations discontinued without further exploration. In the Blue Ridge, manganese occurs in small, scattered pockets near the quartzite or country rock, where it is usually found intimately associated with the iron ore; but, on the same slope of the Blue Ridge along the foot hills and near the valley limestone, it is found in clay beds and is a persistent deposit following the strike of the country rock northeast to southwest.

This fact is demonstrated by the old workings at the Crimora mine in Augusta county and is confirmed by recent development work at Happy Creek, Warren county, Va., where a deposit of considerable magnitude has recently been exposed. This deposit occurs near the contact of the Cambrian quartzite and Shenandoah limestone, on the west slope of the Blue Ridge, in a clay bed one-half mile in length and with an average width of 200 ft. Throughout this bed are found kidneys of black psilomelane and nests of crystalline pyrolusite imbedded in the variegated clays, and these nests or pockets are connected by seams of stringers of granular pyrolusite and wad. Overlying this deposit is a blanket formation of iron ore, 2 to 4 ft. thick, a wash from the heavy iron-ore deposits above.

THE SEIBEL CONCENTRATOR

A concentrating mill has been constructed at the Seibel mines, Happy Creek, Va., and is now turning out high-grade manganese ore. The capacity of the mill is 50 tons per day, and the principal output will be shipped to the steel mills in Pennsylvania, but some of the ore produced will be suitable for the manufacture of chemicals, brick, paint, etc.

In many of the iron mines of the Blue Ridge there are pockets of manganese ores interbedded with the iron ores, which can be recovered as a by-product if proper provision is made for the recovery when constructing iron-ore concentrating plants. With the increased demand for manganese ores, there will be an advance in prices and a ready market for the output. This will lead to the working of many abandoned, small deposits, especially those found with the iron-ore deposits.

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*Manager, Seibel Mines, Happy Creek, Va.

The Santa Gertrudis Negotiation

The actual stock and money transaction involved in the recent notable sale of the Santa Gertrudis mine, Pachuca, Mexico, to the British company, is given in a recent company circular as follows:

The report and accounts show that the total number of shares allotted is 1,196,000, of which 993,131 shares were allotted for payment in cash, 202,869 shares were allotted as consideration for the purchase by the company from Camp Bird, Ltd., of an option granted to Camp Bird, Ltd., by the Cia. Minera de Santa Gertrudis y Guadalupe to acquire a controlling interest in the Santa Gertrudis mining properties.

The total amount of cash received by the company from the shares allotted for payment in cash is £993,131, and application money, 2s. per share on 79,000 shares not yet allotted, £7900; and the following payments have been made to Camp Bird, Ltd., in accordance with clause 2 of agreement with that company dated Jan. 1, 1910, being on account of $200,000 deposit paid to Santa Gertrudis y Guadalupe, £20,000; remittances to the company's agent in Mexico, £956,000 (9,270,303 pesos); for balance of purchase price paid to Santa Gertrudis y Guadalupe as per agreement, 8,800,000 pesos; purchase of Girault mill, 344,825 pesos; 10 per cent of 25,000 pesos of subscription stock in Cia. Santa Gertrudis S. A., 2500 pesos; duty and charges *re* transfer of property 31,007 pesos; total, 9,178,332 pesos; London office expenses and cables £138 18s.

The preliminary expenses of the company payable by Camp Bird, Ltd., to be refunded to that company as per agreement, out of the first profits earned by this company, are: Registration fee, £3240; stamp duty on agreement, £1114; law charges, £367; cables and petty expenses, £112; sundry payments relating to the examination of the mines, etc., £16,027; total, £20,862.

This is clearly the most important mining deal in recent years in the Mexican field.

The North Pole Mine, Baker County, Oregon

Mine Worked by Tunnels; Has Produced One-eighth of Oregon's Gold for 12 Years; Average Value of Ore Mined, $15.63 per Ton

BY EMIL MELZER*

The most important gold-mining section of the State of Oregon is its northeastern part in the Blue mountains, using the name in its wider sense, with Baker City as the main distributing center. The mines which in the last decade have regularly contributed to the gold production of the State are not far from Sumpter, in the Cracker Creek district, and include the Columbia, the Eureka & Excelsior and the North Pole mines.

The North Pole mine is reached by means of the narrow-gage line of the Sumpter Valley railway, 31 miles, from Baker City to Sumpter, and thence by a good wagon road along Cracker creek to the village of Bourne. It is situated on the mountain slope northeast of Cracker creek.

About one mile north of Bourne a strong quartz vein traverses the country, and the principal mines of the district are on this vein. All of them have carried on extensive operations during the last 12 years and have produced a large amount of gold.

At the present time the Columbia is the only mine in active operation on the so-called Cracker Creek "mother lode," the Eureka & Excelsior having stopped operations in the early part of 1907 and the North Pole in August, 1908, after a continuous and successful run since July, 1896.

The North Pole mine embraces a total length of 5679 ft. on the main ledge of the district and some detached claims on parallel ledges. The Bourne Gold Mining Company owns the Eureka & Excelsior mine, covering 3000 ft. on the ledge south of the North Pole property. The Columbia company owns 3000 ft. on the ledge south of the Eureka & Excelsior. The vein has a strike of about north 34 degrees east and dips about 70 degrees southeast.

OCCURRENCE OF ORE

The vein filling is quartz. The walls are as a rule well defined, with gouge seams of varying width. The country rock is a silicious slate described as an argillite by Waldemar Lindgren. The vein itself is quite prominent and persistent, and is traced through the various properties mentioned above. The width varies from a few feet to more than 100 ft. in the widest place.

The ore is generally confined to one wall or the other, but sometimes it cuts across obliquely. Its occurrence might be called a series of lenses which frequently overlap each other, forming an orebody of great continuity. The width of the ore varies from a mere seam to as much as 25 ft.; the average width of all the ore stoped may be given as a little more than 3½ ft.

The gold occurs chiefly in a fine arsenopyrite which often forms concentric layers in coarsely crystalline quartz. The average value per ton of all the ore mined from 1896 to 1908 was $15.63 in gold. This average, however, includes a large amount of high-grade ore which was found on the border line between oxide and sulphide ore. It was found in tunnel No. 3, and was evidently due to secondary enrichment.

Besides the fine arsenopyrite there occurs a little iron pyrite, mostly low in gold. Isolated bunches of telluride minerals have been found, also native quicksilver and cinnabar, tetrahedrite, stibnite and other minerals of less commercial importance.

MINE WORKINGS AND EQUIPMENT

As the mine is situated on a hill with a slope of about 20 deg. or more, it is opened by a series of tunnels. The lowest or No. 1 tunnel is 210 ft. above the level of Cracker creek where the creek crosses the vein near the Eureka & Excelsior shaft house. It is a crosscut tunnel, 1000 ft. to the vein, and then following the vein for a distance of about 2150 ft. Two raises connect it with tunnel No. 2, 424 ft. above. Several smaller manways and some levels were opened between tunnels Nos. 1 and 2 and considerable stoping done from them.

Tunnel No. 2 is about 2450 ft., and No. 3 about 2300 ft. long. Tunnel No. 3 is 270 ft. above No. 2, with a blind intermediate level between. Tunnel No. 3 has been the main working tunnel of the mine for several years. It was remarkable for a continuous payshoot, 1600 ft. long. Tunnel No. 4 is 211 ft. above No. 3. The latest working tunnel, No. 5, starts as a crosscut tunnel from the west side. It is 327 ft. above No. 4. The five tunnels cover a vertical distance of 1227 ft.

The ground to the north of No. 5 is practically unexplored. Surface indications make it probable that further ore may be developed here when the company gets ready to resume operations. The greatest depth obtainable above the level of No. 1 tunnel will be about 2200 ft. at the north end of the claims.

The various tunnels have connections with each other by one or more raises, established for communication, ventilation and exploration. The raise between tunnels Nos. 4 and 5 is, however, only two-thirds completed.

An idea of the extent of the workings can be gained from the accompanying longitudinal section, showing both the North Pole and the Eureka & Excelsior workings.

The North Pole is equipped with blacksmith shops, air compressor fitted for steam and water power, and with electric motors to supply power during the low-water season in the cold winter months. A sawmill with a capacity of 10,000 ft. per day was partly used for sawing lagging and cribbing.

MILL AND TRAMWAYS

The mill is 1½ miles below the mine in the cañon of Cracker creek where there are several water powers available. It is connected with the mine by an aërial wire-rope tramway, single-rope type, with a capacity of 100 tons per 10 hours.

The 30-stamp mill has a 300-ton ore-storage bin, and is built in three 10-stamp units, supplied by the Allis-Chalmers Company. The ore passes over amalgamating plates and is then treated on Wilfley tables for the removal of a first concentrate. It is then retreated on Frue vanners—three for each Wilfley—and a second concentrate is removed. The tailings are then separated into sands and slimes preparatory to cyanide treatment.

The sands plant consists of nine percolating tanks of 100 tons capacity, arranged in two rows with two revolving distributors fastened to overhead carriages—one for each row—to be moved from tank to tank as the operation of charging requires.

The slimes are treated by the agitation and decantation method. There are six 5x18-ft. agitating tanks fitted with mechanical stirring apparatus. The slimes amount to 30 per cent. of the total pulp. The gold solution is precipitated on zinc shavings.

The ore presents peculiar difficulties in the mill. Rather fine crushing is necessary to liberate the finely divided sulphides, causing in turn the sliming of valuable material which has to be recovered by concentration methods. Many experiments aiming to treat this material by cyanidation from an all-slimed tailing have proved unsuccessful. The problem of increasing the saving was therefore one of improving the method of concentration and was to some extent solved by feeding the concentrating machines with screen-sized pulp.

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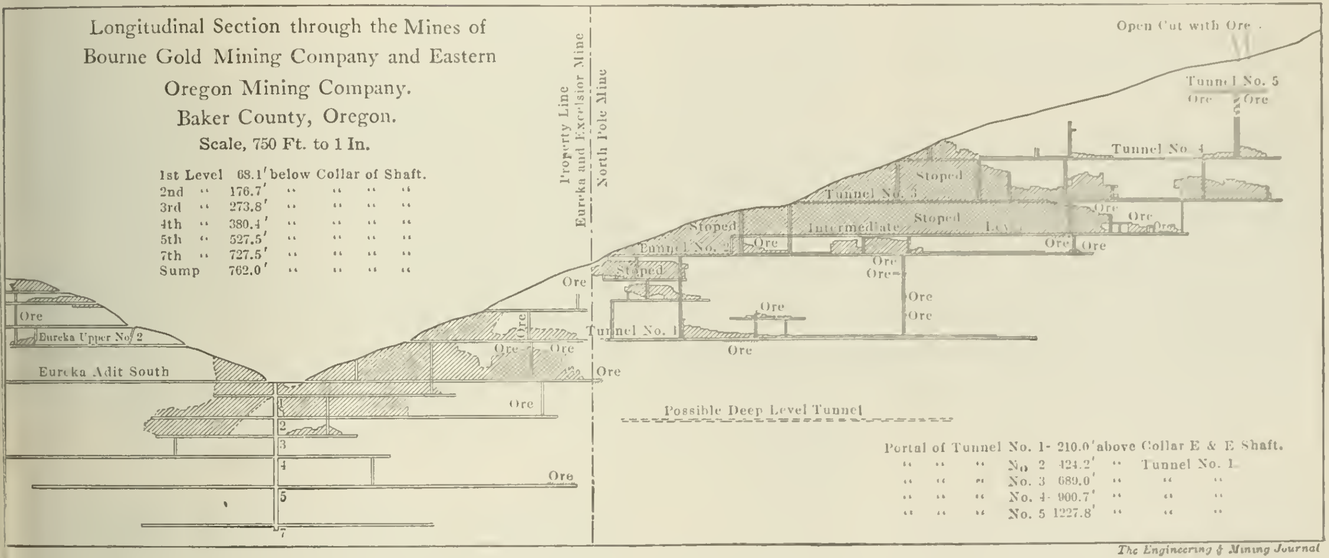
*[illegible] Baker City, Ore.

The compressor is operated by a 3-ft. DeRemer water wheel, driven from an 8-in. pipe line with a 325-ft. head. A flume one mile long brings the waters of Cracker creek to this pipe line. There are two water powers available to furnish power for the mill. The more important one, from Cracker creek, drives a 4-ft. DeRemer water wheel and develops enough power for 20 stamps even during the low-water season. The other pipe line is fed by the waters of Fruit creek and furnishes power for dynamos and solution pumps. An auxiliary steam plant with two boilers and a corliss engine provides power for emergencies and steam heat to the mill.

As the mill is about two miles below the mine by wagon road, the ore is carried from mine to mill by means of an ërial wire-rope tramway, a distance of 7800 ft. in a straight line. The tramway s of the single-rope type and has 200 side-dump buckets of 235 lb. carrying capacity. The loading station for this tramway is in front of the ore bin at the mouth of No. 1 tunnel. Another single-rope tramway, of a length of 2400 ft., connects the ore-storage bins at tunnels Nos. 4, 3 and 2 with the ore bin at the mouth of No. 1 tunnel.



Section through North Pole and Eureka & Eastern Mines

Owing to the great hight of the raises etween tunnel levels and the consequent reat wear on chute linings in dumping re, and the large amount of water to e contended with at certain seasons, with large loss of fines, it was found preferable to handle the ore between tunnels by the tramways instead of passing it down underground.

Summary of Operations

Within the 12 years, 1896 to 1908, there were mined at the North Pole mine 158,917 dry tons of ore containing $2,485,006 in gold, an average of $15.63 per ton. The total gold recovered amounted to 100,045 oz., a recovery of 80.55 per cent. The total tonnage of ore mined includes 1115 tons of high-grade ore shipped direct to the smeltery and averaging $500 per ton.

The balance of 157,801 tons of ore of an average value of $12.21 per ton was treated in the company's mill, yielding $1,443,729 in amalgam, concentrates and cyanide bullion.

The gold production of Oregon during the period from 1896 to 1908 amounted to about $17,000,000, one-eighth of which must be credited to this mine. As it may be assumed that the neighboring Columbia mine has had a similar output, it may be said that the mines of the Cracker Creek district furnished more than one-quarter of the gold output of the State during the last 12 years. The U. S. Geological Survey has issued two publications[1] dealing with the Cracker Creek district.

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[1] *Twenty-second Annual Report*, 1902, Part 2. p. 551-776, "The Gold Belt of the Blue lountain of Oregon," by Waldemar Lindren; *Bull.* 380, Contributions to Economic eology, 1908, Part 1, "Faulting and Vein tructure in the Cracker Creek Gold District, aker County, Oregon," by J. T. Pardee.

Gems in South Australia

The presence of various small gem stones in wash gravel and sand of Tertiary age has been detected in South Australia. The report of the Secretary for Mines of South Australia covering the half year ended June 30, 1909, gives the details of tests which proved the presence of rubies, topaz, sapphire, chrysoberyl, rutile and corundum besides coarse and fine alluvial gold.

Vanadium

Deposits of ores of vanadium, one of the rare metals, occur at several places in the western part of the United States, according to a report issued by the Geological Survey. The most important use of vanadium so far discovered is as an alloy of steel, to which it adds remarkable toughness. Its effect in steel is said to be due to its removal of oxygen and nitrogen, to its union in a solid solution with the iron, and to its formation of carbides that increase the strength of the steel.

It is said that steel treated with vanadium has great resistance to shock and to fatigue caused by constant bending, that it makes much better saws and springs, and that high-carbon vanadium steels also make much better tools, such as cutters and riveting dies. About 0.1 per cent. of vanadium is used for deoxidizing and denitrogenizing steel, and about 0.25 per cent. of vanadium is left in the steel itself. It is ordinarily used with chromium or manganese, or both, to which nickel may also be added.

Vanadium has also been used in cast iron with good effect, and experiments with brass and bronze show that it may be used with advantage in these alloys.

Vanadium salts are said to be favorable to the growth of plants; vanadyl phosphate acts physiologically like potassium permanganate; from vanadates and tannic acid a waterproof black ink is made; vanadium salts are used in coloring glass; metavanadic acid has been used as a substitute for gold bronze in paint; vanadium chloride is used as a mordant in printing fabrics, and the trioxide as a mordant in dyeing. Vanadium compounds are used for several purposes in chemistry.

Copper Deposits of Globe-Kelvin District—III

Operations in the Kelvin Section; Ray Consolidated Reports Nearly 42,000,000 Tons of 2.25 Per Cent. Ore Developed by Churn Drills

BY EDWIN HIGGINS*

Among the several companies that will before many months begin to contribute their quota to the already enormous copper production of southern Arizona, the Ray Consolidated Copper Company promises to take first rank in point of magnitude of operations and output. At the present time[1] there has been developed in the property of this company, by underground workings and churn-drill holes, 41,500,000 tons of ore that will average 2.25 per cent. copper; the last link of the standard-gage railroad from the mine to the concentrator and smeltery site, a distance of 21 miles, has been completed; the grading for a 5000-ton concentrator has been done and the foundations partly laid; and work will soon be started on a 7000-k.w. power plant to operate the mine and mill.

The Ray Consolidated Copper Company owns about 1000 acres of lode mining claims at the old camp of Ray, in the Mineral Creek mining district, Pinal county, Arizona. Ray is situated about six miles north of Kelvin, a small town on the north bank of the Gila river; Kelvin is 81 miles east of Phœnix, on the Phœnix & Eastern Railroad, a branch of the Southern Pacific system. Ray is also connected with Kelvin by a narrow-gage railroad but this will soon be abandoned in favor of the standard-gage road.

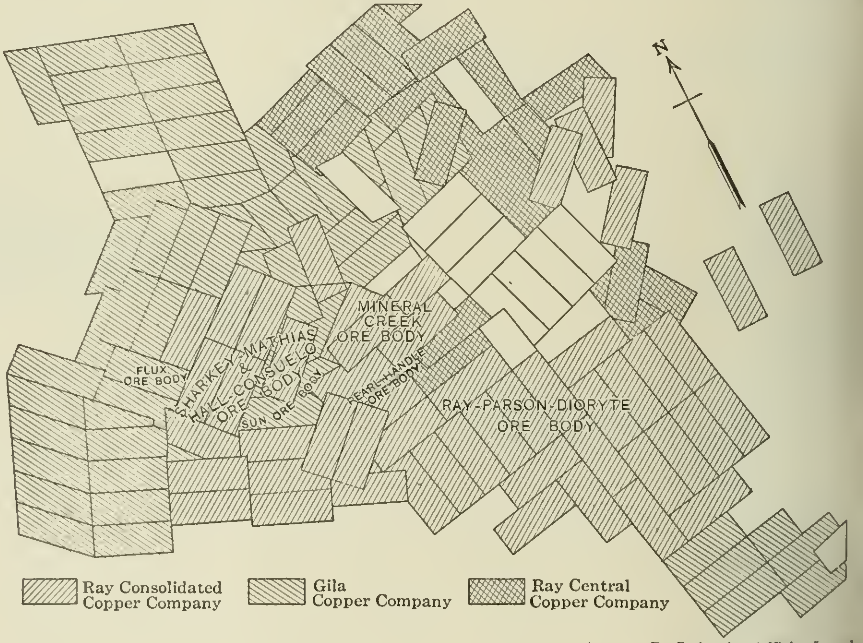
In addition to 200 acres of mill sites in the town of Kelvin the company owns about 4000 acres of mill- and smelter-site lands 12 miles up the river and southeast of Kelvin. The site selected lies principally on the north bank of the Gila river, directly opposite the point where the San Pedro river empties into it. About 2000 acres of the land purchased is approximately level and comprises practically all the land that is, or might become, valuable for agricultural purposes on both sides of the Gila river for a distance of over three miles.

The company's spur from the Phœnix & Eastern starts at Hayden Junction, about three miles west of the station of Winkleman. The point where the mill and smeltery are to be constructed has been named Hayden.

GEOLOGY

The mineralized belt in which the property of the Ray Consolidated Copper Company is situated consists of an area of highly altered and silicified schists. These schists, including different metamorphic rocks, are the oldest rocks of the district. The oldest member of this schist group was a thick series of sediments which was later intruded by granite and granite porphyry, and metamorphosed into schist. Following this period of metamorphism was an intrusion of diorite.

Later, during which period the district was beneath the sea, Cambrian quartzites and Devonian and Carboniferous limestones were laid down. The Ray property lies on the border of a mass or batholith of diabase that came up through the schist, probably toward the close of the Cretaceous, forming sheets at the base of the quartzites and dikes in the overlying strata.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FLUX ORE BODY
SHARKEY-MATHIAS & HALL-CONSUELO ORE BODY
SUN ORE BODY
MINERAL CREEK ORE BODY
PEARL-HANDLE ORE BODY
RAY-PARSON-DIORYTE ORE BODY
Ray Consolidated Copper Company
Gila Copper Company
Ray Central Copper Company
The Engineering & Mining Journal

MAP SHOWING PROPERTY AND OREBODIES OF RAY CONSOLIDATED, GILA AND RAY CENTRAL

Following the granite porphyry there were intrusions of small dikes representing complementary differentiation products of the granitic magma, including monzonite porphyry, diorite porphyry and a still more basic type; also more siliceous dikes, including aplite, pegmatite and pegmatite-quartz veins. Metallic sulphides, chiefly cupriferous pyrites with some molybdenite and galena, partly accompanied, but mainly followed, these quartz veins.

Faulting had begun at the time of the granite-porphyry intrusion, and copper-bearing sulphides were deposited in the fissures formed. The earliest was the great Ray fault, following the general course of Mineral creek, along which, subsequent to the primary mineralization, movement took place, the block on the west side being relatively uplifted. This upthrown block was then attacked by erosion and brought down to the level of the east block; the overlying strata were removed and the Pre-Cambrian schists laid bare. Further erosion of these schists was followed by desert-wash deposits in the valley that had been formed. This was followed by a lava flow, more desert wash and then volcanic ash. These rocks are probably of late Tertiary age.

At about the end of the Tertiary the block to the west of the Ray fault was again uplifted. Erosion then attacked this block and stripped off the Tertiary rocks, again laying bare the schists. The detritus accumulated in the valley as another desert-wash deposit called the Gila conglomerate. This probably occurred in the Pleistocene period. Later the general uplift brought about a period of cañon cutting by streams; at the same time there was a slight reverse movement along the Ray fault, involving the Gila conglomerate, and the west block suffered a downthrow. This brings us not far from the present time.

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*Consulting mining engineer, Columbia Trust Building, Los Angeles, Cal.

[1] January, 1910.

MINERALIZATION

The original or primary ore deposition ollowed the granite-porphyry intrusion nd the beginning of the faulting. The trata then overlying the schists appear o have exercised a blanketing effect on he solutions, which spread out beneath hem, permeating them and the porphyry beneath and forming the basis of the diseminated deposits. A smaller part of the solutions escaped through fissures, usually along faults, into the overlying strata and thus formed lode deposits, sometimes with impregnation of the wall rocks.

The main Ray orebody belongs to the class of disseminated deposits in the schist and porphyry. The mineralized area has been shown to be about 3000 ft. wide near its east end, decreasing steadily and becoming less than 1000 ft. wide to the west. The extreme length of the orebody, through the properties of the Ray and Gila companies, is about 12,000 ft. on the south side and about 9000 ft. on the north. An accompanying sketch shows in section the thickness and horizon of the ore through the greatest length of the deposit owned by the Ray company. The width of the zone transversely to this section varies from about 3000 ft. toward the southeast to about 2000 ft. on the northwest.

The Ray ore zone was silicified during the original or primary mineralization; hence the exposed portion west of the Ray fault, being relatively resistant, stands out as a ledge of hills. It is iron-stained from alteration of the original pyrite. Bordering the belt of maximum mineralization there is another area showing a less amount of mineralization—a transition between the more altered rock and that which is practically unaltered. The boundary between the two is not distinct.

The fault movements which followed the original ore deposition thoroughly shattered the main Ray belt of primary mineralization. The primary orebody was not commercially valuable, containing only a fraction of 1 per cent. of copper. The present orebody, carrying an average of 2.25 per cent. copper, has been concentrated by downward percolating surface waters which permeated the shattered rocks, oxidized the superficial portion, dissolved out the copper and carried it down to the ground-water level, where it was precipitated as the rich copper sulphide, chalcocite.

The present sulphide orebody contains, besides that dissolved from the leached ground, a great quantity of copper that must have been derived from rock leached and afterward removed by erosion. It is estimated that the thickness of the eroded rock was about 500 ft. This amount, added to the present surface, would raise it to the level of the bottom

PANORAMIC VIEW OF RAY CONSOLIDATED COPPER COMPANY'S PROPERTY, KELVIN DISTRICT, ARIZONA

LOOKING WEST FROM MAIN STREET OF RAY. SHAFT AND DUMP OF RAY CENTRAL IN CENTER

WEATHERED SCHIST SURROUNDING SHARKEY SHAFT OF RAY CONSOLIDATED; ORE FOUND HERE 18 FEET FROM SURFACE

TWO VIEWS OF THE RAY CONSOLIDATED CONCENTRATOR SITE AT HAYDEN, ARIZ.

of the Tertiary wash deposits where these overlie the mineral-bearing rocks on the edge of the district, not yet having been removed by erosion. It is, therefore, probable that the secondary concentration began with the removal of the Tertiary cover, and that probably the entire amount of copper contained in the rocks removed by erosion is contained in the present chalcocite zone. Locally the orebodies have been slightly displaced by recent faults.

CHURN DRILL DEVELOPMENT

Although there are over 20,000 ft. of shafts, drifts, raises and tunnels on the Ray property, most of the ore has been developed by means of the churn drill. On June 1, 1908, a report was made by S. W. Mudd indicating the existence at that time of about 3,000,000 tons of reasonably assured ore. Up to that time a comparatively small amount of drilling had been done, and the work was continued on a small scale until November of that year, when the number of drills in operation was greatly increased.

A more vigorous campaign of development, which has continued to the present time, was then instituted by the management.

The whole property has been divided by coördinates into blocks 200 ft. square. At each corner of the developed squares, churn-drill holes have been sunk through the capping and enriched zone to the formation below.

Up to May 15, 1909, there had been completed 151 holes of an average depth of 377 ft., or a total of 57,000 ft. At the time of my visit, early in January, 1910, there had been completed 230 holes totaling approximately 90,000 ft. These holes vary from 200 to 970 ft. in depth.

ORE RESERVES

In calculating the ore developed by drilling, no ore has been figured beyond straight lines connecting holes in ore. On this basis, out of the 230 holes mentioned above, 163 have been used in arriving at the ore developed. These 163 holes average 432 ft. in depth, or a total slightly in excess of 70,000 ft. The average thickness of capping was shown to be 242 ft.; the average thickness of ore 113½ feet.

The ore developed early in January, 1910, by drill holes and underground workings in three groups, was as follows: Immediately contiguous to the main shaft, 54 acres containing 17,000,000 tons of ore, average 2.35 per cent. copper; about 700 ft. north of this orebody, 15 acres containing 3,500,000 tons of ore, average 2.25 per cent. copper; in the Sharkey-Mathias and Hall orebodies to the northwest, 36 acres containing 21,000,000 tons, average 2.18 per cent. copper; total, 105 acres containing 41,500,000 tons of ore, average 2.25 per cent. copper.

DRILLING OPERATIONS

There are at present nine Star and four Keystone drills at work on the Ray property. These machines are of the traction type and have a capacity of from 1000 to 1200 ft. of depth. Considering the rough character of the country, these machines have little trouble in moving from point to point; it is only necessary to grade a road, after which the machines negotiate steep grades with comparative ease.

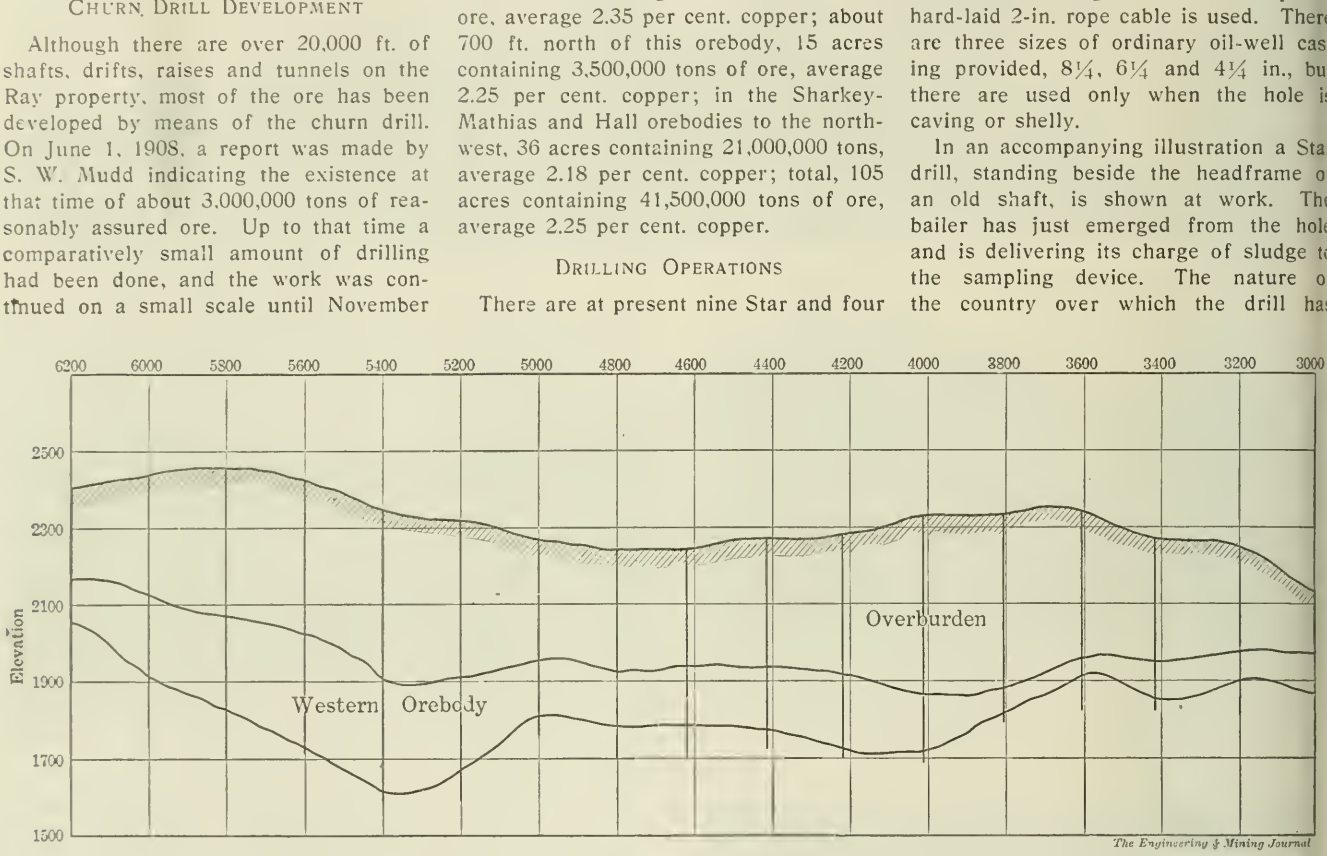
In general, the practice in drilling the holes is as follows: The machine is set up over the coördinate point selected and drilling begun. The drill furnishes a sludge sample; this sludge is delivered to a specially designed sampling device which cuts out any desired proportion. The sample is collected in tubs. When mineralized ground is encountered samples are taken every 5 ft. and a careful record kept of the ground passed through. Work is continued in 5-ft. sections, alternately drilling and sampling until the mineralized zone is passed through. The final record of the drill hole shows the depth of hole, the copper content of every 5-ft. section, the depth of capping, thickness of orebody, grade of ore passed through, and remarks regarding special features of the hole.

At the start the tools used in the hole consist of: (1) drilling bit, 175 lb.; (2) stem, 900 lb.; (3) jars, 300 lb. (put on at a depth of about 200 ft.); (4) rope socket, 75 lb.; total 1450 lb. These tools are for the largest-size holes; for smaller holes the weight decreases. Special hard-laid 2-in. rope cable is used. There are three sizes of ordinary oil-well casing provided, 8¼, 6¼ and 4¼ in., but there are used only when the hole is caving or shelly.

In an accompanying illustration a Star drill, standing beside the headframe of an old shaft, is shown at work. The bailer has just emerged from the hole and is delivering its charge of sludge to the sampling device. The nature of the country over which the drill has to travel is shown also in the illustration

These churn drills work two 12-hou shifts per day and are manned by on driller at $6 per day, one driller's helpe at 40c. per hour, and one sampler a 50c. per hour. Often it is possible fo one sampler to take care of two drills The drills consume about 1½ tons o coal and 1500 gal. water per day. Th depth made per day is variable; as hig as 50 ft. has been made under favorabl conditions at the start. The average i about 30 ft. per day.

The cost of churn drilling at the Ra property varies with the character of th ground and the depth of hole drilled. Th average cost of drilling per day is $60 or $1800 per month. The monthly aver age drilling cost ranges from $2 to $3.5 per foot. The average cost of 89,00 ft., including expenses, amortization o drills, and general charges, was $2.90 pe foot. At times the entire operations con sisted of drilling and general charge

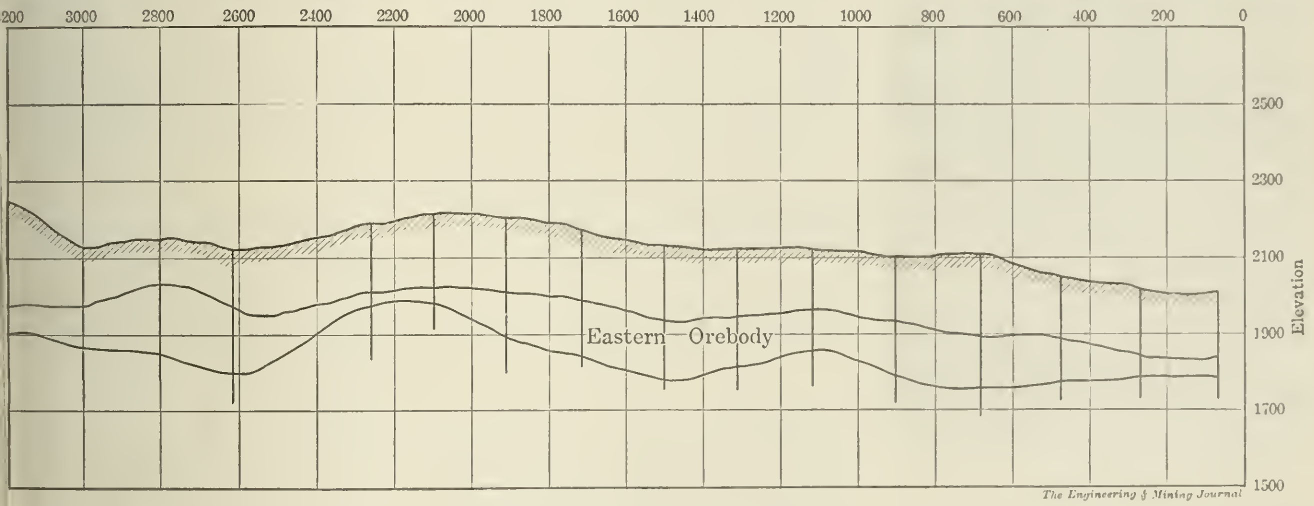


RAY CONSOLIDATED COPPER COMPANY—PROJECTIONS OF EAST AND WEST SECTIONS OF OREBODY, 600-FEET WIDE ere all against this operation. The dis-ribution of charges in the 89,000 ft. entioned above is as follows: general xpense, $0.52; labor and supplies, 1.55; sampling holes and collecting chnical data, $0.57; grading roads, mov-ig and setting up drills, $0.27; total, 2.90 per foot.

That this type of drill is well adapted sampling the character of orebody ound at Ray has been proved by the esults of samples taken from under-round workings in the mine. Approxi-ately 700 ft. of raises in ore have been ut up alongside drill holes, and the re-ılts obtained from hand samples taken very 5 ft. check up closely in nearly very case. Also many drill holes have een checked in part where they pass rough drifts on the underground levels.

Mine Development

The mine is being opened up on three vels, the 50, 160 and 270 ft. Eventu-lly there will be a fourth level to catch e ore east of Mineral creek to the nit of the property. Each of these will nstitute a main haulage level. The in-nation of the orebody is such, follow-g as it does the general topography of te country, that the three levels, driven i different directions, will each be under te orebody it is intended to serve. The st level goes under the hill and reaches te ore developed partly by the old com-ny. The second level goes under a aw and extends into virgin ground. A ntinuation of either the second or third els will open up most of the ore in t northwestern part of the property ere the capping and ore are both tcker.



hese two Sections Represent 53.5 Per Cent of the Developed Area. Drill Holes Indicated by Heavy Vertical Lines

The ore-hoisting shaft, the temporary adframe of which may be seen to the t in the panoramic view, has two npartments, each 6 ft. 10 in. by ft. inside timbers. This shaft will be uipped with a 100-ft. steel headframe a will be used exclusively for hoisting ore. It is situated on the edge of the Ray-Parsons orebody and is at present a few feet deeper than the 270 level. This shaft is designed to accommodate two skips, each 5x5x10 ft. deep (12[illegible] tons) running in balance, which will provide for a hoisting capacity of 5000 tons in not to exceed 16 hours.

A 30-deg. incline shaft, entering the ground at the extreme left of the panoramic view, will hoist and lower all men, tools, supplies, timber, etc. This shaft has three compartments, each 5x7 ft. inside timbers

Mining and Handling Ore

The methods of mining will be modifications of the caving system as practised by the Utah Copper Company. Details of the method cannot now be given, for local considerations will doubtless dictate a system peculiar to the orebody as found at Ray.

Sublevels will be driven at intervals, probably every 25 ft., between the main haulage levels. On the main haulage levels the ore will be gathered in ore trains and hauled by electric motor to 300-ton pockets at the shaft.

There will be three pockets, one for each main haulage level. These pockets will discharge automatically into skips, which will dump into a bin at the surface. This bin will feed to two gyratory crushers which will reduce the ore to 4-in. size; thence it will pass to two 6-ft. (20-in. face) rolls, which will crush to 1-in. size. The crushed ore will then be conveyed about 100 ft. by belt conveyer to railroad bins of 20,000 tons capacity, ready for transportation to the mill.

Equipment

All of the machinery at the mine will be operated by alternating current, to be supplied from the power plant at Hayden. The main ore hoist will have the largest load capacity known and will have a hoisting speed of 300 ft. per min. It will be equipped with a 300-h.p. motor, and will operate two 12[illegible]-ton skips in balance. This hoist is so designed that it may be changed easily to hoist from any one of the three levels. The incline hoist will have a speed of 600 ft. per min. and will be equipped with a 200-h.p. motor.

At the present depth of mining, water gives practically no trouble. A pump operated by air and having a capacity of 50 gal. per min., now handles the flow by working about three hours per day.

There will be installed two 500-h.p. electrically driven air compressors of a total capacity of 6000 cu.ft. of air per min. Large shops are being erected to take care of all machinery at the mine, locomotives, and for general repair work.

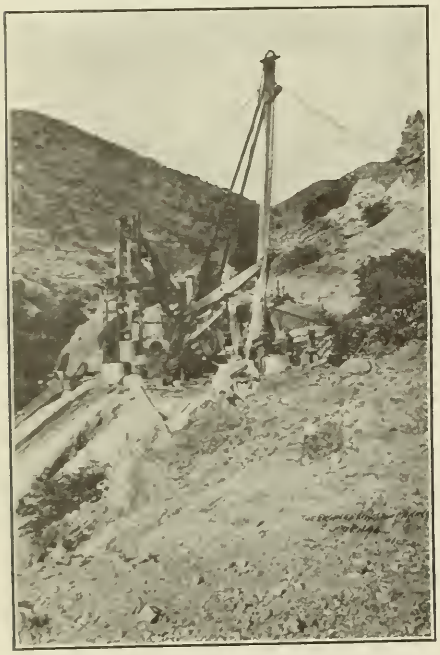
Labor

At the time of my visit there were about 350 men employed in and about the mine. Of these, 120 were working on churn drills, about 150 underground and the remainder on general surface work. The work in the mine is being directed toward prospecting and blocking out ore, so that when the mill is ready to start the mine will be in readiness to supply the required tonnage. Machinemen and hand miners receive $3.50; helpers, $3; muckers and trammers, $2.25 per day of eight hours; top labor, $2 per day of 10 hours. The miners employed are chiefly Americans, Austrians, Italians and a few Swedes. Muckers and trammers are mostly Mexicans, as are also top laborers. Apache Indians make good laborers on railroad work, but for some reason cannot be induced to go underground.

The standard-gage railroad from Ray to Kelvin, a distance of six miles, has been completed. The last work to be done was the building of a small bridge just below the mine. The Ray company will use its own locomotives only as far as Kelvin, whence cars will be run on the tracks of the Phœnix & Eastern and hauled the remainder of the way to the concentrator by locomotives of the railroad company. The haul will be six miles to Kelvin, 12 miles to Hayden Junction, and three miles on the company's spur to Hayden, total 21 miles.

Milling

For about 10 months previous to August, 1909, the Ray company operated an experimental mill at Kelvin. This mill had been constructed by previous owners of the Ray property and was of almost obsolete design and equipment, but with some additions it served well as an experimental plant. The tonnage put through this mill varied from 100 to 150 tons per day, and the results obtained have been valuable in determining the best design and arrangement of apparatus for the new plant. During the last period of its operation, the mill ran on ore of the normal grade shown by all the mine developments and showed a saving of about 70 per cent., accompanied by the production of a 27 per cent. concentrate. From the fact that this mill was poorly designed the management expects to do better when the new plant is running.



Churn Drill Operating Near Old Shaft

The site for the new mill near Winkleman is shown in an accompanying illustration. The work of grading is about completed and the forms for the concrete foundations are fast being put in. The mill will have a capacity of 5000 tons per day, divided into eight sections of 625 tons each. In general terms, the milling practice of the Utah Copper Company will be followed, with the exception that the ore will be crushed to 1-in. size before leaving the mine. Ore from 50-ton steel railroad cars will be dumped into bins at the mill. Each section of the mill will consist of two 42-in. rolls, three 6-ft. chilean mills, and reciprocating roughing tables. After the material is finished to ⅛ in. it will pass over the roughing machines, the coarse being returned to the chilean mills for regrinding. Fine concentration will be done on smooth- and corrugated-belt vanners. The concentrating ratio will be about 17 into 1. A smeltery is planned for taking care of the mill product, and possibly custom ore. This will be near the concentrator, where there is an excellent site.

Power Plant Near Hayden will Supply Mine and Mill

A 7000-kw. power plant will be built near the mill on the Phœnix & Eastern railroad, from which power will be supplied to the mine and mill. This plant will consist of 6600-volt alternators, direct connected with 1750-kw. triple-expansion engines. At normal capacity it will require three of these engines to run the mine and mill; one engine is being installed as a reserve.

In closing I wish to express my thanks to D. C. Jackling, vice-president and general manager of the Ray Consolidated Copper Company, for much of the information contained in this article.

Preparation of Zinc Oxide for Reduction

A process for preparing zinc oxide for reduction, preventing loss due to its small density and during transportation, has been patented by Herman Pape, of Hamburg, Germany (U. S. Pat. 947,399, Jan. 25, 1910).

The zinc oxide, in the loose condition as it leaves the dust chambers, is fed into a muffle or reverberatory furnace, where it is exposed for two or three hours to a temperature of about 1000 deg. C. The oxide is condensed or solidified so that it coagulates into solid lumps and pieces, and when this is accomplished it is withdrawn from the furnace and allowed to cool. It can then be transported in a similar way to roasted blende, and after the larger lumps have been broken up, it can be used in the same manner as blende for reduction to zinc. The looseness of zinc oxide which is prejudicial in the reduction process, is thus entirely obviated.

The Great Salt lake in Utah has been rising at the rate of approximately 7 in. per month, as shown by records kept by the U. S. Weather Bureau. On March 15, the water was 6.5 ft. above the zero mark on the recording scale as compared to 4.4 ft. a year ago at this time.

The Porcupine District

Special Correspondence

As a general thing, the country in the Porcupine district, Ontario, is flat and swampy, with occasional outcrops of rock in the form of hummocks. The country rock is schist, and the gold occurs in quartz dikes varying in width from a few inches up to 60 ft. Some of these dikes have been traced for over 800 ft. In several cases the gold showings are spectacular, the gold occurring in the form of small leaves and nuggets in the quartz.

The district was discovered several years ago, when prospectors passing through staked a few claims and did a little work without, however, finding any free gold. The claims were subsequently abandoned and nothing more was heard of that part until Wilson made his discovery last autumn. Several other discoveries of free gold followed this, and then ensued one of the quickest and quietest rushes ever seen in northern Ontario. In a couple of weeks the townships of Whitney and Tisdale were staked and prospectors were working in Mountjoy, Godfrey, Shaw and Carmen townships and down into the Temagami forest reserve.

Options were taken by prominent people on several of the best properties chief among them being the O'Brien Timmins and McArthur. Subsequently the Wilson claims were purchased for Eastern capitalists. Since that time several shafts have been sunk. A number of plants are on the ground and three o the companies have installed compressors. The deepest shaft is down abou 60 ft. on the Timmins property, and free gold shows in the bottom of it. During the coming summer, when these plants are working, operations will be pushed much more rapidly and the work done during that time will to a large exten determine the future possibilities of the camp.

The first road into the district was cu by the Timmins interests to enable them to take in their supplies, and it is this road that has been used all winter. I is now, however, practically impassable for teams, and people coming out or going in have to do so on foot. The country will be practically isolated until the ice leaves the lakes and rivers and the navigation company starts its boats.

One of the greatest needs of the new camp is a summer road, and although several have been projected, nothin much has been done as yet. The Government has been asked to assist in thi undertaking, but so far has done nothing Surveys have been run for a branch lin from the Temiskaming & Northern Ontario railroad, should the possibilities o the district warrant its construction.

Ore Dressing in the Coeur d'Alene District—IX

Crude Sampling Methods Usually Employed; Haultain Sampler Used for Wet Sands. Assaying Methods; All Ore Sold on Fire Assay

BY EDWARD S. WIARD*

The most pleasant way of treating the question of sampling and assaying the ore entering the Cœur d'Alene mills would be to avoid it entirely. The crude ore sampling is entirely insufficient and inadequate. The same evil exists in many mills in other districts. It is due largely to poor sampling that small advances are made in the art of ore dressing as compared with other lines of engineering. I have heard arguments that small mills could not afford to install proper sampling devices. It is not clear to me why the ton cost of equipping and operating well designed sampling plants in small mills should necessarily be any greater than large ones. The argument of cost has no weight in the rich and successful mines of the district, and I know of no mill where proper devices could not be installed without interfering with the regular mill operations and at comparatively small cost.

The only analogy by which I can compare crude ore-sampling conditions is to suppose a manufacturing concern to spend thousands of dollars on bookkeeping to determine how much and for what prices it markets its finished material, but keeping no records of raw material purchased. I am not sure that the samples taken in the mills and at the mines even allow of a shrewd guess being made as to the metallic contents of the ores passing through the mills.

The Vezin Sampler

The ore is usually sampled after leaving the crusher and when it has been reduced to 1½-in. size. Hand sampling once an hour with an elevator bucket mounted on a rod is the practice at a few of the mills. In others mechanical samplers are used. These often show considerable ingenuity but are faulty in principle. The amount of ore taken at the first cut by these machines is entirely too small. The Bunker Hill rock house contains the most complete set of sampling devices of any mill in the district. By referring to the flow sheet in Section II in the Journal of Dec. 4, 1909, it will be seen that the ore crushed to 1¼ in. is cut by a Vezin sampler at the head of the inclined conveyer belts. The 15:1 cuts indicated on the flow sheet are the ratios the plant was designed for, but actually so large a portion is not obtained. The second cut makes a 500-lb. sample in 24 hours from 1000 tons of ore. There is no mixing or staying device below the set of sample rolls shown between the two Vezins; the time periods when the second Vezin catches the douse from the first which has been passed through the rolls must be variable. This plant is the nearest approach to real sampling of any in the district and it needs but little work to make it accurate, provided the Vezins are run more slowly. It is probable that when the Bunker Hill company's new mill is in operation these faults will be corrected.

Haultain Sampler for Wet Sand

Minor sampling devices about the mills do not need any attention with the exception of the riffle device of H. E. T. Haultain for reducing wet sand and slime samples. By its use the amount of time and trouble in handling of the sample of sand and slime at the end of a shift is reduced to a minimum. I believe it is more accurate than the complete drying of a sample collected in a large settling tank or in a canvas conical filter bag. If desired, the sample can be run through the device from a small settling tank. This is the mode in which it is employed at the Detroit Copper company's mill at Morenci, Arizona.

The complete installation of teeter box sampler tanks and reducing device as installed by Haultain at the Last Chance mill at the end of the sand and slime tailings launder merits description.

Water for operating the teeter box was first introduced into a little V-tank with a plug at the bottom for removing sand and one near the top for furnishing the actuating water under a constant head. At one end of the teeter box was secured an arm hinged so as to hang vertically. At the lower end of the arm was mounted a plunger consisting of a circular piece of pine which fitted loosely in a prismatic box kept full of water. The function of this device was to prevent the tipping apparatus from accelerating its to and fro movements. The teeter box actuated a carriage sliding on two horizontal rails placed about 18 in. apart. Little wheels were tried on these rails but gave trouble. On this account the carriage was provided with shoes which slid on the rails, these being kept well lubricated. Suspended from the carriage was the cutter which passed through the stream of tailings and took the sample. Attached to the teeter box was a Veeder cyclometer which counted the throws of the sampler, and by calculation it could be seen whether the sampler had worked smoothly or intermittently during a shift.

From the cutter the sample flowed into a series of five 5-gal. kerosene cans, arranged as are the zinc-precipitating tanks in cyanide works, one below the other. Each can was provided with a baffle of iron plate suspended in the middle. The overflow of each can into the one below it was through two small angular spouts soldered in V-shaped grooves cut from the front of the can at the top. The interval between cuts in this sampler was between three and four minutes. During this time the slime back of the baffle in the first can would settle fairly well but much better on the front or discharging side of the baffle. The same thing, but marked by progressively better settling, could be observed in the other cans. The last can discharged absolutely clean water. When the douse from the sampler came slightly turbid, water would be lifted from the first can into the second, less turbid water from the second to the third and so on with diminishing turbidity until the final overflow would be perfectly clean.

This system was thus a highly efficient intermittent settling device. The kerosene cans did not last long, although the water was only slightly acid. It was necessary to have a small army of boys gathering in cans and bringing them to the mill. It would have been far better if the series of small tanks had been made of substantial copper sheeting.

At the end of a shift the sampler was hung up, the time being noted. The first can, which usually was about two-thirds full of sand and slime, was lifted up and the surplus water poured through the reducing device shown. The sand was loosened by pouring in water from a lower can of the series and the mixture poured through the reducer. The first can was finally washed perfectly clean with a jet of water pointed up into it from a hose mounted alongside the reducer and put back in place. The remaining cans in order were treated in a similar way with a view of using as little fresh water as possible. The four other cans usually had only an accumulation of sediment in them an inch or less deep. During these operations a can to receive the cutting rested under the lowermost set of riffles at *A*. The reducing device used in this sampler contained two sets of riffles and reduced the sample to a quarter; a third set of riffles would reduce a sample to an eighth. The riffles are inclosed and supported by two heavy sheets of copper, shown by the heavy lines in the drawing. If the contents of the cans at the end of a shift with the added clean water for washing them out amounted to 28 gal., then the sample at the first reduction would amount to 3.6 gallons. On passing this through the reducer a second time the sample would amount to about 0.7 gallon. The second cut was placed in a copper tray and a little hydrochloric acid added. In a few hours it was perfectly possible to siphon off the bulk of the water and the rest could be quickly removed by heating on a sand bath.

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*Mining engineer, Boston building, Denver, Colo.

Comminution of Samples

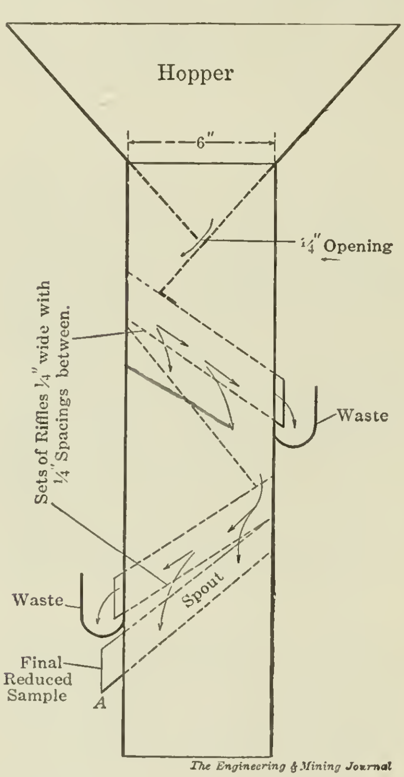
In the comminution of a large number of mine and mill samples a crushing plant consisting of a 4 x 6-in. Blake crusher, a Gates gyratory sample grinder and two or three bucking boards will be found satisfactory. With a crusher of this size the assayer's helper can dump a sample containing 10 to 15 lb. of ore into the jaws and it will be broken to half-inch size without any further attention on his part. The broken ore from the crusher can then be thrown in mass into the bell of the gyratory machine, which will reduce it to sand without attention. For reducing a large number of finely ground samples the riffle cabinet described in the Journal, Feb. 2, 1907, will be found rapid and accurate.

Methods of Assaying

All ores shipped from the district are sold on the fire assay. Silver is determined by scorification assay. At the Bunker Hill mill the mill operations are checked by the wet assay for lead, Guess' electroylitic assay being employed successfully. At the other properties in the district some wet assaying is done but the efficiency of mill operations is based on the fire assay. The fusion period for a fire assay varies from 40 to 60 min., the idea being to raise the temperature of the furnace gradually so as to get a gentle fusion. After the fluxes are thoroughly decomposed and the contents of the crucibles quiet the temperature of the furnace is raised for 15 to 20 min. to make the slag extra liquid and allow suspended shots of lead to settle. I believe this practice better than that of Colorado where a fusion is made in 30 to 40 min. By crushing, weighing and assaying the crucible and slag from certain samples I have found that the loss of lead in the case of the longer melt could be accounted for almost entirely by the slag, whereas with the same ore and a shorter fusion period the smaller amount of lead recovered could only be attributed to sublimation and slagging losses.

Some account of my personal experience in assaying Cœur d'Alene ores may be of interest. I used two flux compositions consisting of sodium bi-carbonate, potassium bicarbonate, borax glass and argols. I preferred argols to flour as the latter burned with a long yellow flame which prevented estimating the temperature of the muffle. For careful work I fired the furnace briskly for two or three hours with bituminous coal. At the end of that period the muffle, being new and free from cracks, would have a clear light orange color. There would also at the end of this period be a bed of bright coals on the grate bars, free from clinker and long flame. The slot in the muffle was luted to prevent any draft through it.

After the crucibles were placed in the muffle a couple of bars of coke were placed in front of them. The front of the muffle was then closed with a cover consisting of alternate sheets of asbestos board and steel riveted together so as to give a thickness to the cover of about ¾ in. The object of luting the muffle and placing the coke at the front was to give a reducing atmosphere in the muffle so that if any metallic lead came to the surface of the melt it would not be oxidized and cupeled. The furnace was then filled with fresh coal to a depth of about 12 in. and the damper closed. I preferred a damper of the pudding-furnace type.


Hopper
6"
¼" Opening
Sets of Riffles ¼" wide with ¼" Spacings between.
Waste
Waste
Spout
Final Reduced Sample
A
The Engineering & Mining Journal

Device for Reducing Sand-slime Samples

The charge would slowly absorb heat from the highly heated walls of the muffle and the furnace. In about 20 or 25 min. a gentle hissing could be heard in the muffle, and if reducing conditions were right, on opening the muffle cautiously, the gases would burst into flame. At 30 min. or thereabouts, the damper would be opened slightly and an hour after the crucibles had been introduced the fusions would be perfectly quiet. At this time I would open the muffle and drop the proper number of nails in each crucible. By doing so at this time I found that the nails performed their function as well as though inserted at the beginning and they were not so heavily attacked by the slag. Moreover, the fluxes had a tendency when melted to rise on the nails by capillary attraction, and when they fell they would leave entangled shots of lead. Ores containing barite attack the nails heavily, but if the nails be introduced after the fusion is quiet it will be found that the soda will have thoroughly decomposed the barite, and the nails can be withdrawn in good condition when ready to pour.

After the fusion was quiet the dampers were thrown wide open and the furnace brought up to a white heat for 15 or 20 min.; the crucibles were then poured. The indications of a good assay were quietness in melting, the hissing sound being heard only by putting the ear near the muffle cover. The charge should not have risen above the line of the dry fluxes in the crucible. Lastly, a thin watery pour which when cold was black and glassy. A certain amount of water of crystallization in the fluxes is essential for a quiet melt. It is a well known fact that salts have their fusion point lowered by combined water. In northern camps it will be found if borax glass be used that the other fluxes and particularly the potash will absorb enough moisture from the air, in all but the driest months of summer, to obtain the quiet melting conditions. In the dry months of August and September in the Cœur d'Alene I used to keep my potash in a closed canister and sprinkle it from time to time.

Assay of Low-Grade Ore

For the lower grades of ore I have found the fire assay very erratic, it being impossible to plat a curve showing the difference between the wet and the fire assay for lead. At about 0.7 per cent. lead and lower the fire assay fails completely, no lead being recovered or only traces. Between 0.7 and 30 per cent. two samples showing the same per cent. lead by wet methods will often give widely different results by the fire assay. I am at a loss to understand these idiosyncrasies. It cannot be attributed entirely to improper fluxes or improper firing of the furnace as Table 1 will show. In assaying these samples, the fluxes were widely varied from day to day. On some days the muffle was badly cracked; on others it was in good condition; and of course the raising of the temperature varied for the different melts.

Above 30 per cent. lead the differences between the fire assay and the wet method are more regular. In the neighborhood of 80 per cent. there is little difference between the fire and the wet assay. The uncertainties in the fire assay are bound to make serious and variable errors in the reports of mill saving. In Table 2, assays of mill feeds by wet and fire assay are shown for a Coeur d'Alene mill for a period of four months. It was the custom at this plant to make up composite samples of the mill-feed samples semi-monthly, about 3 grams being taken from each daily mill sample, and submit this combination to fire and wet assay.

TABLE 1. VARIATION IN FIRE ASSAYS

Samples.	Aug. 24, Pb, Per Cent.	Aug. 29, Pb, Per Cent.	Sept. 3, Pb, Per Cent.	Sept. 8, Pb, Per Cent.	Sept. 12, Pb, Per Cent.	Sept. 15, Pb, Per Cent.
No. 1	5.2	4.9				
No. 2	6.0	5.0	6.0	5.9	5.8	5.9
No. 3	4.1	4.2	3.8	3.5	3.9	3.7
No. 4	15.1	15.8	15.3	15.4	15.3	
No. 5	8.6	9.3	9.2	8.8	8.8	
No. 6	1.0	1.0	0.8	1.0	0.9	0.8

COMPARISON OF WET AND FIRE ASSAY

Let us see what effect this would have on reported savings. Suppose the actual saving is 70 per cent. of the lead received by the mill during the above period and that the wet assay shown is the correct average assay for the same time. Then in 100 lb. of lead ore there will be 10.1 lb. of metallic lead. If the concentrate contains 56.5 per cent. lead, then with the assumed saving there will be 12.6 lb. of concentrate. Now the assay of the concentrate as reported by fire will be about 1.5 per cent. lower than by wet methods. The concentrate will then be reported as containing 55 per cent. lead. From 12.6 lb. of concentrate there will be reported 6.9 lb. of metallic lead. In the 100 lb. of feed as reported by fire assay there will be 8.9 lb. of lead and the saving under fire assays will be about 78 per cent.

TABLE 2. FIRE ASSAY AND WET ASSAY COMPARED.

Date.	Fire Assay, Lead. Per Cent.	Wet Assay, Lead. Per Cent.
May 1 to 15	7.0	8.46
May 15 to 31	9.0	10.48
June 1 to 15	8.3	9.84
June 15 to 30	9.1	11.15
July 1 to 15	8.8	10.80
July 15 to 31	9.1	9.42
Aug. 1 to 15	9.3	9.67
Aug. 15 to 31	9 9	10.92
Average	8.9	10.10

The salient point is that while with concentrates of the grades made in the district, the difference between the fire and wet assays is about 3 per cent. of the latter, the difference between the two kinds of assay on the feed may be over 10 per cent. The great differences between the wet assays of material yielding about the same per cent. lead by fire assay should be noted. In the two assays of July 1 to 15 the fire assay is nearly 20 per cent. lower than the wet figure. With inaccuracies in sampling and a fire return such as this the reported saving might run over 100 per cent. Such a grotesque result has happened to my knowledge.

It may be asked what average figure would represent the saving in the Cocur d'Alene mills. I might guess, but I do not know. If there are any reliable figures from any of the properties I am not cognizant of them.

(To be Concluded)

Oil Shale Development in Australia

Subscriptions are being invited for the Australian Oil Company, Ltd. The properties to be acquired are at Murrurundi and Capertee, in New South Wales, and have been reported on by Ronald Johnstone, Jr., of Glasgow. The oil is in shale similar to the Scotch shale and the samples give a favorable yield both in crude oil and sulphate of ammonia, the second-class shale giving a higher yield than the Scotch shales, while the first-class shale is much richer. The reporting engineer estimates that shale can be delivered to the retorts at 8s. per ton, in which figure are included all mining charges, or cost above and below ground, management royalty and transport of three miles to the retorts. Particulars are given in the prospectus of the various products that will be obtainable from the distillation of the crude oil. A bulk test of the shale was made at one of the oil works in Scotland, 85 tons of shale having been shipped for that purpose. This company will compete with the Commonwealth Oil Corporation which has been in existence several years but which has not yet reached the producing stage, on a large scale. The main properties of this corporation lie in the Wolgan and Capertee valleys, in the Blue mountains of New South Wales, about 120 miles from Sydney. The original capital provided for this undertaking proved inadequate and further funds had to be raised. The company, formed originally to work the oil shale, discovered soon after its formation a coking coal seam and a slice of the original capital was devoted to exploiting this seam and the erection of coke ovens. The corporation then acquired the properties owned by the New South Wales Shale and Oil Company which was then the only competitor in Australia.

The advantage of acquiring this property was that the corporation came into possession of works which enabled it to gain experience in the treatment of the oil shale. But the purchase swallowed up a lot of the capital intended for quite another purpose. Further unanticipated expenditure was required for building a railway to the Wolgan valley, where the retorts and refinery are being erected, over a distance of 32 miles of mountainous country. Besides financial troubles the corporation has had unfortunate labor experiences. For seven months last year there was a strike of miners in the Wolgan valley. In consequence of these difficulties, a good deal of time has been lost.

The outlook today according to the directors' report which has just been issued, is promising and it is hoped that production on a large scale will soon be an accomplished fact. The first bench of retorts will be completed soon and it is expected that before the end of the year the Wolgan refineries will be running for the manufacture of kerosene and motor spirit, and a few months later for the production of paraffin wax, lubricating oil and other products. During the fifteen months ended September 30, 1909, 20,000 tons of export shale have been sold.

The corporation hopes to do a large business in Australia which has a population of 4,000,000. At present, although Australia is a protected country, no duties are placed on such products as kerosene or motor spirit because there is no home product to protect. Whether Parliament will assist this new industry remains to be seen but it is clear that the corporation is looking for protection. As regards the raw material, the oil shale, it is claimed that there is an abundant supply. The longest tunnel in the Capertee valley has opened the shale bed for over 4000 ft. and at the working face the seam is 42½ in. thick in the thinnest part and in the widest 54 in. In the Wolgan valley shale is now being produced at the rate of 800 tons per week from a 2-ft. seam. From what has been said it appears that the corporation has got over the worst of its troubles and is now well on the road toward the establishment of a successful industry.

The South African government is making the recruiting of native laborers a national business. While South African statesmen are quoted to the effect that the labor problem is thus practically solved, the *Mining Journal* truly says that this problem can never be solved in South Africa any more than in England, America or Australia.

Sinking by Means of Underhanging Tubbing

Description of Plant and Method Used at Hamsterley Colliery. A Shaft 55 ft. Deep Was Sunk and 56 Tons of Tubbing Completed in 28 Days

SPECIAL CORRESPONDENCE

The Hamsterley colliery is situated in England about 10 miles southwest of Newcastle-on Tyne, and in his introductory statements, Mr. Cummings gave a section of the strata sunk through, as follows:

SECTION OF STRATA.

	Ft.	In.	Ft.	In.
Soil	1	0		
Sand, dry	2	9		
Sand, with water	9	6		
Sand, with gravel, heavily watered	12	6		
			25	9
Blue clay with boulders	6	9		
Large boulders	2	0		
Dark blue to black shale, very soft	11	8		
Seggar clay	3	0		
White post, very soft	5	6		
			28	11
Stronger and darker post	30	0		
			30	0
Total			84	8

Following a description of the sinking plant, the author explained the process of sinking, and with acknowledgments we make the appended extracts:

THE SINKING

A commencement was made by excavating an annular trench in the sand to a depth of 4 ft., with an outside diameter of 19 ft. An annular concrete foundation-ring, having an internal diameter of 10 ft. 10 in. and an outside diameter of 19 ft., and 3 ft. deep, was then laid, the top of the concrete being 1 ft. below ground level. The concrete block was strengthened by scrap-iron bars and rails laced across each other. The concrete was composed of equal parts of cement, sand, and broken bricks. Great care was taken to level the top of the concrete block, as this formed the bed for the cast-iron hanging ring, from which the whole of the tubbing was suspended, and upon this the vertical condition of the shaft depended.

The hanging ring or curb (Figs. 2 and 3) was of cast iron, 11 in. deep and 19¾ in. wide in the bed. It was in six segments, bolted together to form a circle 10 ft. in diameter inside the flanges. Three out of these six segments had holes sloping downward (Figs. 2 and 3) through which liquid cement was poured for grouting the course of tubbing below. All the joints were machined, and lead sheeting ¼ in. thick was placed between them to form a watertight joint.

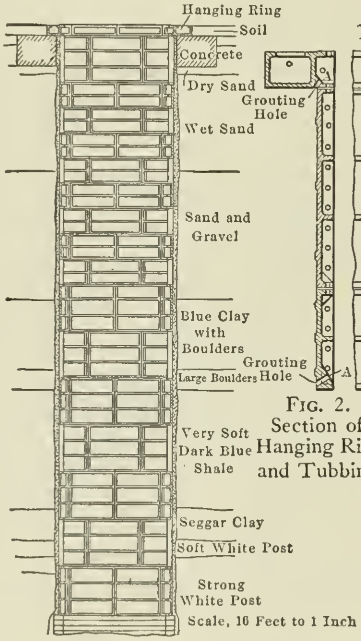
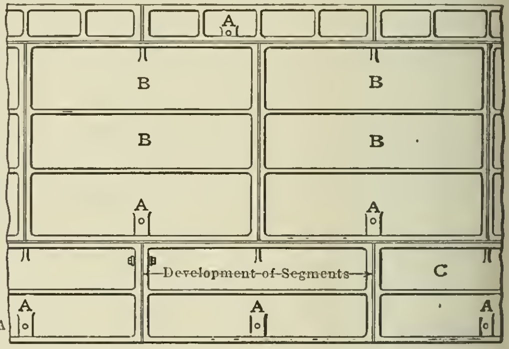


FIG. 1. Section of Shaft.

FIG. 2. Section of Hanging Ring and Tubbing.

FIG. 3. Development of Hanging Ring and Tubbing.



Scale, 4½ Feet to 1 Inch

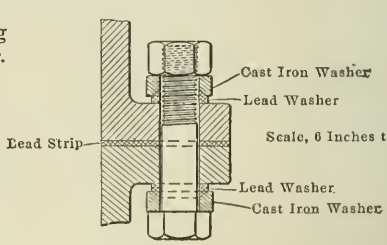


FIG. 4. Section of Joint.

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SHOWING METHOD OF SINKING THROUGH SAND AND GRAVEL BY MEANS OF UNDERHANGING TUBBING

The hanging ring was laid on the foundation with the inner flanges projecting over the edge of the concrete, the top of the ring being flush with the surface of the ground. As a further precaution against slipping, and in order further to spread the weight, two baulks of timber, 20 ft. long and 12 in. square, were laid across, one at each side of the pit, and bolted to the hanging ring.

The sand was then taken out of the center of the pit for a depth of 5 ft. This was done without difficulty, as there was a concrete lining for a depth of 3 ft. A course of tubbing was then put in and bolted to the bottom flange of the hanging ring, strips of lead sheeting being inserted between all joints, both vertical and horizontal, before the bolts were put in.

The bolts being thoroughly tightened up, the space at the bottom of the tubbing all round the shaft bottom was rammed tight with well puddled clay, and liquid cement was poured into the grouting holes of the hanging ring above so as to fill up the space behind the tubbing. Long tapered plugs were driven into the bottom grouting holes, these having a twofold purpose, first, to prevent the liquid from being wasted, and second, to preserve the holes for grouting the next course below.

DESCRIPTION OF TUBBING

The tubbing (Figs. 2 and 3) is of cast iron, 1 in. thick, with six segments to the circle. It is in two sizes, namely, eight courses of segments, *C* 2 ft. 5½ in. deep., for going through the sand and worst ground, and eight courses of segments, *B* 4 ft. 11 in. deep (Fig. 3). The object of the deeper rings was to save joints, as these, being machined, are costly. Every alternate segment in the circle is provided with a grouting hole *A* just above the bottom flange (Fig. 2), which slopes downward as in the hanging ring. All the joints are made with strips of sheet lead ¼ in. thick, accurately cut to pattern (Fig. 4), each strip projecting ⅛ in. beyond the face of the joint to allow for caulking, which was done after the tubbing was completed. The bolts were all turned 1 5/16 in. in diameter, and to prevent the threads from being damaged, ⅛ in. of it was turned off at the end of each bolt. In order to make the bolt holes as well as the joints watertight, a conical lead washer (Fig. 4) was put on next the flange at each end of the bolt, and a metal washer (Fig. 4)

NOTE—A paper by John Cummings, entitled "Sinking the John Shaft at Hamsterley Colliery, Through Sand and Gravel by Means of Underhanging Tubbing," presented to the North of England Institute of Mining and Mechanical Engineers, at Newcastle-on-Tyne, [illegible] 11, 1909.

ving an inverted cone to fit over the ad one, was put on next to it. When e nuts were tightened up, the soft-lead asher was squeezed between the cast on of the flange, and the conical space the metal washer and formed a per- ctly watertight joint.

It will be seen from Fig. 2 that small ojecting horizontal ribs were cast on e outside of the tubbing. These formed pports for the tubbing in the cement outing.

Fig. 1 gives a section of the shaft as bbed. It will be seen that at the sur- ce a course of deep segments was put , as the ground was fairly easy, and it as deemed advisable to keep shallow gments for the worst ground. The 8 allow courses were next inserted, the mainder of the deep segments being put last. Before the sixteenth course was ut in, the sinking had reached a good rm stone; this last course was, there- re, not quite so necessary and was ot inserted until later. The sinking was carried down for over 30 ft. into the post stone, when a walling bed was formed and the shaft was lined with walling lumps 9 in. thick. This walling was carried up to within about 6 ft. of the bottom of the tubbing, and a wooden crib of elm was made to suit and laid on the top of it, being wedged firmly from behind. The last course of tubbing before mentioned, was then put in, and the joint between it and the crib wedged and made tight.

The Total Weight of Tubbing Was 56 Tons

While the sinking and walling was being carried below it, the whole length of tubbing remained suspended from the hanging ring at the surface, entirely without support at the bottom (except so far as it was self-clinging in the grouting) until the walling was joined up below it. The total weight of tubbing with bolts, etc., in the shaft was over 56 tons.

The time occupied in sinking the shaft, putting the grouting, and completing the tubbing to a depth of 55 ft. from the surface, was 28 working days, including the time occupied in laying the hanging ring, but not including a stoppage of 6 days after the tenth course was finished in the boulder clay, due to a consignment of bolts being delayed in transit.

In concluding, Mr. Cummings said that the only objections to this method of tubbing, so far as he can see, are: (1) The absence of a good foundation from which to suspend the tubbing; (2) the difficulty of getting in the grouting against high pressures; and (3) the difficulty of securing a tight joint at the bottom of the tubbing courses to hold the grouting when the pressure is greater than usual.

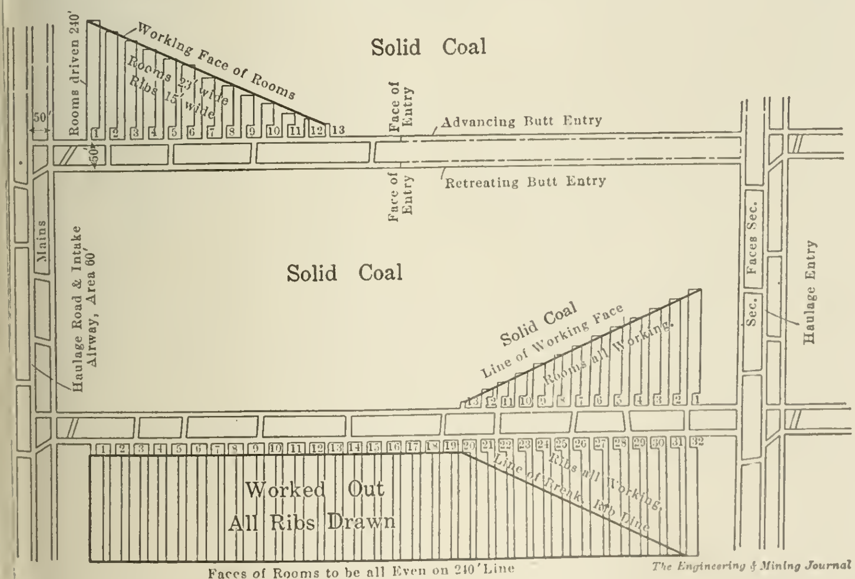
We are indebted to the North of England Institute for copy of engraving enabling us to illustrate Mr. Cumming's description of the sinking of the John shaft.

Advance and Retreat Room-and-Pillar System

BY H. J. NELMS *

The advance and retreating system of perating a coal mine where the room- nd pillar system of mining is used, is e most consistent to employ.

Three face entries, on 50-ft. centers, re driven parallel to the main entries 1400-ft. intervals. The sectional area the face entries is kept as nearly as ssible to a 60-ft. standard in a 5-ft. am.



LAN FOR DEVELOPING A COAL MINE ON THE ADVANCING-AND-RETREATING SYSTEM

It is advisable where possible to use three face entries for intake airways; the middle entry can be used for a haulage road, and should be confined to itself and not enter into the ventilation at all.

No. 1 room on the butt entry can be driven 16 ft. wide and used as a return airway. When the No. 1 room is maintained for an airway, it should be widened toward the face or main entry and be driven on 70-ft. centers with the face entry. A 30-ft. pillar of solid coal should be left between No. 1 and No. 2 rooms; No. 1 rib can then be easily extracted when robbing is commenced on this butt entry.

The gob in No. 1 room should be kept as low as possible and if slate is dumped outside and easily handled, then all the slate from the No. 1 room should be loaded and dumped outside; the superintendent then has a return airway, 16 × 6 ft. = 96 sq.ft., which is large enough under most any circumstances.

Butt entries should be turned every 450 ft. A chute is driven on a 60-deg. angle, from the middle main entry to the outside main for haulage. The butts are turned on a 90-deg. angle, and are driven on 50-ft. centers for a distance of 1400 ft. A 60-deg. chute should connect the butt entries 25 ft. from the center of the outside main for haulage from the butt entry. It is bad practice cutting corners off break-throughs.

Each butt entry should maintain a sectional area of about 50 sq.ft. and be driven perfectly straight. It seems impossible to convince mine foremen that straight entries overcome the troubles of track laying, cars jumping track, etc., and that it is as easy to drive them straight as crooked.

The best engineering practice today advocates having entry sights so that they are never more than 180 ft. apart; this gives a mine foreman a good chance to keep his sights well up. In providing ventilation, I believe that two pairs of butts on one split make a good method. The rooms should be turned 90 deg. off butts and driven as shown in plan.

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*Engineer, Castle Shannon, Penn.

General System of Development

No. 1 room should be started as soon as possible, then No. 2 and so on from the advancing butt entry. When No. 2 room is finished working on the face, No. 14 should be just started; when No. 2 rib is out No. 14 room should be just finished and No. 27 room just starting. The ribs must be extracted as soon as each room is finished, no matter whether the next room on the advance side is finished or not; the rib is started while the next room is still 30 ft. from being finished. When No. 32 room is finished working on the face, No. 19 rib is just finished, also No. 1 room on the retreating butt is about finished and No. 13 room just started. As soon as No. 2 rib on the retreating entry is finished, it is advisable to start extracting immediately the butt-entry stumps and chain pillar, bringing everything along with the retreating butt and closing entry in tight, knocking out the brattice in each succeeding break-through for ventilation.

This method of operating is the most consistent method to use where the room-and-pillar style of mining is used. The rib men and the machine loaders are always separate, you confine your workings to the smallest space possible for a large tonnage and you can easily ventilate it. You will not have your mine dotted with old abandoned workings if this method is consistently used and maintained. Any system that keeps the area of old workings down to a minimum is surely the scheme to adopt.

When a set of butts are worked by this method, they are off the operators' hand when once finished. There is never any danger of a squeeze as every movement of the rock runs up against solid coal, and for this reason it is impossible to have a squeeze swing across a set of butts to another set as it generally does where both entries are worked advancing. The accompanying drawing shows how this system is worked, and five pairs of butts developed on this plan are capable of producing from 1000 to 1500 cars of coal a day.

Small mule "partings" should be at the bottom of each pair of butt entries and the distance for mule haulage will then be as short as possible.

The coal from these partings can be gathered by a 6- or 8-ton locomotive, and delivered to a larger parting where a "dilly," or large locomotive can take it outside.

The directors of the Great Northern railway have filed with the Montana Secretary of State a copy of their resolution authorizing the construction of a branch line from the town of Vaughn in Cascade county along the Sun river west into Lewis & Clark county, a distance of 58 miles. It is thought that the line may eventually be extended over the divide.

The Cost of Electric Shot Firing

Special Correspondence

James Douglas, in a paper before the North of England Institute of Mining and Mechanical Engineers on Dec. 11, 1909, says that simultaneous electric firing from a switchboard outside the mine is an absolute safeguard, not against explosions of coal dust through misfires, or against fire, but against loss of life. He describes the application of the system at Dawson, N. M., devised by David Crow, general superintendent of the Stag Cañon Fuel Company. It consists in firing simultaneously all the shots when all the workmen are outside the mine, by closing for a second a switch in a cabin on the side of the hill away from the pit mouth. The system has been installed for somewhat over a year, and has given entire satisfaction.

Rules Governing Firing

The following are the rules governing the firing:

(1) The mining or cutting must in all cases extend at least 6 in. beyond the back of the holes.

COST OF SHOT FIRING BY ELECTRICITY.

	Mines Nos. 1 and 2.	Mine No. 4.	Mine No. 5.	Total.
Tonnage (short tons)	50,929.15	19,571.80	23,259.35	93,760.30
Drilling, firing and loading	$30.02	....	....	$30.02
Checkman	132.90	....	$67.26	200.16
Wiremen	118.20	$81.00	78.00	277.20
Shot inspector	241.16	100.75	102.39	444.30
Repairing shot-firing wires	54.09	67.21	20.34	141.64
Tapping material	....	....	2.45	2.45
Tamping and powder boxes	3.00	....	....	3.00
Incidentals	0.62	....	....	0.62
Total	$579.99	$248.96	$270.44	$1,099.37
Cost per ton (cents)	1.14	1.28	1.16	1.17

(2) All holes must be at least 30 in. in length; no shorter holes will be fired.

(3) All coal dust must be extracted from the holes before they are charged.

(4) No holes must be charged with more than five sticks of powder.

(5) Standing holes or parts of standing holes must not be recharged.

(6) The holes in a tight corner must be at least 12 in. from the rib at the back end of the holes.

(7) In solid faces, holes must not be more than 6 ft. apart horizontally, and not less than two such holes shall be fired.

(8) The object of these rules is to prevent and remove the danger from blown-out or windy shots; and it shall be the duty of shot inspectors, in addition to the above rules, to refuse to shoot any holes which in their judgment may be dangerous whether the circumstances are fully covered by the rules or not.

Every Man Must Be Accounted for

Every man must be accounted for before the firing is done, and if a man is missing, Mr. Douglas says the shot firer must find him. In connection with the firing system, one wireman, or shot firer, and two fire bosses are employed. Before the wireman enters to connect up the firing circuits he must see that all the employees are out of the mine and that the power is cut off, and after shots have been fired ascertain that all firing circuits are disconnected from power lines. He is also required to see that the firing lines are kept up in good shape, and furnish the miners with wire for repairing lines. After reporting that the switches are all connected, he remains for at least an hour after the shots are fired, and then reënters and disconnects the switches, looking in the return from each split to see whether there are any indications of fires in the mine.

The duty of the fire bosses in connection with the firing system is to distribute electric caps. They examine all shot holes in their districts before they are charged, to see that they comply with the rules governing the same; then they issue the number of caps necessary to fire properly the shots prepared by the miners.

Mr. Douglas submits the accompanying table showing costs of shot firing by electricity at Dawson mines.

Production of Ammonia and Ammonium Sulphate

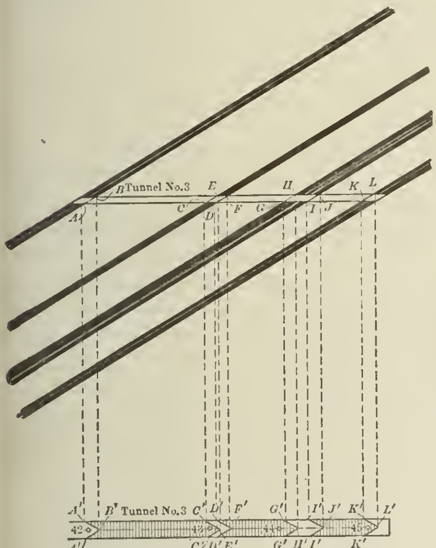
According to statistics collected for The Mineral Industry, the production of ammonia and ammonium sulphate in the United States in 1909 amounted to 106,500 tons (all forms expressed in terms of the sulphate equivalent), of which 75,000 tons came from by-product coke-oven plants, and the remainder was recovered in the manufacture of coal gas, bone black, etc. The production was 23,400 tons in excess of the 1908 output, and 7200 tons more than the recovery in 1907, the best previous year. Imports into this country for the fiscal year ended June 30, 1909, amounted to 40,192 tons, as compared with 34,274 tons in 1908, and 32,669 tons in 1907. The average quotation for domestic ammonium sulphate for the first six months of 1909 was $2.90 per 100 lb., and for the last six months a shade under $2.70, making an average price of $2.80 for the year.

Tunnel Survey in an Anthracite Colliery

By D. P. Jones

The accompanying field notes illustrate the general method employed in taking side-notes of a tunnel survey in the coal-fields of Pennsylvania. Young engineers are often confused when recording, in the small space of a field note-book, the data obtained in locating the various seams that have been cut by a tunnel. In the lower left-hand corner, I have recorded the kind of survey to be made, under that, is the name of mine and the date of the survey, and lastly, the names of the party taking the notes.

The survey party consist of two men (only those who take the side-notes are considered here), first and second assistant transitmen. The first assistant transitman holds the reel end of a steel tape at station 43 while the other man takes the end of the tape at station 42. After a gentle pull to straighten the tape, it is laid on the floor on the line of the two stations, 42 and 43. When the distance between the two stations becomes greater than approximately 150 ft., the first assistant transitman comes back half way between the two stations and records the data obtained by the other man at various places, measured at right angles to the line of the tape. The notes show that station 42 is located in the center of the tunnel No. 3. The station in the notes is indicated by a circle with a dot inside.



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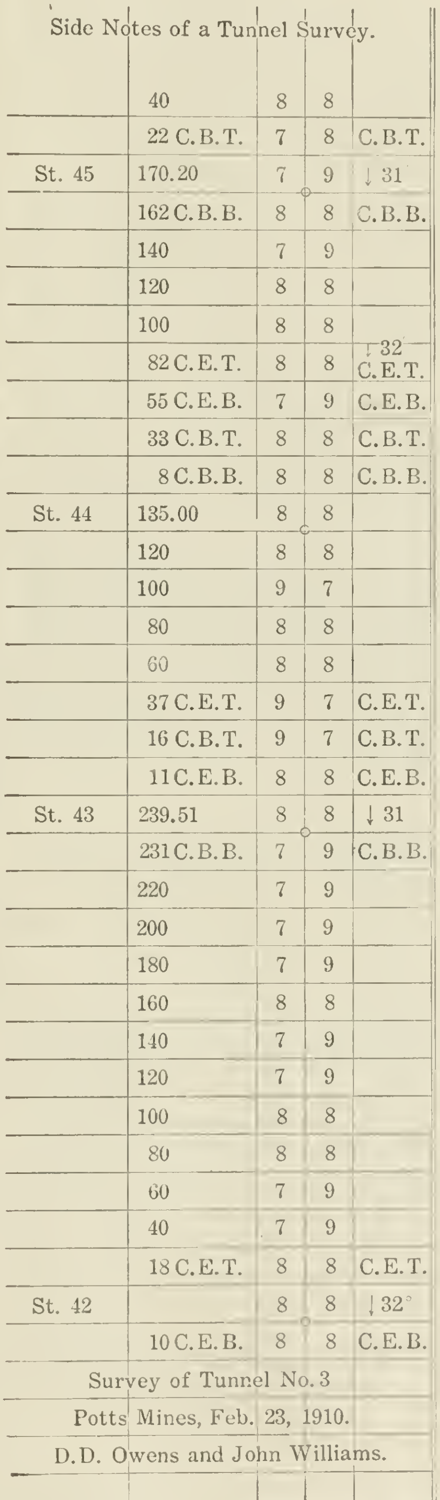
Showing Section of Tunnel as Related to the Different Coal Seams

One line below station 42, is minus 10 (— 10) at which point the bottom of the seam and the bottom of the tunnel intersect. It is indicated in the notes as *C. E. B.* or "coal ends at bottom." At plus 18, you will note *C. E. T.*, or "coal ends at the top," or the intersection of the floor of the seam with the roof of the tunnel. On the right side of the notes at station 42, the pitch of the seam is indicated by an arrow, with the number of degrees on one side of it. The accompanying section of the tunnel shows clearly where these points are.

Points *A* and *B* are station 42, — 10 and + 18 respectively; point *C* is station 42 + 231, and so on. All these points in the tunnel No. 3 are located and recorded in the field note-book. To show these points correctly on the plan of the tunnel is another puzzle to some engineers. The plan of tunnel No. 3 is projected below the section and the points *A B C*, etc., are also projected on this plan as indicated by the dotted lines. When the bottom of the tunnel intersects the seams, as at *A C D G*, etc., as shown in the section, these points on the plan of the tunnel as shown by the projection of the section, correspond to *A′ C′ D′ G′*, etc., or along both sides of the tunnel, while the points, *B′ E′ F′*, etc., on the section correspond to *B′ E′ F′*, etc.

In other words, the intersections at the bottom of the tunnel correspond to the sides on the plan, and the intersections at the roof correspond to the points at center of the tunnel. These points on the plan map are connected at *A′ B′*, *C′ E′*, etc. Thus forming V's, and the area between the V's and *A′ C′ D′ G′*, etc., are cross hatched to represent the rock work, while that of the unshaded portions represents the intersections of the seams with the tunnel. It will also be observed that the vertex of the V's shows the direction in which the seam dips. The side notes above illustrated can be platted on a plan map without the aid of a section.



Side Notes of a Tunnel Survey.

	40	8	8	
	22 C.B.T.	7	8	C.B.T.
St. 45	170.20	7	9	↓ 31
	162 C.B.B.	8	8	C.B.B.
	140	7	9	
	120	8	8	
	100	8	8	
	82 C.E.T.	8	8	↓32 C.E.T.
	55 C.E.B.	7	9	C.E.B.
	33 C.B.T.	8	8	C.B.T.
	8 C.B.B.	8	8	C.B.B.
St. 44	135.00	8	8	
	120	8	8	
	100	9	7	
	80	8	8	
	60	8	8	
	37 C.E.T.	9	7	C.E.T.
	16 C.B.T.	9	7	C.B.T.
	11 C.E.B.	8	8	C.E.B.
St. 43	239.51	8	8	↓ 31
	231 C.B.B.	7	9	C.B.B.
	220	7	9	
	200	7	9	
	180	7	9	
	160	8	8	
	140	7	9	
	120	7	9	
	100	8	8	
	80	8	8	
	60	7	9	
	40	7	9	
	18 C.E.T.	8	8	C.E.T.
St. 42		8	8	↓32°
	10 C.E.B.	8	8	C.E.B.

Survey of Tunnel No. 3
Potts Mines, Feb. 23, 1910.
D.D. Owens and John Williams.

The Engineering & Mining Journal

Showing Method of Recording Field Notes

Mexico's Coal Output

The reports of the mining companies in Mexico show that a total of 919,338 metric tons of coal was produced in 1909. It is estimated that this production will be largely increased in 1910. Practically all of the mines are situated in the state of Coahuila, although there are said to be extensive undeveloped coal-fields in other parts of the republic. The coal produced in the Coahuila field is of the coking grade, and during 1909 a total of 150,000 tons of coke was made. Three companies are now building the new type of retort oven, which will make coke in 48 hours, against 72 hours required by the older process. It is announced that the Mexican Coal and Coke Company, an American concern, will soon have 50 of these ovens in operation. The Lampacitos Coal Company is erecting 30 of the ovens, and the Rosita Coal Company will soon have 60 of them. In the Cleote district a battery of 60 beehive ovens was finished in October, and a secondary plant of 60 more ovens is now being installed. It is claimed that at the present rate of development of the coal industry in Mexico, it will be only a few more years when it will be unnecessary to import coal from the United States.

The Oliver Iron Mining Company, a subsidiary of the United States Steel Corporation, operates more than 150 steam shovels in its Lake Superior iron-mining operations.

Underground Fires in Gassy Mines

Special Correspondence

In the course of a paper on "A Natal Colliery Explosion and Underground Fires in Fiery Mines," presented at the meeting on Dec. 11, 1909, of the North of England Institute of Mining and Mechanical Engineers, William Taylor Heslop indicates the precautions that should be taken in dealing with a fire where firedamp is issuing from the coal. He says the conditions must be so controlled that there is a minimum danger of accumulation of firedamp in explosive proportions at a point not in contact with the fire, but which, as the accumulation increases, may possibly be brought into contact with the still active fire. It is therefore necessary that the area dammed off should be confined within the smallest possible limits. If it should happen that it became necessary to dam off both of a pair of main headings, of which only one was on fire, then, provided that there was no accumulation of firedamp, it would, so soon as preparations for building the dams were completed, be advisable to ignite the gas blowers in the second heading, before commencing the actual work of building the dams.

Air Should Not Be Decreased

Until the building of the dams has actually been commenced, Mr. Heslop says it is preferable that the fire should burn fiercely, so that combustion may be rapid and the air inside the dams be quickly consumed. It is, therefore, not advisable to decrease the amount of air passing over the fire until the preparations to shut it off completely are concluded. This would be accelerating the exhaustion of the oxygen within the dams, reduce the likelihood of any unignited blower of gas accumulating in such quantity as to cause an explosion before the active combustion, or flame of the fire had ceased.

Where the blower of firedamp is insignificant, and the resultant fire very small, a chemical fire extinguisher depending on the generation of carbon dioxide might be tried, but in case of a large fire, the fire itself would furnish the carbonic acid gas in sufficient quantity more readily.

In the view of the author, it is of vital importance that after the air supply has once been shut off from the fire, the greatest precautions should be taken to prevent any possible readmission of air. As soon as the activity of the fire has ceased and the gases begin to cool, then in a rising or level place the carbon dioxide would find its way along the floor away from the region of the fire, and if it were possible, fresh air would rush in to take its place.

In a dip place the risk of rekindling the fire would not be so great, but the risks of accumulation of an explosive mixture at a point not in initial contact with the fire might be greater, unless specially provided for by the arrangements made.

Mr. Heslop recalls that the point has sometimes been raised whether the intake or return road should be first shut off. In practice, he says, it will generally be found difficult indeed to deal with the return airway first, on account of the state of its atmosphere, as far as breathing and working are concerned. Apart from that, the selection should depend on that which would be less likely to cause an accumulation of firedamp away from initial contact with the fire.

It must always be remembered that the cutting off of either airway will stop the supply of air to the fire, except so far as connection currents and diffusion are concerned. If one dam is at a lower elevation than the other it would be preferable to shut it off first, with a view to giving any firedamp a better opportunity of escaping by the higher airway.

In a reference to the conditions obtaining at Glencoe and North Cambrian collieries in Natal, Mr. Heslop says that ultimately the zone of foul gases formed the only barrier, preventing the ingress of fresh oxygen to the fire. That zone was of such an extent that neither diffusion nor convection currents were able to break through it after the final explosion until the embers of the fire were effectually extinguished, but in each case convection currents were able to break through the zone of oxygen depleted gases left by the earlier and smaller explosions.

Explosives Forbidden in Coal Mines of Austria-Hungary

Special Correspondence

The government of Austria-Hungary has decided to stop the use of explosives, "safety" or otherwise, in all coal mines of the danger class. The law just issued recognizes three classes of mines: (1) Gaseous or fiery mines. (2) Medium-gaseous mines. (3) Nongaseous mines. Powder is abolished absolutely from all mines in the first class. To all proprietors of mines in the second class, it is recommended that mechanical means for bringing down the coal be used. As a consequence of this recent legislation, the hydraulic mining cartridge is being largely employed for breaking down hard coal.

To timber all the coal mines in North America controlled by the United States shareholders requires yearly a forest area of 1458 square miles.

COLLIERY·NOTES

Conductors for shot-firing circuits are composed of single wires, or of a number of wires twisted together to form a small cable; the latter type have the advantage of greater flexibility and consequently less liability to rupture in the frequent coiling and uncoiling of the firing line. It is also true that a stranded cable will withstand blows from pieces of coal or rock and other rough treatment much better than a solid wire.

Watering, when properly carried out, constitutes an effective method of preventing coal-dust explosions. However, a universal rule as to complete watering is impracticable. In some mines the watering of the floor is possible, and other mines admit of water being judiciously applied to the roof and sides; however, the latter class of mines are exceptional. The "man and hose" system of watering is best, as it enables the water to be applied judiciously.

In Great Britain alone, 106 mine explosions have been caused by shot-firing during the past 10 years. In the same period more than 3000 persons have been injured and over 500 killed by accidents arising out of the use of explosives. Statistics show that in England, on the average, one person is injured every day and one dies as the result of his injuries each week throughout the year. Practically all of these casualties are the result of inexperience or thoughtlessness and form a powerful argument in favor of the employment of men who are known to possess sufficient knowledge of the duties upon which they are engaged.

There is much talk at present concerning the high cost of living and the necessity of advancing wages to meet this added expense. According to "Bradstreet's," the cost of living in the United States has increased 61 per cent. from 1896 to 1910. If the coal miners secure a 5-cent advance in present wages, the increase in their wages since 1897 will have amounted to about 70 per cent. This is a matter of record and refutes the general idea that wages of coal miners have been advanced but 20 per cent. in the past decade. Moreover, the miners have obtained various other concessions by way of shorter hours and better mining conditions, which give them additional advantages. It is not generally realized how dependent the coal operator is upon the wage scale; while the average manufacturer has both labor and material as distinct elements in his cost sheet, the coal operator has but little charge to make for the cost of material, because his expense is composed chiefly of labor. An advance in the wages of coal miners, therefore, cannot be overcome by buying materials at the same, or a lower price.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Robert T. Hill has returned from London.

C. W. Purington is paying a visit to this country.

J. P. Hutchins is in St. Petersburg, on his way to Siberia.

J. Morgan Clements, of New York, has been in Butte, Montana.

J. Parke Channing is expected to arrive in New York next week.

Pope Yeatman leaves New York for Nevada at the end of this week.

Dwight E. Woodbridge has left Duluth for a month's absence in Sonora, Mexico.

R. V. Norris has returned from Mexico, where he has been doing some personal work.

H. R. Stobie has been appointed assistant metallurgist at the Rio Tinto mines.

A. McLean, of Montreal, has been chosen a director of the Vulture Mines Company, of Arizona.

T. Lane Carter addressed the students of the University of Tennessee at Knoxville recently, on mining in South Africa.

Frederick J. Mayer, of Baltimore, is engineer in charge of construction of the new by-product coke plant of the Bethlehem Steel Company.

Gustav Berentsen, of Pittsburg, has taken charge of some gold mines owned by Louis Dunker & Co., near Salisbury, North Carolina.

L. S. Ropes and R. McIntire have formed the firm of Ropes & McIntire, and have opened offices in the Power block, Helena, Mont., as consulting and mining engineers.

Capt. L. B. Anderson, one of the largest operators in the Fairbanks district, will spend the coming season investigating the quartz possibilities of the Kenai peninsula, Alaska.

W. D. Thornton, president of the Greene Cananea; Arthur C. Carson, general manager of the Red Metal Mining Company; and P. L. Foster, of El Oro, were recently guests of Dr. L. D. Ricketts, at Cananea, Mexico.

Ezra Allendorf, of New York, vice-president and general manager of the Excelsior Zinc and Lead Company, has taken active charge of the company's mines at Joplin, Mo. C. V. Sholl, formerly local manager, has resigned.

W. G. Sharp, president of the United States Smelting, Refining and Mining Company; with Frederick Lyon, vice-president, Stephen L. Bartlett and S. Preston Clarke, directors, are inspecting the Real del Monte mines at Pachuca, Mexico.

H. B. Barling, formerly with the Compania Metalurgica y Refinadores del Pacifico, has been appointed assistant superintendent and chief engineer of the San Antonio Copper Company, one of the Cole-Ryan organizations operating at San Antonio de la Huerta, Sonora, Mexico.

Charles H. Shamel, author of "Mining, Mineral and Geological Law," who is engaged in the practice of law at Seattle, Wash., is delivering the annual course of lectures on mining law to the senior law class and the mining students of the University of Washington at Seattle.

A private geological survey of Tonopah has been undertaken by the principal producing mines of that camp, who have invited J. E. Spurr, of Spurr & Cox (Inc.), to make detailed geological surveys of the development work done since his original examination of that district.

Brooks Fleming, Jr., has been appointed superintendent of the Robinson Run mine of the Consolidated Coal Company in the Fairmont district in West Virginia. John Riggins has been made superintendent of the Pinnickinick, and D. A. Reed of the Ocean mine, in the same district.

OBITUARY

Henry S. Brooks, who died April 13 at Dobbs Ferry, N. Y., had been known of recent years chiefly as an editor and writer. From 1860 to 1895, however, he was a resident of California and a prolific writer on mining topics.

Sir Robert Giffen died in London, April 12, aged 73 years. He was born in Scotland, and was employed in Glasgow for several years, going to London in 1862. For a time he assisted Mr. Morley in the *Fortnightly Review;* from 1868 to 1876 he was assistant editor and principal contributor to the *Economist*, under Mr. Bagehot, being also, from 1873 to 1876, writer of the trade and finance article in the *Daily News*. In 1876 he was appointed chief of the statistical department of the Board of Trade. This office was merged in 1882 in that of assistant secretary, commercial department, and in 1892 the branch was again enlarged, and Sir R. Giffen was appointed controller general of the commercial, labor, and statistical departments. In his connection with the press he was a contributor to the *Fortnightly Review*, *Saturday Review*, *Spectator* and other journals, and in his official capacity had written numerous reports on commercial matters, besides giving evidence on similar subjects before numerous committees of the House of Commons and royal commissions. In 1892 he was elected a fellow of the Royal Society; In 1881 Mr. Giffen resigned his post at the Board of Trade, and was understood to have been for some time on the staff of the *Times*. He retired finally in 1897. He was the author of "Stock Exchange Securities: An Essay on the General Causes of Fluctuation in Their Price," published in 1878; "Essays in Finance," and of many shorter papers and articles on statistical and economic subjects.

SOCIETIES and TECHNICAL SCHOOLS

Engineers' Society of Western Pennsylvania—This society has moved its quarters to the 25th floor of the Oliver building, Sixth avenue and Smithfield street, Pittsburg.

Engineering Association of the South—The Birmingham Section on April 7 visited the University of Alabama and inspected the new buildings of the technical department and mining school of the University.

Wisconsin State Mining Trade School—During the week beginning April 4 Director H. C. George took the seniors of this school at Platteville on a geological and mining inspection trip in the Wisconsin lead and zinc district. The St. Rose, Klar-Piquette, Cruson, Light and Homestead mines near Platteville were visited. The mines of the Highland, and the Franklin Mining companies at Highland were also visited, as well as the zinc oxide works and the sulphuric-acid works at Mineral Point.

Lafayette College—A small concentrating mill has recently been erected in the laboratory of this institution at Easton, Penn. It is designed to give practical results in handling small quantities of ore. The equipment includes a Blake crusher, three sets of Cornish belt-driven rolls, an ore feeder, two elevators, trommels, three five-compartment New Century differential-motion jigs, concentrating table, round buddle, hydraulic classifier, spitzkasten and a 1½-in. centrifugal pump, together with ore bins, shafting, pulleys, etc. All of the machines are of laboratory size. The mill will be driven by a 10-h.p. A.C. motor.

American Chemical Society—The summer meeting will be held in San Francisco, July 12-15. For the accommodation of eastern members, a special train will start from Chicago July 4 making stops at Colorado Springs; Adamana where the petrified forests can be seen; the Grand Cañon of the Colorado; Riverside and Los Angeles, Cal.; Lang, where the borax mines can be visited; and Santa Barbara. In connection with the meeting the local committee in San Francisco has arranged for a number of excursions to points of interest. Members desiring to use the special train should address Charles L. Parson, New Hampshire College, Durham, N. H., the secretary who has general charge of the arrangements.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

April 16—Much activity in mining is being shown in Siskiyou county. Gold dredges are at work during a part or all of the year at the head of Scott river near Callahan and at Hamburg bar on the Klamath river. A small dredge has just been completed on McAdams creek near Fort Jones, built by the Yuba Construction Company. It is equipped with buckets of 5 cu.ft. and is capable of digging to 60 ft. The power is supplied by the Siskiyou company. Formerly a dredge was operated on Yreka creek at Hawkinsville, north of Yreka.

Hydraulic mining still affords the main part of the gold product of Siskiyou county. Local buyers state that more placer gold is brought in than for several years.

Quartz mining is likewise progressing but much of the gold comes from comparatively small properties and from "pocket" mines. The mill of the Zarina mine in the Taylor Lake basin is in full operation as also that of the Lappin mine. The new mill of the Oom Paul mine is ready to operate. It is equipped with electric power. Work has been resumed on the Highland mine, famous for its specimen ore, and on the Big Cliff. The Central mine, adjoining the Hazel, 18 miles northeast of Hornbrook, has been bonded for $50,000 to New York parties. H. O. Cummins, the engineer who promoted the deal, will be retained as manager.

The Cassidy Consolidated Gold Mining Company has been incorporated to take over the Cassidy group of quartz claims between the Empire and Pennsylvania mines at Grass Valley. The early operations on these claims did not extend below the 200 level on account of a heavy flow of water. It is the intention of the new owners to sink to 1000 ft. The adjoining Empire shaft is down 3650 feet.

The formations of the mountainous sections of Tehama and Trinity counties are composed of rocks of the aurifierous slate series and the accompanying igneous rocks. In these mountains are many metalliferous deposits, which have only been worked intermittently on account of high costs due to remoteness from the railway. The manager of the Tomhead copper mines, 40 miles west of Red Bluff, announces that Chicago capital has been interested to build a broad-gage railway from Red Bluff via the Tomhead mines, westward to Eureka on the coast. Eureka is the most important port on the north California coast and has a good harbor. It will soon be connected with San Francisco by the extension of the Northwestern Pacific Railway and if the projected line from Red Bluff is also built, it is likely that mining will be much facilitated not only in Trinity and Tehama counties but also in Mendocino and Humboldt. The new line will perhaps supplant the projected line from Redding to Eureka, by way of the Trinity river basin.

H. H. Yard located and held by assessment work for some years between 600 and 700 placer-mining claims along the north fork of Feather river in Butte and Plumas counties. The Government finally investigated the manner of location of these claims and a number of them were officially declared not to be mines because there had been no discovery of mineral. All the fuss about them amounted to little because nobody else wanted the claims as separately they were of little value and had been lying idle for many years open to location. Yard claimed that he intended to work them as a whole group when the Western Pacific laid its rails through the cañon of the North Fork, taking up the gravel by steam shovel, loading it on cars and taking it down to a point where it could be washed. It cost Yard and associates some $60,000 or $70,000 per annum for annual assessment work. About the last of his large holdings, including 121 placer claims, have now been conveyed to the Northern California Mining Company, of which he was formerly president. Whether or not the company will ever work them on the plan originally proposed remains to be seen. The claims recently deeded are situated near Big Bend in Butte county.

Negotiations are nearly completed by which a British syndicate will acquire the properties of the Pinal Oil Company in the Santa Maria field. This company has paid to date dividends to the amount of $872,109.

Denver

April 18—A new pump with a capacity of 1000 gal. per min. is to be installed in the Wolftone shaft, Leadville, at the 1000-ft. level. It is the only pumping plant in operation on Carbonate hill, and also drains a large proportion of Fryer hill, and it is stated that with the addition of this new pumping plant, a large proportion of the district east of the city will be drained. For this and other reasons, more than ordinary activity among the old mines of this hill is expected during the present year. The Matchless, for which H. A. W. Tabor paid $117,000 in 1879, and the Robert E. Lee, which was bought from the original owners for about $7000 in 1879, and in October of that year produced $125,000 in 10 days, and in January, 1880, $301,500, are both being worked under lease, with excellent results. The Matchless is under lease to T. M. Raney, of Leadville, and the Robert E. Lee, to William Jones. Good ore is being produced from both mines, and great things are expected.

The smeltery of the North American Smelter and Mines Company, at Golden, will be blown in shortly. The manager, George Vivian, has a supply of lime and coke in the bins, and a good supply of ore from Clear Creek and Gilpin counties is being received.

The Künzel smeltery, at Buena Vista, is reported to be running steadily, and a $5 freight rate has been made from Ouray to Buena Vista on all ore not exceeding $25 per ton valuation.

When Winfield Scott Stratton, the discoverer of Stratton's Independence mine, died in 1902, he left the bulk of the great fortune he took out of that mine for the endowment of the Myron Stratton Home for the Aged. The present value of the estate is about $8,500,000. This has been now practically wound up, and the three administrators have been allowed $207,684 as fees. By the sale of the above mine, and what he extracted from it, Stratton must have realized fully $12,000,000 in money, and his large holdings in the Cripple Creek apart from that mine are now known as the Stratton Estate, and are being worked under lease. The Independence mine, since its sale to the English company, must have to date produced ore to the value of upward of $11,000,000 gross. It is now under the sole management of Philip Argall.

The Vindicator Consolidated has been distinguishing itself more than ever by making in March its biggest output for years, and what is of equal importance, by developing two of its richest ore shoots on the 1400-ft. level. These it is said have an aggregate length of 635 ft., and an average width of 6 ft. The output for last month was 128 cars of ore, or about 4000 tons, yielding from 1 to 2 oz. gold per ton. A quarterly dividend has been declared payable April 25, which will make a total paid the stockholders of $2,137,500.

Butte

April 18—President B. B. Thayer, of the Anaconda Copper company, has stated that the Amalgamated mines were in excellent condition, in fact, better than at any time within the last five years. He is also authority for the statement that the orebodies on the 2300-ft. level of the Gagnon mine are the best he has ever seen in a Butte mine. He further states that in the High Ore and Diamond mines, from the 1800-ft. levels up, new bodies of high-grade ore have been found.

The report of the Government assay office at Helena for March shows that a total of $136,854 in precious metals was received. Fergus county, with $52,808, led in the production.

At the hearing of the order to show cause why an injunction should not be issued against the Davis-Daly Copper Company to prevent it from building a tramway from its Colorado mine shaft to the Great Northern Railway tracks through the city of Butte, the local district court granted the abutting property owners an injunction and further work on the tramway has been stopped.

The Parrot Silver and Copper Company has called a special meeting of stockholders to be held in Butte, April 30. The meeting is called for the purpose of considering the proposition of selling to the Anaconda Copper Mining Company, in accordance with the offer. A statement has been issued showing the transactions of the company from May 1, 1899, to Dec. 31, 1909. A loss of $2,101,269 for operations during the six months ended June 30, 1909, is shown. The cost of mining has risen from 8.94c. in 1903 to 17 cents in 1909. Ever since June 30, 1908, operations have been carried on at a loss. Of the properties owned, the Parrot and Little Mina mines were operated actively while the Oro Butte, Champion and Copper Reef in the Last Hope group, have not been operated for several years.

The Anaconda company is outlining an aggressive policy of developments and improvements, with a view of increased efficiency and production and reduced costs. At the Washoe and Great Falls smelteries, important improvements are being made, and at Great Falls, investigations are being made preliminary to an enlargement.

Salt Lake City

April 17—The aërial tram between the Utah Consolidated mine and the International Smeltery at Tooele is practically completed. A cleanup of flue dust, calcines and matte is now in progress on the site of the old Highland Boy smeltery at Murray, which will take the most of the summer. The material will be shipped to the International smeltery. Ore shipments from the mine will be started soon.

The Centennial-Eureka company suspended ore mining, April 9, to permit a chamber and sump being cut for the new electric pumping plant which is being installed on the 2250 level. It will be necessary to bail out the water in the shaft from the 2100 level down to the 2250. This will be done with bailers, and as it is impossible to handle the water and waste from the pump chamber and run the mine at the same time the working force will be put on development while the installation is in progress. Two sets of pumps made by Sulzer Bros., Winterthur, Switzerland, and having a capacity of 500 gal. each, will be used. Each set has a five-stage and an eight-stage centrifugal pump coupled in series, and will be driven by a General Electric 400-h.p. motor. It is figured that not over 125 gal. per min. will be pumped now, so that one pump will be held in reserve. A power house is being built at the mine. Arrangements have also been made with the Knight companies to furnish power.

Scranton, Penn.

April 19—A coroner's jury which has been investigating the death of the seven men in an explosion at the South Wilkes-Barre colliery of the Lehigh & Wilkes-Barre company, March 12, returned a verdict in which they find that the explosion resulted from an accumulation of gas due to faulty ventilation, this condition being brought about by some person unknown passing through a door on the intake and leaving it open. It is understood that the door was left open by one of the seven men who lost their lives. The verdict practically exonerates the owners and managers of the mine from contributory negligence.

Many anthracite-coal operators are again becoming anxious about the water supplies at the mines. While there is a sufficiency at present there is no guarantee for the future, for there is no reserve at any of the mines and a prolonged spell of dry weather entails shutting down a number of collieries, or hauling water from a distance. In former years there was no question about the supply in the anthracite region, for the streams were abundant. But these have been choke udp with culm to a great extent in the neighborhood of the mines, while the denudation of the forests for mine props has had the effect of drying up the watersheds.

The new mine-examining boards seem to be giving as little satisfaction as the old and miners are complaining. These boards should be swept out of existence altogether and a number of practical mining engineers appointed, who reside in the several districts, who are acquainted with local conditions and who would have no other interest than to satisfy the requirements of the law and to insure the preservation of life.

Cobalt

April 19—The reported new discovery of gold 12 miles west of Burke's Siding has turned out to be a fake, and orders are out for the arrest of those who started the rush. Information of the new fields was brought by two prospectors who showed samples of telluride ores that gave high assays. It is understood that they collected a considerable sum of money on their affidavit that the samples brought in by them were taken from claims they had staked, and on their offer to lead the people into the district. The news traveled quickly. The country, mostly muskeg, was practically impassable, and one party spent three days in getting 12 miles. When the engineers arrived at the reported discovery, they found a large vein that was being worked by an old resident. The dump showed ore that ran in some cases $10 per ton in gold. There was no other outcrop of rock in the district. The original prospectors are supposed to have brought the samples of telluride ores from the West.

The change in the mining laws of Quebec has resulted in an increased activity in that part of the Province, near the Cobalt and South Lorraine camps, and many prospectors are going in from Ontaria. Geologically, the country is like South Lorraine, with diabase and Keewatin formations predominating. The contacts between these two formations are numerous, and many discoveries of calcite and smaltite veins have been made. Several prospects in the township of Fabre are being worked, and although no silver in paying quantities has as yet been discovered, the prospects for finding it are considered good.

Judgment has been handed down by the Court of Appeals in the case between the Coniagas mine and the town of Cobalt. The Coniagas claimed the right to carry on any mining operations on all lots in that part of the town under which they had the mineral rights. The trouble arose when some of the officers of the mine were arrested for ordering a trench dug on one of the principal streets. The contention of the mining company has been upheld as far as the lots are concerned.

In the case between the Nova Scotia and Peterson Lake companies, to prevent the former company from mining their Peterson Lake lease, the judge was unable to find any evidence of fraud to warrant the forfeiture of the lease.

The question of the royalty reduction between the Chambers-Ferland mine and the Ontario government has finally been settled. The mine will now pay 25 per cent. of the profits instead of 25 per cent. of the gross proceeds as formerly. This is the only mine that obtained a royalty reduction direct from the government. There is believed to be a large amount of ore on hand, including one or two cars of high-grade, and regular shipments will now be resumed.

Toronto

April 18—The Temiskaming & Northern Ontario Railway Commission is impressed with the importance of the recent lignite discoveries west of Cochrane in northern Ontario, thinking it possible that the lignite at depth may give place to bituminous coal. J. L. Englehart, chairman, has returned from Cochrane. He says that the lignite containing from 40 to 50 heat units, as compared with 80 to 90 in coal, will only prove of value in a limited area, perhaps within a radius of 100 miles. The commission is sending a party to explore and a diamond drill may be sent to determine whether bituminous coal occurs beneath the lignite.

Hon. Charles Devlin, minister of mines for Quebec, has announced that the provincial government intends to impose a royalty on asbestos mined in that province. The government already possessed the power to do this without the need of further legislation.

The Wilson properties in the Porcupine gold area, comprising eleven claims, have been sold by a syndicate represented by George Burns for $1,700,000 a deposit of $35,000 having been made to bind the deal. It is understood that six of the claims were secured by the Dome Mines Company, of New York and Copper Cliff, for $1,500,000, the remaining five being taken by McCormick Brothers, of New York, at $200,000.

Thomas W. Gibson, deputy minister of mines for Ontario, gave evidence before the Mines Committee of the Canadian House of Commons at Ottawa on April 6. In reference to the feasibility of a uniform mining law for Canada, he thought there would be considerable difficulty in getting mining men generally to agree, but if the Federal department could devise a model law it might be adopted by the provinces. As to the question as between granting absolute titles to mining land and the leasehold system, he was disposed to favor the latter, but mining men as a rule preferred an unlimited tenure to lands once obtained. Dealing with the matter of refining nickel in Ontario, he said it was simply an economic question. There was nothing to hinder its being done as the processes were not now patented, but there was an American duty of 6 per cent. against the product and the comparative cheapness of the coal, coke and chemicals required in the United States was an important consideration. The principal market for refined nickel was in the United States. If an electric process of refining could be made commercially successful it would have considerable effect in stimulating refining in Ontario.

The Canadian Department of Mines will establish at Ottawa an experimental ore-concentrating plant to demonstrate the best methods of treating ores of all kinds. It will be operated in connection with the new government peat plant.

Mexico

April 16—Much interest is felt in Mexico in the announcement that as a result of a visit to the west coast of Mexico of President Lovett, of the Harriman Lines, that orders have been issued to carry on, as expeditiously as possible, the completion of all the Southern Pacific work in Mexico now underway. This applies to the completion of the important trunk line extending from Guaymas to Guadalajara, now about two-thirds completed with a missing link in the southern part across a mountainous country, and also to the several small extensions and connecting lines in Sonora which are of themselves important in relation to the development of the mining districts of that State. It is also announced that the Southern Pacific company will build a branch line from Douglas, Ariz., to the El Tigre mining district, a distance of about 125 miles and that the company may assist in the construction of a line from Tonichi to the mines of the Cieneguita company. These Southern Pacific lines in Sonora and the line from Silver Bell in Arizona to the Gulf of California, being projected by the Development Company of America, will give a great impetus to mining in Sonora, Sinaloa and Tepic.

The financial statements for 1909 of the leading companies of the El Oro district is as follows: Production—Las Dos Estrellas, 8,395,359 pesos; Mina El Oro, 5,032,400; La Esperanza, 4,188,892; Mina Mexico, 2,625,700; total, 20,242,351 pesos. Expenses—Las Dos Estrellas, 4,168,123 pesos; Mina El Oro, 3,203,640; La Esperanza, 2,673,064; Mina Mexico, 1,134,940; total, 11,179,767 pesos. Profits—Las Dos Estrellas, 4,227,235 pesos; Mina El Oro, 1,828,760; La Esperanza, 1,515,828; Mina Mexico, 1,490,760; total, 9,062,583 pesos. During the year the four companies milled 922,766 tons of ore; 2114 tons of concentrates, and rich ores were shipped and 749,934 pesos was spent in permanent improvements.

London

April 16—A company, Newfoundland Oilfields, is being formed with a capital of £200,000, half of which is set apart for working capital, to acquire oil-bearing properties at or around Parson's pond on the northwest coast of Newfoundland. The directorate includes a former governor and a former premier of the Colony. The new enterprise is receiving support from the government, which, in order to foster the business, has consented to protect the local industry by the imposition of import duties on oil coming from abroad and to remit or exempt from duty machinery and plant required for the industry. Reports on the properties have been obtained from Sir Boverton Redwood, J. D. Henry, and Prof. James P. Howley, government geologist for Newfoundland. Oil was originally discovered at Parson's pond many years ago, and since then operations have been carried on by individuals and local syndicates. Ten wells have been sunk which have yielded oil, and the experts believe that a payable oilfield exists over a considerable area. According to Mr. Henry £40,000 would be sufficient to put in producing order at least six of the present wells and to drill six new wells, besides erecting and equipping a power house, laying a 4-in. pipe to Cowhead, building tanks for storage, etc. The purchase price is £95,200, the greater portion of which is payable in fully paid shares. As regards the geology of the area to be acquired, the rocks consist of Lower Silurian age, somewhat older than those of any known oilfield, but as little altered and as capable of producing and storing oil as many Tertiary beds in the European and Asiatic oilfields.

The favorable developments at some of the Rhodesian mines, notably the Globe and Phœnix, the Surprise and the Eldorado, have attracted speculators once more to take an interest in the mining ventures of that country. Naturally the company promoter has not been slow to take advantage of the public demand for shares. There is one form of enterprise, which the public should be on their guard against, and that is the company that does not issue a prospectus accompanied by the reports of respectable engineers and the offer of shares for subscriptions. A favorite way now of producing scrip for the consumption of the public is to form a company with a capital of £200,000 or £300,000 in £1 shares, of which probably a small proportion is represented by cash. The promoters of this enterprise then bring the concern to the notice of the public by advertising in the press some general particulars, accompanied by an attractive map or plan, all of which, it is stated, are "for public information only." No shares are offered for subscription and thus no future shareholder presumably can demand his money back for misrepresentation. But while the capital is not offered for subscription in the usual way, it is clearly meant for public consumption, as, shortly after the appearance of the advertisement, it is customary to read in the financial papers that such and such a share was "introduced" on the Stock Exchange, usually at a substantial premium. The system, of course, lends itself to wholesale robbery. It is possible that a company formed on this method may be genuine but the chances are against it. Anyhow companies floated in this way must be treated with suspicion.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

The local representative of the Alaska Northern railway has received instructions to get trains ready for operation May 1.

John T. Milliken, of the Golden Cycle mine, Cripple Creek, says he will install a large mill on an extension of the Treadwell lode.

Alaska-Mexican—The March crushing was 12,397 tons, and total yield $42,199, with operating expenses $26,481, leaving net $14,127.

Alaska-Treadwell—The concentrate cyaniding plant will be in operation in July. It is proposed to cyanide all concentrates, about 100 tons daily.

Alabama

Cullman Coal and Coke Company—This company has nearly completed the railroad which it has been building from the Louisville & Nashville road to its new mines in Cullman county. The company some time ago bought 16,000 acres on which there was one mine, the Parker. It has since opened three new slopes and is preparing to mine 4000 tons daily as soon as the railroad is completed. A new town, called Bremen, has been built. The stockholders are nearly all residents of Holland. G. H. Ten Brock, of St. Louis, is president; George H. Parker, Cullman, Ala., treasurer.

Arizona

Denn-Arizona—The drift on the 1000 level at the Denn has encountered ore. On the 1350 level drift No. 13 has cut 9 ft. of sulphide ore. On this level a raise is being driven to the 1250 level for ventilation.

Bisbee Extension—So much water has been encountered in the shaft at 800 ft., that the boilers were unable to handle it. Further sinking has been discontinued and a station has been cut on the 700 level to drift point.

Princeton—One of the richest strikes in the Huachuca mountains has been reported at this mine.

Calumet & Arizona—An examination of the 1909 statement shows net earnings on the Bisbee properties of a little over $1,200,000, or $6 per share. As compared with 1908 the surplus shows a depreciation of about $270,000, but $375,000 was spent on explorations on properties under option and $139,600 paid in completing payments for properties held under option and which will be reimbursed as the Courtland properties are now producing 100 tons of 5 per cent. ore per day.

Gila County

Superior & Boston—This mine has been shipping, approximately 100 tons of ore per day, principally from the McGaw shaft, and producing, roughly, 500,000 lb. of copper per month. It is now understood that shipments will be begun soon from the Gardner shaft.

Inspiration—The underground work at the Joe Bush and Scorpion shafts and the churn drilling done so far indicate that the Inspiration orebody is 3000 ft. long and has a varying width, the maximum thus far proved being 800 ft. Churn-drill prospecting is continuing, however, and may eventually prove the extension of the ore into the western part of the property. The drills at present are working on the summit or highest part of the company's mineral land. The old mill will be dismantled and much of the material used in erecting a small test plant near the Joe Bush shaft.

Arizona Commercial—An issue of $1,000,000, 6 per cent. bonds has been underwritten in Boston to provide funds for operation and development.

Graham County

New England & Clifton—This Boston company is offering bonds to be used in developing the property at Clifton. J. Parke Channing and Julius A. Lewisohn will have control of the operations and are on the board.

Mohave County

Recent shipments from the Goldroad and Tom Reed mines at Kingman establish new records for these properties. The Goldroad output, consisting of nearly 600 lb. of precipates, is valued at approximately $25,000 and represents an 11-days run of the 200-ton mill. The Tom Reed sent in 159 lb. of bullion, worth about $37,000, and is the result of a 12-days run in a 10-stamp mill. In both mines, the average of the ore now being stoped is better than ever, and the new orebodies being developed are showing up larger and richer.

Yavapai County

Consolidated Arizona—On April 16 the 450-ton furnace was blown in after more than two years' idleness. The tonnage now being treated is made up of about half custom ore, which includes ore from the Goldfield Consolidated and United Verde mines, and about half Consolidated Arizona ore. At the mine, the sixth level has been reached.

California

Amador County

Argonaut—In this mine, near Jackson, the main vein has been encountered on the 3100 level, and is said to show 16 ft. of good milling rock. A station has been cut on the 3300 level.

Plymouth and Empire—These mines have lately been inspected with a view to further operations. The Plymouth shaft is 1800 ft. and the yield of the mine is said to have been $7,000,000.

South Eureka—The additional 20 stamps are now crushing. This mine is using 60 stamps, of which 20 are in the Central Eureka mill.

Marsino—This placer claim, near Volcano, is reported sold for $12,000.

Fremont-Gover—A rich strike in this mine near Drytown was made recently.

Modoc County

Hess—Rich ore is being milled from this mine in the western part of the county, not far from the Hayden Hill district. Considerable interest is shown in the strike and six adjoining claims have been bonded for $90,000.

Nevada County

Fairview—On this mine, Washington district, tunnel development is going ahead and plans for a mill have been made. C. M. Wilson, Nevada City, is the manager.

Grover-Murphy—On this mine, the northern extension of the Mountaineer, the shaft is down 300 ft. and will be sunk deeper. Harry Gray, Nevada City, is the manager.

Banner Ridge—President C. A. Bailey has interested Honolulu people in his drift gravel mine and has resumed work. The shaft is 120 feet.

Siskiyou County

The new dredge in charge of F. H. Boles, on McAdams creek, near Fort Scott is operating. A dredge operating on Hamburg bar, is reported to have found rich gravel last fall, but operations were closed down on account of high water. Drift mining is in progress at the old Leavenworth mine, under the management of F. H. Tibbets. The Scott Bar company, at Scott bar, has started piping. Martin Schuler is the superintendent. Nesbitt & Crawford have a crew of men in their shaft, and Captain Noonan is operating two giants. George Milne is also piping. Scott river is now running thick with mud from the big hydraulic plants being operated near Callahan.

Bennett & Co. are operating giants with good results on both the Bloomer and Crapo claims on the Forks of the Salmon. At the Bonally hydraulic mine three giants with 5- and 6-in. nozzles are at work on a bank of gravel said to be a part of the old Shumway claims. The Red Hill company, operating near the mouth of Knownothing creek, has just finished installing a large elevator. Two giants are in use also. L. E. Taggert is the superintendent. Superintendent Sappe, of the French company that purchased the Bob Younger hydraulic mine at the little North Fork of the Salmon, has ditches and flumes in shape for piping the Yellow Jacket point.

Biglow Brothers are piping a good bank of ground, and Wilke & Co. are operating the Hickey claim on Sawyer bar.

The Gardner & Weed hydraulic mine, Quartz valley, is in operation day and night. This property has produced much gold, and the prospects for a long run this season are good.

Callahan—The dredger is working steadily and handling a large tonnage daily, while the hydraulic mines on Grouse creek are running full force.

Highland—The owners of this mine, of Yreka, have established a custom mill with a crusher, an amalgamator, a Pindar concentrator, cyanide tanks, etc., and an assay office in charge of C. L. Proebstel.

Colorado

BOULDER COUNTY

Shipments for the year of tungsten have been about 100 tons per month of concentrates and high-grade ore. The present price of $7.50 per unit for 60 per cent. concentrates has probably reached the limit, beyond which the foreign product will enter the market.

CUSTER COUNTY

The concentrator tailings dump of the Bassick mine at Silver Cliff, which is credited with a production of $12,000,000, is to be cyanided by a Colorado Springs company.

LAKE COUNTY—LEADVILLE

Last month's production from the Dinero tunnel is given at 350 tons of ore of the usual grade of about 30 oz. silver and about [illegible] oz. gold per ton. It is expected that a spur from the main line of the Colorado Midland to the tunnel will be completed this summer.

New Monarch—The output from the Cleveland and Vinnie shafts is about 75 tons per diem.

Diamond—The old Diamond shaft has been reached with drill holes from the Yak tunnel breast, and is being drained thereby. The Yak company is said to have obtained the control of, and will work this property from its tunnel.

TELLER COUNTY—CRIPPLE CREEK

United Gold Mines—The W. P. H., owned by this company, under lease to Oscar Fogleman, last week sent out two carloads of ore, of which 30 tons of screenings yielded $96 per ton, and 28 tons of coarse rock, $25 per ton. This was mined from a stope above the 400-ft. level of the W. P. H. mine.

El Paso-Gold King—A strike of rich ore is reported, as made by May & Macdonald, sub-lessees, between the 400 and 500 level. The rock will ship at $30 per ton, and the screenings will be much richer.

SAN JUAN DISTRICT

The discovery of a vein carrying free gold is reported from Hazelton mountain at Silverton. It is described as honeycombed quartz, carrying wire and nugget gold, 40 lb. of which rock netted $1920, or $48 per lb. This, of course, is in a small streak, but outside of this there is said to be 5 ft. of ore averaging about $15 gold per ton. The discoverer and owner is Andrew Falk.

Tomboy—The March returns show; crushed 10,500 tons, yielding bullion, $42,000; concentrates shipped, $32,500; total, $74,500; expenses, $47,500; profit, $27,000.

Bullion King—Bankruptcy proceedings have been begun in Chicago against this Silverton Company.

Silver Ledge—This mine, Mineral Creek, is now turning out concentrates and opening silver-lead-zinc orebodies.

Idaho

BOISE COUNTY

Gold Hill—The shaft is being sunk from the 400 to 500 ft. and the new 100-ton mill will go into operation in April. E. E. Carter is manager and W. L. Bowron is superintendent.

Nabob—This company at Wardner, expects to install a compressor and other machinery, and to erect a concentrator.

Monarch—The mill at Murray will be increased to 250 tons capacity.

Western Development Company—This company organized by mining men of the Cœur d'Alene district, will have the control and management of the Idaho Giant Mining Company and the Boulder Creek Mining Company and the Bitter Root Mining Company. It is announced that the company will expend more than $800,000 in development.

Success—This company, which controls the only zinc producer in the district, has apparently doubled the value of its holdings by encountering the north oreshoot on the old Granite claim. This shoot was lost for a long time, owing to a fault. The mine has been producing for a number of years. About 1200 tons of ore are shipped a month. H. F. Samuels has been reëlected president and manager.

Kansas

Eureka—This mill has started operation on the Ihlseng-Ping lease north of Galena. This has been awaited with great expectations as it will be the first producer in the deep-ore beds except the Herald mine.

Kentucky

A company has been organized at Birmingham, Ala., to operate fluorspar mines near Marion, Ky. The company is named the Birmingham Fluorspar and Lead Company. T. H. Benners is president.

Michigan

Adventure—This company's vertical shrtical shaft is 550 ft. on its way down to cut the first of three copper-bearing lodes revealed in drill work. This shaft has been sinking 70 ft. per month, and will be down to the lode this fall. No. 2 lode lies at an approximate depth of 2200 ft. and No. 3, 2600 feet.

Cherokee—This recently organized company has secured two drilling outfits and will start exploratory work at once under the supervision of Herman Fesing.

Mohawk—This mine has cut the Kearsarge lode with the second crosscut from its new No. 6 shaft, and at that point the foundation is 15 ft. wide and well charged with copper throughout. Drifts from the fourth level of this shaft have been extended over 100 ft. in each direction, showing a good grade of stamp-rock. Drifts south from No. 5 shaft to points tributary to this shaft are showing the best grade of rock at the property.

Osceola Consolidated—This company has put into commission two electrically operated pumps at the 600-ft. level of No. 3 shaft.

La Salle—This mine is shipping 700 tons daily, almost entirely from the stock pile.

Minnesota

Reliable advices from Minnesota indicate that the Cuyuna range is coming to the front, and that good ore is being developed.

Missouri

Uncle Joe—The company has started its mill in the Webb City-Carterville district.

West 20—This company is building a 200-ton mill on its lease near the Coahuila mine, Porto Rico.

Muskingum—This company has bought the 300-ton Arena mill and will move it from Peacock, Kan., to its 52-acre lease in the West Joplin sheet-ground district. C. W. Squires is manager.

W. J. Bryan—This mine and 40-acre lease adjoining the Quick Seven mine at Neck City has been sold to Chapman & Lennan, of Webb City.

Bird Dog—The No. 2 mill has been moved from near the Goode mine, Webb City, and is being erected for the Bird Dog No. 1 lease in the vicinity of the Kansas City-Bradford mine.

Whillock-Rhea—This company is erecting a 250-ton mill on its lease north of Webb City.

Montana

Butte District

North Butte—The report is that the diamond drill from the 2800-ft. level of the Diamond mine penetrated the Edith May vein, but it is impossible to obtain any information as to the result.

Amalgamated—The new vertical shaft at the Gagnon is now down 600 ft., and sinking will be continued to 2300 ft. The Belmont shaft is 1450 ft. and will be continued to 2400 ft. When completed, the shaft will be used to hoist ore from the Anaconda mine. The large hoist of the marine type at the Neversweat mine escaped from the control of the engineer recently, and one cage went to the sump. The rapidity of revolution of the reels after the engine ran away caused the reels to burst, demolishing the engine room and killing the engineer. The engine is a total wreck and it will take several months to repair. Operations at the mine will be continued through the adjoining St. Lawrence shaft.

Jefferson County

Ballard—Patrick Dowling has purchased the property from the Ballard Brothers for $150,000.

Lewis & Clarke County

Bald Mountain—About 100 men are employed, and ten stamps are in use at the mill.

Madison County

Realty—A complete equipment is being installed. Operations will be begun May 1.

Lennstrend—The property, in the Mineral Hill district, has been bonded to Passmore & Co., of Butte, for $25,000.

Missoula County

Gold Chrome—A 200-ton mill has been ordered to supersede the 10-stamp mill.

New Mexico

Grant County

Chino — Water supply developments have been favorable and early work on the projected mill will be begun soon. It is reported that a 3000-ton mill will be erected instead of 2500-ton as announced. Tests on the ore have demonstrated that the metallic feature is to be an important one and that a rich concentrate of native copper will be obtained from the jigs, which will be melted into bullion at the mine, by which method it is expected that ½c. per pound will be saved in the treatment over shipping. A recovery of 35 lb. of copper per ton is now looked for on ore of average grade of 2.61 per cent. copper, which exceeds the original estimates of 32 lb. on a 2.46 per cent. ore. Work on a central shaft for operating will soon be started.

Sierra County

Black Range—This mine at Fairview will install an aërial tram and a 100-ton mill and cyanidation plant.

Nevada

Esmeralda County

Goldfield Consolidated—A telegram from Secretary A. H. Howe, April 16, says: "Seventy stamps dropping today. Normal monthly production will be made."

Booth—The Lind lease has cut a 4-ft. vein of milling ore, but has passed it in the search for the main Red Top vein, which is expected at any time.

Combination Fraction—A crosscut has been driven into Mohawk ground and a connection made at the 450-ft. intermediate level for ventilation.

Pioneer Leasing Company—The 5 per cent. dividend authorized last summer, which has been held up pending litigation, will probably soon be released and the company will be in shape to continue its weekly shipments.

Eureka County

For several weeks back, traffic over the Eureka & Palisade railway has been cut off by washouts on the line, and operations by the Richmond-Eureka and other enterprises in the district have consequently been suspended. Now, it is reported that the railway will not be rebuilt. This will keep work in the Eureka district at a standstill until other transportation facilities are provided. If the Ely & Goldfield railway be constructed, as appears probable, a branch to Eureka will likely be built from Hamilton, or that vicinity. The present trouble in Eureka is enhanced by the recent failure of the county bank, in which the savings of the people of the district were largely deposited.

Humboldt County

In the Red Butte district, many claims have been located, but little work has been done.

The lawsuits of the National Mining Company vs. the Stall Brothers, operating the lease on the National Mining Company ground, has been settled by compromise.

Auto—This group at National has been sold to W. L. O'Connel, of Seattle by J. L. Workman, of Winnemucca.

Taft—This copper group at Mina is under option to Walter O'Neil, of New York.

Nye County

Tonopah shipments during the week ended April 9, were as follows: Tonopah, 3050 tons; Belmont, 800; Montana-Tonopah, 975; McNamara, 250; West End, 130; Tonopah Extension, 750; total, 5945 tons.

Tonopah Extension—A second tube mill is to be installed to permit the use of battery screens of lower mesh. The change will increase the capacity between 15 and 20 per cent.

White Pine County

Giroux—The new shaft is now permanently timbered to the 1000-ft. level. The new hoisting equipment now under erection is the heaviest in the district and will be capable of raising from 2000 feet.

Oklahoma

Miami-Yankee—This mill at Miami has started up after a long period during which time the shaft has been sunk to a deeper run of ore and also new upper runs developed.

Oregon

Curry County

Red River—Development is planned and machinery will be installed. J. R. Brown, Marial, has charge.

Jackson County

Cheney—This property is in control of L. Barber and W. R. Oxley, of Gold Hill, and it is proposed to erect a 40-ton stamp mill.

Lane County

Oregon Mines Corporation—This company has been organized at Eugene to operate in the Bohemia district. Herbert Leigh is engineer and L. S. Wilson, of Chicago, president.

Pennsylvania

Philadelphia & Reading Coal and Iron Company—This company's statement for the eight months of its fiscal year, from July 1 to Feb. 28, shows gross receipts of $22,296,206; expenses, $21,358,776; net earnings, $937,430. As compared with 1908-9, there were decreases of $507,219 in gross receipts, and of $223,840 in net earnings.

Utah

Beaver County

Beaver Carbonate—This company, developing a prospect near Frisco, has about 12 men at work.

Juab County

Tintic shipments for the week ended April 8 show an increase. They are in car lots: Sioux Consolidated, 31; Colorado, 15; Iron Blossom, 27; Carisa, 1;

Beck Tunnel, 3; Dragon Iron, 25; Lower Mammoth, 2; Mammoth, 4; Opohongo, 2; Grand Central, 8; Yankee, 2; Centennial-Eureka, 35; Eureka Hill, 2; Eagle & Blue Bell, 4; Uncle Sam, 2; Gemini, 4; Chief Consolidated, 2; Scranton, 4; East Tintic development, 1; Ridge & Valley, 3; May Day (concentrates), 1; total, 168 cars.

May Day—At the annual meeting, April 4, the old board of directors was reelected. The report for the year ended March 31 gives the total receipts as $75,638, less overdraft of $10,000. The disbursements were equal to the income. During the year, 2607 tons of crude ore and 841 tons of concentrates were marketed and sold for $59,371. Superintendent Griggs stated that unless work on the 1100 was productive of results, he would recommend sinking to at least the 2000-ft. level, in view of ore found at depth in neighboring properties.

Tintic Central—The shaft has penetrated porphyry at 635 ft. and is now in a fissured zone which affords a natural drainage.

East Tintic Development—It is reported that new ore has been found on the 430-ft. level, richer in lead and silver than the usual run. Regular weekly shipments are being made.

Utah Mine—This property at Fish Springs marketed 27 tons of ore, April 12, which is said to have brought $2635 net. The ore carried around 138 oz. silver and 60.5 per cent. lead.

SALT LAKE COUNTY

Columbus Consolidated—The mill is being operated one shift on ore from development, and is paying expenses. Work is now being done on the tunnel level and on the 400 east of the shaft. Shipments of crude ore and concentrates will be resumed soon.

Bingham Butte—Ore showing native copper is reported to have been cut in the Eddy tunnel.

SUMMIT COUNTY

Park City ore shipments for the week ended April 8 were: Silver King Coalition, 1,282,160 lb.; Daly-Judge, 905,000; Daly-Judge (zinc), 107,340; total, 2,294,500 pounds. There was no shipment from the Little Bell and Daly West, owing to bad roads and the shutdown of the Daly-West mill.

Daly-Judge—During March, the company shipped 858 tons of crude ore, 770 tons of concentrates and 885 tons of zinc middlings.

Scott Hill—The tunnel is in 200 ft. and is following a mineralized fissure.

Virginia

Notice is given by J. P. Jones, receiver of the Manganese, Iron and Coal Company, that he will sell at public auction at New Castle, April 30, the company's property, consisting of 19,646 acres of mineral and timber lands on Craig and Nutter mountains in Craig county.

Clinchfield Coal Corporation—This company, owning mines in southwest Virginia, has made arrangements to turn over its coal to the Clinchfield Coal Company, of Spartanburg, S. C. The intention is to market the coal in the cities along the South Atlantic coast, with which rail connections are made over the Carolina, Clinchfield & Ohio road.

Washington

FERRY COUNTY

Iron Chief—On this group of seven claims a large body of ore was recently opened, containing 70 per cent. iron and small amounts of gold and silver.

Ben Hur—Operations are being carried on successfully by the leasing company. Four stopes have been opened, from which 4000 tons of ore have been shipped. New machinery will be installed.

Summit—Development work will be continued on the Summit group, and operations will shortly be resumed at the railroad group. S. Tanner, Orient, is secretary.

OKANOGAN COUNTY

Golden Chariot—Capital has been secured and the shaft will be sunk 200 ft. deeper.

Prize—Arrangements are being made to examine this mine. A. J. Reed has charge.

Lucky Knock—This company is mining antimony ore at Loomis. W. A. Ingram is manager.

PIERCE COUNTY

Swastika—This company will erect a 40-stamp mill and build five miles of railway into Lakeview.

SNOHOMISH COUNTY

In the case of the National Mining and Milling Company vs. James Peccolo, *et al.*, the State Supreme Court has decided in facor of the Peccolo people. This involves the title to some rich mining claims in the Silver Creek district.

The Monte Cristo district mines will reopen soon and ship to the Everett smeltery, which is preparing to resume.

West Virginia

MARION COUNTY

Four States Coal and Coke Company—A shaft has been started at Worthington, which is to be the initial point of the development of the large tract of land recently bought.

Keystone Coal and Coke Company—This company has bought 3000 acres from the New England Gas Company, near Fairmont. Arrangements have been made to open two mines.

MINGO COUNTY

S. W. Patterson and associates have organized the Sycamore Coal Company, with main offices at Vivian. This company has purchased and leased some 4000 acres on Sycamore and Lick creeks. It is now running a branch line up Sycamore creek from the main line of the Norfolk & Western. It will commence development, opening first with the Winifrede seam.

Thacker Coal and Coke Company—This company is opening four new mines on Grapevine creek, and will develop the Thacker seam of coal, which is said to be 5 ft. thick at that point. The coal will be handled by retarder conveyers and brought to one tipple, at which five loading tracks for the different grades will be constructed, including a box-car loading track.

RANDOLPH COUNTY

Near Elkins a 6000-acre coal tract will soon be opened by the Four States Company, which also operates in Kentucky, Ohio and Pennsylvania.

WEBSTER COUNTY

A 1000-ton mine will be developed on its 700-acre tract by the Crystal Block Coal Company, which has its headquarters at Gary.

Canada

BRITISH COLUMBIA

Stewart—A native silver strike of importance is reported to have been made. The ore is said to rival that of Cobalt in richness.

Tyee—Returns for March: One furnace was in blast $18\frac{1}{3}$ days, and smelted 4750 tons, producing 270 tons of matte valued at $37,000.

ONTARIO

The shipments from Cobalt for the week ended April 8 were: Nipissing, 253,817 lb.; Kerr Lake, 240,190; La Rose, 146,400; Crown Reserve, 63,500; O'Brien, 61,700; Buffalo, 52,900; Trethewey, 61,673; Right-of-Way, 61,178; Colonial, 43,600; total, 984,958 pounds.

Wyandoh—A vein about $\frac{1}{2}$ in. wide but very rich has been found on the surface. This is the second high-grade vein found in the Gillies Limit.

Black Consolidated—Native silver has been found in the main vein at the 200-ft. level. This is the first native silver found on this property.

Maidens—Good ore has been found in the No. 2 vein, South Lorrain, at 62 ft. A small plant will be installed.

Crown Reserve—Operations for the first quarter of 1910 were as follows: During the period there were shipped 800,000 oz. of silver having a gross value of $410,000. Smeltery charges amounted to $30,000, expenses were roughly, $65,000, and royalties, $30,000, leaving $285,000 net profits. A regular quarterly dividend of 6 per cent. and bonus of 9 per cent. has just been paid, equivalent to $265,000. One of the most significant features is that the whole output for the quarter has been taken from the Keewatin formation at the 200-ft. level.

Nova Scotia

Dominion Coal Company—At the annual meeting in Montreal, April 12, President J. H. Plummer discussed the position of the company and its relations with the Dominion Iron and Steel Company and announced that to meet the strike losses it had been decided to sell $825,000 in bonds. Arrangements are being made to increase the annual output to 4,000,000 tons. The price agreed on for coal by the new arrangement with the Steel company was $1.55 per ton, an increase of 27c. on the former rate. This rate would hold for five years. He pointed out that there would be great difficulties in the way of completing the merger, owing to the disturbed earning power of the Coal company on account of the strike and the changing status of the Steel company by reason of the abolition of bounties and the enlargement of its plant. It might, therefore, be some time before the merger could be accomplished.

Yukon Territory

Atlas—This company recently organized in Spokane with a capital of $600,000, has bought the Yukon-Pueblo property at White Horse, Yukon territory, for $500,000, from Byron N. White, of Spokane. President R. K. Neill announces that Wilbur D. Greenough and John Mocine, of the Snowstorm mine, in the Cœur d'Alene, will leave for White Horse in May to install a 10-drill compresser and erect buildings.

Mexico

Chihuahua

Dr. H. S. Durand, of Rochester, N. Y., is developing a property in the Urique district, and proposes to erect a smelting plant. The Rosario, the principal mine in the district, has not been worked for 25 years. The ore in the district is base sulphide carrying gold.

Los Letreros—This property, better known as the Boggs, is sending out occasional carlots of high-grade ore. It is in the Sierras west of Ocampo in charge of W. Q. Bryan.

Santa Eulalia Exploration Company—Experts in the employ of the Exploration Company of London have completed an examination of this property and reports are that the purchase option may be exercised. The sale price is, $1,250,000. It is one of the largest producing properes in the camp.

Jibosa—J. L. Johnson and associates are operating this copper mine 15 miles south of Jiminez. Shipments are being made.

Nonoava—Increased activities are reported from this long neglected district about 100 miles southeast of Cusihuiriachic. The ores are mainly copper carrying gold and silver.

Hidalgo—Litigation involving ownership to properties in the vicinity of Cienegas de Olivas has been settled in favor of the Hidalgo company, which will resume operations.

Mexico

Mexico Mines—March returns are: crushed 11,336 tons; yielding bullion, $124,490; working expenses, $44,210; expenditure on developments, $11,600; profit, $68,680.

El Oro—The March returns are: crushed 27,527 tons; yielding bullion, $215,260; working expenses, $97,680; expenditure on developments, $21,260; profit, $96,320; profit on railway, $7000; total profit, $103,320.

Esperanza—The reports for March are: Mill ran 25 days and crushed 13,730 dry tons; tailings treated, 2404 tons; concentrates shipped, 26 dry tons. Estimated realizable value of builion and concentrates, $174,034; less working expenses, $98,998; estimated profit, £13,803.

Sonora

Greene-Cananea—Expenditures equalling the outlay for betterments during 1909 have been partially outlined by this company. These include the new reverberatory which is in process of construction now; 4 more units to the McDougal roasters, making eight in all; two turbine generators, probably larger in capacity than the one installed last fall; a trolley line for commercial purposes and supplies. Another 6000-cu.ft. compressor may be placed in the main power plant unless it is decided to place smaller sized ones in the mines and operate them by electricity. The expenditures will reach nearly $400,000, but the reduction in operating cost will return the greater part of this amount within a year.

Picacho—Recent work, under the direction of W. C. Leaming, has uncovered some gold and silver ore in this mine.

Cinco de Mayo—A. J. King has arranged to lease this property, and will work it extensively.

Sonora Copper Company—Wells are being bored at Noria to supply water for the 100-ton smeltery, upon which construction work will shortly begin.

Sierra Gordo—A compressor has been set up at the entrance to the 1200-ft. tunnel just finished near Cumpas. The property is in charge of O. L. Neer.

Altar Gold Placer Company—This corporation has been organized to operate on a portion of the Aguilar lease, Altar district. W. H. Worthington is president.

Roy—This mine, Moctezuma district, has 50 men employed. A cyanide plant has just been finished and the 30-ton stamp mill is undergoing repairs.

Washington Mining Company—This company has been organized by Dr. L. D. Ricketts and James S. Douglas to buy the Washington mine, in the Arizpe district. About 3000 ft. of underground work has been accomplished. Approximately 350,000 tons of 4 per cent. copper is in sight, the low-grade making the construction of a concentrator necessary.

American Ore Milling Company—In the Altar district 1475 pertenencias of placer ground has been secured by this company to be worked by the Quinner machines.

San Ygnacio—A small concentrator has been erected at this mine.

Ryall Concessions—The rights to exclusive mining privileges in the entire region lying between the Yaqui and Tecoripa rivers, from their confluence up each river to Tecoripa and San Antonio de la Huerta, which the concessions gave, will expire April 24. Several promising mines are within this area, among them the Realito, La Barranca, San Javier, Las Bronces, Toledo and Libertad.

Arnold—After a year's idleness, development work has been resumed on this company's holdings, west of Cananea.

Calumet & Sonora—This company, operating a lead and zinc mine at Cananea, has experienced a change in affairs, new interests having been engaged in the company. A. L. Warner has been placed on the directory, and the conduct of the affairs of the company has been put in the hands of an executive committee, of which Mr. Warner is chairman. The company is now shipping about 700 tons monthly of zinc and lead concentrates to the United States. This is the mine that produces the remarkable blende referred to in a recent issue of the Journal.

Pacific Smelting—This company has given an option to the General Development Company, of New York, on the control in its extensive properties in Sonora and an examination is now being made.

Australia

Western Australia

The gold production in March is reported by the Chamber of Mines of Western Australia as follows: Exports, 16,694 oz.; mint deliveries, 100,831; total, 117,525 oz. fine, or 6510 more than in February. For the three months ended March 31, the total was 382,377 oz. in 1909, and 355,861 oz., or $7,355,647, in 1910—a decrease of 26,516 oz. for 1909.

Europe

Russia

The production of the Kyshtim copper mines, in which some Americans are interested, for five months ended Feb. 28 is reported at 1,633,960 lb. blister copper.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, April 20—The Seaboard bituminous trade is comparatively quiet, although the strike conditions in the West are causing some anxiety, and the suspension in Central Pennsylvania is coming rather near home. However, the trade is fairly active and prices are firmer. The anthracite trade is steady and uneventful.

In the West little progress has been made toward a settlement of the wage scales. The agreements made in Ohio and in the block-coal district of Indiana were noted last week. To these may be added a settlement in the unionized Kanawha district of West Virginia. The Indiana bituminous field is still out; though the operators have conceded terms, the miners decline to work pending the settlement of some minor details. The Pittsburg district seems far from an agreement, the explosive question being the main point of difference.

In Illinois operators and miners have been in session in Chicago, but up to date absolutely nothing has been done in even the most preliminary steps toward an agreement and it is the opinion that the meeting will be adjourned without anything being accomplished. The labor situation seems more complicated than ever and many believe that there is no chance of work being resumed before June, with a possibility that it will not be resumed until July.

Further West, Iowa is approaching peace, but nothing is doing in the Southwest.

Meantime it is developing that stocks are not so large as was generally supposed, and if mining is not resumed early in May a shortage of coal will begin to be felt at many points.

COAL TRAFFIC NOTES

Coal and coke shipments Chesapeake & Ohio railway, eight months of fiscal year July 1—Feb. 28, short tons:

	Coal.	Coke	Total.
New River	5,227,165	240,828	5,468,293
Kanawha	4,207,760	37,909	4,245,669
Kentucky	341,144	228	341,372
Connecting lines	66,086	33,562	99,648
Total	9,845,155	312,527	10,157,982
Total, 1908-9	8,119,916	231,396	8,351,312

Totol increase this year 1,803,640 tons, or 21.6 per cent. Deliveries to points west of mines, 5,172,385 tons coal and 150,056 coke; points east, 1,318,908 tons coal and 162,471 coke; tidewater, 3,349,016 tons coal; anthracite to line points, 5110 tons.

Coal passing Davis Island dam on the Ohio, two months ended Feb. 28, was 978,840 short tons in 1909, and 590,630 in 1910; decrease, 388,210 tons.

Coal passing the locks on the Monongahela above Pittsburg, two months ended Feb. 28, was 1,490,280 short tons in 1909, and 1,644,800 in 1910; increase, 154,520 tons.

Coal receipts at St. Louis, two months ended Feb. 28, were 1,203,135 short tons in 1909, and 1,810,580 in 1910; increase, 607,445 tons.

Coastwise shipments of coal from chief Atlantic ports, two months ended Feb. 28, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York	2,693,731	1,814,269	4,508,000	64.3
Philadelphia	313,001	724,268	1,037,269	14.8
Baltimore	36,874	545,420	582,294	8.3
Newp't News	....	465,034	465,034	6.6
Norfolk	....	421,851	421,851	6.0
Total	3,043,606	3,970,842	7,014,448	100.0
Total, 1909	2,635,576	3,428,329	6,063,905	.....

The total increase this year was 950,543 tons, or 15.7 per cent. New York includes all the harbor shipping points.

New York

ANTHRACITE

April 20—The anthracite market is quiet and steady. A good business is being done with dealers on the April discounts, but there has been no unusual rush.

Schedule prices for domestic sizes are $4.25 per ton for lump and $4.50 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes current prices are $3@3.25 for pea; $2.15@2.50 for buckwheat; $1.70@2 for No. 2 buckwheat or rice; $1.25@1.50 for barley. These prices are f.o.b. New York harbor, according to quality, the lower prices being for washery coals.

BITUMINOUS

Strike talk is occupying much of the time of the market. The Central districts in Pennsylvania are pretty well tied up and are not shipping to any extent. The small part of West Virginia which is unionized has reached a settlement, and no immediate scarcity of coal is probable. A continued suspension in the West, however, may have an effect on this market. Meantime there is an inquiry for coal which indicates either a better demand, or some anxiety about supplies.

Prices hold about the same as last week and are firmer than for some time. Car supply is fair and transportation is good.

The Coastwise vessel market is steady, with a good supply of boats. Going rates from Philadelphia are 85c. to Boston, Salem and Portland; 90c. to Portsmouth; 95c. to Lynn; $1 to Newburyport; 95c. to Providence and the Sound. From New York boats can be had at 60@65c. to Boston, Salem and Portland; 75c. to Bangor.

Birmingham

April 18—The coal output in Alabama is heavy and the prospects are bright for some time to come, practically through the year. There is full operation at practically all the mines in the State. The local consumption is heavy. The coke operations show no abatement. As long as the pig-iron production keeps up there will hardly be disturbance in the coke make. There is some demand in the open market for coke also. Good prices obtain for coke, but coal prices are not satisfactory. An increase in wages is promised the miners in Alabama shortly, which will mean more labor.

Chicago

April 18—The coal market hardly exists. Consumers manifest no anxiety over the lack of supplies and most of them—the large ones anyway—have supplies that will last until May 1 at least. Hardly any coal is coming in from Illinois and Indiana mines. Many users of steam coal not provided with storage piles have turned to smokeless with the result that even that coal, so long over-abundant, is not now troubled about surplus on track and sells close to circular quotations. The cool weather of the last three days has caused a new interest in anthracite, which otherwise has had a record of light sales.

Quotations on Illinois and Indiana coals are nominal. The little business being done is at $2.25@2.65 for lump, $2.10@2.50 for run-of-mine and $2.15@2.40 for screenings. Hocking holds to $3.15. Smokeless is selling for $3.55 lump and $3.15 run-of-mine, list prices.

Illinois screenings show a probability of being the first coal actively sought under a continuance of present conditions; such screenings as are now obtainable bringing the high price of $2.40 in car lots.

Cleveland

April 18—Coal rates by Lake from the Lake Erie ports for the season have been fixed at 30c. to Lake Superior; 35c. to the quick unloading docks at Lake Michigan ports; 40c. to the slow docks at Milwaukee. Navigation opened April 15, and a number of coal carriers have started already. The water stages are unusually low, and only 17 ft. 6 in. draft is reported possible to Lake Superior.

Local business is dull. The Ohio mines have resumed work, but many large consumers have stocks which they will use up before buying more. Prices are unsettled, with some prospects of an early decline.

Indianapolis

April 18—It has been discovered that there is not as much coal in storage as anticipated on April 1. Instead of a 90-days' supply there was only a 30-days' supply and one-half of that is exhausted. The miners do not object to the suspension. They have been working hard for several months, the mines having been operated full time. The convention at Cincinnati last month decided on the terms under which the miners would agree to work during the coming two years. The first condition demanded an increase of 5c. a ton in the rate for mining coal and proportionate increases for dead work, outside work and day labor,. and set out the day-wage scale in full. The second condition provided that where a State, district or subdistrict agreed to pay the advance the mines might continue in operation pending final settlement of details. The Indiana operators adopted a resolution agreeing to the advance and asked State President Vanhorn to order the miners to return to work but he has refused to do so until all the details of the contract have been agreed to. The operators charge this to be a direct violation of the conditions agreed to at Cincinnati. A meeting has been called for this week by both the miners and the operators and President Lewis is expected to attend each. Lewis has advised by letter that the miners return to work and it is believed there will be a general resumption of mining in Indiana before the close of the week.

Pittsburg

April 19—A decidedly chaotic condition is developing in the local coal situation, for in the conferences between miners and operators the two sides are as far apart as ever, while several mines, it is understood, have signed the scale, expecting the men to go back to work. On the other hand, conditions are taking on more of a strike appearance, as the men are getting into crowds, hiring brass bands, and marching on nonunion mines for the purpose of closing them, in which work they have scored several successes. While the operators have been particularly careful to make no public declaration of policy, it is evidently their plan to let matters take their course, feeling that whatever develops must prove to their advantage. Coal is growing scarcer and if many nonunion mines are closed conditions may become such as to justify making some concessions. Relations between National President Lewis and District President Feehan have become still more strained, Feehan maintaining the propriety of his accepting scale signatures from individual operators—which would narrow the powder question down to gaseous mines—while Lewis insists that the National convention allowed nothing but district signatures.

While coal is becoming scarcer there are moderate supplies offered, which are more available to some consumers than others, on account of differences in freights. Roughly, mine-run can be quoted at $1.20@1.30 and slack at $1.10@1.30 per ton.

Connellsville Coke—A Chicago steel- and blast-furnace interest has bought coke for the 12 months beginning July 1, but absolute information is not obtainable as to details. Reports have it that standard Connellsville coke was sold at $1.85, but in some quarters it is asserted a higher price was secured, and it is also reported that some West Virginia coke was bought. There has been a slightly better demand for prompt furnace coke, on account of some production being lost in union districts, and prices are firmer, at $1.80@1.90. Furnace coke on contract for second half is generally quoted at $2.25, but the figure could probably be shaded.

The H. C. Frick Coke Company, the coke subsidiary of the United States Stel Corporation, has given orders for the blowing out of a total of 3500 ovens and about half the number seems to have been taken out to date. The Corporation was accumulating coke for a while and the curtailment in production will eliminate this and also cover the blowing out of a few blast furnaces, which seems to be in contemplation.

The *Courier reports* the production in the Connellsville and lower Connellsville region in the week ended April 9, at 447,508 tons, a decrease of 8000 tons and shipments at 4542 cars to Pittsburg, 7275 cars to points west of Pittsburg and 702 cars to points east of Connellsville, a total of 12,519 cars.

St. Louis

April 18—There has been very little doing in the coal market for the past week. Illinois coal is practically cleaned up and prices are not high enough yet to place outside coal in this market advantageously. There is very little coal on the market for jobbers to speculate in. A few operators are loading up screenings which they were unable to give away last summer, and consequently were dumped on the ground. Operators who did this were fortunate, as screenings are now bringing $1.50 per ton at the mines, which is the highest price they have brought in recent years.

Consumers are beginning to eat into their storage supplies and it will only be a very short while before a number of them will be forced to buy coal heavily. Present conditions point to a long suspension of mining.

Several bunches of Kentucky coal have been in East St. Louis up to demurrage. In another two weeks Kentucky coal will undoubtedly be a factor in this market.

Anthracite business opened up very slowly, and while orders are coming in a little better as the month gets older, yet the April business is far from par. It was generally thought that after the price war last year the dealers would be glad to have conditions restored to normal again as they had been during the past two months. However, last week one of the largest companies cut the price 50c. per ton, making the retail price $7.50, delivered, on chestnut, stove or egg, and $7.25 per ton delivered on the grate size. This is a cut of $1 from the winter price. Nearly everyone interested in the coal business had hoped that another price war would be averted, but it looks very much as if such was not going to be the case. At these prices there is no money in selling hard coal, and dealers will be forced to handle same at practically cost in order to hold their trade.

Prices in the St. Louis market are as follows:

Standard:	F.o.b. Mine.	F.o.b. St. Louis.
2-in. lump	2.00	2.52
Mine-run	1.60	2.12
Screenings	1.40	1.92
Carterville:		
6-in. lump or egg	2.00	2.67
Mine-run	1.50	2.17
Screenings	1.50	2.17
Pocahontas and New River:		
Lump or egg	1.50	4.00
Mine-run	1.10	3.65
Pennsylvania Anthracite:		
Nut, stove and egg		6.45
Grate		6.20
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry		5.40
Gas house		4.50
Smithing coal		4.15

Kentucky coal sold, f.o.b. Louisville & Nashville tracks, East St. Louis, at $2.50 for 3-in. lump, $2.25 for 1-in. nut, $2 for mine-run and $1.75 for screenings.

FOREIGN·COAL·TRADE

Transvaal Coal—Coal shipped from Transvaal collieries in January was 311,796 tons. The total mined was 498,000 tons, 37.5 per cent. being sorted or screened out as waste.

Spanish Fuel Imports—Imports of coal into Spain in January, 158,336 metric tons, a decrease of 14,530 tons from last year; imports of coke, 15,407 tons, a decrease of 10,350 tons.

Mexican Coal—A preliminary report gives the total shipments of coal from mines in Mexico in 1909 at 919,338 metric tons. Of this total 538,067 tons were sold to railroads and 381,261 tons for commercial and domestic purposes.

British Coal Trade—Exports of fuel from Great Britain, with coal supplied to steamships in foreign trade, three months ended March 31, long tons:

	1909.	1910.	Changes.
Coal	13,914,097	13,357,353	D. 556,744
Coke	270,145	235,379	D. 34,766
Briquets	338,915	343,968	I. 5,053
Total exports	14,523,157	13,936,700	D. 586,457
Steamer coal	4,520,902	4,405,962	D. 114,940
Total	19,044,059	18,342,662	D. 701,397

Imports of coal were 462 tons in 1909 and 3378 in 1910, both negligible quantities.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices as follows on April 9: Best Welsh steam, $4.08; seconds, $3.96; thirds, $3.84; dry coals, $3.90; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.40; seconds, $2.16. All prices are per long ton f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, April 20—The iron and steel markets continue in a rather sluggish condition so far as new business is concerned, although the finished steel mills are fairly busy on contracts, except in a few lines.

The pig-iron market is especially dull. There is very little buying of either bessemer or basic pig, and foundry iron is going only in small lots for immediate consumption. Large buyers are still holding back and seem to be confident that when they are obliged to come in the market they will find matters in a position to suit them. Meanwhile prices are gradually weakening. Concessions are denied, of course, but there is no disputing the fact that prices which were considered concessions a short time ago are now generally accepted. Foundry iron especially is demoralized by offers of cheap Southern iron, $12 Birmingham, being generally accepted, while a recent large order was reported placed for less. There is much talk about curtailing production and several furnaces have already blown out. There is no question that the production of raw iron has run ahead of finished material with resulting weakness in prices. It must be remembered that blast furnace capacity has been largely increased. We are able now to produce 36,000,000 tons of iron in a year, and for a few months the output was at the rate of 32,000,000 tons, or 25 per cent. above the production of even the boom year 1907. It has not been possible to use this up, and the result has been an apparent weakness even on a very large actual consumption.

Finished material is rather quiet in most lines. There have been no important changes in price, but it is generally known that the large fabricating companies in eastern cities are taking contracts at prices which involve low rates for the material.

Lake navigation opened April 15, and everything is in train for a large early movement of iron ore.

The Steel Corporation has announced a general advance in wages and also a prospective plan for labor insurance and retiring pensions. This is a shrewd move; it is evidently meant to offset the corporation's fight against the Amalgamated Association last year, and to prevent any movement to unionize its working force.

United States Steel Corporation—At the annual meeting in Hoboken, N. J., April 18 the following directors, whose terms had expired, were reëlected for three years: Alfred Clifford, Edmund C. Converse, Elbert H. Gary, J. Pierpont Morgan, J. Pierpont Morgan, Jr., Thomas Morrison, George W. Perkins, Henry Phipps.

Baltimore

April 18—Exports for the week included 3317 tons rails to Freemantle, Western Australia; 1736 tons rails and 116 tons rail joints to Bombay, India; 115,812 lb wire and 109,994 lb. corrugated sheets to Great Britain. Imports included 2950 tons spiegeleisen and 250 tons ferromanganese from Rotterdam; 412 tons manganese ores, 1639 tons ferromanganese and 176 casks silicospiegel from Liverpool; 9800 tons manganese ore from India; 27,400 tons iron ore from Cuba.

Birmingham

April 18—While the pig-iron market in the southern territory has been rather quiet, there are indications of an early awakening. Prices have been low, but some improvement is to be noticed, the minimum being $12@12.50 per ton, No. 2 foundry, with the maximum, $13, deliveries extended through the balance of the year at the last named price. A report that 200,000 tons of iron had been accumulated on furnace yards in Alabama is denied from an authoritative source here; the warrant and furnace company iron stacked up being considerable under the figures given. There is not enough iron on the yards to have any effect on the market. Only the smaller companies have seen fit to make concessions on pig iron, save in a few instances where a round lot or two, immediate delivery, was sold by a larger concern. There has been but little, if any curtailment in the production in this section. The suggestion, however, has been under consideration recently, but no action has been taken. Basic and charcoal irons are still in fairly good demand. The home consumption continues brisk, the foundries and machine shops reporting a little more activity than has been.

Chicago

April 18—Sales of pig iron continue to be unsatisfactory to selling interests and both Southern and Northern iron show decided weakness. Southern at $12@12.50 Birmingham ($16.35@16.85 Chicago) and Northern at $17@17.50 for No. 2 foundry are not actively sought by melters. It seems to be the firm conviction of the melting interests that there is overproduction, and so their purchases remain light in tonnage and for a short time ahead. Nothing like general buying for last-half requirements exists. There are some large inquiries but only rarely does an order for more than 1000 tons materialize. Meanwhile the condition of the foundry business, on which this market relies chiefly, is good and shows every prospect of continuing good. Needs therefore are large, as regards pig iron.

The general conditions of the market for iron and steel products are rather quiet, but firm. Railroad supplies and structural material show no important new contracts; minor products have a fair sale. Coke is very dull at $5.25 for Connellsville as a result of large shipments and no increase in the demand.

Cleveland

April 18—No sales of iron ore are reported, but the movement from the docks to furnaces is active. The Canadian canal at the Sault opened April 11, and the American canal April 15. The first cargo of iron ore started April 11, from Ashland.

Pig Iron—The market is slow and weak. The Cleveland Furnace Company has blown out one of its stacks. Quotations, Cleveland delivery, are $18.40 for bessemer; $16.75@17 for No. 2 foundry; $16.35@16.85 for No. 2 Southern; $16.25@16.50 for forge.

Finished Material—New orders are rather disappointing, but most mills are doing well on contract specifications.

Philadelphia

April 22—The week's business in pig iron has fallen below the average. Large consumers are watching developments at Southern furnace centers and whatever they may do will be determined by what they think of the Southern situation. A few sales of basic have been made and no more are imminent. Consumers are holding off as it were, thinking that the drift of things is in their favor. Large sales of iron for casting purposes are hanging fire and sellers are unable to guess what prospective buyers will do. Forge iron continues strong at $16.50, with basic at $17.50 and No. 2 X foundry selling in a small way at $18. There is less confidence expressed among makers for continued strong prices.

Steel Billets—Steel billets are dull, sales are limited though full prices are asked and paid.

Bars—Bar iron is active in small lots from stores, but mills report no large orders for a week. Deliveries are being hastened on old orders. There appears to be a slowing down of demand at the mills, explained by the fact that many of the large consumers ordered heavily during March.

Scrap—Very little scrap has sold for a week as holders are refusing the prices that are offered for No. 1 yard and heavy melting-steel scrap.

Pittsburg

April 19—No improvement has taken place in the general iron and steel market, which shows a condition of moderate activity, but not enough to raise the least question of productive capacity being able to take care of consumption, so that the market lacks snap and prices show no tendency to harden. Apparently there will be a gradual curtailment in total production, although some finished steel lines appear able to take care of themselves. Tinplate promises full activity through the third quarter, as mills are completely sold up into the fourth quarter, and steel bars come next, mills being able to see full operation into midsummer. Plates and shapes, particularly the latter, are not so well sold up and some mills cannot look ahead much more than a month. Shading in sheets has slightly increased, particularly in the West, and sometimes amounts to $2 a ton.

Pig Iron—The tendency to curtail production continues. Clinton, the only merchant furnace in the county, has gone out of blast and several merchant furnaces in the Valleys are to follow. Prices are no stronger and indeed the market is so quiet that it becomes a question what a block of iron would really bring. While prices are down close to cost, based upon purchased ore and coke, it does not follow that this will control, for there are many furnaces owned by ore interests, and, of course, these furnaces could sell even at a loss, in order to make an outlet for the ore. It is of great significance that at this moment no less than eight merchant furnaces are being built by Lake Superior ore interests, these being two Iroquois at Chicago, one Zug Island at Detroit, two Rogers-Brown at Buffalo and two Cleveland and one Josephine by Corrigan, McKinney & Co., the latter announcement having been made within the past week. Merchant furnaces which have to buy ore can, of course, only obtain the overflow pig-iron business and in present stagnant conditions it is not certain there will be any. There is no harm in noting, however, that somewhat similar obituaries were written for the merchant furnaces in the Valleys in 1897 and 1898. Nominal prices may be quoted as follows: Bessemer, $17.50; basic, $16; malleable, $16; No. 2 foundry, $15.75; gray forge, $15.25; all at Valley furnaces.

Steel—The scarcity of open-hearth steel continues, but there is probably less demand. Prices remain quotable at $27@27.50 for bessemer billets, $27.50@28 for bessemer sheet bars, $28.50@29 for open-hearth billets and $29@29.50 for open-hearth sheet bars, with rods nominally at $33, all at mill, Pittsburg or Youngstown.

Ferromanganese—The market has continued quiet, prices being nominally quotable at $41, Baltimore, for prompt and $41.50 for second quarter, freight to Pittsburg being $1.95 per ton.

Sheets—Business in sheets is somewhat lighter, and the shading has increased, sometimes reaching $2 a ton. Regular prices are 2.40c. for black and 3.50c. for galvanized sheets, $1.70 for painted corrugated and $3 for galvanized corrugated roofing, with blue annealed sheets at 1.90c. for early delivery.

FOREIGN IRON TRADE

German Iron Trade—Exports and imports of iron and steel, and of machinery in the German Empire, two months ended Feb. 28, metric tons:

	Exports.	Imports.	Excess.
Iron and steel..	688,514	71,207	Exp. 617,367
Machinery......	49,402	7,862	Exp. 41,540
Total..........	737,916	79,069	Exp. 658,847
Total, 1909.....	602,990	66,220	Exp. 536,770

Imports of iron ore in 1910 were 812,868 tons; exports, 483,628 tons.

METAL · MARKETS

New York, April 20—The metal markets this week have been more interesting, and some activity seems to be developing on certain lines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1910..	$ 1,815,329	$ 4,492,229	Imp. $ 2,676,900
" 1909..	21,252,462	5,161,648	Exp. 16,090,814
Year 1910..	10,915,595	9,686,702	" 1,228,893
" 1909..	37,978,632	12,158,275	" 25,820,357
Silver:			
Mar. 1910..	4,553,110	3,872,912	Exp. 680,198
" 1909..	5,079,287	3,279,531	" 1,799,756
Year 1910..	13,640,033	11,276,595	" 2,363,438
" 1909..	14,473,930	10,453,218	" 4,020,712

Exports from the port of New York, week ended April 16: Gold, $4,016,640, chiefly to London; silver, $855,759, also chiefly to London. Imports: Gold, $100,402; silver, $71,526, from Mexico and South America.

Gold—The price of gold on the open market in London has been 77s. 9d. per oz. for bars, and 76s. 5d. per oz. for American coin, the premium on the latter having been dropped. In New York an additional $4,500,000 was taken for London, and $1,350,000 for shipment to Argentina on London account.

Platinum—Business is steady and prices are unchanged, dealers asking $29@29.50 per oz. for refined platinum and $34.50 per oz. for hard metal.

Silver—The market has remained steady the past week with small fluctuations in price. The China banks have been inclined to sell on any advance. The market closes quiet at 24½d. in London.

SILVER AND STERLING EXCHANGE

Apr.	14	15	16	18	19	20
New York....	53¼	53½	53½	53⅜	53⅜	53¼
London .	24½	24⅝	24⅝	24 9/16	24 9/16	24½
Sterling Ex..	4.8765	4.8765	4.8785	4.8780	4.8775	4.8785

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan 1 to April 7, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£1,150,600	£1,559,300	I. £ 408,700
China........	925,600	1,088,500	I. 162,900
Straits.......	82,800	......	D. 82,800
Total......	£2,159,000	£2,647,800	I. £ 488,800

India Council bills in London brought an average of 16.09d. per rupee.

Copper, Tin, Lead and Zinc

Apr.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
14	12⅞ @13	12⅝ @12¾	57⅛	33	4.35 @4.40	4.20 @4.25	5.32½ @5.37½
15	13⅛ @13¼	12¾ @12⅞	57¾	33⅛	4.35 @4.40	4.20 @4.25	5.32½ @5.37½
16	13⅛ @13¼	12¾ @12⅞	....	33⅛	4.35 @4.40	4.20 @4.25	5.32½ @5.35
18	13⅛ @13¼	12⅝ @12⅞	57⅞	33	4.35 @4.40	4.20 @4.25	5.32½ @5.35
19	13⅛ @13¼	12⅝ @12¾	57¼	33	4.35 @4.40	4.20 @4.25	5.32½ @5.35
20	13⅛ @13¼	12⅝ @12¾	56⅝	33	4.35 @4.40	4.20 @4.25	5.32½ @5.35

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The large business that we reported last week continued up to April 16 and led to some stiffening of prices, but since April 18 the market has been weakish again, demand having dwindled, owing apparently to the weakness in the London market. A fairly large business has been done, total sales having been probably in excess of 30,000,000 lb., effected chiefly during the first half of the week, and several of the more important producers are now well sold for the near future. These sales were both for domestic and foreign delivery, more or less equally divided, and were chiefly in electrolytic copper. European consumers who had allowed their stocks to run down came into the market, and American consumers followed. Calumet & Hecla having sold freely of Lake at 13c. previous to April 14, then raised its asking price to 13¼c. Other Lake producers have made some scattering sales at that price, but these have been for carloads only and broadly speaking, the business in Lake during the last week has been insignificant and the quotations are essentially nominal. On the other hand, the producers of electrolytic have been free sellers, with nearly all of them offering unreservedly at 13c., delivered, 30 days, for domestic account and at 13c. c.i.f. for shipment abroad, these terms corresponding to about 12.85 to 12.80 net, cash, New York, while toward the close some were offering at a concession of 10 to 15 points. The consumption of copper is very large, and it is noteworthy that enterprises requiring large amounts of copper are still being held in abeyance, owing to the difficulty in financing them, and that the present consumption is evidently caused by an increase in the general needs of the country, due to its growth. However, several of the more important producers are now well sold for the near future. At the close electrolytic copper is quoted at 12⅝@12¾c. in cakes, ingots and wirebars, while Lake is nominally at 13⅛@13¼c. The average for casting copper for the week has been nominally 12½@12⅝ cents.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c. base, carload lots at mill.

The London standard market on Thursday opened at £57 2s. 6d. On Friday and Monday it was strong, and there was a large turn-over at about £57 15s.@£57 17s. 6d., but on Tuesday and Wednesday, under realization of speculative holdings and the influence of weaker stock markets, prices declined, the market closing at £56 12s. 6d. for spot and £57 12s. 6d. for 3 months.

Refined and manufactured sorts are quoted: English tough, £60; best selected, £60 10s.@£61; strong sheets, £69@70 per ton.

Statistics for the first half of April show a decrease in the visible supplies of 1200 tons.

The report of probable cessation of publication of statistics by the Copper Producers' Association, circulated widely during the last week, was apparently manufactured out of whole cloth. The matter has not been discussed at all by the association, and all of the members of the latter are as much at a loss to account for this report as is anyone else. Inferentially, the report was circulated for purposes of speculators for the decline in the London market, telegrams by interests not directly connected with the sale of refined copper having been sent from this side. On Apr. 20, sales of standard copper in London amounted to about 4000 tons at a decline. It is quite true that the statistics of the Copper Producers' Association have been the subject of amateurish deduction, but among the producers it is generally recognized that the statistics themselves have been for the benefit of the industry and as stated above no motion for their discontinuance has been made.

The contract of the United States Selling Company for disposal of the product of the Boston Consolidated expires in May. After that date this copper will be sold by the Guggenheims.

Copper exports from New York and Philadelphia for the week were 3170 long tons. Our special correspondent gives the exports from Baltimore at 506 tons copper.

Brass Prices—The Ansonia Brass and Copper Company, on April 14, reduced prices of brass ½c. per lb. The new base price for high-brass sheets, high-brass wire and high-brass rods is 14¾c. per lb. net; brazed-brass tubing, 19⅞c. per lb. net. Other conditions as before.

Tin—Toward the middle of last week, the London market was helped considerably by large buying from this side. The lower prices ruling induced both dealers and consumers in this country to buy more heavily than they had done for some time past. The consequence was an advance of £2, which was almost entirely maintained, and the close is cabled strong at £149 17s. 6d. for spot and £151 5s. for three months.

After the buying movement of last week, things in this market have quieted down considerably, and little interest is shown at the higher quotations. At the close, tin can be bought at 33 cents.

Lead—The market is quiet and unchanged at 4.35@4.40 New York and 4.30@4.35 St. Louis.

The London market also is dull and unchanged, the closing quotations being £12 12s. 6d. for Spanish lead and £12 15s. for English.

In St. Louis, April 12, Henry Greve was elected president of the John Wahl Commission Company, in place of the late John Wahl; J. B. Wahl, treasurer, and Edward Wahl, secretary. The occasion was the fiftieth anniversary of the firm, which for years has been one of the leading dealers in lead and spelter in the West.

Spelter—During the last week the business in spelter has been comparatively small, there having been a marked absence of buying demand, although reports from manufacturers indicate that consumption is going on at a large rate. However, continued large production has made smelters somewhat nervous over the absence of orders and they have been willing to make some concession. Toward the close of the week quotations at 5.35c. St. Louis, were underbid. Consumption of spelter by brass manufacturers appears to continue large and for brass specials a substantial premium over ordinary brands, rising as high as ⅓c. per lb., is paid. At the close ordinary brands are quoted at 5.32½@5.35, St. Louis, and 5.47½@5.50, New York.

New York quotations for spelter, April 14 and 15, were 5.47½@5.52½c.; April 16-20, inclusive, 5.47½@5.50 cents.

The London market is also lower, being quoted £22 7s. 6d. for good ordinaries and £22 12s. 6d. for specials.

Beer, Sondheimer & Co. have taken a lease of the Altoona plant of the Cockerell Zinc Company and intend to operate it at full capacity.

Other Metals

Aluminum—Business continues active and sales are good. The market is strong at 23¼@23¾c. per lb. for No. 1 ingots in large lots, New York delivery. The foreign producers continue optimistic in their views, and anticipate an increase in quotations in view of the steady demand.

Antimony—The market is dull, and prices are unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—The market is steady, but not active. New York quotations continue $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for retail lots. San Francisco, $47@48 for domestic sales; $2 less for export. London prices, £9 5s., but jobbers have sold down to £9 per flask.

Zinc and Lead Ore Markets

Joplin, Mo., April 16—The highest price paid for zinc-sulphide ore was $46.50, the base being $40@44 per ton of 60 per cent. zinc metal. Zinc silicate sold at $21@36 per ton of 40 per cent. zinc, with the high price at $30. The average price, all grades of zinc ore, was $40. Lead ore continues unchanged at $50 per ton for grades of 80 per cent. or above with deductions of $1 per ton for each 1 per cent. under this grade. The average price, all grades of lead ore, was $49.86 per ton.

The zinc-ore market jumped to a $44

base bid at the close of last week, for ore delivered this week, was maintained on this base throughout the week, with no evident weakening at the close. The reserve stock was lowered over 1500 tons, and a large portion of the tonnage in the bins is sold for early delivery next week. Outputting conditions have not been so good, owing to spring rains and a growing shortage of mine help, occasioned by several hundred miners going West.

SHIPMENTS, WEEK ENDED APRIL 16.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Cartorville	5,519,670	658,230	$129,583
Joplin	2,346,180	227,130	56,064
Oronogo	973,500	41,590	21,461
Galena	698,850	69,450	16,062
Alba-Neck	617,990	9,250	14,435
Duenweg	496,230	127,210	12,769
Jackson	595,020	......	12,197
Miami	374,370	255,320	10,501
Spurgeon	392,290	91,050	8,816
Aurora	498,290	......	7,710
Quapaw	362,700	......	7,254
Granby	431,720	2,200	6,310
Carthage	239,090	......	5,259
Sarcoxie	303,680	......	4,769
Badger	220,160	......	4,733
Stott City	124,700	......	2,680
Carl Junction	115,340	......	2,537
Cave Springs	63,460	......	1,300
Totals	14,373,240	1,481,430	$324,440
16 weeks	177,094,810	26,190,750	$4,348,841

Zinc value, the week, $287,497; 16 weeks, $3,643,285

Lead value, the week, 36,943; 16 weeks, 705,556

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., April 16—The highest price paid this week for zinc ore was $43.50 per ton. The base price of 60 per cent. zinc ore was $41@42. The base price of 80 per cent. lead ore was $50 per ton.

SHIPMENTS, WEEK ENDED APRIL 16.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Plattevillo	452,190	....	....
Highland	448,000	....	....
Mineral Point	432,800	....	....
Cuba City	254,580	87,840	....
Galena	236,600	....	....
Harker	196,330	....	....
Benton	86,800	....	....
Montfort	70,000	60,000	....
Linden	60,990	....	....
Rewey	......	58,900	....
Total	2,238,290	206,740	....
Year to date	24,009,900	1,747,939	4,506,390

In addition to the above there was shipped during the week to the separating plants, 2,370,920 lb. zinc concentrates.

CHEMICALS

New York, April 20—The general market remains quiet. Contract deliveries are good, but new business is only moderate.

Copper Sulphate—Business is steady and the market shows no change. Prices continue $4.10 per 100 lb. for carload lots and $4.35 for smaller orders.

Arsenic—The market is slow, and prices have weakened a little, $2.37½@2.50 per 100 lb. being quoted for white arsenic. Sales of several 25-ton lots are reported at the lower figure.

Nitrate of Soda—Futures are a little softer and quotations are 2.05@2.07½c. per lb. Spot nitrate holds at 2.15c. per lb., with good sales.

Sulphur—Best unmixed seconds are quoted at $22@22.50 per ton, New York delivery.

Petroleum

Exports of mineral oils from the United States for the three months ended March 31 were, in gallons:

	1909.	1910.
Crude petroleum	34,739,991	33,058,260
Naphthas	13,598,247	18,873,141
Illuminating oil	250,815,260	219,731,498
Lubricating and paraffin	35,434,307	37,053,851
Residuum	17,577,905	22,352,344
Total	352,165,710	331,069,094

The total decrease this year was 21,096,616 gal., or 6 per cent.

MINING·STOCKS

New York, April 20—Some signs of recovery early in the week in the general stock market were hailed by brokers and speculators as the beginning of the bull movement; but this failed to materialize and a reaction followed. The market has been uncertain and inclined to dullness. It has been mainly professional also, and the public does not seem to be deeply interested. It closes rather irregular and without much promise of immediate improvement.

The Curb market also has been rather uncertain, with small fluctuations and little inclination to strength. The copper shares have not been strongly in evidence, although they were the most active of the mining stocks. Cobalt shares were dull and weak and nobody seems to be worrying over the Nevada gold shares.

The New York Stock Exchange has adopted a new rule, under which the commission on mining shares is $6.25 per 100 shares for stocks selling below $10 per share, instead of $12.50 as formerly.

Sales at public auction in New York, April 14, included 200 shares Morning Star Consolidated Mining at $105 for the lot; 13 shares Pahasa Mining, preferred, $1 for the lot; 5½ shares same company, common, $1 for the lot; 2 shares Cannelton Coal Company, $2.50 per share.

Boston, April 19—Copper shares have shown a much improved tone and outside of a $6 drop in the price of North Butte upon the appearance of the annual report which carried the price down from $41, a fair amount of optimism prevails. Today being Patriot's Day, there was no local market.

Arizona Commercial has steadied now

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	January.	February.	March.
Arizona, Ltd	2,646,000	2,658,000	2,886,000
Boleo (Mexico)	2,614,800	2,331,832	2,148,383
Copper Queen	10,001,000	8,927,203	10,809,488
Calumet & Ariz	2,331,000	2,024,000	....
Cananea (Mexico)	3,500,000	3,586,000	3,700,000
Detroit	2,166,156	1,486,400	1,698,975
Imperial	850,000	750,000	....
Nevada Con. (Est.)	3,800,000	5,000,000	5,600,000
Old Dominion	2,130,000	2,035,000	2,674,000
Shannon	1,510,696	1,526,000	1,468,000
Superior & Pitts	2,166 000	1,864,000	....
Utah Copper Co	4,745,066	5,798,819	8,190,000
Butte District	19,250,000	13,758,620	24,000,000
Lake Superior	19,260,127	18,250,000	19,250,000
Total production	77,000,845	69,995,874	....
Imports, bars, etc	24,305,526	14,093,381	....
Imp. in ore & matte	7,053,522	6,063,764	....
Total	108,359,893	90,153,019	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report for March includes for the first time the output of the Boston mill.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
IV, 1909	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767

	Visible Stocks.		
	United States.	Europe.	Total.
IV, 1909	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

that it is known that the $1,000,000 convertible bond issue is to be a success. The high price of the week was not retained, however, when it was announced that the smeltery would be closed down to allow of an accumulation of reserves. The other Amster stocks are also steadier. The new Lake issues have been fairly steady, although the sharp decline in North Butte caused a similar drop in the price of Lake Copper shares.

The North Butte report for 1909 was a deplorable exhibit and following despatches telling of rich drill strikes, was particularly distressing. The Cole-Ryan issues certainly have done copper shares a tremendous amount of harm. Utah Consolidated has been in better demand and seems to have recovered from the free offering of stock.

Curb stocks have followed closely the trend of prices in the big market.

Assessments

Company.	Delinq.	Sale.	Amt.
Brownstone, Utah	Apr. 15	June 10	$0.00½
Central Eureka, Nev	Mar. 13	Apr. 23	0.02½
Columbus Con., Utah	....	May 11	0.25
Confidence, Nev	Mar. 25	Apr. 15	0.20
Con. Imperial, Nev	Apr. 19	May 12	0.01
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal	....	....	1.25
Gould & Curry, Nev	Mar. 14	Apr. 6	0.10
Hancock, Mich	May 2	....	3.00
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	....	2.50
Mass, Mich	Apr. 5	....	2.00
New Arcadian, Mich	Mar. 10	....	1.00
New York-Bonanza, Utah	Apr. 8	....	0.03
Ojibway, Mich	Mr.Oct.	....	2.00
Opex, Utah	Apr. 12	....	0.03
Ophir, Nev	Apr. 22	May 16	0.25
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21	....	0.03
Utah, Nev	Apr. 12	May 3	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52.338	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.726	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.561	......	12.93	......	57.363	......
May	12.893	......	13.248	......	59.338	......
June	13.214	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	32.403	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Apr. 19

Name of Comp.	Bid.
Listed:	
Acacia	.06
Cripple Cr'k Con.	.02½
C. K. & N.	.12
Doctor Jack Pot.	.08
Elkton Con.	.69¾
El Paso	.75
Fannie Rawlins	‡.05
Findlay	.08
Gold Dollar	‡.10½
Gold Sovereign	.04
Isabella	.16¾
Mary McKinney	.46
Pharmacist	.02⅞
Portland	1.05
Vindicator	.79
Work	.03¾
Unlisted:	
Golden Cycle	1.00
United Gold Mines	‡.07½

SALT LAKE Apr. 19

Name of Comp.	Clg.
Carisa	.50
Colorado Mining	.77
Columbus Con.	.48
Daly Judge	4.00
Grand Central	1.60
Iron Blossom	1.07
Little Bell	1.60
Little Chief	‡.45
Lower Mammoth	.47
Mason Valley	8.25
Maj. Mines	‡2.32½
May Day	.06
Nevada Hills	.54
New York	.13
Prince Con	.83
Red Warrior	‡6.00
Silver King Coal'n	2.40
Sioux Con.	.33
Uncle Sam	.31
Victoria	1.30

SAN FRANCISCO. April 19.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.15	Belmont	2.50
Belcher	.99	Daisy	.07
Best & Belcher	.25	Jim Butler	.17
Caledonia	.56	MacNamara	.30
Challenge Con.	.29	Midway	.28
Chollar	.19	North Star	.03
Confidence	1.15	West End Con.	.37
Con. Cal. & Va.	1.40	Atlanta	.15
Crown Point	1.00	Booth	.15
Exchequer	.25	C.O.D. Con.	.08
Gould & Curry	.31	Columbia Mt.	.08
Hale & Norcross	.45	Comb. Frac.	.48
Mexican	1.35	Great Bend	.02
Ophir	1.62	Jumbo Extension	.33
Overman	1.25	Oro	.05
Potosi	.50	Red Hill	.04
Savage	.29	Sandstorm	.03
Sierra Nevada	.64	Silver Pick	.09
Union	.75	St. Ives	.11
Yellow Jacket	1.00	Tramps Con.	.05

N. Y. EXCH. Apr. 19

Name of Comp.	Clg.
Amalgamated	77⅜
Am. Agri. Chem.	45
Am.Sm.&Ref.,com	84½
Am. Sm. & Ref., pf.	107
Anaconda	46¾
Bethlehem Steel	30
Col. & Hock. C. & I.	13⅛
Colo. Fuel & Iron.	41
Du Pont P'd'r, pf.	87½
Federal M. & S.	65
Great Nor., ore ctf.	70
Nat'nal Lead, com.	82¾
National Lead, pf.	‡108
Pittsburg Coal	‡20½
Republic I&S, com.	37½
Republic I & S, pf.	‡101
Sloss Sheffi'd, com.	77½
Sloss Sheffield, pf.	‡117½
Tennessee Copper	31
Utah Copper	48¼
U. S. Steel, com.	86⅜
U. S. Steel, pf.	120⅞
Va. Car. Chem.	58⅞

N. Y. CURB Apr. 19

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19
Braden Copper	4¾
B. C. Copper	6¼
Buffalo Mines	3½
Butte Coalition	22½
Chino Copper	13⅜
Cobalt Central	.12
Combination Fra.	.49
Con. Ariz. Sm.	2 11/16
Cumberland Ely.	9
Davis-Daly	2¼
Dominion Cop.	7
Ely Con.	.62½
El Rayo	3¼
Florence	3⅛
Gila Copper	6
Giroux	8⅜
Gold Hill	1⅜
Goldfield Con.	8 3/16
Greene Cananea	9¾
Guanajuato	1⅜
Guggen. Exp.	195
Kerr Lake	.08⅞
La Rose	3 11/16
McKinley-Dar-Sa.	.91
Miami Copper	24⅛
Mines Co. of Am.	49
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1
Newhouse M. & S.	3½
Nipissing Mines	10⅛
Ohio Copper	3 9/16
Pacific Sm. & M.	1 3/16
Silver Queen	.20½
Standard Oil	635
Stewart	½
Tonopah	7
Tonopah Ex.	.78
Tri-Bullion	15/16
Utah Apex	‡3¾
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4½

LONDON Apr. 20

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 12 3
Esperanza	2 11 3
Tomboy	0 18 9
El Oro	1 8 0
Oroville	0 10 0

BOSTON EXCH. Apr. 18

Name of Comp.	Clg.
Adventure	7½
Allouez	48½
Am. Zinc	‡26
Arcadian	5¾
Arizona Com.	18¼
Atlantic	8½
Boston Con.	17
Butte & Balak.	9½
Calumet & Ariz.	65
Calumet & Hecla.	600
Centennial	19
Con. Mercur	.10
Copper Range	70
Daly-West	8¾
East Butte	8¼
Franklin	15
Granby	48½
Greene—Can.	9¾
Hancock	21
Helvetia	3½
Indiana	‡26½
Isle Royale	17½
Keweenaw	..
Lake	57¼
La Salle	14¾
Mass	7¼
Michigan	5½
Mohawk	55
Nevada	21½
North Butte	35
North Lake	‡15¾
Ojibway	8½
Old Dominion	39¼
Osceola	‡138
Parrot	15½
Quincy	82
Shannon	13
Superior	47
Superior & Bost.	13
Superior & Pitts.	13¼
Tamarack	‡58
Trinity	7
U. S. Smg. & Ref.	44½
U.S.Sm. & Re., pd.	49¾
Utah Apex	3½
Utah Con.	25
Victoria	3¼
Winona	8½
Wolverine	125
Wyandotte	2

BOSTON CURB Apr. 18

Name of Comp.	Clg.
Ahmeek	‡170
Bingham Mines	‡3⅛
Boston Ely	3¼
Calaveras	5⅞
Champion	‡.09½
Chemung	‡10
Chief Cons.	2
Chino	13⅝
Cons. Ariz.	2⅝
Corbin	.07⅞
Cactus	3¾
Crown Reserve	3 1/16
First Nat. Cop.	2 15/16
Gila Copper	6⅝
Indiana	‡34½
Inspiration	7⅛
Majestic	.80
Nevada-Douglas	‡2⅝
New Baltic	‡8⅛
Oneco	4¼
Ray Central	3⅝
Ray Con.	21½
Rawhide Coal	37
Rhode Island Coal	‡8⅛
San Antonio	10
Shattuck-Ariz.	25
South Lake	9⅝
Superior & Globe	.60
Trethewey	1.38
Tuolumne Copper	3¼
Vulture	9⅝
Yuma	.90

‡Last quotation.

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Some Matters of Copper History

There is nothing new under the sun; not even a great accumulation of copper, an enormous production, and forebodings that it will outrun all possibilities of consumption at remunerative prices. The following is the first paragraph of the article on copper in THE MINERAL INDUSTRY, Vol. 1, reviewing conditions in 1891:

"The production of copper in the United States has increased each year, almost without an exception, since the commencement of the industry, and in recent years at a rate which has brought it not only above that of any other country but has made it equal in amount to the aggregate product of all the rest of the world. It is not surprising that the copper markets of Europe should look with amazement, the copper mines of the world with anxious forebodings, and the mining and metallurgical professions with unbounded admiration at this marvelous growth, and perhaps, still more at the figures of cost, which, despite high wages, high values of supplies, and transportation for thousands of miles to the nearest seaport, have enabled us to control the markets of the world and have almost placed upon the ragged edge of bankruptcy the copper mines of the older producing countries. It is not unnatural that those who have watched from a critical position the rising of the tide of this great stream and the ever increasing flow from the sources which supply it, should have feared a coming "deluge" of the metal. They overlooked, however, the facts that though the volume of the torrent easily carried away all artificial dams and obstructions in its course, and drowned out the little surface springs along its route, it spread its fertilizing flood over the desert and created such new uses and rapidly increasing demands that even its vast and growing volume could scarcely supply. The known sources are not inexhaustible; the stream may, yes, it will increase, but the area its very abundant floods have fertilized already absorbs the whole and calls for more. There can be no deluge now or hereafter, but there may be a drought and a famine."

That the present accumulation of copper and its gradual distribution are not without precedent are manifest from the examination of previous records. When the Secretan syndicate collapsed in 1889 the world's visible supply of copper was about 175,000 metric tons. The production in that year was 265,516 metric tons, the accumulation being equivalent to eight months' output. But the price for copper, which fell from 17¼c. to 11c. (monthly averages) recovered to nearly 17c. in a little less than a year.

Again, in 1901, when the Amalgamated umbrella was blown inside out, the accumulation of copper rose to 150,000 tons. The production in 1901 was 529,508 tons. Consequently, the accumulation was nearly 3½ months' supply. The price falling from 16½c. to 11c. rose to 14½c. before the end of 1904.

The present accumulation of copper is about 170,000 tons. The world's production in 1909 was about 840,000 tons. The accumulation is, consequently, less than 2½ months' production. If it were less than one month's production the situation of the market would be unsafe.

Both in 1889 and in 1901, the most dangerous element of the situation was the fact that the bulk of the accumulation was held in a single hand; by the Secretan syndicate in 1889 and by the Amalgamated in 1901. The Secretan stock was taken over by bankers who carried it for several years pending ultimate distribution, during which time the copper producers pursued an even tenor of way. After the Amalgamated collapsed, it was only a few years before we had a copper famine.

There is no particular lesson to be drawn from the above figures except that the present situation is not without precedent. It is always more important to forecast the future than to review the past. It seems to us that the production, which increased so largely in 1909, has reached a climax for the moment, while consumption is continuing to increase. The new production, whereof such gloomy view is taken, will not materialize so soon as anticipated. Miami will begin to produce early in 1911. Ray and Braden are further behind. Chino still further. The other new porphyry mines do not command immediate attention. There will be no metal from Copper River before summer of 1911. The flood of copper promised from Katanga need not worry anyone. Copper exists there, but probably it will come in driblets.

Both Calumet & Hecla and Copper Queen have large potentiality for increased production, but their policy seems distinctly in the direction of restraint except when metal price is high—sound business policy. Utah Copper Company will doubtless increase largely, but not much before middle of 1911. The big porphyry mines once started cannot very well curtail.

On the other hand, old mines like North Butte, Granby, and Highland Boy are nearing the end of their life. Even Butte will not live forever. So there is subtraction to be figured as well as addition.

It looks as if the absorption of the present accumulation would depend upon the extent to which consumption gains during the next 12 months. The indication is that it will continue to forge ahead. This does not mean, however, that any great rise in the price for copper is to be expected, but we may during the next 12 months have 13½@14c., with which producers ought to be satisfied.

Lake Superior Ore Shipments

The Lake shipping season has opened and iron-ore traffic is in full course, nearly three weeks earlier than last year. The mines of the Lake Superior region have been put in shape for a production and shipment of 50,000,000 tons of iron ore this season, if it is required. From present appearances, however, it is hardly probable that so great an output will be made; nor that they will reach the 42,500,000 tons of 1909. Not that there is likely to be any decided break, but the demand from the furnaces for ore is less pressing than was anticipated early in the year. Ore is not being rushed, as might have been the case if furnace capacity was fully taken up. The event has proved that the present capacity has gone beyond present needs, and the result will be a number of idle stacks for some months to come, until consumption has a chance to work up. It will do so in time, but not with a rush; and ore supply will have to be kept down to the demand.

The Mesabi range will, of course, be the largest shipper as it has been for several years. Its production can be more easily regulated, and its ores can be mined for the most part at a little lower cost than those of the other ranges. For this reason its fluctuations are not so extreme as those of the other ranges.

Upon the whole, it looks as if this season would see shipments well up to the average of several years past, but a "record" is hardly to be expected.

Connellsville Coke Production

A sharp and sudden drop in the production of Connellsville coke is one of the signs of the present condition of the iron trade. To some extent it had been presaged by a continuous decline in selling prices which has now extended over two months, and by an absence of demand for coke over the regular contract deliveries. In January the weekly average of production in the region was 464,293 tons; increasing a little in February to 466,461 tons, it dropped a little in March to 461,072 tons. For the week ended April 9 the reported output was 447,508 tons, but in the following week, April 16, it fell sharply to 338,374 tons. This indicated that nearly one-fourth of the coke ovens were out of commission.

There had been some talk previously of a curtailment of production, but no general agreement had been made. The present reduction, apparently, was made chiefly by the H. C. Frick Company, the coke subsidiary of the Steel Corporation, and rather took the independents by surprise. In part it is held to be the forerunner of the blowing out of several of the corporation furnaces; but it may be in part also due to the fact that the corporation has been piling up stocks of coke, and may not consider it wise to continue the accumulation. A third cause may be that some Connellsville coal may be needed by the corporation's plants in case of a continuance of the present deadlock between the miners and operators of the Pittsburg district.

So large and sudden a drop in coke production has never before occurred, and it could only result from the action of the largest producer; especially as there was no evidence of concerted action among the independents.

The report of the Utah Consolidated Mining Company for 1909 gives some interesting information respecting the salvage of a smelting works upon dismantlement. The cost of this company's plant was $972,676. The structural steel sold to the International Smelting and Refining Company has realized $72,047, while machinery and plant have brought $92,473. There is estimated to remain property valued at $15,000, not yet realized. Against these credits is the wrecking expense, amounting to $37,350. The net salvage in this case appears to amount to a little more than 14 per cent., which appears to be unusually high and is, of course, explainable by the fact that the material and machinery of the old plant could be employed for a new plant being erected in the same district, in which the Utah Consolidated is financially interested, this being a condition that does not ordinarily occur.

In its report for the year ended Dec. 31, 1909, the Utah Copper Company has for the first time stated the tonnage of ore mined, the figure for 1909 having been 2,674,271 tons. In the JOURNAL of Apr. 2, we discussed the statement made by this company to the New York Stock Exchange, and estimated the tonnage at 2,600,000. Consequently our deductions as to the cost of mining, milling, etc., were very close to the actual results.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

The Census Report on Mines and Mining

The statements in the editorial of the Journal of April 9 are unwarranted and erroneous.

The first misstatement is that the Geological Survey mixed into the business. The Geological Survey did not take any initiative in regard to the mining census. The proposition of coöperation came from the Census Office, and as a result of numerous conferences, a scheme of coöperation between the two bureaus was agreed upon by the two directors and received the approval of the secretaries of the two departments.

The second misstatement is that according to well authenticated reports the arrangement between the Bureau of the Census and the Geological Survey is not working altogether satisfactorily. This is not true. There is entire harmony between the officials of the Bureau of the Census and the Geological Survey, and there has been no friction whatsoever. It is also untrue that the "inspection of the returns, so far received, has convinced some of those in charge that the results are wholly unreliable for the anthracite and bituminous coal regions, so much so that it is now understood that there is in contemplation a retaking of the anthracite cencus." There cannot be a retaking of the census when the census has not been taken. The work has only begun in the anthracite region, and up to date, only a few schedules have been received; these, so far as the Geological Survey is concerned, being entirely satisfactory. It is not true that the bituminous reports are even in worse shape. I have been agreeably surprised by the complete and correct manner in which the schedules are turned into the Geological Survey, and the amount of editing and correction necessary has been practically *nil.*

It is not true that the essential difficulty has been found in the fact that "some of the questions asked in the schedules are incapable of intelligent answers." All of the questions on the schedule returned to the Geological Survey have been intelligently answered. It may be that in some cases "the cost of labor reported has exceeded the value of the finished product," but there are some cases, particularly when exploitation and development work is in progress, where the labor cost exceeds the value of the product.

In such an undertaking as a census of mining and manufactures, it is natural that there should be some cases where the replies to inquiries need amendment or explanation, but the experience in taking the Thirteenth Census has thus far been that less difficulty in this regard has been encountered than has been the case in any previous census.

E. W. Parker.

Statistician in Charge, U. S. Geological Survey, Washington, D. C., April 18, 1910.

[Besides the letter from Mr. Parker, we have received one from Dr. Durand, director of the Census, to the effect that the census investigation as to mines and quarries is proceeding satisfactorily. We are pleased to hear this and sincerely hope that the result of the work for 1910 will be better than that of 1905, which was poor. We are glad to hear, moreover, that harmony exists between the Census Bureau and the Geological Survey, and that both are pleased with the returns so far received. In spite of these official statements, however, we do not repudiate our own information. If the Census schedules do not discriminate between the labor of coal extraction and that of dead work they ought to.

Our remark that the Geological Survey had mixed into the census business was based upon a statement to us by a responsible official of the census. Of course, he did not employ just that phraseology, but he *did* say that certain parts of certain schedules were incorporated at the request of the Geological Survey and therefore could not be discussed insofar as the Census Bureau was concerned, and we knew the inquiries to be unwise.

Our previous remarks were based upon the opinion that the census of 1905 was a very poor affair, from the mining and metallurgical standpoint, and the prospect that the census of 1910 would be no great improvement, it being conducted, to a large extent, by the same methods and under the same officials of the Census Bureau. In some of the cases that we have investigated, we say that the methods are not good.

In connection with our previous remarks, we are not to be interpreted as suggesting that there is any opposition on the part of anthracite and bituminous coal miners to furnish the information required. We have not heard of anything of that kind, and we urge the operators of all mines to fill out the schedules promptly and to the best of their ability.—Editor.]

Experts and the Productive Area of California Oil Fields

In the Journal of March 26, attention is called to the great gusher of the Mays Oil Company, which recently "came in" in the Midway field of California. It is noteworthy that about the middle of March, shortly after the completion of the Mays well, another phenomenal fountain of oil rose about ten miles farther southeast in the Lakeview well of the Sunset field. During the first month of the life of this well it is said to have produced the extraordinary daily average of from 30,000 to 40,000 bbl. of oil. It thus takes rank as the greatest gusher of the Pacific coast, and assumes a place among the most productive oil wells that have been known.

Some statements made by your correspondent in the issue of March 26 call for correction. He states that "in the Coalinga field, the Coalinga-Mohawk Company has brought in a 4000-bbl. well . . where geologists and oil experts did not expect oil could be found." Whether or not this statement applies to the "experts" who have reported on the territory I cannot say, but I question whether your correspondent knows of any geologists who have held the opinion which he ascribes to them. This locality was included well within the area of the probable productive territory and was specifically mentioned as favorable ground in the report on the Coalinga district (*Bull.* 357) published by the U. S. Geological Survey in 1908. It may be noted, likewise, that the Mays and Lakeview wells above mentioned are situated on hitherto unproved ground, mapped and described as offering good chances for the discovery of oil, in the McKittrick-Sunset report of the Survey (*Bull.* 406.), which is just coming from the press, and the proof of which was read some months since.

Your correspondent further says that the Midway field is the most productive in the State. As a matter of fact, its output in 1909 was less than one-sixth of the amount of oil produced in the Coalinga district, the banner district of California, and ranked seventh in production among the districts of the State. Its present output may have brought it up to fifth place.

Robert Anderson.

Assistant Geologist, U. S. Geological Survey.

Washington, D. C., April 20, 1910.

McKittrick-Sunset Oil Region, California

California now stands first among the States in production of petroleum, which is its most valuable mineral product, gold at last ranking second. This enormous production has naturally attracted general attention to the oilfields of the State, which are now being actively exploited. A report[1] on the McKittrick-Sunset oil region, in western Kern and eastern San Luis Obispo counties, has been prepared by Ralph Arnold and H. R. Johnson. The region covered embraces about 1800 square miles and includes the most productive territory of the McKittrick, Midway and Sunset fields and the undeveloped or less developed Devils Den, Temblor, and Carrizo Plain districts. Large areas of public lands in this region have been withdrawn from entry pending legislation or reclassification. The McKittrick field produced 2,517,951 bbl. of oil in 1908, the Midway field produced 410,000 bbl., and the Sunset, 1,556,263 bbl. Some single wells in this region have yielded more than 2500 bbl. a day. The oil is dark and heavy, has an asphalt base, and has been used principally as fuel on railroads, as road dressing, and for refining for asphalt.

CHARACTER OF THE REPORT

The report gives an account of the geography, topography, and general features of the region, sketches the geology, includes notes on the water supply, and describes the oil-bearing strata and the wells in detail. It includes many logs of wells, lists of companies and wells, giving location, elevation and other features, statements of production of wells and character of oil, and notes on methods of drilling, especially with a view to shutting off water. A section on the future development of the region states the probabilities of getting oil in areas not yet exploited.

Platinum, Palladium and Iridium

A correspondent communicates the following review of the market for platinum and allied metals: "Platinum has been steadily advancing since last September, and today is worth fully $5 per oz. more than during the latter part of 1909. In small lots, ingot metal cannot be bought for less than $29 per oz., but in large lots it is obtainable at $28.50@28.75. Advices from abroad indicate that the price for this metal will continue to advance for some time to come.

"Palladium can be purchased at $31@32 per oz., but iridium is simply 'out of sight.' There is very little of this metal on the market, and for what can be had as high as $50 per oz. must be paid. The holders do not seem to be particularly anxious to part with it even at that figure. Iridium has never been sought for to any great extent until during the last year, when the electrical concerns and automobile manufacturers began using it for sparking points. Jewelers are also using large quantities of it for the setting of precious stones."

Ownership of Utah Copper Company

In the following list are given the names of the largest stockholders of Utah Copper Company, as shown on the company's lists at the annual meeting on April 22:

Holders.	Shares.
Guggenheim Ex. Co	401,433
S. R. Guggenheim	28,666
Daniel Guggenheim	23,150
Murray Guggenheim	21,898
Isaac Guggenheim	10,500
Isaac Guggenheim	38
Carrie Guggenheim	888
Irene R. Guggenheim	94
E. & G. Guggenheim	23
Wm. J. Yates	174,505
Hayden, Stone & Co	109,567
Samuel Hayden	40
Spencer Penrose	52,060
Boies Penrose	4,986
Chas. B. Penrose	4,986
Lydia S. Penrose	577
Mary Penrose	190
Clement B. Penrose	100
Julia V. L. Penrose	100
C. M. MacNeill	34,194
D. C. Jackling	11,368
Henry M. Blackmer	400
Judd Stewart	50
Edward Brush	2,300
Jos. Clendenin	2,006
S. W. Eccles	10
T. E. Fell	7,800
W. Hinkle Smith	8,888
W. B. Thompson	101
Alvin Untermeyer	12,664
Isaac Untermeyer	586
Charles L. Tutt	5,000
William Crawford	3,788
Richard Delafield	1,422
Andrew Freedman	1,000
Bkrs. Tr. Co., trustee	3,836
Darr & Moore	341
R. L. Day & Co	1,116
De Coppet & Co.	92
De Cop. & Doremus	173
Dominick & Dominick	919
Baruch Bros	5,014
Aug. Belmont & Co.	4,000
Farson, Son & Co.	960
Flower & Co	885
H. P. Goldschmidt Co.	6,074
Halle & Stieglitz	6,920
Kanawha Inv. Co.	5,097
Ladenburg, Thalman & Co.	7,278
W. E. Lauer & Co	26,454
Lee, Higginson & Co	[illegible]459
Eugene Meyer & Co	46,149
Eugene Meyer, Jr.	10
Paine, Webber & Co	4,277
Sutro Bros. & Co	2,220
Spencer Trask & Co	1,575
Lehman Bros	10,240
H. P. Whitney, executor estate Wm. C. Whitney	15,188
H. P. Whitney	7,833
Cornelius Vanderbilt	[illegible]488
Henry T. Graf	10,558
F. C. Druding	11,000
James G. Lynch	7,950
Louis Marshall	5,100
J. G. Hopkins	5,000

The stock in the name of William J. Yates is supposed to be the property of the Guggenheim interests. W. B. Thompson appears as holding only 101 shares, but he is supposed to be one of the heaviest stockholders, the bulk of his stock being presumably registered elsewhere under a different name. Utah Copper Company has about 2500 shareholders.

Grass Valley Mining District

By R. E. Tremoureux*

With seven stamp mills running regularly and three more to start within a short time, the Grass Valley mining district situated in Nevada county, Cal., has made a favorable beginning for 1910. The North Star mine leads the State as a gold producer, $300,000 having been cleaned up during the first three months of this year. The shaft is down 5400 ft. on the vein and most of the ore comes from below 3000 ft. Two 40-stamp mills with cyanide plants handle about 8000 tons of ore per month.

The Empire mine ranks second in Nevada county and is one of the largest producers in the State. The accounts are not made public but it is thought the bullion shipments closely rival the North Star. The shaft is now down 3750 ft. on the vein and sinking is to be continued for the next two years. A 40-stamp mill handles the ore. The tailings are now run over a canvas plant, but the company contemplates erecting a cyanide plant in the near future.

The Pennsylvania and W. Y. O. D. are now worked under the same management and the 20-stamp Pennsylvania mill is running but the W. Y. O. D. mill has been closed for two years. About 70 men are employed, mostly on development work.

The Sultana's 20-stamp mill is dropping on good ore with over 60 men employed. The Union Hill runs 10 stamps and employs about 40 men. The Idaho-Maryland, once the greatest mine in the district, is now only working in the upper levels where sufficient good ore is encountered to keep a 20-stamp mill running.

The Brunswick has started a new vertical shaft which is expected to strike the vein at a depth of 1050 ft. Work on a new hoist is also being carried on rapidly. There are several smaller properties which are developing and sinking. The Norambague and the Ben Franklin are the most important of these.

Two gravel mines are working; the Jenny Lind and the Posey Cañon. Both of these mines have channels 250 ft. wide and at places, a depth of 8 ft. in good paying gravel.

Barytes in the United States

According to statistics compiled for THE MINERAL INDUSTRY, the production of barytes in the United States for 1909 was 39,831 tons, valued at the mines at $138,634. Of this amount, 28,127 tons came from the southeast Missouri district. North Carolina produced about 8000 tons.

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[1] Bull. 406, U. S. Geol. Survey.

*Grass Valley, Cal.

Judge Gary on the Steel Trade

At the recent meeting of the Steel Corporation, Judge Gary made the following remarks:

"I have no objection to saying that we have no reason to anticipate trouble from any source, nor any reason to suppose that our business prospects will be any poorer than they are at the present time. Of course, naturally, from time to time, we encounter more or less difficulty in keeping our mills running to their full capacity and in receiving prices which we think are adequate and reasonable. But our effort all the time is to do our business in such a way that one cannot reasonably be criticized by anyone who is interested in our affairs—criticized by the stockholders, by the employees, by our customers, by our competitors or by the general public. We believe that in the long run if we transact business in that way and at the same time keep the public fully advised from time to time in regard to our affairs, we will receive such treatment as we deserve.

"Of course, when general business conditions are good we prosper more, and when they are not so good, we prosper less. That may not be as applicable to our business as to the business of some others, for the reason that we think we have some advantages in regard to cost of production and cost of deliveries. But that we are more or less affected by general business conditions goes without saying. Therefore, you can tell something about what our business must be and what our prospects are when you consider what general conditions are and what you think they will be.

"We had a very serious depression following the panic of 1907; but during the year 1908, as you all know, notwithstanding all the difficulties surrounding us, we were fairly prosperous. You know by our recent annual report for 1909 that we were much more prosperous during that year. At the present time our mills are running to practically their capacity, and some of them are considerably behind in shipping up to the requirements of the trade. That we may have some reactions during the year is possible, but we have nothing in sight at the present time to indicate that our business during the whole of this year will not be very good and entirely satisfactory.

"At the time the United States Steel Corporation was organized, we had a capacity of about 25,000 tons per day; at the present time we have a capacity of about 42,000 tons per day; and our manufacturing capacity has been increased by investments made from our earnings. So you will see from the statement I have made that our opportunities for success are much greater at the present time than they were when we were organized. Moreover, since we were organized, we have spent large sums of money in the acquisition of additional raw products, which are scarce and growing scarcer, and also in the improvement of our facilities by the introduction of new methods, new machinery, labor-saving devices and the installation of the most modern methods of manufacturing at a low cost.

"It would not be seemly to boast of our position or of our prospects, but we believe we are well secured against trouble in the future from any direction. The stockholders of our corporation have the opportunity at any time of securing information which is proper for them to receive. We have in our company no officials who receive advance information and profit by that information."

American Institute of Mining Engineers

A circular from the secretary's office announces that the proposed excursion to Japan has been postponed, owing to difficulties in the arrangement of details. The Council has authorized a meeting to be held in the autumn in the Panama Canal Zone. Cordial letters have been received from the President of the United States and from Colonel Goethals, engineer in charge. Concerning this meeting, the following preliminary statement is offered:

The party will leave New York about the beginning of November; the trip will occupy between three and four weeks; and the cost to each passenger will be about $200, covering hotel expenses and transportation on the isthmus.

Besides the trip to and from the isthmus, it is proposed to include, among other possible stops *en route*, a visit to the mines and works of the Spanish Iron Company, on the north shore of Cuba. It is probable that other points, such as Havana, Kingston, etc., will be touched.

According to present information, the number of members and guests (including ladies) who can be transported at the rate stated above is 150. This number can be accommodated upon one of the regular Hamburg-American steamers, if ample notice be given in advance to secure reserved rooms.

Members are requested to indicate their intention concerning the Canal Zone meeting. To those replying in the affirmative special circulars will be subsequently sent concerning all necessary details; and, if the number of members and guests thus indicated should exceed 150 (without amounting to an aggregate so large as to require an entirely new arrangement), the following order of preference will be observed. (a) Members in the order of the date of their applications up to May 15. (b) After May 15, guests accompanying members, in the order of the date of application prior to May 15, one guest for each member having preference, and a second or third guest being accepted only in case there is still room on May 15. (c) After May 15, both members and guests must take their chance in the order of their applications.

Potash Salts Supplies

The new organization of the German Kali-Syndikat has been formally incorporated. It is stipulated that the companies holding American contracts can come in provided they terminate those contracts at the end of a year. If they decline to do so, a new syndicate will be formed.

The London correspondent of the *American Fertilizer* writes: "Until lately it has been believed that Germany was the only country in the world in which deposits of potassium salts existed. Now, however, the news of the discovery of potassium deposits in other countries is announced in the German press. According to the Brunswick *Landes-Zeitung*, the latest German discoveries are in Alsace, close to the French boundary, and the potassium deposits there will probably extend across into France, as has been the case with the salt deposits. It has also been established that deposits occur in Hungary, Russia, Holland and Persia. It is further announced that potassium salts have been found in China. Although the fact has been known for some time, it has been kept a secret, and the whereabouts of the deposits has not been disclosed. Samples of these Chinese salts have been tested by a chemist connected with the Potassium Syndicate, and the results have shown a large percentage of chloride of potassium."

Dry Land Dredge

Special Correspondence

By the incorporation of the Western Gold Dredging Company, at Oroville, Cal., with a capital stock of $100,000, plans for opening up an entirely new field in gold dredging are revealed. The company has taken a lease on 35 acres of ground at Thompson flat, near Oroville. The new dredge is described as a dry-land steam-shovel dredge and will work ground to the depth of 6 ft. only. It consists of a steam shovel on traction-engine wheels so that it may easily be moved about. Attached to the steam shovel as a trailer is a sluice car on which are sluice boxes in which the gravel will be washed. It is claimed that this apparatus will leave the land in suitable condition for farming purposes after the gold is extracted. There is undoubtedly a large area of shallow gravel land that cannot be worked by the regular dredges and if this new method is successful, it will have a wide field.

A dry-land dredge is said to be operating on the P. R. Welch place, near Oroville.

DETAILS of PRACTICAL MINING

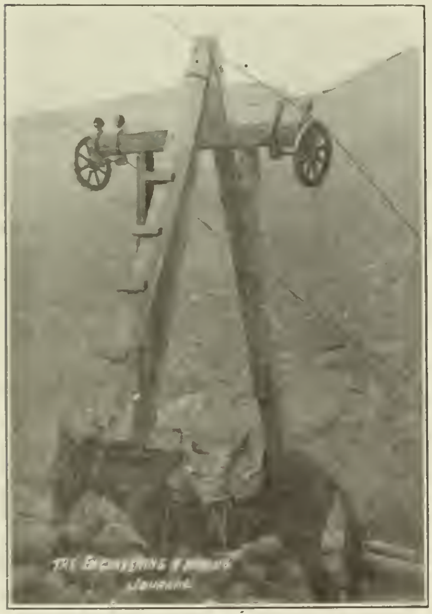
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

A Cheap and Durable Cable Tower

By H. S. Reed, Jr.*

The cable tower shown in the accompanying photograph was designed to meet conditions of unskilled labor and high cost of material. Three of these towers have been in use at Mina La Gloria, Batopilas, Mexico, nearly a year with satisfactory results

To make the joint at the top five cuts are necessary, but as they are all equal when one is laid out the workman has but to use it as a pattern for cutting the others. The cross piece is bolted flat to the two back legs by ⅞-in. bolts and is notched only sufficiently to give a seat for the front leg to which it is also bolted by a ⅞-in. bolt.



Mexican Cable-way Tower

Erection

In erecting, the two back legs are bolted firmly together by a ¾-in. bolt and the ¾-in. U bolt put in loosely, then when the back legs are raised to a perpendicular position the front leg is inserted and the three legs spread and settled into position and tied together at the bottoms by small poles bolted to each leg. The *carpentero* now climbs up the steps, and tightens the U-bolt, at the same time putting in another ¾-in. bolt at right angles to the first bolt in the back legs.

After the bottoms of the legs are each placed on a large flat rock and the whole securely anchored by piling rocks on the tie pieces, the cross piece is raised and placed level, where it is held temporarily by boards nailed across from leg to leg while it is bored and bolted. Of the two uprights only one, that on the loaded side, is needed. The legs are 6x8 in. x5 m. long, rough hewn, being the way the Indians bring them from the mountains, and cost two pesos each. The cross piece is 9 x 9 in., also rough hewn. The ties at the bottom, *morillos* as they are called, are about 5 in. in diameter at the butt and from 4 to 5 m. long. The cable used is 1400 m. long and is ⅞ in. in diameter. It has a capacity of 60 tons per day, each bucket holding 80 kg. when filled.

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*Mina La Gloria, Batopilas, Chihuahua, Mexico.

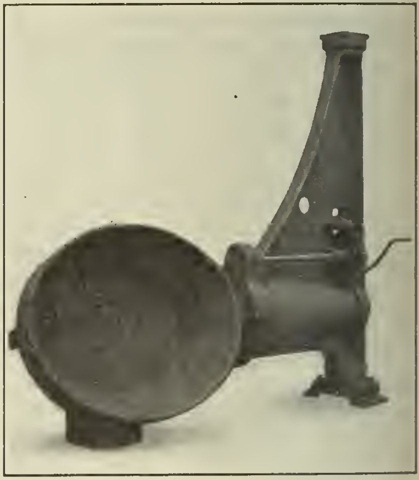
The Economic Limit of Concentration

A discussion of William Poole's paper on ore treatment brought out many interesting features at the October meeting of the North Queensland Mining and Mill Manager's Association at Charters Towers. Possibly the most interesting and novel problem discussed was, "Will it pay to concentrate ores so carefully that their value will be reduced to, say $1.25 per ton, at which no leasing cyanider would make an offer for them?" If this careful concentration were carried out, the resulting cost to the millman for carting the tailing from the settling pit must be added to milling cost. This is about 25c. per ton. "Would it not be better to send out a slightly higher-grade tailing and sell to the cyanider who discharges a 25c. instead of a $1.25 tail."

It is a question, also, whether the gold in the concentrate which gets away with the sand is amenable to cyanide treatment. The sand from the Brilliant Extended assays $2 and the slime $4 to $5, the mixture being worth $3 per ton. "Would it pay to concentrate the fine mineral from the slime?" This additional concentration, it was stated, would cost 25 to 40c., increase the mill machinery 50 (?) per cent. and add seriously to labor cost. At the same time the value of the tailing might drop from $2.50 or $3 to $1.50 per ton, and it would cost 75c. to cyanide this tailing and 25 to 40c. to cart it out of the pits.

Slag Handling Arrangement at British Columbia Copper Company

To handle economically and efficiently the flow of slag during the interval of changing pots, the British Columbia Copper Company has in use at its Greenwood plant the device shown in the accompanying halftone illustration. The method adopted eliminates the necessity of a second spout on the settler, simplifies the track layout for slag disposal and avoids the spilling of slag, which invariably happens when an attempt is made to change slag pots by holding a hand ladle under the settler spout.



Auxiliary Slag Bowl

The British Columbia arrangement is simple and merely consists of a bowl of ample capacity to be swung under the slag pot during the period of changing pots. It is an adaptation and amplification of the old hand-ladle idea with sufficient capacity provided and suitable means for sustaining and moving the larger bowl.

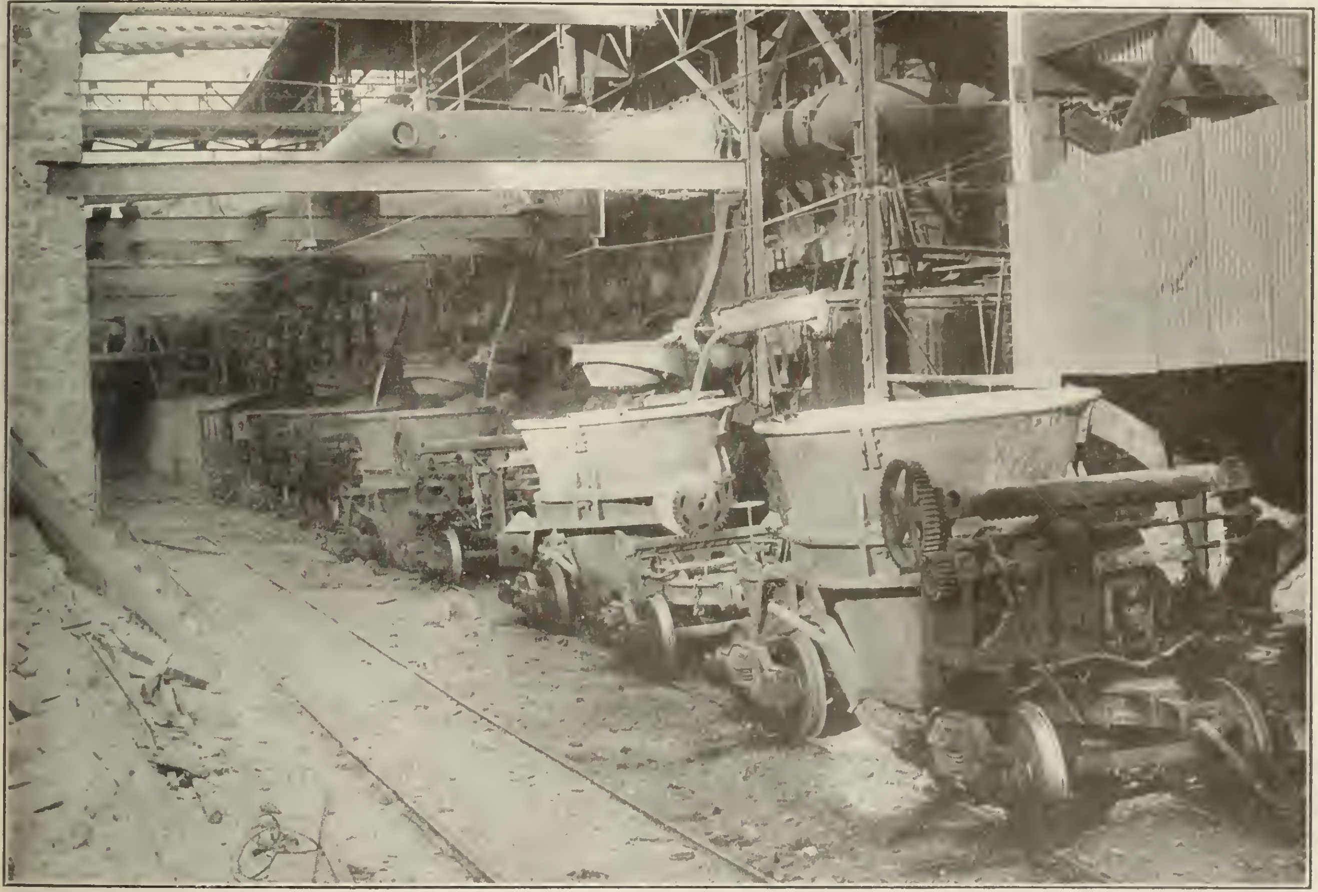
The slag-handling arrangement at this plant consists of two parallel tracks on which an electric locomotive handles the 225-cu.ft., motor-dumped slag pots. Short spur tracks connect the two parallel tracks at each settler and the locomotive, returning from the dump with the string of empties, takes the full pot from the settler to the outside parallel track, "kicking" it a short distance down the track, which is level at this point but has an upgrade as it approaches the dump proper. The locomotive then leaves an empty pot at this furnace and passes on to repeat the operation at the next.

During the interval of changing the large slag pots, the auxiliary slag bowl is swung under the settler slag spout and receives the slag flow until the new pot is in position. During this period the auxiliary bowl is only filled to about one-third its capacity so that there is ample allowance for emergencies and delay in changing the pots.

The auxiliary bowl is approximately 2 ft. deep and is elliptical in shape with diameters of about 4 and 5 ft. The bowl rests in a cast-steel frame and is held in place by lugs. The cast-steel frame is socketed in the swinging cast-iron frame. This cast-iron frame has ball bearings at both top and bottom, the base resting on a cast-iron seat in the floor and the top being fastened to a girder as shown in an accompanying view. The frame and bowl operate easily on these bearings and could be readily moved by a boy. The center of gravity of the auxiliary bowl is so placed that it tends to right itself when empty, and to dump when full. When receiving slag, it is held in position by a pawl in the ratchet near the handle.

This slag-handling arrangement has proved highly efficient at this plant and it is said that the blast has not been taken off the furnaces in two years on account of the blocking of the slag flow. The auxiliary-bowl arrangement was installed at the British Columbia Copper Company's smeltery in the autumn of 1906 and is not patented. We understand that a similar equipment is now used at the plant of the Canadian Copper Company at Coppercliff, Ontario.

An important consideration in the use of this auxiliary bowl is the fact that at no time does the slag stream impinge against the metal of the large and expensive slag pots used at the British Columbia plant. When a new slag pot is placed at a settler, the slag caught in the auxiliary bowl during the interval of changing pots is turned into the new pot at once, forming a pool or buffer to receive the slag stream of the settler. The bowls of the slag pots at this smeltery have not been replaced in two years and the incidental saving in this connection is noteworthy.



Slag-handling Arrangement at British Columbia Copper Company, Greenwood, B. C.

The problem of securing safety in hoisting, which is as old as mining, is still unsolved. The Langlaagte Estate, South Africa, has an experimental shaft head with which two inventors are working. These promise to stop gradually a cage with its load, a total of 8 tons at least, after it is detached from the hoisting rope, without friction on the guides.

Smooth Lining for Tube Mills

Of late there has been much discussion as to the best lining for tube mills, and the old silex liners have in many cases been replaced by the El Oro and similar types. The displacement of the silex lining is mostly due to the fact that the other types of lining can be renewed much more quickly and are cheaper.

It is interesting to learn the success of the smooth lining at the Butters', Virginia City, Nev., plant. Here 20 stamps, crushing to 2½ mesh supply the ore for four tube mills. The tubes are 5x22 ft. and are run 36 r.p.m. The linings are made up of rectangular pieces of smooth white iron 1¼ in. thick, 8 in. wide and 48 in. long. These iron plates are set in the tubes edge to edge and are bolted to the shell of the tube mills with ⅞-in. plow bolts.

It has been found that such linings, grinding the coarse, 2½-mesh material, last about nine months on Virginia City ores. The El Oro linings will do little, if any better and are more expensive. The duty of the mills is about the same with each type of lining, and either can be renewed in about the same length of time. In the Butters' mill the El Oro lining was tried first, and later discarded for the smooth-plate lining which is now used exclusively.

Useful Knots for Engineers—IV

By A. Livingstone Oke.*

Fig. 37, Slipping Lines—A method of attaching a rope to a spar or post is shown at *A*. For heavy strains the toggle should be smooth and tapered. *B* is a slipline arranged with two bowlines and a toggle. *C* is a half hitch with a slip; a clove hitch may be similarly employed. *D* is a slip on a slip knot. It can be used when the knot has to be made on the line before it is placed over the bar or post. In the arrangement with two bowlines shown in *E*, less strain comes on the toggle than in *B* and it is more easily slipped.

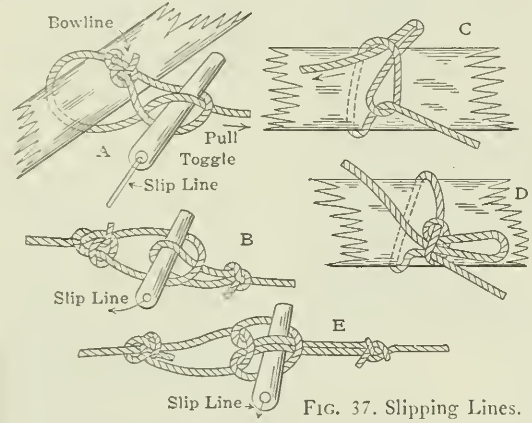


Fig. 37. Slipping Lines.

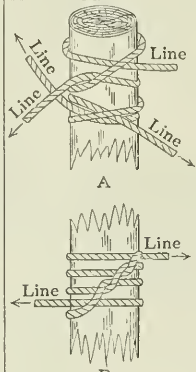


Fig. 38. Derrick Head.

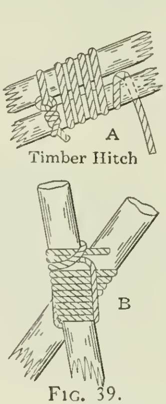


Fig. 39. Two-Leg Derrick.

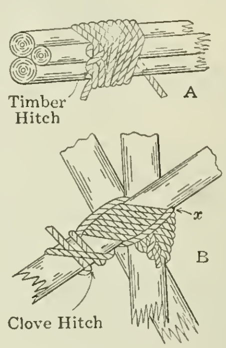


Fig. 40. Three-Leg Derrick.

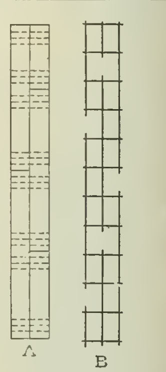


Fig. 41. Building Up Poles

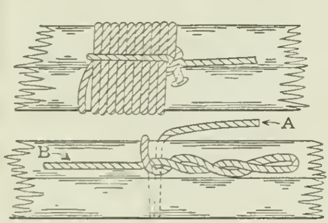


Fig. 42. Pole Lashing.

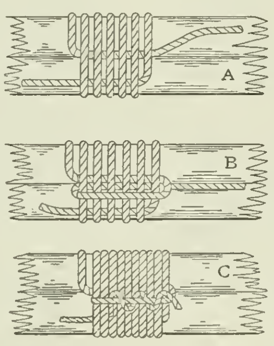


Fig. 43. Pole Lashing.

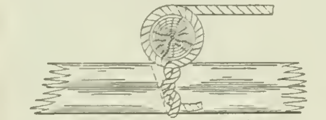


Fig. 44. Scaffold Lashing.

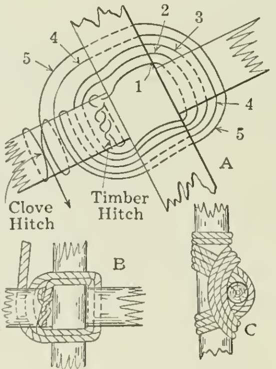


Fig. 45. Scaffold Lashing.

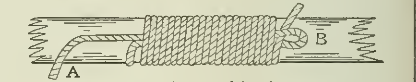


Fig. 46. Whipping.

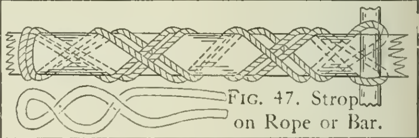


Fig. 47. Strop on Rope or Bar.

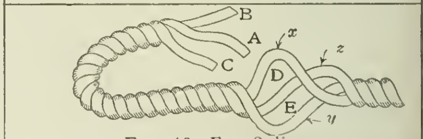


Fig. 48. Eye Splice.

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Slipping Lines, Eye Splice and Lashings for Derricks, Scaffolds and Poles

Fig. 38, Derrick Head—Two clove hitches are employed as shown in *A* for two sets of lines. If it is desired that the lines should leave the pole from opposite sides, further half hitches may be put on until the overlaying of the turns brings the end around as shown in *B*.

Fig. 39, Two-leg Derrick—In *A* is shown the lashing started with a timber hitch and the end drawn through between the two poles. After the legs have been opened out, one or two turns are taken around vertically between the poles to bind the other turns together, and the lashing finished off with a clove hitch as in *B*.

Fig. 40, Three-leg Derrick—The lashing is started with a timber hitch on one pole. The three poles are then laid together as in *A* and as many turns as required are taken around them. The rope end is temporarily pulled through the poles as shown. The three legs are then slightly spread and the turns around the poles are bound together by further vertical turns *x* in *B*. The lashing is then finished off with a clove hitch.

Fig. 41, Building up Poles—To build up a double pole to form a gin pole, the ends are butted and joints broken as shown in *A*. Lashings are put on at either side of each joint. The same method is employed with three poles, as shown diagrammatically at *B*.

Fig. 42, Pole Lashing—The bight is laid as shown in the lower sketch, and, after a sufficient number of turns are made, the end *B* is taken over outside the turns and put through the bight. End *A* is also put through the bight, and the whole tightened.

Fig. 43, Pole Lashing—This form of lashing is shown started at *A*, then the end is brought over and passed back under the turns as in *B*, and the lashing finished as in *C*.

Fig. 44, Scaffold Lashing.—This is a lashing for holding a crosspiece in place when the strain is from above and not laterally. Less rope is required, but it does not lend itself to being tightened as well as the usual method, Fig. 45.

Fig. 45, Scaffold Lashing—This lashing is started with a timber hitch and is shown diagrammatically at *A*. *B* shows the first stage of lashing with only two turns complete, and *C* shows a side view of the finished lashing. If desired, wedges may be driven into the lashing to thoroughly tighten the turns.

Fig. 46, Whipping—A long bight is laid on the pole, turns taken around it, and the end drawn through the bight. This method of binding may be used to finish off a rope end; for binding splints to a fractured span to strengthen it; or to make the lashings on derrick heads and in scaffolding, the bight always being put well on the outside (see pole lashings).

Fig. 47, Strop on Rope or Bar—An endless strop or sling is made and wrapped around the bar as shown. The diagram shows how the ends of the sling are alternately passed through each other. The power is, of course, to be applied to the toggle. This is a most excellent method for getting a strong grip on a smooth bar or tube, such as a drill casing or tube jammed in a drill hole. It is suitable for hanging a block or tackle to a gin pole or a mast or rope. The sling should be made of relatively small rope as it grips better. This arrangement is more powerful than a rolling hitch.

Fig. 48, Eye Splice—Open the rope as shown and pass the end *B* through to the back at *D*, and the end *C* through *E*; the center strand *A* will lie between the two strands x and y. A is now passed over x and under z; B over z and under y; C over y and under x. All three ends are now up, lying between two of the strands of the other part or standing of the rope. The process of over the next on the left and then under the next strand but one is repeated as many times as the proposed load calls for.

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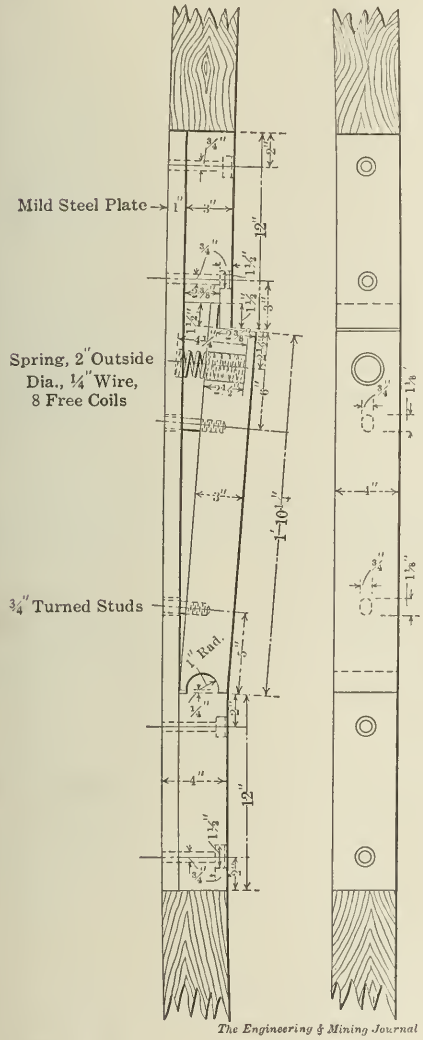
*Mining engineer Argentine & General Exploration Company, Ltd., Rodeo, San Juan, Argentina.

Safety Stop on Guide Timbers

The accompanying sketches have been made from data supplied by the South Kalgurli Gold Mines, Ltd., and reported in the *Monthly Journ.* of the Chamber of Mines of Western Australia. The device is put in between the dumping station and the safety collar on the headgear. It does not come into action unless the skip is overwound, and acts as an added safeguard to the ordinary safety hook.



The Engineering & Mining Journal

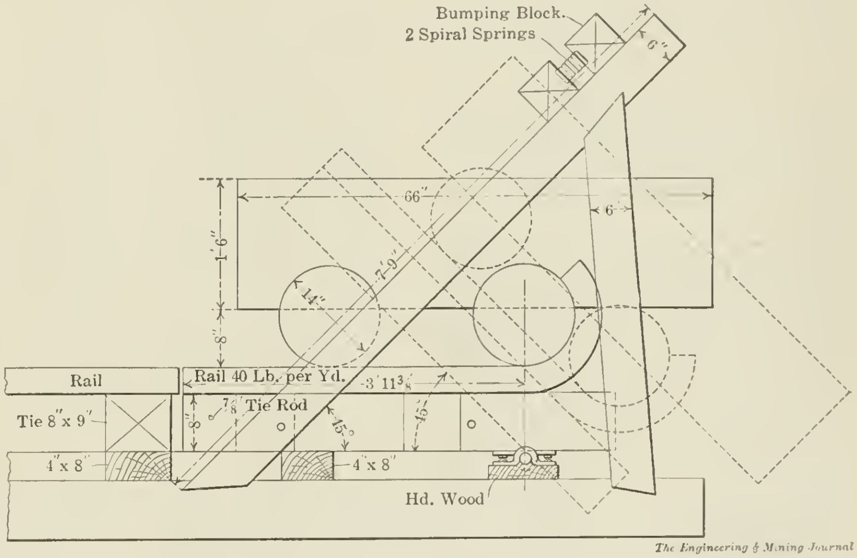
Arrangement of Guide Timbers for Safety Purposes

In the case of a rapid overwind there is danger of the impact of the skip destroying the collar and damaging the safety dogs. Should this occur, there is nothing to prevent the skip from falling down the shaft after rebounding from the impact. The safety stops are so placed that the skip is prevented from falling in the event of the destruction of the safety collar. The stops may be made of cast or mild steel.

Tram Car Tipple

By Guy C. Stolz *

A tram-car tipple used by the Cheever Iron Ore Company, and Witherbee, Sherman & Company, in the Mineville, N. Y., iron district, is similar in principle to the one described in the Journal of Dec. 11, 1909, as being used by the Tennessee Coal, Iron and Railroad Company. A distinctive feature in this tipple is the bumping-block arrangement which is attached to the frame proper. The tipple is made of 8x8-in. timbers, securely tied together and operating on a frame of 8x8-in. timbers. As the car assumes a position of 45 deg. in discharging its contents, the back of the car strikes against a bumping block, which has behind it, two spiral springs which contract 3 in. before the block will press against a second stationary bumper. This device lessens the shock to tipple and frame in dumping and makes a saving on tram-car repair bills.



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Tipple Used by Witherbee, Sherman & Co., Mineville, N. Y.

The axle is in such a position with respect to the center of gravity of the car and tipple, that a tram car will automatically dump when pushed on the tipple at the average rate a man walks. The position of the axle for the first tipple was calculated in the drafting room by the following method: In tipping the car containing 3360 lb. of ore to a 45-deg. position, the combined center of gravity is raised 2 in. or 0.167 ft. The total weight of car and tipple is 1814 lb. With a load of 3360 lb. the total weight is 5174 lb. The energy is equal to 5174 × 0.167, or 864 ft,lb. Solving for velocity in the equation

$$E = \frac{W v^2}{2 g}$$

in which E = energy in foot-pounds; W = total weight; v = velocity and g = gravity, v is equal to 3.27 ft. per sec.; the velocity the car should be sent on the tipple to discharge its contents when the axle is in the position shown.

Storing Compressed Air

Compressors of modern design are equipped with unloading devices which overcome, to a certain extent, the loss of power through air blowing off at the safety valve when a hoist or a number of drills are stopped for a few minutes. But with an unloader cutting out the compressor every few minutes the daily capacity of the plant is much less than if it were allowed to compress air constantly observes C. Sangster in *Power;* and if that air could be stored and given back when all the drills and hoists happen to be at work at the same moment, calling for more air than the compressor could deliver, a great advantage would be gained.

The storage capacity of the ordinary mining installation is small. Suppose a 10-drill plant has a storage equal to 5000 ft. of 6-in. pipe and a receiver 48 in. by 15 ft. This would hold 1188 cu.ft. of compressed air, which at eight atmospheres would be equal to 9504 cu.ft. of free air. If the compressor were stopped, only about one-third of this air could be used, as when about that amount had been drawn off the pressure would be too low to do effective work. Ten 3¼-in. drills at a 3000-ft. altitude would pull down the pressure in this pipe line and receiving tank from 96 to 60 lb. in about four minutes.

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*Mining engineer, Mineville, N. Y.

Dredging Operations of Natomas Consolidated

SPECIAL CORRESPONDENCE

The Natomas Consolidated of California has recently offered on the London market $5.000.000 6 per cent., first-mortgage, 20-year gold bonds. The proceeds of this issue, together with the subscription of an additional $1,000,000 of the bonds in America, will be applied partly in the purchase and erection of five 13½-cu.ft. continuous-bucket-line dredges of an estimated capacity of 16,250,000 cu.yd. per annum, bringing the earnings from the dredging lands alone up to $1,961,600 annually. The additional funds will also be used in completing the purchase of additional land and the construction of works for reclamation and irrigation. It is the intention of the company to make arrangements for supplying Sacramento, which is at present inadequately provided with water from the Sacramento river, not under pressure, with a constant supply of pure mountain water under pressure.

Natomas Consolidated is a going concern incorporated in 1908. The properties of the consolidation include large areas of dredging lands, important water rights, rock-crushing plants, real estate and the right by contract to purchase a tract of approximately 50,722 acres of valuable land to be reclaimed, which immediately adjoin the city of Sacramento, being separated from it by the American river. These lands have a river frontage of 22 miles along the American and Feather rivers, and in connection with them a complete project of reclamation and irrigation has been prepared.

The prospectus is supported by a report by Charles M. Rolker, in which the history of gold dredging along the American river, geology, past results and future prospects are described in considerable detail. Mr. Rolker also supplies an interesting report on the subject of land reclamation and irrigation prepared largely from the reports of experts in these branches of engineering, notably that of Stephen E. Kieffer. He sums up his report on this branch of the company's business by saying that, from his intimate knowledge of the United States and of the Western States in particular, he feels that if the engineering part is well done the overflow lands of the Sacramento valley may well rival the valley of the Nile in fertility.

As regards the dredging of the auriferous gravel, Mr. Rolker described three distinct periods of gravel deposition on the American river. The result of these deposits is a broad sheet of gravel with gold more or less evenly distributed through it, though richer channels exist within the present trunk system of dredging lands. It is probable that with the largely cheapened cost of dredging of late years, the entire tested areas will be dredged as one continuous mass of gravel.

In examining the ground, 1274 drill holes or test pits were put down. The average cost per cu.yd. during eight months of 1909 with eleven dredges in the Natoma, Folsom and Feather River divisions, is given at 3.885c., the minimum (Natoma) being 3.036c. and the maximum (Feather river) 5.17c. The average yield in the three divisions was 6.6c. per cu.yd. and the net returns $780,410. According to Mr. Rolker the cost of a 13-cu.ft. dredge should not exceed $200,000, and of a 13½-cu.ft. dredge $250,000.

The estimated net profits on all proved lands of Natomas Consolidated is put at $20,067,195, and on unproved lands an additional $3,240,000. The life of the gravels with the new plant appears to be about 13 years.

Report of Nipissing Mines Company

The Nipissing Mining Company, all the stock of which is held by the Nipissing Mines Company, completed on Dec. 31, 1909, the most profitable year in its history. Nearly four and three-quarter million ounces of silver were produced at a cost of 16.39c. per oz., leaving a net profit of $1,687,000. The mining company paid the holding company $1,535,000 in dividends, the last dividend being paid in January, 1910. Out of this amount the Nipissing Mines Company paid four dividends aggregating $1,500,000, or 25 per cent. on the capitalization. The net surplus of the mining company was $913,195 at the end of the year.

NIPISSING SHIPMENTS IN 1909.

	Tons.	Silver Oz. per Ton.	Net Value per Ton.	Gross Silver Oz.
High-grade	1047.69	3,093.71	$1518.17	3,241,259
Low-grade siliceous ore ...	5174.20	212.23	81.88	1,098,167
Concentrates.	183.07	855.42	100.73	156,606
Nuggets	7.63	19,771.12	9844.94	150,841
Total.	6412.59	724.64	$ 339.68	4,646,876

The shipments made during the year are given in an accompanying table. The high-grade ore contained 8.46 per cent. cobalt and 6.98 per cent. nickel, and the concentrate contained 8.32 per cent. cobalt and 3.78 per cent. nickel. Sales of cobalt amounted to 177,706 lb., worth $19,833, and of nickel 117 lb., bringing $14. The actual production for the year, adjusting stocks on hand, was 6391.75 dry tons containing 4,727,231 gross oz. of silver worth $2,462,039 gross or $2,222,562 net. The profit on the operations amounted to 68.53 per cent. of the gross. The detailed costs are given in an accompanying table. During its life, Nipissing has shipped 14,860 tons of ore containing 12,747,468 oz. of silver.

COSTS AT NIPISSING.

		Per Ton Ore.	Per Ounce Silver.
Trenching ...	$26,669	......	......
Development....	141,714	......	......
Tunnels and shafts.	71,039	......	......
Stoping	81,685	......	......
Sorting and loading.	33,913	......	......
Office and general..	96,141	......	......
Total mine operation.	$454,191	$71.06	$0.0961
Concentration.....	35,434	5.54	0.0075
Depreciation	19,799	7.79	0.0105
Marketing, etc ..	263,224	41.18	0.0557
Corporation, etc	12,483	1.95	0.0026
	$815,131	$127.52	$0.1721
Less miscellaneous..	10,320	6.30	0.0085
Total cost of production ...	$771,811	$121.22	$0.1639

Work was carried on in 1909 through 10 shafts and two tunnels, and a total of 4504 ft. of drifting, 2528 ft. of crosscutting, 996 ft. of raising, 423 ft. of sinking and 9483 cu.yd. of stoping were done. An average of 87 men were employed five and one-half months in the trenches, of which 33.1 miles, averaging 3.4 ft. deep were dug. This work was entirely confined to the central area, which had already been prospected. The management proposes to remove the overburden from the entire surface of the property. The surface conditions are given in an accompanying table.

AREA OF NIPISSING.

	Total Acres.	Partly Prospected.	Unprospected.
Conglomerate	429	306	123
Keewatin........	176	157	19
Diabase	241	16	225
Total.........	846	479	367

The Nipissing Reduction Company, a custom concentrator on Nipissing ground, treated the low-grade ore from No. 63 vein. Its operations are given as illustrating the present milling of Colbalt ores: Dry weight concentrated, 11,159 tons; silver contents of ore, 311,824 oz. (27.94 oz. per ton); concentrates produced, 264.44 tons; silver contents of concentrates, 246,462 oz. (932 oz. per ton).

The ores reserves are estimated by Manager Watson as 6,539,200 oz. silver in 10 veins, more than three times the reserve of a year ago. The estimate is based largely on past results, and when an orebody is cut through by a drift and is not further developed by winzes or raises, ore is estimated not further than 10 ft. above or below the tunnel.

The known veins on the property now are numbered up to 132, and one vein discovered during the year, No. 122, has already produced over 400,000 oz. of silver. The largest production was made from No. 63 vein. Winzes sunk below the 146-ft. level showed conglomerate at 45 ft. and ore is probably below the present depth of working. The largest vein is No. 64, which shows 30 in. of ore at one place.

Fifth Annual Report of Utah Copper Company

The report of C. M. MacNeill, president of the Utah Copper Company, dated April 1, 1910, states that the capital stock outstanding at that date was 1,540,100 shares, of which 734,375 shares were outstanding Dec. 31, 1909; 310,000 were exchanged for Boston Consolidated; 422,288 were exchanged for Nevada Consolidated and 73,437 were sold at $50 per share. It is not contemplated that any of the remaining 959,900 shares will be issued in the immediate future. In the fiscal year ended Dec. 31, 1909, the net earnings were $2,160,090. The income account was printed in the JOURNAL of April 2.

UTAH BALANCE SHEET, DEC. 31, 1909.

ASSETS.

Cost of property acquired.......	$5,972,901
Improvements at Garfield plant..	4,097,592
Improvements at Copperton plant	31,277
Mine, surface equipment........	434,480
Prepaid expenses, ore...........	1,513,946
Ore held in reserve at Garfield Mill	5,094
Garfield Improvement Company..	40,000
Garfield Water Co...............	100,000
Accounts receivable.............	114,158
Storehouse supplies and fuel....	311,858
Equity in copper in transit......	1,371,374
Cash in banks..................	91,131
	$14,083,815

LIABILITIES.

Capital stock outstanding.......	$7,343,750
First mortgage bonds outstanding	7,500
Treatment and refining charges not yet due................	381,406
Accounts payable...............	45,490
Hospital fund..................	20,327
Nat'l Bank Com., New York.....	197,963
Surplus (amount rec'd above par from sale of stock)..........	3,143,750
Undivided profits...............	2,943,626
	$14,083,815

The gross profit of the company from July 1, 1904, has been $5,293,004, from which has been paid $151,102 interest on bonds, $37,500 bonus on retirement of first issue of bonds and $2,160,775 in dividends, leaving undivided profits Dec. 31, 1909, $2,943,627. Of this amount, $1,562,698 was invested in fixed assets, leaving a net working capital of $1,380,929.

The stock mentioned above as sold at $50 per share yielded the company an additional capital of $3,671,850 since the close of the year. The Utah and Boston Consolidated properties are now being operated as one, and this additional capital will be utilized in part for the enlargement of the Arthur (Boston Consolidated) mill to a capacity of at least 6000 tons per day. The slight changes necessary in the Magna plant (the old Garfield mill) should not exceed $60,000. It is expected that by July or August at the latest, the Magna plant will have a regular capacity of from 10,000 to 12,000 tons per day, although originally designed for a capacity of 6000 tons.

GRADE OF ORE RESERVES DECREASED

During the year the underground development amounted to about 24,000 ft., at an average cost of a trifle over 4c. per ton of ore mined and shipped. Most of the development was in the southeasterly and northwesterly portions of the orebody and increased the fully and partially developed areas to 104 acres. The net quantity of ore remaining in this area is over 90,000,000 tons, of which 50,000,000 are fully developed. The ores developed during the year are somewhat lower in grade than that hitherto reported, and bring the average grade of the reserves down to 1¾ per cent. copper.

The total amount of capping removed during the year was 1,526,000 cu.yd., an average of over 127,000 cu.yd. per month. The total stripping removed to date amounts to 3,232,000 cu.yd.

The total area over which stripping operations have been conducted is 37 acres; the average thickness of capping shown by all stripping to date is 71 ft., corresponding to about 115,000 cu.yd. per acre. The actual area fully stripped at the close of the year was 16.4 acres; the total yardage removed, however, represents the equivalent of completely stripping 28 acres. The area over which stripping has been partially completed contains approximately 1,000,000 tons per acre, so that the work has resulted in removing a quantity of capping equivalent to the complete stripping of approximately 28,000,000 tons of ore. About one-seventh of this quantity of ore has been removed from the area in question.

During the first quarter of the year the ratio of underground ore to the total ore mined was in excess of 21 per cent.; during the last quarter less than 3 per cent. of the total ore mined came from underground. The averages for the entire year were 13 per cent. of underground ore and 87 per cent. of steam-shovel ore. The total ore treated was 2,674,271 tons.

Both the Garfield and Copperton plants were in continuous commission throughout the year, although neither of them could be operated at full capacity, excepting for short periods, on account of a deficiency in tonnage due to inadequate transportation service. This loss in tonnage averaged about 20 per cent. of the capacity of the plants.

MILLING AND COSTS

The total production of copper contained in concentrates, was 54,472,845 lb.; the resulting net production, after smelter allowances and deductions were made, was 51,749,233 lb. The concentrates also yielded 20,862 oz. gold, and 198,943 oz. of silver, after smelter deductions on silver. The average grade of concentrates for the year was approximately 26 per cent. copper.

The ore treated during this period contained approximately 5 lb. of copper less per ton than that milled during the preceding 18 months. This decrease in grade resulted largely from a discontinuance of production of underground ore.

The average price received for copper sold during the period was 12.915c. per lb. The average cost per pound of copper produced, based on the net pounds of copper resulting after smelter deductions and allowances were made, was 8.787c. per lb., this cost including all expenses of smelting concentrates, and the refining, transporation and disposition of the metal. The average total cost of mining and milling, exclusive of transporation and smelting charges, was 94.43c. per ton of ore treated. Included in this cost is a charge of 9¼c. per ton, which covers all underground development costs at the mine, and a proper proportion of stripping expense.

The costs above stated include the expense of mining an average of 13 per cent. of the ore produced from underground; during the latter portion of the year, when nearly all of the ore was mined by surface methods, the total mining and milling cost, including all underground development expense and proper proportion of stripping expense, was reduced to less than 80c. per ton, and this cost will be further reduced on a full capacity basis, when all the ore is mined by steam shovels.

Old Dominion and Subsidiary Companies

The Old Dominion Company, as the holding company which owns the entire capital stock of the United Globe Mines and 155,245 shares of the 162,000 issued shares of Old Dominion Copper Mining and Smelting Company, reports the payment of three 50c. dividends amounting to $439,867 in 1909, and a surplus of $71,307 Dec. 31, 1909.

The Old Dominion Mining and Smelting Company, Globe, Ariz., paid three dividends of $1 per share each in 1909, amounting to $486,000, and produced 34,519,301 lb. fine copper, 154,545 oz. silver and 2257 oz. gold, of which 9,101,589 lb. copper, 120,490 oz. silver and 468 oz. gold were from custom ores. During the year reductions were made in the mining and smelting costs, but the concentrating department showed a slightly increased per-ton cost as follows: Mining cost, $5.08 per ton of ore mined in 1909 as against $6.33 in 1908; concentrating, $0.74 against $0.60 per ton; smelting and converting, $2.52 compared with $2.83 per ton of charge. These reductions permitted the mining of smelting ore averaging 1.1 per cent. less copper than in the previous year, and concentrating ore averaging 0.16 per cent. less copper, at a slightly lower cost per pound of copper mined.

The average grade of smelting ore mined was 6.71 per cent. copper, and the concentrating ore contained 2.9 per cent. The concentrator treated 106,537 tons of company ore and 17,440 tons of custom ore.

In the smelting department the lessened cost was mainly due to the substitution of lower-priced Western coke for about half of the Eastern coke formerly used. The smelting cost was 0.03118c., and converting 0.00509c. per lb. of fine copper produced. The practice has been inaugurated of resmelting all converter slags, thereby securing the needed flux and eliminating barren material from the furnace charge.

Development was chiefly with the view of finding and opening ore at the east and west ends of the mines. The pumping problem is one of the most serious at the mine, the maximum flow of last year being over 5,000,000 gal. in 24 hours. The main steam-pumping station is being placed at the 12th level, where there will be two pumps with a capacity of 1200 gal. per min. each, and two with 900. All water from below will be raised to this level by electric pumps.

At the United Globe mine, the year recorded a profit of $80,041 as against the deficit of $73,968 in 1908. Several good bodies of ore were exposed in the Old Dominion vein, and sufficient sulphide ore discovered to render the Old Dominion smeltery independent of foreign sulphide ores.

Alaska United Gold Mining Company

The Alaska United Gold Mining Company, owning the Ready Bullion and 700-Foot Claim mines on Douglas Island, Alaska, made a net profit for the fiscal year ended Dec. 15, 1909, of $261,743. Four dividends aggregating $234,260 (26 per cent. on issued stock) were paid, and the company carried forward $100,686 to the balance sheet.

At the Ready Bullion mine, 2170 ft. of development work were done, including the sinking of the main shaft to a total depth of 1926 ft. on the incline. There were 227,710 tons of ore of an estimated average value of $2.37 per ton mined and sent to the mill at a total mining cost of $1.13 per ton, inclusive of development. The ore reserves below the 900-ft. level are estimated at 1,116,650 tons worth $2.68 per ton.

The 120-stamp mill lost only 13 days time during the year and crushed 227,710 tons of ore at a cost of $0.2497 per ton. The ore yielded in free gold, including copper and base bars, $278,868, or $1.22 per ton, and $215,359 from sulphurets treated, or $0.9457 per ton, making a total yield of $494,227, or $2.17 per ton.

The 700-Foot Claim mine produced and milled 190,474 tons at a mining cost of $1.37 per ton inclusive of the cost of 4370 ft. of development done. The Alaska-Mexican company crushed 38,100 tons of this ore and the "700" mill crushed 32,425 tons of Mexican ore. The ore reserves are given at 536,069 tons, averaging $2.36 below the 660-ft. level.

The 100-stamp mill ran 341½ days and crushed 184,799 tons of ore at a cost of $0.2468 per ton. The ore yielded in free gold, including base bars, $265,606, or $1.44 per ton, and $224,083 from sulphurets treated, or $1.21 per ton; making a total yield of $489,690, or $2.65 per ton.

Bauxite Production

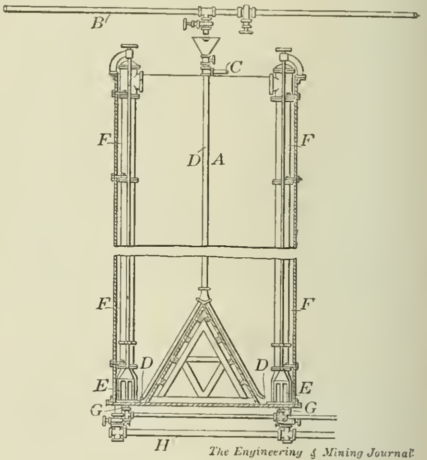
According to statistics collected for THE MINERAL INDUSTRY, the production of bauxite in the United States in 1909 amounted to 90,325 long tons, valued at $475,110, an average of $5.26 per ton. The bulk of the production, 54,966 tons, came from Arkansas and Tennessee; 33,515 tons from Georgia; and 1814 tons were mined in Alabama. In 1908 the production was 52,167 tons, valued at $263,968.

The chief producers of bauxite in this country are the Republic Mining and Manufacturing Company, 1111 Harrison building, Philadelphia, Penn.; Aluminum Company of America, Pittsburg, Penn.; National Bauxite Company, Rome, Ga.; John Hawkins, Rome, Ga.; Howard Hydraulic Cement Company, Chattanooga, Tenn.; and the Cherokee Mining Company, also of Chattanooga.

Apparatus for Treating Ore Pulp

The salient feature in an apparatus patented by B. MacDonald, of Guanajuato, Mexico (U. S. Pat. 948,766, Feb. 8, 1910), for treating ore pulp and slimes, is the minimizing of the deposition of heavy particles on the bottom of the tank, and constantly transferring them to the upper part of the tank as they settle.

Referring to the drawing, *A* is the tank, preferably of steel, *B* the pulp or slime main, which discharges into a funnel with a perforated bottom where it meets the cyanide or other chemical solution. The pipe *C* is for admitting compressed air, or water under pressure, to the charge pipe *D*.



MACDONALD'S PULP AGITATOR

The valve casings *E*, one on each side of the transfer pipes *F*, are provided with openings that are closed or opened by valves or slide gates having operating rods which are pushed up or down by handles at the top. The pipes *F* are fitted with tees at their upper end; through the side opening the pulp flows into the tank, and air escapes through the perforated top, from jets in the valve casings. These jets, supplied by compressed air from the pipe *G*, extend well into the casings, where they terminate in expanded or bell-shaped ends.

The outlets for the pulp after it has been treated are within the valve casings, and discharge into the pipe *H*, which conveys the treated charge to the waste dump.

Correction

Referring to the article in the JOURNAL of April 9, 1910, on the "Smelting of Bismuth-Lead Ore, Sinaloa, Mexico," Mr. Bretherton writes that the analysis of the ore mentioned in the third line from the bottom of the first column, page 773, should read "copper, 0.9" per cent. instead of "copper, 9," as given in the typewritten manuscript.

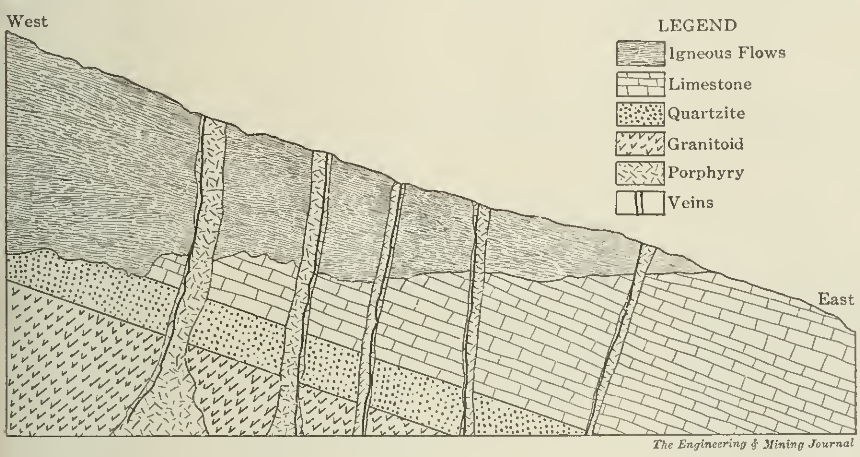
The Black Range Mining District, New Mexico

Some High-grade and Large Veins of Low-grade Ores Found; High Extraction by Laboratory Tests; No Development below Water Level

BY MARTIN FISHBACK*

A mining district worthy of more notice than has hitherto been given to it is the Black Range district, situated on the eastern slope of the Black range in the northern part of Sierra county and continuing into the southern part of Socorro county, N. M. The Black range constitutes a section of the continental divide; the creeks and streams on the eastern slope emptying into the Rio Grande.

The district is reached via Engle, a station on the Santa Fe railroad 112 miles north of El Paso, Tex. From Engle a daily mail stage runs to Fairview and Chloride, 50 and 53 miles respectively, crossing the Rio Grande at the site of the Elephant Butte reclamation project.



The Engineering & Mining Journal

Ideal Section, Black Range District

Fairview is the principal post office and supply point for the district, although Chloride, 3 miles farther on, also claims this distinction.

History

About 1880 ore was first discovered in this district. At that time this section of New Mexico was the favorite hunting ground of the Apaches; the mountains were then, as now, heavily timbered, well watered with creeks and streams and contained an abundance of game. The Apaches promptly resented the white man's appearance, and it was war for the prospectors from the beginning. It required nerve to prospect this rough, heavily timbered, mountainous country under those conditions, but eventually, as always, the red man had to give way. He did not do so amicably, however, and Indian fights and raids kept up for several years until finally Victoria, Geronimo and other less important chiefs were rounded up by Government troops and rendered harmless.

The first mining rush occurred at the time of the finding of the Ivanhoe mine, 10 miles northwest of Fairview, where the town of Grafton was built. Some rich ore carrying several hundred dollars in gold and silver to the ton, was found on a large outcrop on this property and a few cars of this grade of ore were shipped from the claim. In a few weeks after the Ivanhoe strike, the town of Grafton had a population of between 1000 and 2000 people. By virtue of this increased number, principally composed of prospectors and the usual allotment of adventurers, the Indians were somewhat intimidated and prospecting in the surrounding mountains became safer.

There are yet to be seen, however, on the bluffs and high points around Grafton, remnants of "forts" made of rocks where outposts were stationed to warn the camp of approaching Indians.

Veins Follow Dikes

The vein system may be said to be 14 miles long, approximately 2½ miles wide, and at an average elevation of about 7500 ft. The summit of the range is four to eight miles farther to the west and attains an elevation of 8000 to 10,000 ft. The vein formation and mineralization is strongest in the northern half of the district; yet one of the principal gold properties, the U. S. Treasury mine, is situated at the south end.

The formation consists essentially of a series of igneous overflows, principally rhyolites and andesite, occurring in sheets and masses and probably 1000 ft. or more in thickness in some places. The immediate underlying rock is a limestone, probably Cretaceous judging from a small patch exposed near Wild Horse creek, four miles north of Grafton. These overflows have been subjected to subsequent intrusions by a system of north and south dikes, 10 to 30 ft. wide and generally composed of yellowish granite-porphyry.

From the character of these dikes it may be reasoned that the basement rock underlying the limestone is a granitoid, the original source of the dikes. However that may be, these intrusions were accompanied with large volumes of silicic acid, and a system of gold and silver-bearing quartz fissures were formed along the dikes. In some places the dike will constitute the hanging-wall of the vein, and *vice versa*. There are also cases where, apparently, a vein occurs without being associated with a dike, but there is no question but the movement incident to the forming of the dikes is responsible for the existence of the vein.

The veins are from 3 to 15 ft. wide and have a dip of 5 to 30 deg. from the vertical, generally to the east. The country rock is as a rule softer than the vein material, and erosion of the former has left the veins cropping out prominently, which made prospecting comparatively easy as far as locating the lodes was concerned.

Little Development Done

During the excitement incident to the Ivanhoe strike every outcrop resembling a vein was covered with a location and much surface work was done throughout the district, looking for bonanza ore. The limited development done in the district indicates large bodies of low- and medium-grade gold-silver ores, carrying from $6 to $12 per ton in gold and silver, about equal amounts of each. High-grade ore in shipping quantities has been found in the Ivanhoe, Great Republic and U. S. Treasury claims and it is probable that similar ores will be found on other properties.

The veins all show extreme leaching, and so far no development has been done below water level at any point in the district. The Ivanhoe has the deepest shaft, 385 ft. below surface, sunk with a windlass 27 years ago, but no laterals were driven below the 185-ft. point. The vein is 5 ft. wide in the bottom of the shaft and will average $8 per ton. No water was reached in this shaft owing to its being situated at an elevation of 500 ft. above the creek level.

The U. S. Treasury property is now

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*Consulting mining engineer, El Paso, Tex.

being developed by a company of Colorado Springs men, and is showing up well. The Great Republic property, near the north end of the district, shows a large oreshoot which comes to the surface. There is hardly an outcrop in the district, but shows free gold by panning. Silver occurs generally as stephanite, and traces of tellurium are also present.

HIGH EXTRACTION IN TEST

A laboratory metallurgical test on a general sample representing the average of the district showed an extraction of 79.5 per cent. by straight amalgamation followed by concentration; 49 per cent. of the gold and 15 per cent. of the silver being saved by amalgamation. The ore was crushed to 60 mesh. A cyanide test on the tailings brought the total extraction up to 98 per cent. of the gold and 80 per cent. of the silver. The ores average 90 per cent. in silica, and a small percentage of magnetite is present. Vugs of manganese occur in the veins, especially in the Ivanhoe.

Near the north end of the district, in Socorro county, on a group of claims called the Elephant, a vein outcrops for a distance of several thousand feet and stands out in bold relief 10 to 20 ft. above the surface. On this group an attempt was made to go below water level with no hoisting apparatus but a windlass, but water was struck at 45 ft. in too large quantities to handle. A few tons of ore were taken out just at water level which averaged more than an ounce in gold, whereas near the surface the vein would assay only a trace to a few dollars in gold. A similar increase occurs at water level on Poverty creek, on a claim now called the Gold Reserve, and where work was also discontinued on account of no facilities for handling the water.

From the two instances mentioned it may be reasonable to look for an increase in metallic contents below the leached zone, and perhaps a change in character of the ores, possibly nothing more radical than the appearance of iron pyrites.

Report of Iron Silver Mining Company

The annual report of the Iron Silver Mining Company, Leadville, Colo., for the year ended Dec. 31, 1909, states that the year was an important one with respect to the many improvements that have been introduced at the Tuscon shaft, all tending to a more economical operation at the mine. The ore produced from the Tuscon shaft was formerly hauled to the railroad by wagon at a cost of 60c. per ton. In order to eliminate this expense, an aërial wire-rope tramway was constructed in 1909. It is 1400 ft. long and has a carrying capacity of 20 tons per hour. Its operation has been highly successful and economical from the first. The ore is now transported and loaded into the railroad cars at a cost of 10½c., showing a saving of 49½c. per ton. The total cost of the tramway was $7854, including terminal building.

ORE SORTING

On account of the complex mixture of the various sulphide ores, with more or less waste rock, it is necessary to sort the ore before shipping it. In order to provide sorting facilities for an increased tonnage, and means for loading the finished product into tramway buckets, it was necessary to enlarge and reconstruct the Tucson ore house. This was done at a cost of $5582. The scheme for handling the ore is as follows: As the ore comes from the mine it is dumped into hoppers where it is fed to sorting tables. The waste rock is picked out and thrown into mine cars and trammed to the waste dump. The lead ore is then picked out from the zinc ore, and each class thrown into separate cars, which are dumped into storage bins. From these bins the shipping ore is loaded by gravity, through chutes, into tramway buckets. On reaching the lower terminal, the tramway buckets discharge their loads directly into railroad cars. The cost of sorting the ore by this method is 22c. per ton of finished product.

Several new pieces of machinery were purchased during the year, and the Tucson shaft was equipped with an electric hoist. An electric signal system and underground telephones were installed which have proven to be of great convenience in the daily operations of the mine. The total cost of all permanent improvements was $19,459, including new machinery.

MOYER MINE

While it cannot be said that any new oreshoots were developed in the Moyer, it is true that bodies of ore have been recently opened in the immediate vicinity of the old stopes that were overlooked in the mining operations of former years. In certain portions of the mine orebodies were found underlying or occurring over the main oreshoots previously stoped out, and separated from the old stopes by a layer of limestone or a sheet of porphyry. Owing to the peculiar conditions existing in the Moyer, which has been reworked and stoped so many times, it is impossible to make any estimate of the exact tonnage available, since the ore in many of the working faces is apt to lead into an old worked-out stope at any time. At present a large proportion of the output is being gleaned from old stopes.

This condition has given rise to some difficult mining problems. In breaking into the old stopes, they are found filled with loose timbers, large blocks of rock and caved material, and great skill is required to prevent serious caves and accidents. Whenever it is possible, the old stopes are being filled with waste rock. A part of the underground tramming and all of the hoisting and surface tramming expense is thereby avoided.

TUCSON MINE

The orebodies in the Tuscon workings are holding out in a most gratifying manner, while the development during the year was generally successful in opening ore in the new deeper levels of the mine. Large stopes of low-grade zinc ore were opened northwest of the shaft between the fifth and sixth levels. The existence of a large tonnage of sulphide ore has also been established in this section of the mine. During the year the shaft was sunk to a deeper horizon which is considered an important feature of the year's work. Not only will it permit of a more economical mining of ore-bearing fissures already developed, but it definitely determines the downward extent of the fissures.

PRODUCTION OF IRON SILVER MINING COMPANY.

Kind of Ore.	Moyer Mine. Tons.	Moyer Mine. Value.	Tucson Mine. Tons.	Tucson Mine. Value.
Zinc	13,127	$60,252	7,895	$79,050
Lead	6,104	39,532	7,477	66,865
Copper	6,066	41,371	1,666	64,264
Carbonate	41	592		
Dump	16,949	8,293		
Silicious			74	7,092
Silver-lead-zinc			153	23,774
Iron	11,480	40,408		
Total	53,767	$190,448	17,265	$241,045

In addition to the ore from the Moyer and Tucson mines, a number of leases yielded 3134 tons, worth $15,530. The total tonnage was 74,166, valued at $447,024, an average of $6.02 per ton. The development work during the year at the Moyer and Tucson shafts was 3286 feet, which includes shaft, winzes, raises and drifts.

The receipts from sales of ore, royalty and interest were $440,318. The total expenditure account for the operating departments was $237,738 ($3.20 per ton); for permanent equipment, $19,486. The operation of the company shows a profit of $183,122 or about $2.47 per ton. The surplus on hand, Dec. 31, 1909, was $329,342. Dividend No. 52, which amounted to $50,000, was declared during the year.

Oil Flotation Process at Broken Hill, N. S. W.

Zinc and Lead Sulphides Are Collected in a Froth and Floated off; Highest Recovery Is Made from Slime. Total Cost, $1.84 per Ton

BY THEODORE J. HOOVER*

The material treated in the plant which is described herein is an accumulation of old tailings from the Central mine wet concentration plant. The plant, the tailings and the process belong to the Minerals Separation, Ltd., of 62 London Wall, London. Another similar plant is working on the current tailings from the lead concentration plant of the Central mine. The average assay of the tailings is: Silver, 7.5 oz.; lead, 6 per cent.; zinc, 19.5 per cent. A partial mineralogical analysis of the tailings is as follows: ZnS, 27.1 per cent.; $ZnSO_4$, 2.4; PbS, 6.4; $PbSO_4$, 1.3; FeS_2, 2.5; MnO_3, 4.6; $CaCO_3$, 3.2; SiO_2, 42.4 per cent.

The sulphates are largely the products of weathering since the tailings were dumped; the carbonates occur naturally in the ore as it is mined, the chief carbonate mineral being a complex one containing manganese, iron, calcium, zinc and magnesium. This mineral is amorphous and relatively soft. Under the microscope the sulphides appear to be nearly free from attached gangue. The galena is mostly in the fine portion of the tailings and retains its cubical form, while the blende is flaky. The blende is composed of zinc, iron and manganese sulphides in about the following proportions: ZnS, 81 per cent.; FeS, 14 per cent.; MnS, 3 per cent. The silver occurs largely in pyrrhotite. The blende carries less silver than the galena and in some cases an appreciable amount of silver occurs with the garnet. Apart from the sulphides and carbonates mentioned, the tailings contain a large amount of quartz and rhodonite and smaller quantities of garnet, calcite, rhodochrosite, feldspar, fluorspar, cerussite, chalcocite, etc.

HANDLING THE DUMP MATERIAL

To facilitate the loading of the old tailings and in order to cut a way through the dump for a railway, the method of loading by "chinamen" was adopted. A carefully timbered tunnel was driven into the dump and a track laid on the incline to the top of the mill. Chutes with doors were made at intervals in the roof of the tunnel and the cars were run beneath these chutes and filled by gravity. When the material had been drawn away from above the tunnel so that an open cut extended the whole length of the dump, the tunnel timbers were taken away and the track moved as occasion required to keep it close to the working face.

After weighing, these cars in trains of three are hauled up the double-track incline by a steam winch, and dumped into the bins. One winch man and nine laborers per shift, working two shifts of eight hours each, deliver the daily tonnage to the bins.

The bins are covered with a 2-in. grizzly to remove rocks, chips, etc. The bins, which hold enough for two shifts. are shaped in cross section like a "W," thus dividing the mill into two units, one on each side of the bin. The two-unit idea is carried as far as the concentrate- and residue-handling appliances, where the material from the two units is brought together and handled in one set of appliances, as shown in the plan.

GRINDING SECTION

From the bins the material is fed by push feeders to eight classifiers of a form invented by G. A. Chapman, former superintendent of the mill. The overflow goes direct to the V-box settler and the underflow goes to eight positive-feed 8-ft. grinding pans. These push feeders insure a regular feed, a most important factor for good work in this, as well as in all other well regulated concentration plants. These pans are called positive-feed pans because the material with about five times its weight of circuit water from the head tank is fed into a water-tight cylinder surrounding the shaft of the pan; the outlet from this cylinder is through the muller, so that everything fed into it must pass under the muller before being discharged. The discharge from these pans is placed low and the sides of the pan need be only high enough to prevent splash.

MINERALS SEPARATION PLANT AND DUMP AT CENTRAL MINE, BROKEN HILL, N. S. W.

From the positive-feed pans the pulp goes with more water to four classifiers, which have a capacity of 125 to 175 tons per day. The overflow from the classifiers goes direct to a large settling box. The underflow from the four classifiers goes to four ordinary-feed 8-ft. pans, where it is finally made to pass a 0.0241-in. screen. The discharge from these pans joins the overflow from the classifiers in the settling box. These twelve pans grind 750 tons per day from a maximum of 0.1270 in. to a maximum of 0.0241 in. Two men per shift attend to the whole grinding and classifying section.

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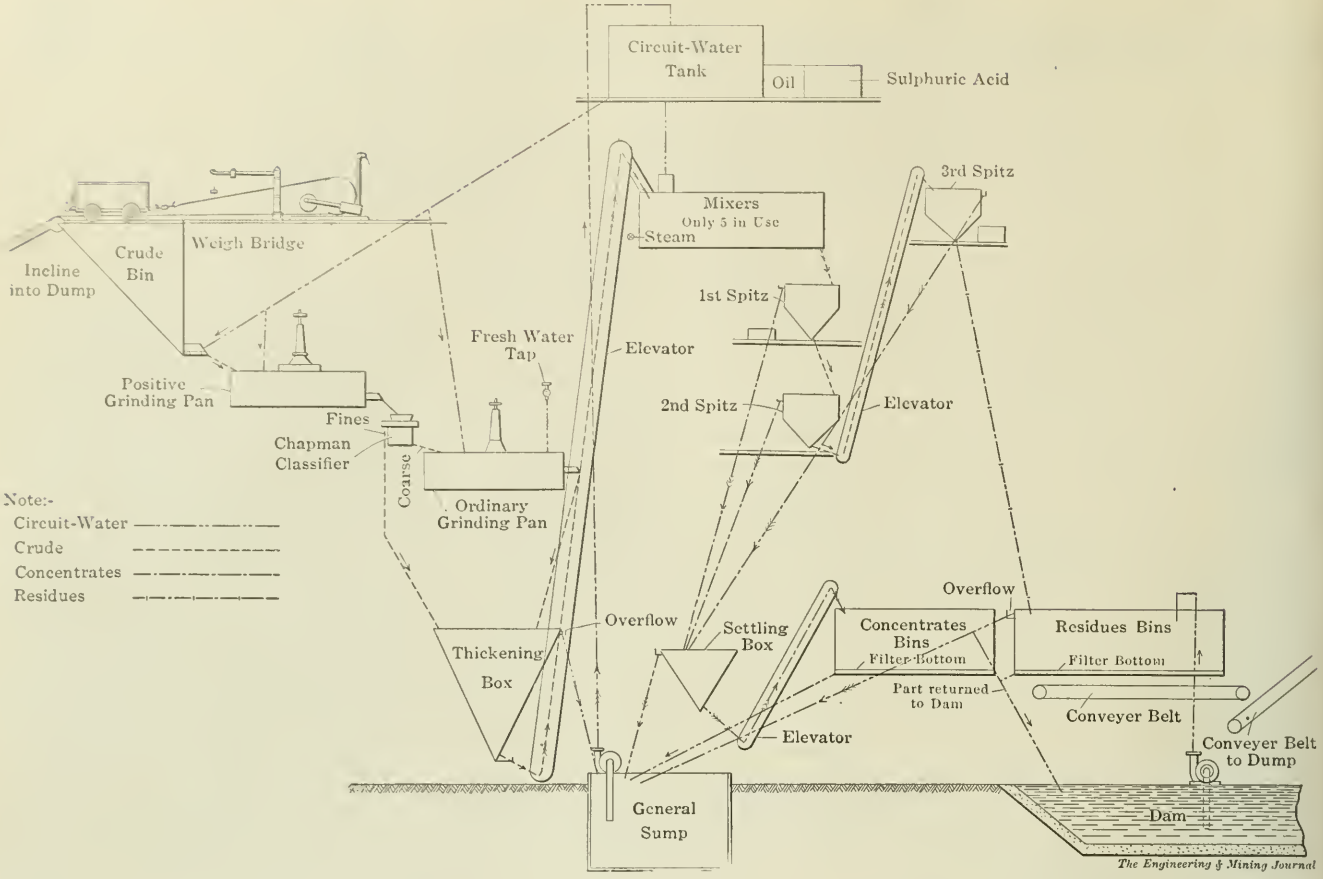
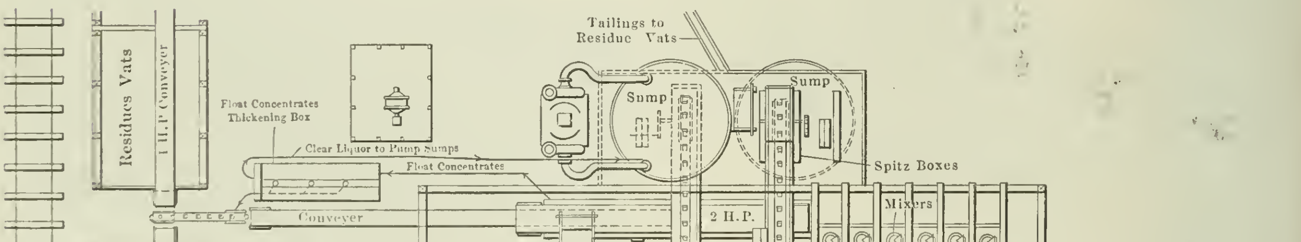
*General manager, Minerals Separation, Ltd., London.



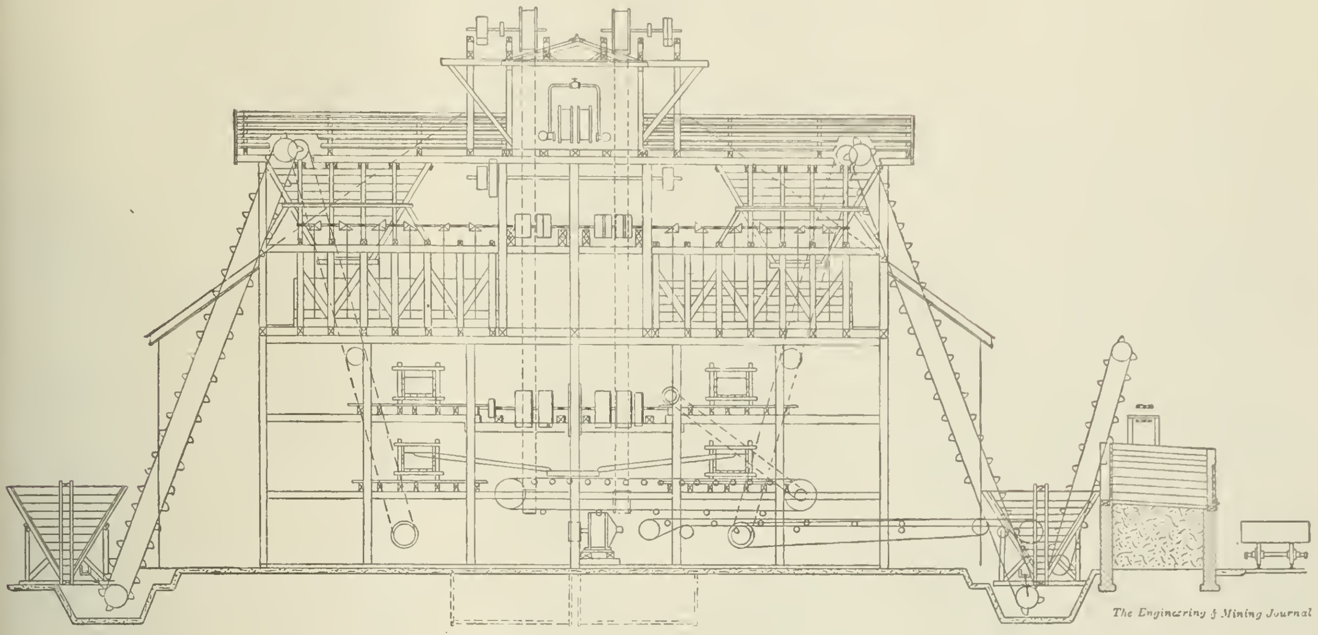
DIAGRAMMATIC FLOW SHEET, MINERALS SEPARATION, LTD.



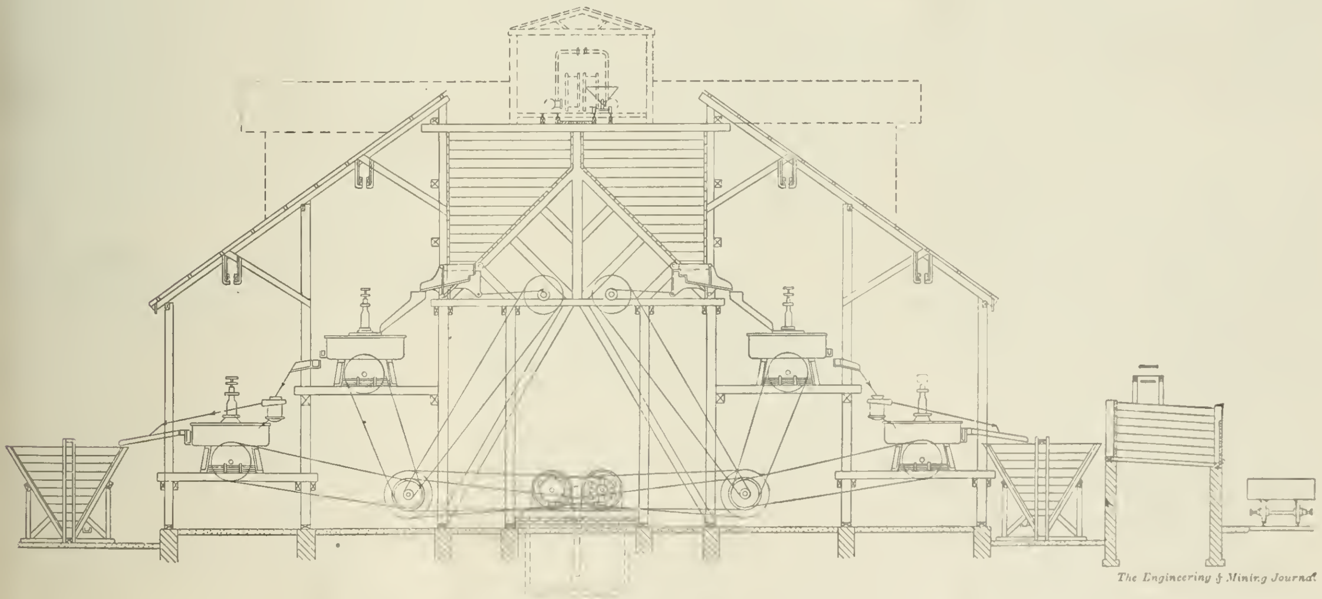
MILL PLAN, MINERALS SEPARATION, LTD., BROKEN HILL

Settling and Mixing

The pulp from the pans is about 15 per cent. solids by weight. This being too dilute for efficient and economical work in the flotation section, the material runs from the pans into two V-shaped settling boxes 18x10x10 ft. The continuous, slightly colloidal or muddy overflow returns to the head tank to join the general circuit. The underflow from the settling tank, above 25 per cent. solids, runs by gravity to the boots of two elevators which feed the flotation section. Two boys per shift attend to the settling boxes and elevators.



Section Through Flotation Department, Minerals Separation, Ltd.



Section through Grinding Department, Minerals Separation, Ltd.

The mixing apparatus is of the simplest form that could be devised. This is a box divided into series of compartments, 3x3x5 ft. deep, and lined with hardwood. These compartments communicate with each other near the bottom. In each compartment is an agitator of special design driven 220 r.p.m. The pulp is fed by the elevators into one end compartment and steam is introduced with the pulp by a 1$\frac{1}{2}$-in. pipe and the temperature of the whole raised to 115 deg. F. Fifteen pounds of monoacid per ton of ore is fed into the first compartment and one pound of oil per ton of ore into the second compartment of the mixing box.

These agitators give the pulp in its progress violent agitation and splash it against the sides of the compartments and beat and roll into the pulp a great quantity of air. In this way the sulphides in the pulp are churned into a froth, and the whole mass emerges from the last compartment about a foot above its floor and is led by a flume to the first spitz box. In this frothing action lies the success of the process.

The Flotaton

The froth, which floats immediately the pulp emerges from the mixers, is composed of zinc and lead sulphides and bubbles of air. Repeated observations fail to detect appreciable quantities of carbonic acid or gas other than air. The seething, frothing pulp falls upon a submerged apron within the spitz box, the froth being drawn off over a lip at the opposite side of the box by a slight overflow current, the underflow being less than the inflow. The gangue with most of the circuit liquor passes out at a hole in the side of the spitz box near the bottom, the size of which hole is governed by an ingenious slicing valve invented by T. H. Perrott. The concentrates from the first spitz box are led by flume to the concentrate-collecting box, while the residual pulp in the underflow, still frothing and seething, is led to a second spitz box, where a further concentrate is removed. From the second spitz box the residual pulp, still seething and frothing to some extent as the last of the air occluded by the agitation escapes, is elevated to a third spitz box similar in every respect to the first and second, and where the last useful concentration takes place. The concentrate froth, although black in color, has the appearance and consistency of the froth on beer and is of depth as follows: First spitz box, 2 to 3 in.; second spitz box, 1 to 1½ in.; third spitz box, ¼ to ½ in. One man and two boys per shift attend to the flotation section.

SIZING TEST ON PRODUCTS FROM MINERALS SEPARATION FLOTATION PLANT.

Approximate Width of Aperture in Screen, Inches.	Crude at Hoist.	No. 1 Classifier Overflow.	No. 1 Classifier Underflow.	Positive Pans Discharge.	No. 2 Classifier Overflow.	No. 2 Classifier Underflow.	Ordinary Pans Discharge.	V Settler Underflow.	V Settler Overflow.	Discharge from Mixers.	No. 1 Spitz Overflow.	No. 1 Spitz Underflow.	No. 2 Spitz Overflow.	No. 2 Spitz Underflow.	No. 3 Spitz Overflow.	No. 3 Spitz Underflow.	Residue Vats Overflow Liquor.	Pump Delivery Liquor.
On 0.1250....																		
On 0.0992...	2.50		0.449															
On 0.0787.....	2.15		1.89															
On 0.0625.....	2.00		3.77	0.05														
On 0.0496......	5.00		7.30	0.04		0.25												
On 0.0394......	6.20		5.56	0.19		0.24										0.10	0.25	2.01
On 0.0313......	10.30		9.05	1.25		1.57	0.20	0.16		0.14		0.16		0.10		0.27	0.10	0.26
On 0.0248......	8.30	0.18	10.10	6.45	0.10	9.65	0.64	0.37		0.16		0.36		0.40		0.75	0.10	0.26
On 0.0197......	6.70	0.76	10.00	12.00	1.02	16.10	3.07	2.08		0.50		1.16		0.45		1.40	0.07	0.13
On 0.0156..	17.80	1.00	10.40	13.42	2.40	20.10	4.90	4.00		5.38	0.92	6.83	2.37	7.65	1.06	12.95	0.95	1.47
On 0.0124...	8.70	3.38	8.66	11.13	4.65	14.12	6.40	5.77	0.08	4.23	1.23	5.20	4.35	7.15	3.31	11.25	1.40	1.61
On 0.0098...	6.70	7.03	8.13	10.56	7.87	12.14	10.46	9.54	0.03	8.60	5.08	10.20	7.10	8.15	6.96	11.55	1.97	2.01
On 0.0078...	7.50	9.94	6.32	9.49	10.43	9.05	13.00	12.00	0.23	12.36	10.08	13.23	12.70	12.45	12.80	15.05	2.72	1.34
On 0.0062...	5.90	14.90	5.72	8.54	13.16	6.47	15.87	15.00	3.80	14.66	15.14	14.93	16.05	14.25	14.20	13.50	4.27	4.03
On 0.0049....	4.10	16.05	3.73	6.72	7.38	3.54	12.90	13.30	7.50	14.06	16.70	13.33	15.10	13.45	13.64	10.80	5.52	5.51
On 0.0039.....	1.30	4.55	0.77	1.25	7.00	0.72	2.86	3.20	3.40	5.63	7.33	5.13	5.65	5.10	5.38	3.80	3.12	2.76
On 0.0031.....	1.12	6.69	1.06	2.34	6.79	0.95	4.48	4.93	2.41	3.76	4.88	3.16	3.85	3.47	3.70	2.55	2.75	2.20
On 0.0025.....	0.05	8.42	0.87	2.78	8.22	0.60	6.85	7.35	4.60	8.66	11.63	6.86	6.00	7.07	7.60	3.65	10.50	4.03
Through 0.0025.	4.70	26.90	5.37	12.57	30.94	4.39	16.47	20.00	77.80	21.46	26.33	18.53	24.45	19.30	30.60	12.15	62.00	66.66
Correction......	1.53	0.17	0.93	1.18			1.98	2.27	0.15	0.40	0.68	0.92	2.38	1.01	0.77	0.23	4.28	5.74
Total......	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Collecting the Concentrate

The concentrate from all the spitz boxes is led by launders to a common collecting box built with baffles so arranged as to submerge the froth repeatedly, the end sought being to discontinue the flotation or drown the concentrates. This collecting box is tapped at the bottom at intervals to draw off the settled concentrates which are elevated and carried by belt conveyer to the various draining bins. These bins, of which there are eight having a capacity of 70 tons each, are provided with rough cocoa-matting filters whereby the concentrates are drained sufficiently to be loaded by shovel into railway trucks. Four men per shift attend to the care and loading of concentrates.

The residues from the third spitz box, with the greater part of the circuit water, are run by launder to a row of six residue vats. It is necessary to settle the residues carefully in order to save water, because water costs 5s. per 1000 gal. The total loss by evaporation, seepage, etc., is 100 gal. per ton of ore treated. These residue vats have a capacity of about 85 tons each. A vat is filled with circuit water from the supply before any residues are run in, and the vat thereby acts as a settling tank, the overflow which carries a small amount of concentrate froth returning to the head tank in the mill via centrifugal pump. These residue vats have a rough filter in the bottom and are also provided with a bottom discharge hole. After a full vat has drained about six hours, the movable cylinder is raised by a screw and the residues drop to a belt conveyer and go by it to a boom stacker and so to the dump.

Extraction and Cost

The result of the first two years' operations, including the "tuning up" period, in which about 400,000 tons of material were treated, is given in an accompanying table.

RAW MATERIAL AND RECOVERY.

	Assay.			Recoveries.		
	Ag. Oz.	Pb. %	Zn. %	Ag. %	Pb. %	Zn. %
Crude	7	6	20	100	100	100
Concentrates	14	10	17	75	70	85

These recoveries are calculated on the total lead and zinc present in the ore, no deduction being made for oxidized material present in the ore. There is a custom at Broken Hill of deducting the oxidized lead and zinc before calculating the recoveries in flotation processes. This custom is mentioned here in order to condemn it.

The capacity of the plant has been steadily maintained at 750 tons per day. The costs of treatment over a three-month period in the early part of the operation of the plant when the daily tonnage was about 550 long tons are given in an accompanying table. The capacity of the plant has since then risen to 750 tons per day and this has of course decreased the total cost per ton. The distribution of cost remains about the same as before with the exception of oil, acid and water, these being practically fixed charges per ton. The other charges, notably those of power and labor, are much reduced when distributed over 750 tons.

Subdivided according to departments, the following totals are chargeable: Tramming, 12.957c. per ton; crushing, 41.081; flotation, 107.678; handling concentrates, 13.236; handling residues, 8.912 cents.

Electric power is purchased from a generating plant, and the items are as follows: 8 push feeders, 4 h.p.; 2 elevators, 8; 2 elevators, 6; 1 winch, 5; 8 pans, 72; 4 pans, 40; 10 agitators, 50; 2 pumps, 20; shafting and friction, 45; total, 250 horsepower.

COST OF TREATMENT PER TON.

	Cents.	Cents.
Labor—Superintendence........	3.744	
General..............	16.296	
Sundry	8.520	
Residues.......	7.152	
Concentrates......	8.688	
Assays.......	1.752	
Tramming..........	10.320	
Total............		56.472
Stores—General............	11.352	
Assays...........	0.696	
H_2SO_4..............	24.264	
Oil............	12.960	
Timber..........	0.624	
Water...........	12.792	
Accident........	1.008	
Locomotion........	1.728	
Total......		68.424
Power—Fuel.......	11.112	
Electric.....	27.336	
Total....		38.448
General expense...	20.520	
Grand total.....		$1.838

This plant was erected at the time of labor shortage and labor disturbance and it would be safe to deduct 20 per cent.

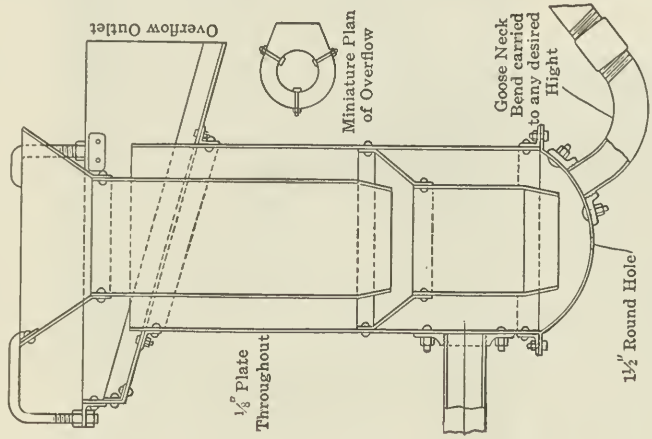
CONSTRUCTION COSTS OF TAILINGS PLANT OF THE MINERALS SEPARATION, LTD., BROKEN HILL, N. S. W.

	Machinery.	Timber.	Electric Motors.	Belts.	Iron-work.	Masonry.	Pipe and Fittings	Castings.	Galvanized Iron.	Sundry Stores.	Labor, Day.	Labor, Contracted.	Drafting.	Superintendence.	General Charges.	Total.
Opening up dump											$961 20					$961.20
Incline tramming		$786.00			$391.92					$38.40		$261.84	$33.60	$28.80	$81.60	1,622 16
Crude bins	$2,385.72	4,464.00			614.40	$864.00		$48.00		225.60	$1,200.00	1,430.94	211.20	182.40	460.80	12,087.06
Grinding section	19,841.48	6,688.80	$5,464.92	$796.80	988.80	1,728.00	$985.32	240.00	$499.52	375.16	3,326.00	4,773.60	321.60	283.20	705.60	47,018.80
Flotation section	8,232.24	6,688.80	5,464.92	1,903.92	960.00	897.96	985.32	1,196.40	499.52	768.28	5,692.36	4,761.12	336.00	297.60	715.20	39,399.60
Concentrates bins		2,106.24		733.20	360.00			7.20		335.76	720.00	877.44	124.80	105.60	268.80	5,639.04
Residue disposal	846.48	5,040.00		3,203.52	32.40		240.00	38.40		240.00	960.00	1,574.40	220.80	196.80	489.60	14,182.80
Dams and ponds	494.88										96.00	1,106.40				1,697.28
Railway					735.12						720.00					1,455.12
Total	$31,800.80	$25,773.84	$10,929.84	$6,637.44	$5,183.04	$3,489.96	$2,210.64	$1,530.00	$999.04	$1,983.16	$13,675.56	$14,785.74	$1,248.00	$1,094.40	$2,721 60	$124,063.06

from the labor and contracting cost. The total cost of construction, installation and opening the dump was $124,000.

Working Details of Interest

The oil and acid are pumped by compressed air to the feed tanks at the top of the mill, the storage tanks being on the ground at some distance from the plant. The feed is set at a constant rate and not varied unless the tonnage fed to the pans varies. The regularity of feed to the pans then becomes a matter of importance, otherwise the proper proportion of oil and acid will not be maintained, too much being quite as detrimental as a deficiency.


Overflow Outlet
1/8" Plate Throughout
Miniature Plan of Overflow
Goose Neck Bend carried to any desired Hight
1½" Round Hole

The Engineering & Mining Journal

Chapman Classifier

The heating of the pulp has a double effect: In the first instance it thins the oil and so induces its quick adherence to and selection of the sulphide particles; and in the second instance it both drives the air out of solution and makes it available for froth production, and expands the bubbles and renders them more buoyant, i.e., increases their lifting power.

The larger the proportion of slimes in the pulp the higher the percentage of recovery. This point is so surely established as to be beyond discussion. It then becomes a simple problem to decide where the economical mean lies between power consumed for fine grinding and added recovery. Material ground to pass 200 mesh can be treated with a high recovery.

It has been found that by using the water over again an increase in the solids in solution takes place. This has a beneficial effect on the working of the plant up to 4000 grains per gallon, as these solids assist in the settlement of the gangue slimes, and also to some extent beneficially affect the flotation.

In low first cost of plant, cheapness and ease of operation, and quality of work, this plant is without an equal in flotation concentration. It marks a definite advance in the art of concentration.

The Nundydroog Gold Mine

The report of the Nundydroog mine, India, for 1909 records a prosperous condition of affairs. The value of the gold won amounted to £326,470 from 90,100 long tons crushed, a return of nearly an ounce to the ton. This output constitutes a record for the mine, which has now produced about £4,000,000, out of which over a million and a half has been distributed to the proprietors. The cost of working per ton, including London expenditure, amounted to about 33s. ($8) per ton. Dividends paid in 1909 aggregated £113,200, or 40 per cent. on the nominal capital, besides which a sum of £20,000 has been placed to a reserve fund. The ore reserves, on which no definite value is given, but which are presumably equal to the average grade now being worked, are slightly in excess of what they stood at the close of the previous year.

The manager reports that the conditions in the lower levels of the mine have improved sufficiently to make the prospects of the company brighter than for a long time past. The manager of the mine, Thomas Richards, who has successfully administered the affairs of the company for 15½ years, is retiring and will be succeeded by his son, Charles H. Richards, who has been employed on the Kolar goldfields for many years.

Great attention is paid to the health of the employees on this as well as the neighboring mines under the control of John Taylor & Sons, so much so that it is claimed that in times of plague and cholera the Kolar goldfield is considered one of the safest places in India. When an epidemic occurs, the natives come flocking into the district instead of flying out of it, and consequently the labor supply is always abundant.

Polybius, in the second century, B. C., described the rich gold and silver mines of the Tyrol. These mines yielded abundantly until the middle of the sixteenth century, after which date their productiveness rapidly diminished because the mouths of shafts became covered with ice. A shaft sunk at this epoch was covered in 1570 by a glacier 65 ft. thick. Resistance to the invasion of the ice soon became impossible. In the eighteenth century the glacier was more than 300 ft. high and in 1875 it had attained a hight of 400 ft.

The Quarries of the Canadian Asbestos District

Canada Supplies Most of World's Market; Asbestos Occurs Only in Serpentine; Productive Area Restricted but Large Supply Ahead

BY FRITZ CIRKEL*

Asbestos, when freshly obtained from the rocks, has more the appearance of an organic substance than a mineral. It presents sometimes tall, slender crystals from 1/16 to 2 in. long, suggesting complete crystallization in a mineralogical sense; but at other times it is of such light and feathery weight that it resembles silk or fibers of other substances of organic origin. The Romans, who obtained it in small quantities in the Italian Alps, believed it to be of vegetable origin, evidently its unctuous feel, silky appearance and fluffiness contributing to this belief.

Plant of Robertson Asbestos Company, Quebec, Showing Productive Serpentine Rock

King's Pit Asbestos Quarry, Thetford, Quebec

Quarry of Bell Asbestos Company, Thetford, Quebec

When first discovered and mined in the Italian Alps in the beginning of the last century, asbestos seems to have been looked upon only as a substance of interest to the mineralogists and geologists; no practical application in a commercial sense was ever attempted, and it was not until about 1870 that experiments were attempted on a large scale by London people with asbestos mined in the Aosta valley, Italy.

Concurrently with this discovery, asbestos was also found in Canada, but it was not until 1877 that mining was commenced in the serpentine hills of Thetford and Black Lake in the province of Quebec. Asbestos has been discovered in other parts of the eastern townships since that time, yet the high-grade qualities, combining length and great silkiness in the threads, are found in large payable quantities in these two localities only, where now all the principal mines are situated.

Occurrence of Asbestos

The asbestos is found only in serpentine. The productive character of this rock varies with its color, hardness and chemical composition, but in all cases it is essential for its economic productiveness that the ratio of silica, magnesia and water be about the same. A chemical analysis of these productive serpentines shows them to contain: Silica, 39 to 41 per cent.; magnesia, 39 to 43; water, 13.8 to 15 per cent. Serpentines in which part of the magnesia has been replaced by lime produce brittle fiber which cannot be used for the purpose to which the regular fiber is applied.

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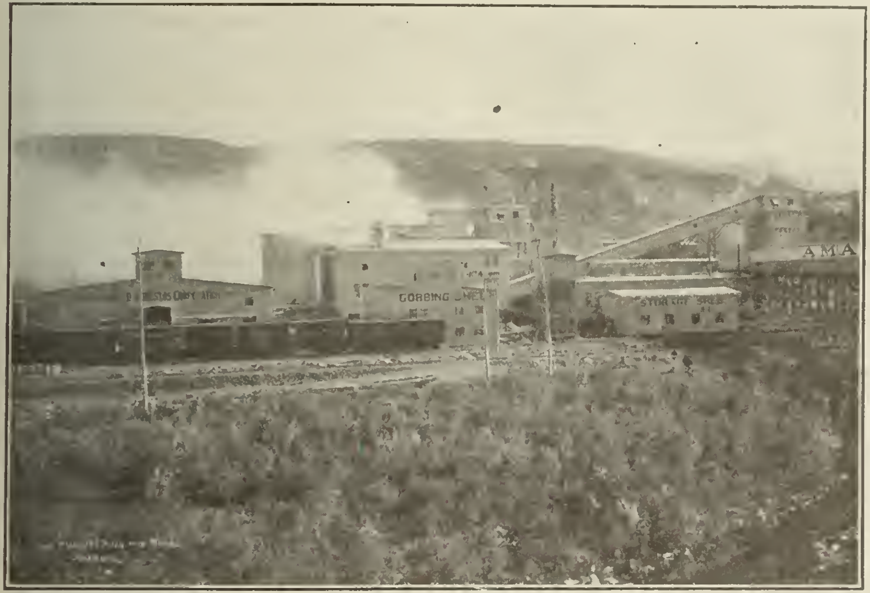
*Consulting mining engineer, 80 Stanley street, Montreal, Canada.

With the exception of a small territory lying outside the main productive belt, that at Danville, the quarries are scattered over a stretch of about 22 miles in the townships of Coleraine, Thetford, Robertson and Broughton. The width of this serpentine belt is in some localities only 100 ft., and in others from one to four miles; the largest width known is that between the towns of Thetford and Black Lake. It must not be inferred that this greater width would necessarily contain the greatest number of quarries; on the contrary, it was found that a great part of the serpentine is of the nonproductive variety.



Mill of Amalgamated Asbestos Corporation, Black Lake, Quebec

The asbestos proper occurs in the form of small veins from 1/16 to 2 in. in width, and is irregularly distributed, forming a network through the mother rock, serpentine. There is no regularity to be noticed anywhere; accumulations of veins alternate with dead and unproductive serpentine, the former constituting the pay shoots which produce the so called "crude" (long fiber) asbestos and the mill rock. This great irregularity in the occurrence of the asbestos pointed to quarrying as the best method of winning the mineral, and this method has been in vogue since the beginning of operations.

Quarries and Mills

The asbestos serpentine, as compared with many other rocks, is of medium hardness and is easily spalled and disintegrated. As a result of continued operations covering a period of many years, large quarries may be seen in the district, especially in Thetford; the King's Pit quarry of the Amalgamated Asbestos Corporation measures over 1350 ft. long by 300 to 400 ft. wide, and is almost 200 ft. deep. The method of quarrying is simple; the rock is blasted down in galleries and benches; whatever "crude" may be found in the blasted rock is separated roughly right in the quarry and sent to the cobbing sheds; the residue consists of waste rock and mill rock, both of which are hoisted by cable derricks, placed in three- or four-ton dumping cars and sent to the dump or the mill.

The extraction of the fiber from the serpentine has been brought down to a science The rock undergoes a process of diminution and the fiber liberated from all rock matter in the first stages of this process is placed in fiber receptacles by means of exhaust fans. The residue still containing fiber is submitted in some mills to the action of rollers, and in others to "cyclones." While it must be admitted that this process so far has given some satisfaction, the fact must not be lost sight of that the fiber, through the violent action in the fiberizers, especially in the cyclones, is to some extent torn up into threads of smaller length, reducing the value of the resultant product. Further improvements are being made and machinery is being manufactured which will do away to a certain extent with the destroying forces acting upon the delicate fiber.

The old-time method of extracting the "crude" by hand and leaving the residue on the dump has thus been replaced by modern mechanical methods, and since 1896 all the larger quarries have been equipped with complete milling and fiberizing plants. Up to 1904, 16 mills with a total capacity of 3600 tons of asbestos rock per day were installed; but since that time the demand for the mineral has been so great that all the older companies have had to increase and even double the capacity of their mills. There are at present 10 companies working in the district, with 19 quarries and mills, employing in the summer season over 3000 persons. The combined capacity of all mills is 8250 tons of rock per day.

Production and Uses

As to the immediate outlook of the Canadian asbestos industry, it must be stated that the superior quality of the Canadian mineral is now universally acknowledged. From the beginning of the industry until 1910, Canada produced asbestos to the value of $23,500,000 and the production is now at the rate of over $2,500,000 per year.

The principal application of asbestos is in the manufacture of asbestos millboard, paper, boiler and steam-pipe covering, etc., and allied articles; about 65 per cent. of the asbestos mill fiber being absorbed by these manufactures alone. A new invention in fireproof materials, asbestos slates and shingles, is also being introduced. There is an ever-growing demand in the construction of fireproof buildings, such as railway stations, summer cottages, office buildings, etc., where asbestos is used for all classes of works, as asbestos cover, roofing material and floorings. In battleships and ocean liners asbestos is used largely as a building material and as an insulator, to avoid condensation of steam and to prevent the heat from the boiler rooms from penetrating into other parts of the ship. New factories for the manufacture of asbestos goods are being built every year.

Future of Canadian Mines

The heaviest buyer of Canadian asbestos is the United States. According to the Quebec Bureau of Mines, the United States in 1907 imported $1,304,480, which was 78 per cent. of the total Canadian production, Great Britain importing 13 and Germany 8.4 per cent. However, according to inquiries made at the headquarters of one of the bigger corporations these figures are not entirely correct. For instance, many shipments are made to Germany by way of New York which are generally credited to the United States. One firm in Hamburg alone received during 1908 about 7000 tons of fiber and "crude," which evidently were included in the United States importations. It may here be stated that Canada in 1908 contributed 83 per cent. of the world's total supply of asbestos.

Russia is increasing its output every year, but, owing to many reasons, the Russian mines can compete only in the higher grades of fiber, which forms a small percentage of the total production.

The medium grade is mostly used in home consumption. Asbestos has also been discovered in Western Australia, in the Carolina district of the Transvaal, in Cyprus and other foreign countries, but although some of these occurrences date back five or ten years ago, not one of them has proved to be of such a character and extent as to invite capital for systematic exploitation.

Concerning the future ore supply in the Canadian quarries, although the extent of serpentine is quite large, recent investigations tend to show that the productive area of asbestos within these limits is comparatively small; of all the discoveries which have been made in the last five years, especially in new territory, only three of four promise to become asbestos quarries in a true sense. It may be stated, however, that the present available resources in the Canadian asbestos field are considered large and no fear is entertained as to the future ore supply. The resources of the Thetford quarries have never been a subject of serious study, but considering past achievements, and considering further that the greatest Canadian quarry, the King's Pit, has been in operation for over 25 years and has contributed about one-third of the whole Canadian production and is today only 190 ft. deep, the Canadian operators have no reason to worry about the future.

Metal Production of Upper Silesia in 1908

Special Correspondence

According to the statistics of the Upper Silesian mines and reduction works, published by the Upper Silesian Mining and Metallurgical Society, there were in operation in Upper Silesia during 1908, 18 zinc reduction works, with a total of 484 furnaces, of which 310 were one-story furnaces, with 12,360 muffles, and 174 were of more than one story with 18,456 muffles. In these works there were employed 8444 workmen, who earned 8,231,056 marks ($1,959,775). There were treated 562,443 metric tons of ore and zinkiferous products, of which 212,640 tons were calamine (carbonate), and 344,182 tons were roasted blende. The consumption of fuel was 1,030,280 metric tons of bituminous coal, and 284,205 tons of coke slack were used as reducing material. The consumption of fireclay was 69,239 tons.

There were produced 141,461 metric tons of spelter, worth 54,529,468 marks ($12,983,206), 3863 tons of zinc dust, worth 1,269,903 marks ($302,358), 1163 tons of lead worth 297,402 marks ($70,810) and 32,795 kg. of cadmium worth 203,822 marks ($48,529), a total of 56,300,595 marks ($13,404,904). There were 11 blende-roasting establishments in operation, which treated 413,486 tons crude blende and produced 344,122 tons of calcined blende. Eight zinc-rolling mills worked 48,521 tons of crude zinc and produced 47,206 tons of sheet zinc.

Piedras Verdes Disseminated-Copper Zone

By S. L. Pearce *

In July, 1909, through the efforts of C. W. Botsford, engineers in close touch with the Calumet & Hecla mine visited the Alamos district, Sonora, Mexico, and examined the Piedras Verdes copper zone, 12 miles northwest of Alamos. As a result of this investigation, representatives of Boston copper interests and others were soon in the field for properties. Lewis A. Dunham, representing the Seeley W. Mudd interests, secured through Pearce & Pearce, options on 2000 acres and denounced 1000 acres more. Messrs. Moody, Hardy and Harrington, of Boston, secured 1200 acres and Pearce & Pearce, 1400 acres.

Geological Features

This zone is about seven miles long and from one to two miles wide. Fully 60 per cent. of this area shows leached red schists with stains of copper carbonates on the surface. There is a series of quartzite strata cutting through the zone from northwest to southeast, passing through the center and departing about 25 deg. from the strike of the zone. These strata are from 10 to 30 ft. in width, nearly parallel, and dip about 65 deg. to the southwest, and it was along these that the former owners had prospected for high-grade silver and copper ores.

The zone is practically within a granite basin, having its greater axis extending from south 76 deg. west to north 76 deg. east, and is ideal in every respect for the retention of the leached copper contents of the sulphide zone. The contacts are principally with granite, though limestone is found on the south and southwest, while the foothills of the Alamos mountain range, jutting in from the south, near the center, are mostly of rhyolite. Numerous diorite intrusions project into and through the schist, and at one or two places small belts of mineralized porphyry are noted.

The Alamos branch of the Southern Pacific railroad passes within three miles of the property on the south and the Mayo river is about the same distance to the north.

Prior to Mr. Botsford's examination, the property had been rejected for the reason that an adit cutting the quartzite strata from 500 to 700 ft. in the hill and at a depth of about 150 ft. from the surface had encountered much iron pyrite in the quartzite. Between the strata the copper was oxidized, but not leached, leading to the conclusion that the zone had not yet leached to the extent of producing a zone of secondary enrichment in depth. At one point the Conglomerado shaft had been sunk, near the north line of these strata. It passed through the extreme footwall of the quartzite belt at the 250-ft. level and entered the schist, carrying 3 to 4 per cent. copper, as chalcocite.

Results of Development by Churn Drills

In December, Mr. Mudd started the first drilling and to date has driven five holes along the strike of the quartzite strata. These holes range between 350 and 600 ft. in depth. While the results have not been announced, it is known that the existence of a body of low-grade ore has been proved, and that the theory of Mr. Botsford has been practically demonstrated. The general average of the borings has been less than 2 per cent. copper, but taking into consideration the fact that fully 40 per cent. of the borings and samplings have been in the quartzite, and that not over 50 per cent. have been in the actual mineralized schist, the results appear satisfactory and indicate that the deposits outside of the quartzite belt will show 3 per cent. copper.

Following the above conclusions, the Lewishons and Mr. Wright, of the Miama Copper Company, have secured the Pearce holdings and are now preparing to drill the ground. This property, on the western slope of the zone, has less of the quartzite, and it is expected will give more uniform results.

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*Mining engineer, Alamos, Sonora, Mexico.

Heroult Furnace Licensees in America

There are three American licensees under the Heroult electric furnace patents in the United States. They are the Halcomb Steel Company, Syracuse, N. Y.; the Firth-Sterling Steel Company, McKeesport, Penn., and the United States Steel Corporation. The licenses to the last named interest permit the operation of a considerable number of electric furnaces at its various plants. Under their provisions, one 15-ton Heroult furnace is now in continuous operation at the South Chicago works of the Illinois Steel Company and another of the same capacity is nearing completion at the Worcester works of the American Steel and Wire Company, to run in conjunction with a basic open-hearth furnace. A number of additional furnaces are contemplated, but they will probably be larger than the 15-ton type.

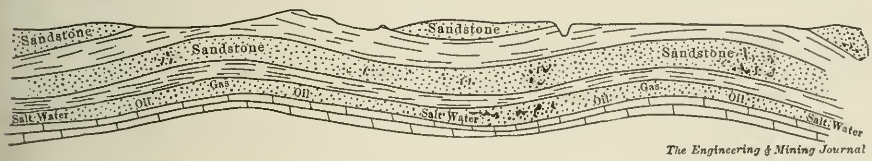
The Petroleum Fields of the United States

Position of Oil Depends upon Quantity of Water in the Strata; Oil Not Always Found With Gas; Organic Theory of Origin Most Tenable

BY W. G. BURROUGHS*

The six great oil provinces of the United States are the Appalachian, Lima-Indiana, Illinois, Midcontinental, Gulf and California fields. Minor occurrences of petroleum are found in numerous other States.

The origin of the oil in all of these fields is probably the same. Of the many hypotheses advanced, the organic origin of petroleum is based on the soundest geologic facts. The hydrocarbons are found in large quantities, save in one instance, in rocks of sedimentary character. No matter where sediments are deposited, if they inclose animal or vegetable matter, bitumens may be produced. "The presence of water, preferably salt, the exclusion of air and the existence of an impervious protecting stratum of clay seem to be essential conditions toward rendering the transformation possible. Seaweeds, mollusks, crustaceans, fishes and even microscopic organisms of many kinds may contribute material to the change."[1] This change is accomplished by a process of slow distillation of the organic matter.



The Engineering & Mining Journal

FIG. 1. RELATIVE POSITIONS OF GAS, OIL AND SALT WATER IN FOLDED STRATA

That petroleum varies in different fields[1] is accounted for by the fact that in some regions the original material may have been plant, in other areas animal remains, thus producing hydrocarbons of different character. The different petroleums thus produced in the various fields are those principally paraffins, naphthenes and nitrogenous or sulphureted oils.

The oil first appears in a state of dissemination, but collectible in economic quantities. It "must gather in proper channels, moved by gravitation or by hydrostatic pressure of waters behind or below it, or by the pressure of dissolved and compressed gases; and accumulate in porous rocks or cavities under layers of impervious material.[1]"

The surface indications of petroleum common to oilfields in general are: (1) A seepage of oil, which is the best sign of its presence. Care must be taken, however, not to take for oil the iridescent scum of iron oxide which often appears on stagnant water in a country whose soil is strongly colored with limonite.[2] (2) At shallow depths an asphaltic substance is sometimes found impregnating the soil. (3) Escape of gases, which is the most common of all evidences. To distinguish between gas from petroleum and other kinds of gases, it must be noticed whether the bubble of gas on breaking in water leaves an oil film. If it does so, it may be regarded as evidence that the gas contains petroleum vapor and is therefore the kind sought.[2] Oil in economic quantities may not be below, however, as it is not always found where gas is. (4) The escape of hydrogen sulphide, incrustations of sulphur and "sour waters," are phenomena often associated with the petroleum fields. Low mounds of the spindle-top type are characteristic of the occurrence of oil in the Gulf field.

THE APPALACHIAN FIELD

The Appalachian field extends from western New York[3] in a general southwesterly direction along the western side of the Alleghany mountains, through Pennsylvania, eastern Ohio, West Virginia, into Kentucky and Tennessee. Although some petroleum occurs in conglomerates, the rocks from which the greater part of the oil is derived are principally sandstones. These sandstones extend in age from the Allegheny formation of the Pennsylvanian nearly to the base of the Devonian.[4]

Referring to Fig. 1, whether the oil will be in the syncline, near the top of the anticline or at some intermediate point, will depend upon the degree to which the strata are saturated with water.

In dry rocks[4] the principal places of accumulation of the oil are at or near the bottom of synclines, at the lowest point of the porous medium, or at any point where the slope of the rock is not sufficient to overcome the friction, such as structural terraces or benches. In porous rocks completely saturated, it will be in anticlines or along level portions of the structure. Where the area of porous rocks is limited, the accumulation will occur at the highest point of the porous medium; and where areas of impervious rocks exist in a generally porous stratum, the accumulation will take place below such impervious stop, which is really the top limit of the porous rock. In porous rocks partly filled with water, the oil accumulates at the upper limit of the saturated area. This limit of saturation traces a level line around the sides of each structural basin, but the hight of this line may vary greatly in adjacent basins and in different sands of the same basin.

Partial saturation is the condition most generally found in the Appalachian field. The most likely places, however, for the oil to occur is upon structural terraces or levels, as these are favorable[4] to accumulation in both dry and saturated rocks.

When the petroleum occurs in synclines, there must be water in the rock just below the oil to get it in paying quantities; for if the rock is dry the oil will not be forced into the well, unless by the gases which it may contain.

The approximate distillation products[5] of the crude oil obtained from this field are as follows: Napthas, gasolene, benzine, etc., 12 per cent.; illuminating oil, 67; lubricating oils (including grease), 12½; gas oil and fuel oil (including acid oil, asphaltum oil and asphalt), 4; paraffin wax, 2 per cent.

The oils of this field are practically free from asphalt and sulphur.[3] In Kentucky and Tennessee, however, the oil varies so distinctly within short distances that it frequently resembles the sulphur oils of the Lima-Indiana field. The gravity of Pennsylvania oil is 46.2 to 42.6 deg. Baumé.

The production of the Appalachian field, including the States of Pennsylvania, New York, West Virginia and southeastern Ohio, Kentucky and Tennessee in 1907[6] was 25,342,137 bbl. of 42 gal. each. Production in 1908,[7] not including Kentucky and Tennessee, was 24,240,000 bbl; in 1909,[8] 25,394,200 bbl. The amount obtained from Kentucky and

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*Formerly professor of geology, Kendall College, Okla., 129 North Professor street, Oberlin, O.

[1] *Bull.* U. S. Geol. Surv., No. 330, p. 640.

[2] *Bull.* U. S. Geol. Surv., No. 282.

[3] *Mineral Resources*, 1907, p. 352.

[4] *Bull.* U. S. Geol. Surv., No. 318.

[5] ENG. AND MIN. JOURN., Feb. 6, 1909, p. 297.

[6] *Mineral Resources*, 1907.

[7] ENG. AND MIN. JOURN., Jan. 9, 1909.

[8] ENG. AND MIN. JOURN., Jan. 8, 1910.

Tennessee in 1907[7] was 820,844 bbl.; in 1908,[8] 1,250,000 bbl.; in 1909,[8] estimated at 1,250,000 barrels.

THE LIMA-INDIANA FIELD

The Lima-Indiana field includes the northwestern part of Ohio and a strip in the middle of Indiana.[9] The oil occurs mainly in the dolomitic Trenton limestone of the Ordovician, a section of which is shown in Fig. 2, having accumulated in anticlines.[9,10] It should be noted that the oil is only in those parts of the limestone that have been changed to dolomite. The reason for this is that when an ordinary limestone of calcium carbonate is changed to the limestone containing magnesium, which is called dolomite, the resulting rock is porous, for a crystal of dolomite does not take up so much room as a crystal of lime. In the spaces thus left, the petroleum was able to collect. The Lima-Indiana field yields petroleum having such a high per cent. of sulphur that the oil is subjected to a special treatment to free it from this element.[5]

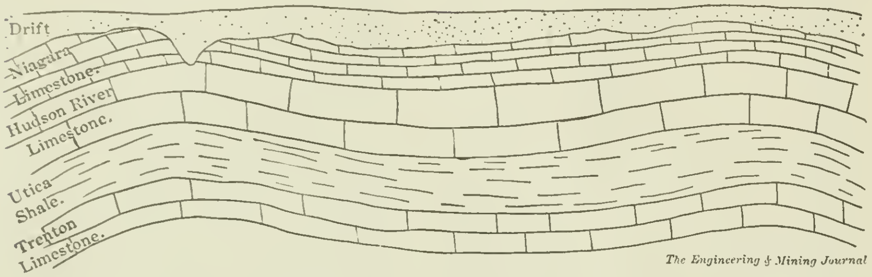

FIG. 2. SECTION OF INDIANA OIL AND GAS FIELDS

The distillation products[7] are: Naphthas (gasolene, benzine, etc.) 11½ per cent.; illuminating oil, 43; lubricating oil, 15; gas oil and fuel oil, 25; paraffin wax, 2 per cent. The gravity of Ohio oil is 42.8 to 32.5 deg. Baumé.

The production in 1907[7] was 13,121,094 bbl.; in 1908,[7] 7,287,000 bbl.; in 1909,[8] 6,192,000 bbl. The maximum production[7] of this field from 1902 to 1907 was in 1904, when it produced 24,689,184 barrels.

THE ILLINOIS FIELD

In the Illinois field the oil comes principally from eight or ten separate pools in the southeastern part, though small isolated pools have been developed in other places in the State. The oil-bearing rocks are generally sandstones or sandy shales, such as are always found in the coal measures, all being Pennsylvanian in age, with the exception of the Kirkwood sand, which is found in the Chester formation of the Mississippian.[12] In the Westfield pool, however, part of the oil is found in a coal-measure limestone, locally altered to dolomite. This occurrence is particularly striking in view of the fact that none of the similar coal-measure limestones are known elsewhere in the State to be magnesian. Indeed, these limestones are characteristically nonmagnesian.[12]

The general structure of the field in southeastern Illinois is anticlinal. This structure, as elsewhere, is an important condition to the accumulation of the oil, minor arches also being important. The sides of the arches[12] under which the individual pools of gas and oil here occur, if plotted to scale, are not too steep to form thoroughly practicable railway grades.

In an analysis[6] of samples taken from 34 wells in the Illinois field in 1908, the oils range in gravity from 39.5 deg. in the deep wells (1500 ft.) to 22.3 deg. B. The oils contain small percentages of sulphur; in the extreme northern part of the field the sulphur runs no higher than 0.5 per cent., and farther south the average is about 0.25, the oils being taken as nonsulphur.

The average for the State of the samples taken was 13.2 per cent. distilling below 150 deg. C., while the illuminating oil averaged 31.2 per cent. Nearly all the oils contained considerable proportions of paraffin and were practically without any asphalt.[6]

The product in 1907[6] was 24,281,973 bbl.; in 1908,[7] 38,844,899 bbl.; in 1909,[8] 29,500,000 bbl. This field has had a phenomenal growth, for in 1905[6] the production was only 181,084 barrels.

THE MIDCONTINENTAL FIELD

The Midcontinental field comprises southeastern Kansas, Oklahoma and northern Texas. The important accumulations of oil occur in disconnected lenses or beds of sandstone at various horizons in the Cherokee shale formation of the Pennsylvanian series.[13,14] Of these sandstone beds there are two classes[14] in the Cherokee shale: (1) A lens-shaped deposit (see Fig. 3) of sandstone which, as it thins out, finally ends abruptly, and the shale begins, there being no grading of the standstone into the shale. The reason for this is that the lens was formed when only sand was being deposited. (2) A sandstone which grades into the shale. This type of deposit was formed at a time when both sand and mud were being laid down, according to the varying strength of the currents, which at one time were able to carry sand, at another only mud. The first class of deposit is apt to extend for longer distances than the second type, which varies from place to place in an extremely irregular manner.

"That these sand lenses and patches were laid down along the pre-Cherokee shore lines, is strongly suggested by the linear grouping of known pools into belts, the discordance of such belts with the strike of outcropping rocks and the parallelism of these belts with the pre-Cherokee shore lines. If this be the fact, the pools may, in general, be expected to develop greatest length in a north-south direction, thus explaining a characteristic of the known pools. Furthermore, the upper contour of the thickened lenses of sandstone determines the attitude of the succeeding deposits, developing therein a structure which may likewise influence the distribution of oil and gas. For instance, the rapid thickening toward the west of the sandstone lentil in the Labette shale in the vicinity of Coody's bluff, might locally counterbalance the normal westerly dip, producing a depositional feature in the overlying sediments akin to a structural terrace or arrested anticline. Sandstones overlying an oil-bearing sand of pronounced lens shape might also be oil bearing over the some area."[15]

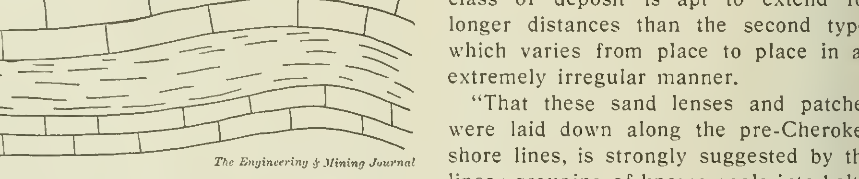

FIG. 3. MIDCONTINENTAL FIELD, SHOWINGDISAPPEARANCE OF SANDSTONE BEDS

Up to November, 1908, not one-tenth of the probable oilfield of the State of Oklahoma had been touched, and not one-tenth of what has been proved productive is yet developed.[16] According to this estimate, not more than 1 per cent. of the State's oil and gas has been developed.

Distillates[5] from the Midcontinental oil

Thirty-first Annual Report, Dept. of Geology and Natural Resources, Indiana.

Economic Geology, Geological Survey of Ohio, Vol. VIII, 1906.

Mineral Resources, 1907, p. 370.

Economic Geology, Bain, Vol. III, August, 1908.

[13] *Bull.* U. S. Geol. Surv., No. 296.

[14] *Bull.* U. S. Geol. Surv., No. 238.

[15] *Bull.* U. S. Geol. Surv., No. 340.

[16] *Bull.* Oklahoma Geological Survey, No. 1.

are: Naphthas, 11 per cent.; illuminating oil, 41; lubricating oils, none; gas oil, 25; fuel oil, 20; paraffin wax, none. The gravity of Kansas oil is 37.3 to 28 deg. Baumé.

The production of petroleum, including northern Texas, in 1907[6] was 46,846,267 bbl. In 1907[16] Oklahoma produced 44,300,149 bbl., while Kansas produced 1,633,500 bbl. In 1908[8] the output of oil from Kansas and Oklahoma was 50,741,678 bbl.; in 1909[6] the output of oil from these two States was 46,826,196 barrels.

THE GULF FIELD

Geographically the Gulf field includes all petroleum-producing areas in Texas and Louisiana. The rocks containing the oil are either sandstones or porous limestones, being overlain mainly by an impervious capping of clay[2]. Fig. 4 shows an ideal section of this field. The oil is buoyed up by the ground water and in its upward movement finds innumerable small pockets or traps in which it comes to rest. It thus may reach the surface, or be caught in these pockets of porous rock and be retained in large enough quantities to be of commercial value. Oil occurs in limestone which is either porous or cavernous or both. Not all porous limestones contain oil, however.

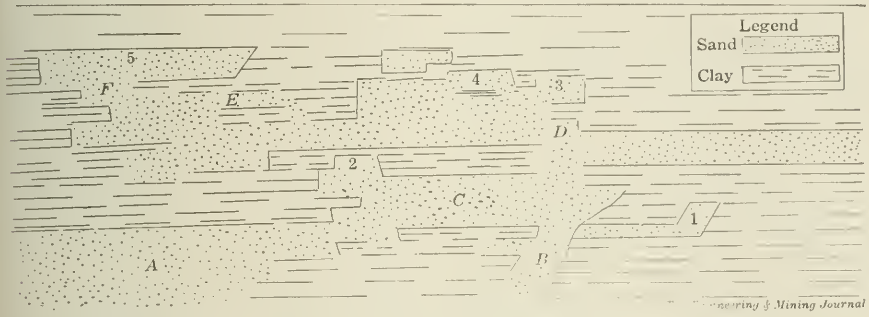

FIG. 4. IRREGULAR SANDS AND CLAYS, TEXAS-LOUISIANA FIELD

"Beneath the reservoirs in the sand are usually thick clays, and beneath the porous limestone are various impervious formations among which clay, marl and gypsum are common. In no case can it be shown that the beds beneath the oil are less impervious than those above."[2] In all probability the oil entered the reservoirs from the sides.

A striking topographic peculiarity of some of the oilfields are low mounds of which Spindletop (Fig. 5) is a good example. This mound is but 10 ft. above the adjacent prairie and in area but little more than 200 acres. The oil occurs in a dolomitic limestone to which the far deeper wells of the surrounding prairie have found no formation to correspond. The two best hypotheses are that either "the rock may be horizontal outside the limits within which it is shown, but have its character changed within a narrow space to that of the ordinary Coastal Plain deposits,"[2] or that it "may thin out and disappear, the entire formation having the form of a lens, concave below and convex above." The probability is that it is due to a combination of these two ways.

The age of the beds overlying the oil is uncertain. The horizon of the oil, however, is not older than late Miocene, and the topmost beds are very recent. Rocks and minerals closely associated with the oil and the presence of which is peculiarly characteristic of the mounds which yield oil or show close structural similarities to the oilfields, are dolomite, sulphur, gypsum, salt and pyrite with associated salts.

"There is some reason for thinking that these mound structures are ranged along lines of slight crustal deformation of disturbance. If such lines exist they probably trend northeast and southwest."[2]

"Extending from southern Arkansas through Texas and forming a belt in which lie the cities of Sherman, Dallas, Austin and San Antonio, are the Upper Cretaceous rocks of the western Gulf coast. The higher formations are oil and gas bearing in a number of places, and at Corsicano, Texas, there is a productive oilfield. The sands which contain the oil are found in a formation of blue-clay shales which serve to seal in the oil and gas."[17]

The gravity of Corsicana oil which is refined is 38 to 39 deg. B. The distillate products[5] of the Gulf fields are: Naphthas, 3 per cent.; illuminating oil, 15; lubricating oils, 6; gas oil, 45; fuel oil, 28; paraffin wax, none. The gravity of Beaumont, Texas, oil is 24.8 to 31.1 deg. B., and that of Sour Lake oil is 24.7 to 16 deg. Baumé.

The petroleum which occurs near the Gulf contains quite a percentage of sulphur, chiefly as hydrogen sulphide; but the sulphur is easily removed by steam before the oil is used. This petroleum is important as a fuel oil, and, being situated near the coast, it can readily be exported. The value of the gasolene obtained from this petroleum is considerable, for although the per cent. of gasolene derived is small, about 3 per cent., it is a better solvent than that from other fields.[18]

The petroleum from Corsicana and other parts of the northern Texas field are lighter and contain less sulphur[18] than that from the Gulf district. The distillate products of Corsicana oil are: Naphthas, 7 per cent.; illuminating oil, 50; lubricating oil, none; gas oil, none; fuel oil, 40; paraffin wax, none.

The production of the Gulf field, including the oilfields of Louisiana and coastal Texas (northern Texas excepted), in 1907[6] was 16,410,299 bbl.; production in 1908[8] for Texas, 11,206,464 bbl.; for Louisiana in 1908[8], 6,833,130 bbl.; for Texas in 1909;[8] 9,593,000 bbl.; for Louisiana in 1909[8], 3,192,000 barrels.

CALIFORNIA OILFIELDS

In California there are a number of productive fields, all lying south of the latitude of San Francisco, although there are minor occurrences north of this latitude.[19] The oil is found in sandstones, conglomerates and zones of fractured shale or flint offering interspaces in which the oil can gather. This structure is shown in Fig. 6. There is also one noteworthy occurrence of oil in crystalline schist.

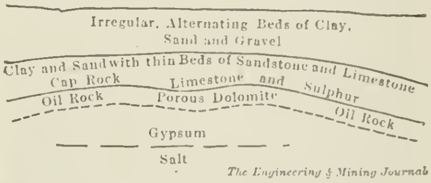
Irregular, Alternating Beds of Clay, Sand and Gravel
Clay and Sand with thin Beds of Sandstone and Limestone
Cap Rock
Limestone and Sulphur
Oil Rock
Porous Dolomite
Oil Rock
Gypsum
Salt
The Engineering & Mining Journal

FIG. 5. SECTION OF SPINDLETOP OIL POOL

The petroleum occurs in connection with anticlines, monoclines, local lenses of sand or gravel, associated with faults and in synclines. The principal formations from which the oil is obtained are the Monterey (Upper Miocene), Fernando (Upper Miocene or Lower Pliocene), Tejon (Eocene), Vaqueros (lower Miocene), Santa Margarita (Upper Middle Miocene), and the Jacalitos (Upper Miocene).

In the Santa Maria district the oil is always intimately associated with gas.[19] This oil exhibits a striking tendency to migrate upward, in spite of the fact that whatever water is present occurs, in all but four wells, near the surface, or at least considerably above the oil-producing zones. This tendency of the oil to migrate is accounted for by the associated gas.

An example of the oil occurring in monoclines is found in the Westside and Kreyenhagen fields, in which water is associated with the oil.[20] Here the oil is prevented from escaping to the surface, not by an overlying impervious formation, but by the heavy residual hydrocarbons which were left when at the first period of formation of the oil it rose to the surface, the lighter compounds in the petroleum being evaporated and escaping into the air. These hydrocarbons thus seal the outcropping porous oil strata.

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[17] *Bull.* U. S. Geol. Surv., No. 184.

[18] *Mineral Resources*, 1907, p. 353.

[19] *Bull.* U. S. Geol. Surv., Nos. 213, 321, 322.

[20] *Bull.* U. S. Geol. Surv., No. 357.

In Placerita cañon, five miles east of Newhall, is an area of oil land of insignificant size and yet one of the most remarkable oil territories in the world. The oil occurs in crystalline schist.[21] Under this schist is the San Gabriel granite, and overlying the schist, at a short distance from the oil wells, are rocks which are thought to be of the Fernando formation. "The schist in which the oil occurs is micaceous and granitic, conspicuously banded and greatly contorted. The presence of oil under conditions similar to those that exist here is perhaps unknown in any other part of the world. The oil itself is almost a naphtha, white in color, and having a gravity of 50 to 60 deg. B. It may be that the oil is of later origin than the rocks from which it is derived, or, in any event, that it was for a time stored in another reservoir, perhaps of Vaqueros, possibly even of Fernando age. It is possible that from such a reservoir the light oil, already from some cause separated from the heavy oil, may have found its way between the two formations and penetrated the crystalline rocks through one of their fractured zones."[21]

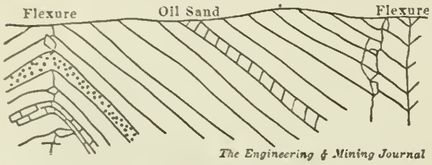

FIG. 6. SECTION IN LOS ANGELES OILFIELD

The distillation products[5] of California crude petroleum are: Naphthas, 6 per cent.; illuminating oil, 18; lubricating oils, 1½; gas oil and fuel oil (including acid oil, asphaltum oil and asphalt), 72; paraffin wax, none. The gravity of California oil is 35 to 12.3 deg. B.; that of oil from the crystalline schist is 50 to 60 deg. Baumé.

In 1906 the amount of oil used as fuel in California was greater than the entire production of the State for the year; the production in 1906 being 33,098,598 bbl. The production in 1907[7] was 39,748,375 bbl.; in 1908,[8] 45,000,000 bbl.; in 1909,[8] 58,250,300 barrels.

THE COLORADO FIELDS

In Colorado the principal occurrences of oil are in sand lenses in an anticlinal fold of the Mancos shale (Cretaceous) as shown in Fig. 7; in the more arenaceous beds within the Pierre formation (Cretaceous) upon a structural slope; and along a monoclinal fold of the Fort Pierre shales (Cretaceous), sometimes in the sandier beds and sometimes in the shale itself.[22] [23]

The distillation products[5] of the crude petroleum of Colorado are: Naphthas, 3½ per cent.; illuminating oil, 35; lubricating oils, 3; gas oil, none; fuel oil, 55; paraffin wax, none. The gravity of Rangely oil is 44 deg. Baumé. The production[7] in 1907 and 1908 was 400,000 bbl. in each year; in 1909,[8] 500,000 barrels.

ALASKA AND OTHER FIELDS

The petroleum fields of Alaska are Controller bay, Cape Yaktag, Cook inlet and Cold bay, all these fields being on the southern coast of Alaska and situated on tidewater.

In the Cape Yaktag field, in which the geological occurrence of the oil has been determined, it is found associated with rocks consisting of shales with interbedded sandstone and limestone, the structure being anticlinal.[23] In the Controller Bay[24] field the structure is extremely complex and difficult to interpret.

"West of Katalla the seepages of oil are associated with metamorphic rocks, the oil coming to the surface either through the joints and bedding or cleavage planes of the slate and graywacke, or through superficial deposits which probably overlie such rocks."[24] The explanation for this is probably that the metamorphic rocks, which are known to be separated from the Tertiary shales by a fault, are overthrust upon the shale along a fault plane of low hade, and that the oil at the seepages is coming through the metamorphic rocks from the underlying shales.[24] The petroleum of the region is a refining oil of high grade.

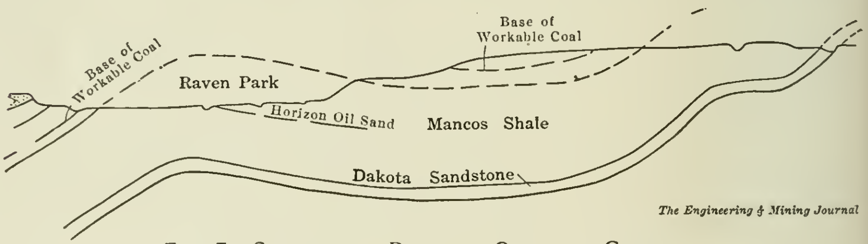

FIG. 7. SECTION OF RANGELY OILFIELD, COLORADO

Other fields in which small quantities of oil have been produced are Wyoming, Missouri, Michigan and southwestern Utah. Of all these smaller fields, including Colorado and Alaska, Wyoming gives most promise for the future. In 1908[9] it is estimated that Wyoming produced 13,000 bbl.; in 1909,[8] 15,000 barrels.

Oil also occurs in Montana, Washington, Oregon, Idaho and Nevada.[19]

SUMMARY

Oil-bearing rocks range in age from Ordovician to the most recent. In the eastern States these rocks are chiefly Paleozoic in age; in the western and southern States, of Post-Carboniferous age. The oil occurs in sandstones, dolomitic limestones, sandy shales, shales, conglomerates, gravel, flint, slate, graywacke and crystalline schist. The structures of the rocks from which the petroleum is derived are anticlines, synclines, structural terraces and benches, arrested anticlines, lenses, monoclines and in rocks associated with planes of faulting.

Treatment of Antimony Ores Containing Arsenic

H. L. Herrenschmidt, of Paris, France, in U. S. Pat. 948,545, Feb. 8, 1910, describes a process of treating antimonious ores containing arsenic, whereby the antimony is recovered free from arsenic in whatever proportions the latter may be present. The process is based essentially on the dry treatment of the coarsely crushed ore, and on the wet treatment of the pulverulent portion.

In the dry treatment the ore is roasted in a furnace, so as to give off a mixture of oxide of antimony, arsenious acid and sulphur dioxide. The roasting is done at a temperature of about 400 deg. C., preventing any agglomeration of the residue.

TREATMENT OF PULVERIZED RAW ORE BY WET METHOD

In the wet treatment, the fine unroasted ore is mixed with an alkaline solvent, charged into an autoclave containing water, and boiled until the pressure reaches four or five atmospheres. The content of the autoclave is discharged into a vat. The liquor, containing antimoniate or sulph-antimoniate of soda, and arsenate or sulph-arsenate of soda, is drawn off. The liquor is then caused to react with the mixture of antimony and arsenious acid from the roasting furnace, thus separating the arsenic. From the arsenical and alkaline liquor obtained in this reaction, the antimony is precipitated by the sulphurous acid resulting from roasting the ores in the furnace.

Besides recovering antimony free from arsenic, the following advantages are claimed: Economy in fuel consumption; cheap construction by the use of cast-iron chambers; and the possibility of collecting the oxides of antimony and arsenic as they are condensed, without interfering with the operation of the furnace.

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[21] *Bull.* U. S. Geol. Surv., No. 309.

[22] *Bull.* U. S. Geol. Surv., Nos. 260 and 350.

[23] *Bull.* U. S. Geol. Surv., No. 225.

[24] *Bull.* U. S. Geol. Surv., No. 314.

A Suggestion to the Coal Mining Industry

If the Operator Were Willing to Drive Entries to Boundary First, and Mine Retreating, There Would Be Greater Recovery and Fewer Fatalities

BY T. B. BANCROFT*

Time was when very little capital was required to open a coal mine and put it in condition to ship coal. Especially was this the case in drift mines, where $2000 or even less, would open and equip the mine in an uptodate manner. The single-entry plan prevailed, with its consequent bad ventilation, which was aggravated by the aimless and wandering directions that these entries took. Muscle and pick brought down the coal and the patient but perverse mule hauled it to the surface, where a small tipple of the "before the war" type served for loading it into a five-ton railroad car, or the hull of a canal boat, as the case might be.

The long-suffering canal mule, or a small locomotive, hauling a correspondingly short train of small cars, conveyed the product to the markets, which were mainly local and in near proximity to the place of production. What is known as "slack" formed no part of this product and was hauled out and piled in huge banks as waste, to be added to the great loss of coal inside the mine, by reason of the careless, prodigal and unscientific methods of mining then in vogue. A map of a coal mine did not exist, and to suggest to a mine owner the making of one would have called forth a torrent of invective and abuse because of its uselessness and expense. Anything like statutory control of the industry was unknown until in the late 'sixties—Pennsylvania appointed one mine inspector in the anthracite coalfield. In 1871 occurred the great disaster at the Avondale mine, in that State, whereby 109 miners lost their lives through an explosion of firedamp.

In 1872, the First Mining Law was Enacted In Ohio

This aroused the mine workers of Ohio to the necessity of legislation for their own safety and protection in the hazardous occupation in which their days are spent. Agitation in this direction ensued and in 1872 the first mining law was placed upon the statute books of that State. This law fell still born, as it contained no provision whereby anyone, official or otherwise, was specially charged with its enforcement. Further legislation followed from time to time, until 1884, when the basis was laid for the mine department, as it now exists in Ohio. Other States followed suit, and it is believed that every State wherein the mine worker plies his calling now has its laws, more or less stringent, for his protection.

Coincident with the creation of the mine department of Ohio (though perhaps not by reason of its provisions or their enforcement) began a rapid improvement in the methods of mining and a largely increasing output of product; followed on the part of the railroads by a growth in transportation facilities, made necessary by the changed conditions.

About 1883 came in the rope haulage, which, dispensing largely with mules and drivers, gave more satisfactory results, at less cost to the producer; at the same time the "Mitchell" tipple began to be adopted, which quadrupled the dumping capacity of the old style tipple, under its most favorable circumstances. The year 1884 saw the exhaust fan rapidly taking the place of the furnace, as a better, safer and cheaper form of ventilation; and the mining machine, driven by compressed air, began to make its appearance; while 1887 ushered in electricity as a motive power in mining. Electricity not only runs the mining machines, but it does the hauling, lighting and pumping in the mine, and has contributed more than all the rest in bringing the practical problems met with in coal mining to the acme of perfection in their solution.

In the mining company's office of today will be found a map of the mine showing all the interior workings and the surface boundaries of the property. This map is drawn and extended monthly, as the workings grow, by the mining engineers employed by the company. It is now considered absolutely essential to the proper and intelligent conducting of the business that this map be available for reference whenever required, and the trained engineer, with his assistants, is as much a necessity as the old "bank boss" was formerly.

Going over to the mine, we find the electric plant in a clean, airy building convenient to the opening. This plant supplies power wherever needed and is under the care of a trained electrician. The machinery is too costly and delicate to be entrusted to unskilled or ignorant hands. The haulage system extends from the mouth of the drift, or the bottom of the shaft, to the innermost recesses reached by the entries and is extended, from time to time, as the working faces advance. The best type of electric machines do the mining and drilling; the shots are fired by electricity; the roads and entries are kept scrupulously clean, that the work may not be interrupted by accidents; for, with the large number of men employed and the great daily output, the loss of an hour's time mounts up on the pay roll and makes a large hole in the value of the day's output as well.

If it is a shaft mine, a small dummy engine keeps loaded cars, on the siding at the bottom, constantly moving toward the cage, so that the loaded car passes onto the cage as soon as it lands, bumping the empty car off on the other side, thus avoiding having to go back on the entry for the last cars of the trip, and keeping the hoisting engine going so that there is a constant run of loaded cars going up, with no break except for reversing the engine at the top. To facilitate this, the car never leaves the cage at the top, but is dumped and returned to its position on the cage automatically without a hand being laid upon it. The separate sizes of coal pass to their separate railroad cars, while the dust is carried off by elevators or blown away by a fan.

The Small Operator Is No More

So quickly can the coal be passed over the tipple to the cars at a modern mine that the writer has seen a train of cars passed under the tipple and loaded while in motion, from the first car to the last, without once stopping the moving train. It is this system, this clocklike regularity, that has enabled the modernly equipped mine to load from 2000 to 4000 tons daily, where its ancient forerunner was unable to do the same in 10 days. The "happy-go-lucky," "come day, go day" method of mining has gone down before modern science, and the spirit of modern commercial economy. The change having once set in, has been rapid and final and with the coming in of the new and the passing away of the old, has passed the "small operator." Verily, his day has gone by.

The pace is set by men with capital sufficient to enable them to take advantage of all labor-saving devices, be they mechanical, scientific, or natural. In the absence of natural advantages, he who enters the field against them must be able to equip his plant with all the appliances of the other. The cost of a modern, uptodate mining plant is so largely in excess of what it formerly was that we may look in the future for the business to be in the hands of men with large means and with resources beyond what we have been accustomed to. It is, perhaps, well that it should be so, as it makes for the benefit of the mine worker, in that the false spirit of economy so long prevalent among operators, which gave him poor ventilation and exposed him to other risks, because of the cost, will have passed away and the true economy that looks far ahead and sees that in the long run good ventilation, clean roads and proper drainage pays, will have taken its place.

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*Ex-chief Inspector of Mines, Springfield, Ohio.

The readiness and ability of the American citizen to grapple with and overcome all obstacles in the way of advancement has, in this case, been supplemented by nature in the endowment of the largest carboniferous deposits in the known world—and they of the best quality, each in its class; while the reward that stimulates to further effort lies revealed to this generation in the demand for our product, about to descend upon us from all points of the commercial world.

We Will Soon Send Coal to Europe

Europe, whose mines have been worked for hundreds of years, will soon be looking to us for her supply; in fact, we are already sending to her of our abundance. A prominent operator with mining interests in several States, upon his return from Europe recently, informed me that he could have sold his coal, to be delivered in London, at a price much below that of coal mined in England, and have realized a good profit on the sale. He further said that he could have placed some large contracts but feared to undertake them because of uncertainty as to finding vessels to carry the coal. Here, then, is all that stands between us and an export trade with the world. Can it be doubted that the requisite fleet will be forthcoming in the near future, and are we not on the eve of another great change of conditions in the coal trade?

Nevertheless, and in despite of our immense deposits and our labor-saving mechanical appliances (which mainly tend to an increased output and a corresponding depletion of our resources) we are told our coal supply is limited! And this on the eve of an increased demand upon it, altogether without precedent in the past; and as this paper is being written, the press is burdened with accounts of the holocaust, at Cherry, where upward of 300 men were caught, like rats in a trap, and suffocated, while hundreds of willing rescuers stood around the pit's mouth unable to enter it.

Mining laws have been passed, good, bad and indifferent; some of them have been "more honored in the breach than in the observance," and still disasters follow each other in such terrible frequency and awful increase of victims, that the horror of Avondale, where only 109 were lost, sinks into insignificance when compared with those of the "modern mine."

It is well known to the trade and to mining engineers, that the percentage of coal lost under the present system of mining is very great. It varies, from local causes, in mines and districts. Large part of it comes from sheer waste and lack of economy; while thousands of acres are lost annually by falls of roof cutting off access to coal as yet untouched, and by robbing the supporting-room pillars in order to save entry driving.

The nation demands—and the mine owner will no doubt agree—that our coal beds be preserved and protected from unnecessary loss; while the mine worker asks that practical and proper means be afforded for the safety of life and limb in his hazardous vocation.

The Coal Operator Is Sometimes Too Greedy

Hitherto, the custom has prevailed in America, of attacking the coal of the newly opened mine for shipment as soon as the developing entries are sufficiently under cover to warrant it, and I have been in one mine where the rooms had been opened so close to the shaft (in order to get to work at once) that a squeeze was brought upon it, crooking the shaft to such an extent that, within a year after its being sunk, it was almost impossible to get a cage up or down it; there was no other opening to this mine, and in case of accident there could be very little hope of saving the men employed in it. Another case came under notice, where the seam lessened in thickness from 6 ft. to 4 ft. The entries were deflected to follow the thick coal, and the thinner coal was left untouched. Some years after, when the mine was nearly exhausted, an effort was made to take out this coal, once rejected; but it could not be reached, and several hundred acres of the best coal in that State were added to the amount lost under the present system of mining.

It will be self evident to all, be they of the craft or not, that as the entries press forward and development progresses by this method, the entire product of the mine, from its opening until the last pillar is drawn, must pass to the surface throught a maze of old workings, left behind with their poisonous exhalations and falls of roof, lack of drainage, heaps of what is known as "gob," breeding "black-damp" in one place and "white-damp" in another; all, perhaps, having been once bratticed off, as required by law, but now (being in an unproducing district) seldom visited by anyone, unless it be by some miner who tears open the barrier for a short cut to another part of the mine; and, be it remembered in this connection, that practically all the men working in the mine are employed at the faces, so called, the point farthest from the entrance, which is frequently miles away.

Entries Should Be Driven to the Boundary First

In England and on the continent the has long been in use a plan for openin coal mines that is the reverse of th handed down to us by our forefather and to which we so tenaciously adher I am under the impression that this pla of opening is mandatory, under the English law; but, be that as it may, it consists in driving the entries through t the boundaries of the territory to be attacked before beginning to open room and ship coal. This increases the amoun required for the initiatory investment, bu is the cheaper in every way, in the lon run.

Let us compare the two plans in a concise a manner as possible within th limits of this paper; and what is writte above in connection with the past an present news items, anent the subject given by the daily papers, may serve a data showing the imperfections of coa mining as practised by us, and we wil pass to the consideration of the foreig method.

In mines opened in this manner, th increased amount of the first and origina investment is the cost of driving the entries and of the rails, ties, etc., require by them, for the whole mine; this iten exists at present, to be met and liquidate during the life of the mine. Practicall we find that the expense attending th adventure from beginning to end, is th same in both cases; the cost of the entries alone being advanced in the foreig mine and there is no other charge to b met save that of interest; which the merchantable coal from the entries themselves will more than care for.

These entries are in the nature of explorations; they permeate the whole proposed territory of the mine, in the direction it is to be worked. If there be a rock fault, a cutting out of the coal, a large body of gas, or any other difficulty to be met, these entries expose it and measures to meet the contingency can be made in time. The floor levels can be taken, and at the lowest point in the mine the sump can be dug and the big pumps located, so as to drain every part of the mine well and properly. The highest point of the roof can also be found, and there can the escapement shaft be sunk with a good, safe stairway up it, to the end that should anything occur to the fan, "natural" ventilation would begin automatically, to the probable saving of many, obliged to rush for the high places, and of others who "follow the air" in such crises, knowing it leads to the air shaft and safety.

Mining on the Retreating System

All of these entries will be air courses for the ventilation of the mine, and the superficial area of coal exposed by them will be immense. Everywhere over this surface will be met blowers, or leaks, of the gasses common to coal mines, liberated by the entries or forced out by pressure from behind, to be taken up by the air current and carried away at once, before accumulating and becoming dangerous; and this while the entries are being driven and even before the work of shipping coal begins.

With its advent we find that repairmen are not needed, nor are they likely to be needed to any great extent until the mine is worked out; for the entries stand in solid coal where no weight can affect them, and when the rooms are finished the pillars can be attacked at once. There are no old workings behind us, for we clean everything out as we work back to the entrance, which we do rapidly, for our air is provided for, and the haul becomes shorter daily. There are no old workings between us and daylight, and the pure air from the outside sweeps through the passages by which we escape, should any unexpected accident occur. To some extent our props and ties can be used more than once, and once installed they are always near the next point of need. The rails also can be used again, for those nearest the front will be the least used and the first to be taken up. The rapidity with which the mine can be exhausted will more than compensate for the amount, with interest, made necessary for its development.

Over and above all this we must take into consideration the great saving in coal which would accompany this method of attack. In this instance, Nature has been so prodigal with her gifts to us that we have been reckless from the start and have become too lavish in dissipating our wealth. Notwithstanding, our immense coal deposits and our rapidly increasing output, we are confronted by a demand in the near future, that bids us pause. The time has come when the old waste must cease, and we must turn our attention to the matter of economizing our resources. It has been estimated that by the present method of working we do not get more than 70 per cent., and even lower estimates are on record.

Ohio's coal product for 1908 was 26,287,800 tons. If in the getting of this coal only 10 per cent. were lost, it would amount to 2,628,780 tons in Ohio alone for that year. An article of the *Ohio State Journal,* of Dec. 27, says "the production of coal for the current year (1909) is estimated at 412,000,000 gross tons by the operators of mines that account for 89 per cent. of the national production." It will be seen by this that the coal lost in one year's operations, even at the low and safe estimate of 10 per cent., becomes appalling when the gross tonnage of the nation is considered, and it behooves us to be up and doing that this wastage of our heritage, with its accompanying mortality, be reduced, if it cannot be altogether avoided.

We Should Mine on the Retreating System

There can be no question that by adopting the European method of opening mines we shall have reached the practical limit in conserving our resources and at the same time shall have thrown around the mine worker additional safeguards, and removed most of the present conditions that go to make his occupation hazardous.

Would not a simple statute (State or National) commanding such a system of development, be of more practical service to him than our present mining laws? Under it we would destroy the incipient "germ" and abolish conditions, which, when left undisturbed, lead up to falling roof, generation of poisonous gases which suffocate, explosions of gas which mean sudden death, and the closing up of traveling ways which should have been avenues for escape. To this may be added an increased profit to the operator, as has been demonstrated in two cases, coming under my notice, where this plan was adopted; one in a 4-ft. seam in Ohio, the other in a 6-ft. seam in West Virginia.

Utilization of By-Product Gases from Coke Ovens

BY HENRY M. PAYNE *

It is evident that the amount of volatile matter contained in the coal, and the method of coking, will influence the amount and quality of the by-products, but the three principal residuents are tar, sal ammoniac and benzol.

One of the most complete by-product plants in Europe is at Gelsenkirchen, Germany, and has already been described in this Journal, by Prof. Wm. S. Hall, (in June, 1908). Here, in addition to the regular by-products, the company furnishes illuminating gas to the surrounding villages and cities, at the rate of 3½ pfg. (= 1c.) per cu.m., or about 23c. per thousand cu.ft. They furnish 60,000 cu.m. per day or about 21,180,000 cu.ft. which gives the company a net profit of 2½ pfg. per cu.m., or 1500 marks (= $375) per day.

The original tar is passed through various washing and distilling processes, whose resulting products are principally,

(1) *Carbolic acid* in the crystalline form C_6H_5OH.

(2) *Anthracene,* $C_{14}H_{10}$, which is used for dye-stuffs.

(3) *Toluene,* $C_6H_5CH_3$, from which, by oxidation is formed benzoic acid, $C_6H_5CO_2H$.

(4) *Creosote,* $C_6H_4(CH_3)OH$, a mixture of carbolic acid, cresylic acid, etc., used as a preservative and antiseptic.

(5) *Naphthaline,* from which α and β naphthol $C_{10}H_7(OH)$ are derived, and which are used in the manufacture of coloring pigments.

(6) *Benzol,* C_6H_6, which differs from the primary by-product benzol, only in the temperature at which it is distilled, and which is commonly known at "65 per cent. benzol" and subsequently worked up into solvent naphtha.

Some of these, as creosote, have been effectually used as timber preservatives; and the tar itself, in various forms as binder for briquetting coal slack, coating for prepared roofing, and as pitch to be mixed with furnace slag in the building of roads. The amount of tar so gathered averages about 7½ lb. per ton of coal.

The Sal Ammoniac Recovery is 25 Pounds Per Ton of Coal

The value of the sal ammoniac will depend largely upon its whiteness, which in turn, is only to be obtained by the presence of large quantities of steam to keep the saturator constantly in ebullition, and by keeping the solution always alkaline, since the ammoniacal liquor contains distillates which form white ferrous salts, rapidly oxidizing when coming in contact with ferro-cyanides, and forming prussian blue unless kept continuously alkaline.

This high-grade sal ammoniac sells at Gelsenkirchen for 18 marks (= $4.50) per ton at the works. The amount recovered is about 25 lb. per ton of coal.

Sulphuretted hydrogen is one of the gases which passes off during the manufacture of sal ammoniac, and on account of its odor, it is necessary to reduce this to free water and sulphur, which is done by passing it through Ferric Hydroxide, $Fe(OH)_3$.

The benzol, as has been indicated, occurs in the mixture of hydrocarbons, and is separated by passing it through a hydrocarbon oil, by which it is absorbed. Creosote is frequently used for this purpose, on account of its affinity for, and receptivity of benzol.

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*Mining engineer, Morgantown, W. Va.

The process of distillation is known as "fractionation," or the graded distilling of the lighter hydrocarbons, which first pass off at lower temperatures on up to the heavier ones, as the temperature increases. This creosote, or other hydrogen oil, is repeatedly used until it has absorbed so much naphthaline as to be unfit for further service.

Benzol Mixed with Alcohol is used as Fuel for Haulage Motors

Each ton of coal yields from 3 to 3½ gal. of 65 per cent. benzol. This benzol is then refined to various grades, depending on the purposes to which it is to be put. Most of it, in Germany, is used in combination with denatured alcohol, as a fuel for haulage motors. The reasons for this combination are that the waste gases of the benzol alone are not only dangerous, but decidedly unpleasant, and rapidly vitiate the ventilation, whereas by using from 66 per cent. to 75 per cent. denatured alcohol, the odor after a gasolene haulage motor has passed, is scarcely noticeable.

These haulage motors weigh from 2 to 5 tons, developing 8 to 18 h.p. and costing from $1750 to $2125. The cost of operation is said to be from 2½ to 4c. per ton-mile, as compared to 12c. per ton-mile under the same conditions, with horses.

The specific gravity of the benzine made from petroleum is greater than that of the benzol made from coke-oven by-products, and the latter is preferable for haulage purposes, giving less odor to the waste gases. The lower the temperature of distillation, the better the grade of benzol.

In the open German market the best grade of by-product benzol costs 18 marks per 100 liters, or about 17c. per gallon, while the coal companies operating by-product plants produce it at a cost of 7¾c. per gallon. The grade here spoken of, is the 65 per cent. benzol refined to 90 per cent., and commercially called "gerinnigdesbenzol."

This benzol when treated with nitric acid becomes nitro-benzene, which when reduced, gives aniline, or amido-benzene, and from this base, by the use of acetic and other acids, acetanilid and the other coal-tar-derivative-drugs are prepared.

I am indebted to Herr Direktor G. A. Meyer, Herr Berginspektor Ackermann, and Herr Direktor Lindenberg, of the Hibernia, Königin Luise, and Gelsenkirchen Bergwerks, respectively, for courtesies extended and information furnished, and to Herr Meissner, Geheimer ober Bergrat, of Berlin, for placing at my disposal many facilities not otherwise obtainable.

Explosions in Coal Mines

SPECIAL CORRESPONDENCE

The coal-dust question is one to which much careful thought has been given by the members of the British Royal Commission on Mines, whose second report was recently made public. They indicate that much may be done to prevent the accumulation of dust in mines. Directing attention to the large amount of the finest dust that enters the shaft from the screens, they suggest that means should be taken to prevent this by removal of the screens to a more distant point, or by drawing off the dust or otherwise. They also point to defective cars as being responsible for causing a considerable amount of dust, and in all dry and dusty collieries the adoption of dust-tight cars is recommended. Further than this, care should be taken in loading the coal into cars to prevent the scattering of pieces of coal along the roadways; spraying of coal should be carried out where practicable if fast haulage is the rule.

Coal Dust the Dangerous Factor

The danger of the presence of gas in mines is not underestimated, but mining authorities in Britain have been convinced by experience that in the fine particles of coal dust there lurks a danger far greater than may be attributed to firedamp. The inquiry into the West Stanley (county of Durham) holocaust resulted in the verdict that the 169 victims lost their lives by reason of an explosion of coal dust. It was coal dust that caused the Courrières explosion—the greatest in the world's history of mining, destroying 1100 lives. This French disaster, upon the authority of a British Home Office report, emphasizes the risk now generally admitted to exist in dry and dusty mines of great loss of life in case an explosion is initiated. In some of the larger mines in Britain, the report suggests the loss of life might equal that of Courrières if an explosion took place when the maximum number of men are underground, and the declaration is made that "the only certain method of preventing loss of life would seem to be to render the mines incapable of being the scene of widespread dust explosions by watering or otherwise preventing the accumulation of dry dust in the roads and workings."

Some years ago with the growing recognition of the dangers of coal dust, the explosives for blasting purposes in mines were revised as a partial if not complete remedy. The well known Woolwich test was enforced, gunpowder being banned under certain conditions, and safety explosives placed upon the "permitted" list. A saving of life has been attributed to the applicatioan of the new conditions attending the employment of dangerous explosives, but the view gained currency that the "permitted" explosives were flameless, and not until the Departmental Committee on Bobbinite issued its report was the fallacy clearly combatted. This committee declared that "there is no such thing as a completely safe explosive; that is to say, there is no explosive which under any conceivable circumstances, might not ignite gas or dust, or a mixture of gas or dust."

This report further indicated that the Woolwich test passes explosives which would be discredited under the Continental test, while the latter allows to be used in French and German mines explosives which are looked upon with disfavor at Woolwich. The commissioners say that in practice it is impossible to resist the conclusion that the class of explosives of which Bobbinite is a prominent and good example, is upon the whole, more suitable for coal getting than the more detonant explosives, but it is also true that this group is distinctly more favorable to the ignition of gas and dust when insufficiently confined in a shot-hole.

Permitted Explosives May Be Dangerous

They then proceed to say that the results of practical working do not invariably confirm the Woolwich test, one reason for this appearing to be that the active chemical change involved in the explosion is completed before the containing walls have yielded, and consequently the still exploding material may come into contact with inflammable atmosphere outside the shot-hole. Three ways in which this may occur are indicated: (1) The charge may have been considerably overestimated; (2) the stemming may be inferior in quality either from being too soft, or from its being material which does not bind and is, therefore, easily blown out, or it may be deficient in quality with the same result; (3) unsuspected fissures may exist in close proximity to the shot-hole. The commissioners suggest in their report that the tests used by the explosives department should no longer consist of the single test as at Woolwich, but should include a more severe test, probably on the lines used on the Continent. They also think it would probably be desired to add a testing station for testing coal dust and safety lamps.

According to particulars collected for the present Commission on Mines, there were at the mines in Great Britain 183 fatal explosions causing 720 deaths in the 10 years 1896-1905. Of the total number, the influence of coal dust in extending the explosion was remarked in 21 cases, including the more serious disasters. The death roll in the latter was high, amounting to 476 out of the 720 deaths. In the mines, the making of coal dust is inevitable, and where it cannot be removed something should be done to reduce to a minimum the danger of its becoming the central factor in a fiery blast destroying the mine and its workers.

After an experience extending over more than three decades, R. Donald Bain, the Durham mines inspector, favors a system of watering the mines as a means of preventing colliery explosions. When before the commission he gave it as his opinion that the Wingate (Durham) explosion, destroying 25 lives in 1906, would not have occurred if the existing regulations as to watering had been carried out. The whole question, he says, should be considered with a view to incorporating in the special rules, some means of laying dust. "Wet zones" have been proposed and practised, and it is possible that the area of an explosion would be limited in that way.

COAL MINE DISASTERS IN GREAT BRITAIN.

Date.	Colliery and County.	No. Killed.
July 15, 1856	Cymmer, Glamorgan.	114
Feb. 19, 1857	Lund Hill, Yorkshire.	189
Dec. 1, 1860	Risca, Monmouth.	142
Dec. 12, 1866	Oaks, Yorkshire	361
Nov. 8, 1867	Ferndale, Glamorgan.	178
Dec. 6, 1875	Swaithe Main, Yorkshire.	143
Oct. 22, 1877	Blantyre, Lanarkshire.	207
June 7, 1878	Haywood Wood, Lancashire.	189
Sept. 11, 1878	Abercarn, Monmouth.	268
July 15, 1880	Risca, Monmouth.	120
Sept. 8, 1880	Seaham, Durham.	164
Dec. 10, 1880	Naval Steam Colliery, Glamorgan.	101
June 18, 1885	Clifton Hall, Lancashire.	178
Feb. 6, 1890	Llanerch, Monmouth.	176
Aug. 26, 1892	North Navigation, Glamorgan.	112
July 4, 1893	Combs Pit, Yorkshire.	139
June 23, 1894	Albion, Glamorgan.	290
July 11, 1905	National, Glamorgan.	119
Feb. 17, 1909	West Stanley, Durham.	168

It may be of interest to recall parenthetically that at Altofts in Yorkshire, experiments are being made in the direction of proving that the admixture of stone dust will be the means of checking flame and limiting the effects of an explosion. W. E. Garforth, well known as the inventor of the "Weg" breathing apparatus, is conducting these tests, and takes a sanguine view of the possible results.

MINERS MUST COMPLY WITH REGULATIONS

Having regard to the dangers of coal dust and gas combined, due attention should be paid to regulations suggested by the bitter experiences of the past as the most likely to maintain the mines in a condition of safety. In the absence of discipline, the destruction of the mine is ever imminent and calamity may overtake the workers. It may be appropriate to recall the reminder of the Liverpool mines inspector, Henry Hall, "that the labors of scientific experts will be of no avail to avoid disaster unless the workers submit to strict discipline and cheerfully comply with the regulations for their safety." This, of course, applies also to the management, for as W. H. Pickering, the Yorkshire mines inspector, says, "Discipline, or the want of it, begins at the top, with the chief in command."

From time to time the views of recognized British experts will be summarized, in relation to this and other important mining questions, in the light of evidence laid before the Royal Mines Commission and other channels of information. In the meantime, as some big disasters have overtaken the mining communities of America in recent times, the opportunity is taken of appending a list of holocausts which have killed five score or more British workers during the last half century. Contemplation of the list, while revealing the horrors attending explosions, may also strengthen the resolutions of those who "dig for coals" to conform to all known safety measures.

Colorado Coal Mines to Open with Nonunion Labor

SPECIAL CORRESPONDENCE

The strike of the miners in the northern coalfield of Colorado, by which is meant the lignite fields north of Denver, is still on, with no apparent chance of an immediate settlement. The point at issue is that the miners demand an increase of about 5½ per cent. in wages and an 8-hour day, which must include "bank to bank," instead of the time consumed in going to and from their work (say one hour) being outside of the eight hours. They also demand a half holiday on Saturday, and one or two minor concessions which do not cut much figure in the matter.

The operators stand pat and refuse to grant what the miners ask, on the ground that they cannot afford it. There is no trouble, however, and although the operators have sent some deputy sheriffs to protect their property no threats are made; there are now five months of warm weather ahead of us, when not much coal mining is done; the probability is that the trouble will end in the mines being worked on the "open shop" system, which the operators say they will do. Meantime, it is stated by the operators that they expect to open at least four of the biggest mines in a few days with nonunion men.

COLLIERY·NOTES

In testing the practical efficiency of a batch of detonators, a simple method is to fire a few detonators on separate sheets of lead in the open air. The quality of the detonator is revealed by examination of the sheets.

In the design of cars for use underground in coal mines, it is important to consider carefully the distance apart of their axles. Cars with axles too close to each other, have a tendency to end up and be derailed when there is the slightest opposition to their front wheels. Such an obstacle may be a projecting joint of the rails, or only a small stone or a piece of wood. Even though the car is quickly lifted on the track again, the stoppage of work, when it occurs frequently, is a matter of much consequence. When the axles of the cars are too far apart, the wheels do not easily get off the track, but when this does happen, the cars are difficult and heavy to lift on again.

The depth and direction of shot holes, as also the weight of the charge, are governed by the nature of the material to be dislodged. The position of the bedding and jointing planes, faults, fast and loose ends, etc., is best determined by practical experience. It is important that drills should not be used when they become so worn as to fail of giving easy clearance to the charge. A ridge occurring in a hole may cause the cartridge to stick fast, in which event the operator will often use force to drive it to the end of the hole. In the case of explosives containing nitroglycerin, this action is liable to cause disaster. Even where gunpowder is used, sufficient heat may be developed by friction to produce ignition.

Too much importance should not be attached to the prospective proceedings of Attorney General Wickersham against an alleged combination affecting the production of bituminous coal. It is reported that the suit is to be brought under the Sherman Anti-trust Act. There is no one important bituminous coalfield in America that is controlled by any railroad or single body of men. It is possible that operators in some districts are handicapped by unfair transportation rates, and, if so,, the discrimination should be abolished. However, there is no bituminous trust, and no probability of one. It would be about as easy to form a trust in fresh air as in soft coal. When capitalists have tried to buy up the independents in any district, the result has been that the independents have put half the money in the bank and opened new mines in adjacent territory with the remaining money. It would be a costly and endless job to form a bituminous-coal monopoly.

? QUESTIONS and ANSWERS ●

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure for the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

DAMAGES FROM MINING TRESPASS

A few months ago I read something like the following: A certain mining company had cut into an adjoining property and had taken out considerable ore. This trespass was on an end line. The penalty for such stealing was three times the value of the ore taken out. If any such decision has been handed down, can you inform me where I can secure complete information regarding it?

W. L. W.

We do not recall a case where the penalty for mining trespass involved payment by the defendant of three times the value of the ore taken out; or, indeed, any case involving "exemplary" or "punitive" damages for the extraction of "ore." There are cases in Maryland and Illinois, in which punitive damages (i.e., amounts exceeding the proved value of the property taken) have been recovered for trespass in coal mines. The measure of damages depends upon the law of each State, or, in the absence of a special statute, upon the application of the common law. The general rule is, that for innocent trespass the defendant must pay the value of the ore as it was in the mine, that is, its final market value less the cost of mining, etc. But wilful trespass entitles the complainant to recover the value of the ore without credit for the labor incident to its extraction.

Many incidental difficulties arise in the determination of such damages. For instance, if the exact value of the ore cannot be shown by the defendant, by reason of the destruction or loss of records, or the absence of separate records (the ore unlawfully taken having been mixed with other ore), other evidence as to its value will be accepted and construed with full weight against the defendant. This doctrine was well expressed in 1722, during the reign of George I, by the Court of the King's Bench, in the case of Armory vs. Delamirie, in the following words (quoted in *Lindley On Mines*. Sec. 868):

"When the nature of a wrongful act is such that it not only inflicts an injury, but takes away the means of proving the nature and extent of a loss, the law will aid a recovery against the wrongdoer, and supply the deficiency of proof caused by his misconduct by making every reasonable intendment against him and in favor of the party injured. * * * A man who wilfully places the property of others in a situation where it cannot be recovered, or its true amount or value ascertained, by mixing it with his own, or in any other manner, will consequently be compelled to bear all the inconvenience of the uncertainty or confusion which he has produced, even to the extent of surrendering the whole, if the parts cannot be discriminated, or responding in damages for the highest value at which the property can reasonably be estimated."

Another question of difficulty is, whether the defendant may be allowed to fix the value of the ore in place by deducting from its gross value the costs of unskilful or wasteful mining and reduction. In some cases, the defendant has offered to prove that the ore taken netted him nothing. But this would be as if a man who had taken another's horse, ridden him lame and then sold him for a song, should propose, as a measure of damages, the price received by him. The usual doctrine seems to be that the complainant shall not be made to pay for the defendant's ignorance and blunders.

In estimating the cost of mining, transportation or reduction which may be allowed to an innocent trespasser, it is not usual, we think, to include general expenses, dead work, new constructions, etc. Thus, if, during the period of trespass, the defendant mined 10,000 tons of ore of which 1000 tons belonged to his neighbor, he cannot deduct from the gross value of that 1000 tons one-tenth of his total mining expenses. The actual cost of stoping, tramming and hoisting—not the running of new levels, sinking of shafts or timbering outside of the stopes—may be thus deducted.

It will easily be seen that when the defendant, a wilful trespasser, produces no proof of the returns received from the ore taken, but evidence is given as to the usual *net* value of the ore from that deposit, the damages (which in that case would be the *gross* value) might be assessed at three times the *net* value. Thus, if the trespasser netted from his operations $2 per ton of ore mined, it might be assumed, for lack of a better measure, that the *gross* yield was $6 per ton; and in this way "three times the value of the ore" might happen to be recovered. Interest is, we believe, always collectible from the date of the trespass. The foregoing are the leading principles; but the books are full of special applications.

MANUFACTURE OF PAVING BLOCKS FROM PEAT

Can you give me some information regarding the use of peat for paving blocks—where has it been used; who manufactures the necessary machinery for its preparation; could peat occurring in salt water be used?

G. D.

Friedrich Schünemann, of St. Louis, Mo., has described[1] the process covered by the Helbing patent (German No. 128,728) for making boards, paving blocks, and similar materials from peat. The process is in substance as follows: Fibrous wet peat is washed, without grinding, mixed with lime and an aluminum salt, and possibly "sulphurous argillaceous earth," and the mixture is pressed in molds, in hydraulic presses, under pressure of 6400 to 7100 lb. per square foot. After a short application of pressure the board or block can be taken out of the press and dried in the open air, and when dry can be worked into any desired shape or size as easily as wood.

A copy of official tests made by the royal mechanical-technical experiment station of the Technical Academy at Dresden, shows the "peat wood" to exceed natural wood in compression strength and wear and tear; that it is less absorbent and inflammable, only glowing when held in a hot flame. Its tensile strength exceeds that of the softer woods. The only plant reported is that of the inventor, situated at Wandsbeck, near Hamburg, Germany. It is doubtful if peat occurring in sea water could be used for this purpose by the process mentioned, as it is probable that the dissolved salts in the contained sea water would react unfavorably on those used for cementing material. This is, however, merely a surmise.

More information could probably be obtained on the whole subject from Mr. Jablonski, general secretary of the "Verein zur Förderung der Moor-Kultur in Deutschen Reiche," with headquarters in Berlin. While the product is an excellent and desirable one, it has never attracted capital enough to have its possibilities thoroughly tested. Mr. Schünemann owns the American rights to the Helbing patents and is desirous of interesting capital in the process.

VALUE OF TALC DEPOSITS

What are the commercial possibilities of a talc deposit situated within about 100 miles of New York?

W. V. C.

The value of a talc deposit within reasonable distance of New York might vary widely, depending primarily upon the grade of talc and its proximity to transportation. The market for talc products is limited, especially for the ordinary grades of ground talc. The fibrous talc found near Gouverneur, N. Y., is used chiefly in paper making and is worth about $10 per ton at the mill. The massive variety when quarried and manufactured into soapstone products such as slabs, plumbing fixtures, gas tips, etc., brings varying prices, from $12 per ton upward. The ordinary ground talc is worth from $6 to $20 per ton, while the French and Italian talcs bring from $13 to $40 per ton. These prices are for ground or manufactured product.

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[1] "Artificial Wood Made from Peat." *Journ.* American Peat Society, April-July, 1909, Toledo, Ohio.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. Parke Channing has returned to New York from Arizona.

Dr. James Douglas has returned to New York from Arizona.

Charles F. Saviers, of Mapimi, Durango, Mexico, is in Philadelphia.

Pope Yeatman has gone to Utah and Nevada, to be absent about three weeks.

H. V. Winchell, who has been spending some time in New York, has gone to California.

A. J. McMillan, managing director of Le Roi mine, Rossland, B. C., is on his way to New York.

E. P. Merrill, of Cleveland, Ohio, is in New York, and leaves this week to examine coal mines in Kentucky.

Robert H. Richards has just returned to Boston from a professional trip to Virginia and to New York City.

J. E. Spurr, of Spurr & Cox, Inc., has been appointed consulting geological engineer to Camp Bird, Ltd., at Ouray, Colorado.

George A. Tweedy, manager of the Minas del Tajo, Rosario, Sinaloa, Mexico, is in New York on his way to Europe on business.

Dr. G. E. Cram, for seven years past prominent in the Mapimi district, Durango, Mexico, is in New York on mining business.

Walter Harvey Weed is making a geological examination of the mines of the Wolverine & Arizona Company, near Bisbee, Arizona.

Linn W. Searles, of Bristol, Tenn., is at Gadsden, Ala., on professional business for the Alabama Consolidated Coal and Iron Company.

Dwight E. Woodbridge, of Duluth, Minn., was in New York last week, but sailed April 23, having gone abroad on professional business.

W. G. Trethewey has assumed control of the Dominion Cobalt Mining and Development Company, which has a location adjoining the North Cobalt.

Douglas F. Reed, E. F. Ayrault and Count Alfred du Puy Fontaine, all of Paris, have been visiting the United Verde and other mines in Arizona.

A. M. Yonge has resigned his position as general superintendent of the Aguacate Mines Company, of Costa Rica, and has returned to Richmond, Virginia.

John D. Pope, who has been foreman of North Butte since its organization, has been appointed manager to succeed A. C. Carson, who resigned four months ago.

Dr. Arthur A. Hamerschlag, director of the Carnegie Technical schools of Pittsburg, delivered the class address to the class of 1910 of the Michigan College of Mines.

Herbert Haas has removed his office from 61 Fremont street to 528 Merchants' Exchange, San Francisco. Mr. Haas is at present in Arizona on professional business.

George W. McDaniels, engineer for Spurr & Cox, of New York, is examining the Diamond Joe mine in the Bill Williams district, the copper end of Mohave county, Arizona.

Benjamin Talbot, managing director of the Cargo Fleet Iron and Steel Company, Middlesborough, England, is visiting the United States in the interest of the Talbot continuous steel process.

R. H. Burrows, of Guanajuato, has accepted the position of manager for the mining subsidiary to the Kansas City, Mexico & Orient Railway Company, with headquarters at Chihuahua, Mexico.

J. B. Fleming has gone to Goldfield, Nev., to take charge of rebuilding that portion of the Goldfield Consolidated mill which was recently destroyed by fire. Mr. Fleming had charge of the original construction of the mill.

Marion Beckwith, recently superintendent of the Quartz Hill mine at Old Diggings, Shasta county, Cal., has been appointed superintendent of the mines owned by the United States Smelting, Refining and Mining Company, at Pachuca, Mexico.

OBITUARY

Mott I. Newhouse died suddenly April 22 in Paris, France. He was a brother of Samuel Newhouse, and was associated with him in many of his mining operation. He was 51 years old.

William Strickland committed suicide at Wickenburg, Ariz., April 16. He was 70 years old, and a graduate of Heidelburg University, and is said to have been employed as a teacher and lecturer in several colleges. He had been a resident of Arizona for five years, being employed as an assayer.

John McCallen died at Irwin, Penn., April 13, aged 71 years. He was born in Ireland and came to this country when a young man, settling at Irwin 48 years ago. He started with the Westmoreland Coal Company as a checker, when it was first organized and had been with the company ever since, gradually rising to a responsible position.

John Von Bergen died suddenly at Scranton, Penn., April 14. He had been for many years engaged in mining in the anthracite country and was considered an authority on mining questions. He had been for a number of years manager of the Scranton Coal Company, and all the coal interests of the New York, Ontario & Western Railroad Company.

SOCIETIES *and* TECHNICAL SCHOOLS

Iron and Steel Institute of Great Britain—The annual meeting will be held May 4 and 5, in London.

Rocky Mountain Club of New York—The club holds a meeting and smoker April 30 at the Waldorf-Astoria, New York.

American Chemical Society—At the meeting of the Pittsburg section on April 21, a paper was read by Earl Blough on "Aluminum in Industrial Engineering." Dr. W. O. Snelling, chief of the explosives laboratory, United States Geological Survey, spoke on "Thermo Chemistry of Explosives."

University of Wisconsin—The mining engineering building at Madison is now nearing completion. Much of the equipment of mining machinery has already arrived and the laboratories will soon be in readiness for research and instruction. The basement portion is to contain the crushing and screening room, the ore bins, supply room, dark room, and ash wells. The upper floor is divided into a large assay furnace room, a chemical laboratory, a balance room, two offices and the gallery on which will be installed the hand ore-dressing equipment and the mining museum.

Utah Society of Engineers—The fourth annual meeting and dinner were held at the Commercial club, Salt Lake City, April 15. About 35 members were present. Officers for the coming year were elected as follows: O. A. Honnold, president; C. H. Repath, first vice-president; F. E. Arnold, second vice-president; W. C. Ebaugh, secretary; B. F. Tibby, treasurer. R. E. Caldwell acted as toastmaster, being introduced by President J. F. Merrill. The toasts were as follows: "Salient Points in Smelter Building," C. H. Repath; "Hydro-Electric Development," Leonard Wilson; "Irrigation in Idaho," Alexander McPherson; "Power Plants in Utah," Owen H. Gray.

Association of American Steel Manufacturers—At the recent annual meeting steps were taken to to add to the manufacturers' standard specifications one governing the chemical and physical properties of concrete reinforcement bars. This new specification will be published by the association upon formal adoption by letter-ballot. Another subject referred to ballot by the meeting, is a schedule of standard allowable variations in the size of hot rolled bars and in the weight of angles and other shapes of bar size. All officers were reëlected, as follows: President, W. A. Bostwick, Carnegie Steel Company; vice-president, A. A. Stevenson, Standard Steel Works Company, Philadelphia; secretary and treasurer, Jesse J. Sherman, Jones & Laughlin Steel Company, Pittsburg.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

April 25—Under the California corporation laws, foreign companies doing business in the State must pay the same license taxes as companies organized under the laws of California. The Refining and Producing Oil Company, capitalized at $21,500,000, and the Petroleum Producing Company, capitalized at $10,000,000, organized under the laws of Nevada, on filing papers with the Secretary of State are said to have been presented with a bill of $3250 for license taxes, etc. These oil companies have brought action in the State supreme court to invalidate the California law, basing the action on a decision of the U. S. Supreme Court, which declared a similar law in Kansas to be invalid.

The lower Klamath river in northern Humboldt county may be the scene of dredging operations during the coming season. Thirty-five placer claims have been located. Attorney Henry L. Ford, of San Francisco, is interested.

The Northern California Mining Company has filed a formal abandonment of 6400 acres of land in Butte county. Most of the locations of this company, originally covering over 200,000 acres of land, were selected where fine timber covered the surface and much of the so called annual work consisted in the building of trails and telephone lines until an investigation was started by the Department of the Interior, which resulted in the canceling of a large number of entries in Plumas county. Since that date more or less testing of other claims has been made by the company and it has been found that much of the land is not valuable for mining purposes, and hence, has been abandoned.

M. Mayekama, a Japanese mining engineer, has been inspecting dredging operations and dredging lands at Oroville. He declares that there are lands in Korea even better suited to dredging than those at Oroville, and expects to install a dredge on the lands owned by his company in Korea. The mining taxes there are light, being 1 per cent. of the gross output, with a ground tax of 50c. per acre.

The belt of gold mines in Sierra county extending from the Standard mine north of Downieville, south through Alleghany to Moore Flat in northern Nevada county, continues to show up surprises. Nearly all of the mines of the belt are characterized by rich free-gold ore, usually accompanied by arsenical sulphides of high content. The recent strikes embrace the Standard, the Rainbow, Sierra Wonder and Eastern Cross, at Alleghany, and the Middle Yuba and Fruitvale at Moore Flat, on the south side of the Middle Yuba river in Nevada county was for many years the scene of successful hydraulic mining operations. The great amphibolite-serpentine belt, in which the Alleghany mines occur, crosses here into Nevada county. The ore recently uncovered at Moore Flat is said to rival that of the Alleghany mines in richness.

The miners of the Queen Radigunde mine at Alleghany have requested a raise of pay from $3 to $3.50 per day and have given May 1 as a date on which a reply is demanded. It is understood that similar demands will be made on the other companies operating in the district.

As a result of a meeting at Bakersfield on April 15, the Coalinga Oil Producers agency was merged into the Bakersfield agency and the contracts of the Coalinga agency with the Producers Transportation Company and with the Union Oil Company were ratified. The Bakersfield agency is now the largest producing body in the State. The Union Oil Company will market the product.

The San Joaquin Light and Power Company is about to expend $1,250,000 on a power plant on the north fork of the San Joaquin river, near Fresno, where there is already a small plant. The larger plant will develop 22,000 h.p., and supply several towns as well as the Coalinga oilfields. A dam 125 ft. high will be built.

The projected California-Arizona oil-pipe line will start from the end of the line of the Producers Transportation Company at Midway in Kern county, and approach the Santa Fe railway at Mojave. From there it will follow the railway by the Parker cutoff to the branch railroad to Phoenix, Ariz., and thence on to Phoenix.

The Lakeview gusher north of Maricopa, has now been spouting oil for over five weeks and shows no diminution. It is reported to have produced over 700,000 bbl. of oil in this time. The Union Oil Company is the heaviest stockholder. This well is said to be the greatest gusher in the history of the oil industry in America.

Denver

April 23—Now the camp of Aspen is wrestling with the cöoperative drainage question, and a movement is under way to get the mine owners to agree to a division of pumping costs in unwatering the properties at great depth. It is said that there is no good reason for their not doing so, as the camp is now supplied with cheap hydroelectric power.

The Trilby mine of the Moose company, on the western slope of Bull hill, Cripple Creek, is being worked by lessees and also on company account, and is a steady producer. It has now joined the group of those mines of the district which are finding rich ore in the deepest levels, which fact, owing to the approaching completion of the deep drainage tunnel, is eminently satisfactory. A good strike of two feet of ore is reported on the 1300 level. Lessees Hogan and Wright are said to be mining 2-oz. gold ore from below the 500 level, and it is stated locally that there are six orebodies exposed in the mine from which ore is being shipped of from $7 to $60 in value. The average of all the ore from the whole mine is probably 1½ oz. per ton. The country rock below the 400 level is breccia, and some of the ore (telluride) is in a basalt dike, and some in a zone of shattered phonolite.

Goldfield

April 22—The performance of the Goldfield Consolidated Mines Company in resuming operations in its big mill in seven days and nine hours from the time the serious fire of April 8 broke out, demonstrates resourceful management. The fire, starting in the refinery, thoroughly wrecked that department, and then almost entirely destroyed the storehouse and contents, the change-rooms and the 700-ft. belt conveyer which carries ore from the coarse-crushing building to the battery storage bins at the top of the mill. Twenty stamps were completely disabled, but the fire was checked before the other 80 stamps or any of the other machinery in the mill proper became damaged. The actual property loss was estimated at about $200,000, a comparatively small amount, but the chief concern of General Manager Finlay and Director McKenzie, who arrived in Goldfield the day after the fire, was to get the plant in shape to operate the 80 uninjured stamps in the shortest possible time. The supplies in the storehouse wrere to a large extent perishable, and it was necessary to replace many of these before a great deal could be done. Orders were sent out by wire for much of this material even before the fire was over, and new supplies were soon coming in from all parts of the country. The precipitating department in the refinery was out of commission, so none of the solution from the lower part of the mill could be handled. This held up the rest of the mill and made it impossible to crush even the 2000 tons already in the battery bins. A large force of men was put to work in the refinery clearing away the wreckage and cleaning up precipitate which was scattered all over the place. The fire occurred in the middle of a "melt" so that considerable fluxed precipitate as well as the contents of two large acid-treatment tanks was spilled everywhere. It was found that the Merrill precipitating and filtering presses were unimpaired. After being cleaned and supplied with new filtering cloths, they were in good shape. It was decided, pending the construction of a new refinery to replace the acid treatment with a niter roast. Since the roasters and three of the four melting furnaces were in condition to be repaired the refinery was inclosed with sheet iron and was in fair condition for temporary work. The greatest problem was to devise a method for getting the ore from the coarse gyratory crushers under the railroad bins up to the battery-supply bins. The big 700-ft. rubber belt of the inclined conveyer was entirely destroyed and even if the trestle could have been replaced it would have required 60 days to have the belt made to order and shipped to Goldfield. It was finally decided to build a temporary inclined, double track tramway from the bottom of the hill to a point behind the mill on a level with the top of the storage bin. Mine cars and track were used and an electric hoist installed to pull the cars up. A temporary track was built over the orebin and the cars were trammed in by hand. The ore from the crushers was relayed to a loading bin at the lower end of the tramway by means of a short belt conveyer running on the regular conveyer idlers. A portion of the distributing conveyer belt which had run above the uninjured 80 stamps was utilized for this puropse. In one week all of this work was completed and the mill was pounding ore at practically 80 per cent. of its normal capacity. Meantime work was being rushed clearing away the bent and twisted steel around the injured stamps so that as rapidly as possible new batteries could be installed and new steel work set in place for the reconstruction of the mill building. The present conveying system will in no way interfere with the rebuilding of the old conveyer so that within 60 days it is hoped to have the entire plant in just as good or better shape than ever.

The fire affords room for some speculation on fireproof mill construction. The Consolidated mill was a structural steel building and was regarded as fireproof. Working on this basis the company provided practically no fire protection whatever. At the time of the fire the nearest available fire-plug was 100 yards away, the fire hose was practically all stored away in the burning storehouse and when connections were finally made it was impossible to get any thing like an adequate pressure. The Consolidated management is planning to install ample fire protection and it looks as though the conclusion has been reached that the mill is far from fireproof.

Another step in this direction will be the building of a new refinery farther up the hill and several hundred feet from the rest of the mill. The present location is a poor one. It stands between the mill proper and the storehouse with the long inclined conveyer running above both it and the storehouse. The wooden conveyer trestle and rubber belt being directly over the refinery immediately took fire and the blaze spread with practically no hindrance in each direction taking in both the storehouse and the adjacent end of the battery building. The new refinery will be larger and probably of different design.

The mines were shut down for a few days but most of the men were put to work around the mill.

George Wingfield, of the Goldfield Consolidated, has made the final payment on the Buckhorn property in Eureka county, a new camp of apparently remarkable possibilities. Mr. Wingfield has had an option on the property from Jones & Rannells for the past year, and during that time has had a force of men doing extensive development work on the ground. It is a milling operation, although some high-grade ore has been found.

Butte

April 23—The Georgetown district, Granite county, is the scene of considerable activity. The investigation of the title and deposit of the Southern Cross mine is under way and the deal will probably be consummated. Gordon & Zink are working the Red Lion property and mill. William McIntyre, operating the American Flag under bond, will begin shipping as soon as the roads are opened. The Modoc mine has been worked steadily all winter under bond to the Modoc Mining Company. The shaft is down 100 ft., from which depth a crosscut has been run to the vein, proved to be 30 ft. in width. The management states that assays give $6 per ton in gold and 4 per cent. copper. At the Montana mine, leased by Hugh McFadden and others from John Ducie, a hoist for 500 ft. and a No. 7 Knowles pump are being installed. It is the intention of the lessees to sink the shaft, now 110 ft., to 500 ft., and from there crosscut.

In the Corbin-Wickes district, W. Q. Ranft, of Missoula, has acquired the Blue Bird mine, and will operate it jointly with the Robert Emmet, also controlled by him and which has recently been supplied with electric power. The Hageman group, near the Blue Bird and owned by Larson & Donaldson, of Helena, has recently disclosed some good copper ore.

At the annual meeting of stockholders of the North Butte company, held in Duluth, April 18, the old board of directors was reëlected. The report to the stockholders on the financial condition of the company Dec. 31, 1909, shows that at that time there was $62,466 cash in the treasury. The mining property is valued at $7,221,181, the furniture and fixtures at $1717; accounts receivable, $325,482. The cost of producing copper is stated to be 10½c. per lb. The ore reserves are given out as follows: Edith May, 627,671 tons; Jessie, 173,237; Adirondack, 9090; Gem, 2373; Speculator, 4000 tons.

Dr. R. J. Formad has recently made a report to the bureau of animal industry of the Department of Agriculture concerning the effect of the Washoe fumes upon the livestock and vegetation in the Deer Lodge valley. The report states that from 1902 to 1906, 2024 horses died in the valley as a result of these fumes. An analysis of the grass and hay in the valley is said to show the presence of a considerable quantity of arsenic.

Salt Lake City

April 24—A bulletin by the United States Weather Bureau of Salt Lake City on April 15 states that there is less snow than usual in the mountains. A good water supply is assured, however, as most of the snow is well packed, some of it being in the form of ice, which condition is favorable to late melting. In Salt Lake county, Little Cottonwood Cañon, the snow averaged about seven feet in depth, while the amount of snow and ice in Big Cottonwood was not over one-half of what it was last year. In both cañons the snow was well packed. There was less snow in Beaver county than in former years, but it was unusually solid, and the normal supply of water is expected.

The Tintic Mining and Development Company owns the Yampa mine at Bingham, and has property in the Tintic district. The Yampa smeltery near Bingham is operated by the Yampa Smelting Company, which is controlled through stock ownership by the Tintic Mining and Development Company. At the present time the Yampa smeltery is handling between 600 and 700 tons of crude ore daily. The ore is a heavy sulphide, and comes almost entirely from the Yampa mine, which is connected with the smeltery by an aërial tramway 12,300 ft. long. The average copper content is in the neighborhood of 1.7 per cent. with a small silver and gold content. Some custom ore is received from leasers and others, but this is variable in amount and is not being actively solicited. On account of the large excess of iron in the Yampa ore, the company is able to treat some silicious ore from certain parts of Bingham. Two reverberatories and one blast furnace are being operated out of a total of three blast furnaces and three reverberatories. The ore is calcined in McDougall calciners. The company erected a two-stand converter plant in 1907, and reduced matte of 20 to 40 per cent. copper content to blister copper, which was shipped to Chrome, N. J. for refining. This plant was operated about a year, but is not being used at present. It is said that the output of matte was not large enough in connection with such ores as the company was receiving to operate the converters at a profit. At the present time the company has a contract with the American Smelting and Refining Company, and ships its matte to Garfield.

The holdings of the Tintic Mining and Development Company in Tintic include claims between the Sioux and Carisa on the east and the Mammoth and Gold Chain on the west. The company ran the old Sioux-Ajax tunnel, and spent considerable money in development work but without important results. The claims are not being actively worked at the present time. Whether the company is operating at a profit or not is known only to inside interests, as it is operated as a close corporation and makes no public reports. It is generally understood that for some time it has not much more than paid expenses or has been operating at a loss, but has recently been doing somewhat better. No dividends have ever been declared.

The Salt Lake Stock and Mining Exchange has taken steps to revise some of the present business methods which have resulted from a lax enforcement of the rules. At a meeting of the membership committee of the board of governors, April 1, it was decided that every member should be called on to render a statement of his financial condition at not infrequent intervals. There have been three failures which would have been avoidable under a strict observance of the rules of the exchange, especially those regarding future trading. The rules provide that when a "buyer" or "seller" transaction is made the stock and 30 per cent. of its value must be deposited. This has not been enforced, and many of the future deals have had only a personal agreement to bind them. A new rule was adopted by the governing committee which requires that after April 15, 1910 contracts covering future options shall be deposited with the secretary of the exchange, with either the stock or certified check attached.

Seattle, Wash

April 24—A cablegram signed by eight of the leading bankers and business men of Fairbanks, Alaska, urges the immediate sending of 1500 men as there has been a stampede to Haiditarod (Iditarod) and there is serious danger that placer-mining operations in the Tanana valley will be hampered during the coming season in consequence. The spring clean-up at Fairbanks and vicinity is estimated at $9,000,000. On account of the discovery of rich gold ore in the "George E." mine at Stewart, on the Portland canal, there has been a rush of prospectors from Ketchikan and Juneau.

Deadwood, S. D.

April 24—The Homestake mines and mills are now running again at full capacity. Public sympathy is with the company. Although technically the strike is not yet over, practically most of the men have returned to work, and it is generally believed that the end of the trouble is in sight. In the future, the Homestake will probably be strictly non-union.

Cobalt

April 25—The Dominion Reduction Company has been organized by Pittsburg interests to erect a custom plant at Cobalt for the treating of low-grade ore. At the present time there are two custom mills, the Nipissing Reduction, and the Northern Customs. The former is handling nothing but the output of the Kendall shaft of the Nipissing while the latter is treating ore from the City of Cobalt, the La Rose and the Nancy Helen. Both of these mills have more ore than they are able to handle.

It is reported that D. Lorne McGibbon, president of the La Rose, is to be appointed a director of the Nipissing at the next annual meeting to be held shortly. If such is the case, this will be a big step toward the merger of the two properties. Mr. McGibbon has frankly stated that he is favorable to such a plan.

A smeltery to treat Cobalt high-grade ores is to be erected at Swansea, near Toronto. There are three Canadian smelteries that are treating approximately 75 per cent. of the high-grade output of this camp.

Toronto

April 25—As a result of the unexpectedly early spring and the breaking up of the winter roads, the Porcupine mining camp has been practically cut off from communication with the outside world, greatly interfering with development. To prevent the forfeiture of claims, the Department of Mines has extended the time for the first 30 days' work on claims staked between Jan. 1 and March 15 until June 15.

A mining suit, involving an important legal point as to the rights of companies incorporated outside of Canada, was decided here March 19 by Chief Justice Falconbridge. An action was brought against Henry Timmins by Grant Hugh Browne, of New York, on behalf of the United Cobalt Exploration Company, a New Jersey company, for the recovery of $150,000 deposit money on two claims at Cobalt, bought for $750,000. The company, to which Browne had transferred his interests, was made a party to the suit. The judge dismissed the case on the ground that a foreign corporation not licensed in Ontario had no status and could not bring suit.

E. E. Jones and A. Blackburn, the two prospectors charged with causing the recent rush to the Camel's Back Lake area when about a thousand gold-seekers were deceived by erroneous reports, have been arrested and brought to Haileybury to face charges of perjury and obtaining money under false pretences. They are alleged to have sold claims to Haileybury men for $2000, signing affidavits as to their value. They assert their innocence of intentional wrong doing and it is claimed surrendered themselves of their own accord. They are prospectors who had been in the Porcupine district all winter.

John Morton recently located an iron property in the immediate neighborhood of Fort William, Ont. He forwarded samples to the Geological Survey at Ottawa and has received a report from Director Brock stating that it carries large quantities of magnetite and is good commercial if the deposits are of sufficient quantity. Development work is being undertaken.

Monterey, Mexico

April 22—There is a movement on foot to carry natural gas into Houston and Galveston, Texas, from the Caddo field in Louisiana. The same interests which are reported to have the capital needed are in control of the Agualares gasfield near Laredo, Texas. This field and Caddo both have wells producing 20,000,000 to 30,000,000 ft. of gas per day, and extend over a large area and give evidence of long production. These same interests are planning the erection of zinc smelteries to use this gas on both sides of the Rio Grande, near Laredo.

The Compañia Agricola y de Fuerza Electrica del Rio Conchos, a Pearson concern, has completed the grading for its 39-km. railroad from Santa Rosalia to the dam on the Conchos river in Chihuahua, and it is anticipated that tracks will be laid the entire distance within 30 days, and that trains will be running by June 1. The same progress is being made with the dam itself. This is an important undertaking for the mining as well as other interests throughout northern Mexico as it means cheaper power.

THE MINING NEWS

Reports of New Enterprises, New Machinery,
Installations, Development Work and Property
Transfers The Current History of Mining

General Mining News

Relative to the copper merger mat-er, Thompson, Towle & Co. say: "We nderstand that conferences have been eld since the Washington situation has leared, which it is believed means a re-umption of negotiations looking toward merger of properties which will con-rol an annual copper production of be-ween 900,000,000 and 1,000,000,000 lb. uch a merger cannot be brought about asily because of the wide difference of pinion between the Cole-Ryan and Gug-enheim interests as to property values, ut the fact remains that negotiations ave been resumed, if only in a tentative ay. The culmination of the merger plans, owever, may be many months off, for the rime movers are not prepared to for-ulate their plans too definitely until the egal aspects become clearer."

Alaska

James and Charles Meaghan and W. J. omerville will install machinery on their ining property at Bluff City, Nome dis-rict.

At Willow Creek the stamps for the rooklyn Development Company are be-ng installed. Three mills will be in op-ration in this district this season.

The Johnson-Gorley-Barry claims on cLean's Arm, Juneau district, have een sold to Eastern capitalists, and de-elopment work will be rushed. The ore arries copper and gold.

Lon de Van—This company on eorge's inlet will install a power plant. tto Lonstorf is manager.

Marble Bay—This group on Dall island as been bonded to the Pacific Metals ining Company, of Victoria, which will egin work at once.

Alaska United—The report for the onth ended March 15 is as follows: To-l crushing, both mills, 17,440 tons; to-l production, $64,285; net, $23,687; ield, $2.25 and $2.35 per ton milled.

Arizona

COCHISE COUNTY

California & Paradise—This company t Paradise has installed an engine and umping and hoisting equipment and ex-ects to start shipping. W. V. Richards superintendent.

Calumet & Arizona—The drift on the 50 level of the Irish Mag has broken to the cave. Just before entering it assed through 30 ft. of the highest grade brous malachite. At the Oliver shaft the sulphide orebody on the 1350 level has now been blocked out.

Superior & Pittsburg—The Briggs shaft continues in sulphide ore. As the shaft gets deeper a higher grade ore is being found. The recovery has increased per ton from 73 lb. in 1907 to 87 lb. in 1908 and 95 lb. in 1909. The cost for 1909 was 9½c. per pound.

Wolverine & Arizona—Stoping continues in the orebody next to the Copper Queen and Shattuck side lines.

Denn-Arizona—At the Denn drifting and crosscutting is continued on three levels. For the last three months the pumps have handled about 700 gallons of water per minute.

GILA COUNTY

Miami—J. Parke Channing, during his recent visit in Globe, said that everything in connection with the building of the new concentrator is proceeding according to schedule and that he expects to have the mill running toward the end of 1910. Regarding the results of the churn drilling on the northwest part of the property, Mr. Channing said that while the developments had been most satisfactory, he disliked to predicate reserves on data of this character. He said, however, that seven holes drilled to date at 200-ft. intervals have struck ore varying in thickness from 110 to 210 ft., and of grade ranging from 2 to 2.5 per cent. copper. The total area prospected by the drills is about four acres, indicating 2,000,000 tons of ore. The drilling will be continued until the entire property is gone over.

New Keystone—J. Parke Channing recently stated at Globe that the orebody at the New Keystone is more or less undulating following the topography of the schist underlying the porphyry and that while the results of drifting, crosscutting and churn drilling so far have been satisfactory, all the work has not been sufficiently correlated to enable him to make estimates of tonnage. He thought, however, that in about two months the various connections will be made so as to give definite figures. Mr. Channing said that undoubtedly a large body of ore running over 2 per cent. copper will be developed and that the ore can be mined cheaply by means of adits, as it is well up above the level of the gulches. On the Philadelphia group three holes recently drilled have given negative results in two cases, while the third is not yet deep enough to give definite results.

MOHAVE COUNTY

Tom Reed—Ten of the 30 stamps in the new mill are in commission producing $40,000 monthly. All development and equipment and several dividends have been paid out of the mine during the last two years. S. S. Jones is superintendent.

PINAL COUNTY

Cobabi—This company, 75 miles west of Tucson, is completing its 100-ton concentrating plant and will build a smeltery. S. G. McWade, manager.

YUMA COUNTY

Machinery for a $30,000 placer plant to be erected in the Quartzite district has arrived at Vicksburg. The company will install a pumping plant 5 miles away.

California

BUTTE COUNTY

The Streeter ranch is being prospected for dredging purposes.

Bonanza—This company has been incorporated at Oroville to operate the Merrimac mine on the Western Pacific.

Standard—This mine near Oregon City may shortly be reopened.

Bumble Bee—The chilean mill at this mine in Morris ravine is crushing ore with satisfactory results. The incline shaft is down 240 ft. and will be sunk deeper.

Banner—The Banner quartz mine, on the south slope of Table mountain is being put in shape for operations. W. E. Livesley is in charge.

Old Glory—Mr. Phillips is again operating this gravel mine, Morris ravine. Machinery was installed here two years ago.

William Beik—In this mine, east of Forbestown, a 4-ft. vein of ore has been encountered. The mine is equipped with a 5-stamp mill.

Gold Bank—This mine is under bond to Donald Woodrum.

NEVADA COUNTY

Marcotte—A merger is planned of the Marcotte, Starr, Ethel and Baltic groups near Washington, as all of this ground can be worked through the lower Marcotte tunnel. All of these mines have been productive.

Birchville—Superintendent Fred Medlin has gone to this mine, Graniteville district, to make preparations for resumption.

Canada Hill—Satisfactory progress is being made in unwatering and stoping is in progress in the upper levels. The ore is treated at the Mayflower mill. B. Barnes is superintendent.

North Star—The company has purchased the Tulle Belle claim and the mineral rights to 105 acres of the Nancy Collins estate.

Ocean Star—The Red Cross mill is being transported to the Ocean Star at Omega.

Middle Yuba—Much interest is shown in the specimen ore exhibited in Nevada City from this mine at Moore Flat. E. A. Bauder is the owner.

Blue Lead—Superintendent Oscar Jones, of the drift mine at Relief hill, reports that the channel has been intersected.

Prudential—Development is actively in progress on this property, formerly known as the New York-Grass Valley Consolidated. Superintendent Wilson is drifting on the 900-and 1000-ft. levels.

Gold Blossom—The tunnel is in 800 ft., and the vein is exposed for this entire distance.

Colorado

CHAFFEE COUNTY

Madonna—A new bonanza has been discovered in this mine, which promises to rejuvenate the property to the eminence that it possessed during the '80s.

LAKE COUNTY—LEADVILLE

Louisville—This mine on Carbonate hill, operated by Hanifer and associates, is producing about 50 tons per day of ore of good grade.

Valley—This property, in South Evans gulch, has been shipping regularly, and is doing extensive underground development.

Anona—This mine in Iowa gulch, which has been idle for a year, is to be started up under the management of Howard B. Collins.

Alps-Aztec—This tunnel, at the head of Little South Evans gulch, which has been worked steadily for a year past, is in 583 ft., and is following a small streak of gold ore, expecting to reach the main orebody shortly.

Printer Boy—This mine, under lease to Andrew Hill, is producing two carloads a week of high-grade ore.

PARK COUNTY

Hilltop—This property, in the Horseshoe district, has started shipping from Leavick. Several hundred tons per day are being produced, and the bucket tram from the mine to the railroad is in operation. The ores are a silver-lead and a zinc. H. F. Berger is the lessee.

SAN JUAN DISTRICT

Gold Bug—In this group, in the tellurium belt, in the southeastern section of San Juan county, Tully & Vota, lessees, report a strike of 4 ft. of ore. Some four inches of this carries from 10 to 70 oz. gold, and 20 to 150 oz. silver. The balance of the vein averages about $20 in value. The extent of the orebody has not yet been shown by development.

Shenandoah—In this mine, a winze being sunk from one of the levels, has opened up a large body of gray copper ore, carrying high gold and silver.

TELLER COUNTY—CRIPPLE CREEK

Princess Alice—The Ruby mine, Bull hill, is said to have opened permanent shoots of high-grade ore at the 1500 level. It is under lease to one of the Humphreys-Thompson syndicates.

Gold Dollar—H. Martin and others, leasing on this mine on Beacon hill, are reported to have made a strike of 4 ft. of sylvanite ore, which is estimated to average 2 ounces.

Vindicator—This mine, April 20, sent out three carloads averaging 1½ oz. gold to the ton. The company will pay a quarterly dividend of 3c. per share April 25. The amount is $45,000, which will make a total paid of $2,137,500.

Savage—The International Gold King of this company, on Gold hill, has been leased by W. W. Kirk, of Colorado Springs, and a force put to work.

Portland—This company paid a dividend of $60,000 on April 15, making the total to date $8,557,000.

Pinnacle Leasing—The Mitchell mine at the base of Bull hill, near Cameron, is reported to have a strike of from 3 to 6 ft. of ore at the 350 level, grab samples of which run from 2 to 5 oz. gold per ton. The vein is in breccia, and most of the ore is found between two basalt dikes and sometimes in the dike.

W. P. H.—Four cars of ore per week are being shipped from this mine on Ironclad hill, by Fogleman & Roche, lessees.

Granite—The Monument mine of this company, under lease to the Carol company, is outputting from every level from the 1100 to the surface, and last month produced 750 tons of average content of $30 per ton. The deep levels are operated through the Gold Coin shaft, and produce the best ore.

Uintah-Ajax—The Necessity, on Battle mountain, owned by this company, and operated by the Uintah Leasing Company, in March produced 150 tons of very high-grade ore, and the stockholders of the latter company received a dividend before being called on for the first monthly assessment.

Idaho

CŒUR D'ALENE DISTRICT

Federal Mining and Smelting Company—The stockholders have ratified the compromise with Bunker Hill & Sullivan, whereby 27,000 shares of the latter are turned over for the Last Chance mine. It is estimated that these shares will yield the Federal $108,000 per annum in dividends. The Federal company used to be controlled by the Guggenheims, but now is understood to be in the hands of John D. Rockefeller.

Mineral Point—In consideration of the control, eastern stockholders have decided to run a 1500-ft. crosscut tunnel.

Hecla—Nearly all ore is being broken from the stope above the 900-ft. level. On the 1200, the drift has followed the fracture zone about 400 ft. easterly. It is figured that it must be driven as far again before the oreshoot will be encountered. About 110 men are employed underground, and about 375 tons of ore are sent to the mill daily. Including waste and shipping ore, about 500 tons of rock are hoisted per day.

Mace—This Federal property is producing 625 tons per 24 hours, with a working force of less than 375 men; about 225 are employed on production. Ore is being stoped above the 1200- and 1400-ft. levels, west. Drifting west on the 1600 has advanced nearly 400 ft. and the shaft is almost to 1800 ft. Frank Davis is acting superintendent.

Snow Storm—A daily production of 300 tons is being maintained with a working crew of about 80 men. Stoping is being done on four levels above the No. 3 main entry tunnel. The No. 4 tunnel, 550 ft. below the present working level, has been advanced about 3000 ft. Fred McCormick is mine superintendent.

Morning—About 1000 tons of ore are being mined and milled per 24 hours at this Federal property. An underground force of about 260 men is employed. Ore is being stoped from the levels between the No. 6 entry tunnel and the No. 5, 800 ft. above. The new shaft has been sunk 200 ft. and the station cut on the No. 6. Charles K. Cartwright is superintendent.

Illinois

The Zeigler mines, Franklin county, have been sold by Joseph Leiter to the Bell-Zoller Coal Company, of Chicago. The new owner is making arrangements to reopen the mines, and will employ union labor.

Michigan

COPPER

Elm River—This company is operating one drilling machine which is driving on an amygdaloid formation that was encountered by the southeast crosscut from the bottom of its exploratory shaft.

Hancock—No. 2 vertical shaft is down 2250 ft. and should encounter the No. 1 Hancock lode at 2500 ft. Developments on No. 3 lode continue encouraging.

Superior—This property is maintaining regular shipments to the mill with abou the same high average of mineral yield. No. 1 shaft is down to the 14th level and the levels above are being extensively opened. No. 2 shaft is reaching a depth where good copper ground should be encountered when lateral openings are started.

Ojibway—Drifting 1250-ft. level of No. 1 shaft is under way. Drifts from the 500- and 650-ft. levels continue and machines will soon be at work on the 950- and 1100-ft. levels.

Laurium—The shaft at this property is to the 400-ft. level with good copper ground in evidence both in the shaft and in the lateral openings from the levels above.

IRON

Independent Iron Company—This Marquette company has been incorporated in Arizona, with a capital of $1,000,000. Its officers are: President, John A. Russell; vice-president, Capt. John T. Spencer; secretary, Wm. L. White; treasurer, McArthur Rittenhouse, all of Detroit with the exception of Captain Spencer, who is of Iron Mountain, Mich. The company has acquired the holdings of Captain Spencer in the Lake Superior country. It is the intention to develop the Spencer property northwest of Iron Mountain. Exploration will be conducted at various properties, among them the old Erie mine on the Marquette range.

Missouri

JOPLIN ZINC-LEAD DISTRICT

The Alabama mill owned by Jamot Brown at Porto Rico was burned, as was also the Red Ant mill east of Carthage.

J. M. Short has made a strike in the Thoms Station camp north of Joplin of an 18-ft. face of ore at the 152-ft. level and 10-ft. at the 152-ft. level on the Brinkerhoff land.

Granby—This company has started mining at Oronogo in the east end of the old camp. This tract has been mined to the 160-ft. level and a great many rich mines worked. The company has put down a great number of drill holes and demonstrated the deeper run that is found at the Oronogo circle and has installed two pumping plants of 1700 gal. capacity.

MADISON COUNTY

North American Lead Company—This company has gone into the hands of a receiver. W. B. Doddridge, of St. Louis, has been appointed.

Montana

BROADWATER COUNTY

Black Friday—Sinking has been resumed at the 400-ft. level and will be continued to 500 feet.

Ohio-Keating—New machinery has been arriving, and when the electric-power line is completed, sinking will be resumed. The lease and bond which the company held on the Ohio mine has been taken up by the company.

Surprise No. 2—A Seattle syndicate has purchased the mine in the Radersburg district. A 200-ft. shaft will be sunk.

BUTTE DISTRICT

Red Metal—No hoisting is now being done through the Rarus shaft, the Tramway alone being used. At the Rarus the only work which has been done during the last month is the running of a drift on the 2200-ft. level. About 1300 tons are being hoisted daily through the Tramway shaft.

Amalgamated—At the Mountain View mine the air shaft is now down a few feet below the 1200-ft. level and will be sunk until the 1800-ft. mark has been reached. On the 1400-ft. level the drift being run east to connect with drift west from the West Colusa should be finished soon. About 1400 tons are being hoisted daily. At the Pennsylvania mine, between 1200 and 1300 tons are produced per day. At the Badger State mine the shaft is now down 1730 ft. and sinking will continue to 1800 ft. where a station will be cut. No station will be cut between the 1300- and1800-ft. levels. On the 1300-ft. level a crosscut, now in about 400 ft., is being run south to intercept the North Butte's Edith May vein. A small amount of ore is being mined on the 1300-ft. level, but it is being stored in bins at the surface.

Butte Central—The Ophir mine of this reorganized company will resume. The shaft is down 500 ft. and will be sunk to 1500.

North Butte—Thompson, Towle & Co. say: "The agitation between the North Butte and Tuolumne companies over the ownership of a portion of the Jessie vein is evidently at an end, for it is understood that the question of proportionate division of profits from the working of the narrow strip jointly owned by these companies is now receiving consideration. This would indicate that the Tuolumne company now recognizes North Butte's ownership of the ground so long in dispute. Also it is officially stated that all developments to date clearly indicate that all this ore apexes in North Butte ground, and North Butte owns all of it except the portion under the jointly owned ground."

FERGUS COUNTY

West Kendall—Operations at the mine have been resumed and it is planned to erect a mill.

JEFFERSON COUNTY

Lahrer—A lease and bond has been taken on the group which adjoins the Boston & Alta. Two shafts, each about 150 ft. deep, are already on the property.

London & Corbin—The tunnel is now in 275 ft. and sulphide ore has been encountered.

Minnie Shea—Dr. J. H. Reed, of Butte, has taken a bond on this mine in the Corbin district. The shaft on the property is 100 ft. deep and an 18-in. body of ore has been opened.

Chicago & Alta—The company owns the Surprise and Euberta quartz claims, adjoining the Bertha, Hidden Treasure and Alta mines, Corbin district. A two-compartment shaft has been sunk 150 ft. from the bottom of which drifts have been run east and west 180 ft. In addition to this, 700 ft. of tunnel and drifts have been run.

YELLOWSTONE COUNTY

Ontario Nickel and Copper Company—This company, capital $2,000,000, has been organized by I. T. W. LaFramboise and John C. Thurston, of Chicago, George W. Savage, of Butte, and John B. Annin, of Columbus, Montana.

Nevada

CHURCHILL COUNTY

Fairview—The consolidation of the Fairview-Eagle and the Nevada Hills properties seems to assure the erection of a big reduction plant in the camp. Tests show the ore to be well suited for concentration and cyaniding. Interested in the consolidation are George Wingfield and associates, and prominent operators in Salt Lake City.

ESMERALDA COUNTY

Grizzly Bear—The shaft is now down 1175 ft. making it the deepest in the Goldfield district. The junction of the St. Ives and Jumbo vein systems is looked for at 1200 feet.

Atlanta—Seven leases are in operation on the property.

LANDER COUNTY

Shoshone Quicksilver Company—This company claims to be developing extensive deposits of high-grade quicksilver ore near Austin. W. J. Davis, of Salt Lake City, is secretary.

NYE COUNTY

Weekly ore shipments from Tonopah are: Tonopah, 3300 tons; Belmont, 600; Montana-Tonopah, 921; MacNamara, 250; West End, 120; Tonopah Extension, 750; Midway, 100; total, 6041 tons.

Tonopah-Belmont—Workmen are making alterations on the stamp mill at Millers which will shortly resume after six months. At the mine a new surface plant will be installed. Developments underground promise a production up to the mill requirements.

Eclipse—The cyanide department of the mill at Bullfrog will be completed shortly, when the tailings from the plates which have been impounded will be leached.

Keane Wonder—Nearly $25,000 in bullion resulted from the March operations.

Aurora-Bullfrog—As soon as patent titles are obtained on the 18 claims at

Pioneer, a compressor and drills will be started on development.

Washoe County

Comstock Tunnel Company—This company which was recently listed on the New York Stock Exchange owns 5000 acres of mineral ground, comprising the congressional grant to Adolph Sutro, and other ground in the Carson valley; also the Sutro tunnel and its branches approximating 7½ miles in length built to drain the Comstock Lode mines. The company also owns the Leonard Reduction Works and equipment at the mouth of the tunnel. The capital of the company is $4,000,000, and the bond issue was $2,769,000.

Nevada-Commonwealth—The smeltery at Reno has been sold to J. S. Loder and will be remodeled.

New Mexico

Oil has been found in a 1300-ft. well at Camp City, 10 miles north of Alamagordo. Many claims are being taken on the strength of the flow.

Bernalillo County

Providence—This copper company of Denver is doing development in Hells Cañon district.

Octoroon—The company has a 45-ft. shaft with drift of 60 ft. A 110-ft. tunnel as in ore. Three hundred tons of low-grade lead ore is on dump and 200 tons of high-grade fluorspar. W. C. Thaxton is secretary.

Pennsylvania

Anthracite Coal

Lehigh Valley Coal Company—Work has begun to recover what coal there is left in the Morris Ridge colliery, west of Centralia. The property was formerly leased by May, Troutman & Co., but was abandoned 20 years ago. At present the Lehigh Valley is pumping out the workings and installing hoisting machinery.

Losberry Coal Company—The breaker near Pottsville, was destroyed by fire April 13. The colliery is owned by Warnke Brothers, of Scranton. It will be rebuilt.

Susquehanna Coal Company—This company has bought a chemical fire engine to be used to extinguish fires in the mines. The advantage of an engine of this character are its portability and adaptability; while the use of chemicals prevents the spread of noxious gases.

Bituminous Coal

Pittsburg Coal Company—This company reports for the three months ended March 31 earnings over operating expenses of $792,538. Charges were, for depletion of coal lands, $173,982; depreciation of plant and equipment, $225,272; interest on bonds, $248,013; total, $647,267, leaving a surplus of $145,247. As compared with the first quarter of 1909 the earnings increased $363,538; while the surplus above compares with a deficit of $165,454 last year.

Utah

Juab County

Mammoth—Drifting is being done on the 1300 level in search of the orebody in the Don Pedro claim, which was recently developed by the Gold Chain. These two companies own the Don Pedro.

Grand Central—The mine is in good condition, and shipments are being made regularly. The underground showing is reported better than at any time during the last few years.

Bullock—A flow of water recently encountered in the shaft at a depth of 215 ft. made it necessary to abandon sinking. A hoist and pump will be installed and sinking continued to the 300-ft. level.

Centennial-Eureka—Work is being done in the tunnel connecting with the shaft at the 535-ft. level. Arrangements for carrying off the water have been completed, and the tracks are being laid. The power plant which is being erected at the mouth of the tunnel is being built rapidly. Work of mining ore was suspended on April 10 until the new electric pumping plant is installed.

Iron King—From 40 to 50 tons of ore are being mined daily and are shipped to the American Smelting and Refining Company for fluxing. The tunnel is in 2500 ft. and will be driven 500 ft. further. N. Roberts is superintendent.

Scranton—This company in North Tintic is shipping from 600 to 700 tons of lead-zinc ore per month.

Iron Blossom—Ore has been encountered in the raise from the 500-ft. level of the company's north workings, which is in part of shipping grade. The east drift on the 500 has been following a partly open fissure. A raise was driven on this fissure, which broke into characteristic silver-lead ore. This orebody is being developed.

Eagle & Blue Bell—The orebody on the 1000-ft. level has been opened for about 200 ft., and for some distance both above and below the level. Ore has been opened in the eastern part of the 1100-ft. level. It is said that arrangements have been made for sinking the shaft, as the showing at present justifies deeper mining.

Salt Lake County

Bingham Mines—This company is actively operating its properties. The Commercial mine is being worked about as usual. At the Dalton & Lark the ore mined is more than taking care of development. Considerable work is being done on the Yosemite properties. A porphyry dike has been driven through, and the upper workings are being unwatered. No ore is being mined at the present time, and the company is confining its attention to development. The new workings will give a much greater depth than the bottom of the lowest work formerly done on the property. About 700 ft. south of the Yosemite, a long drift is being sent under the old shaft workings in the Brooklyn ground.

Carbonate—This property on Custer peak above Big Cottonwood cañon has been lying idle for years. A vigorous campaign of development will be started and continued.

Columbus Consolidated—Development is being continued on the third and fourth levels. On the fourth level a drift is being driven northwest in new territory. Some milling ore has been encountered. The third level is being driven south of the shaft to cut an ore-bearing fissure which was developed in the upper workings a force of 40 men is employed.

Washington

Ferry County

North San Poil—This mine has been leased to W. M. Crummer for two years, and development will be started.

Insurgent—Merrill Brothers & Delbridge, of Republic, are operating this mine and will equip it.

Copper Key—Operations under the direction of Jack May are being carried on.

Okanogan County

Lucky Knock Mining Company—This company, of Loomis, reports that it has just cut through the largest body of high-grade stibnite ore yet encountered in its mine. At 350 ft. a tunnel went through 50 ft. of ore assaying 35 per cent. antimony and through a streak, 14 ft. thick, assaying 60 to 70 per cent. Some of the ore carries silver.

Stevens County

Big Bear—Development is in progress under the direction of Charles H. Albin, of Spokane.

Blue Star—The present shaft will be continued to the 300-ft. level. Mark Mitchell is manager.

Conquest—At this property a rich strike of gold and copper ore was recently made. The mine is six miles north of Northport.

West Virginia

Harrison County

The new Peacock Coal Company, of Clarksburg, is preparing to develop its coal and timber lands and to lay out a townsite; while the Monongah Fuel Company will soon open up coal mines in the clay district.

Logan County

The Island Creek railroad is to be extended up the creek, to enable the United States Coal and Oil Company to extend its mining operations; and a tunnel may be also driven through Dingess mountain to make a connection with the Norfolk & Western.

Mingo County

The Borderland Coal Company is opening new mines on its lease and is installing an aërial tramway, which will take the coal from the mines in Kentucky, across Tug river. Besides the Borderland, or Winifrede seam, the company is opening the Thacker lower in the hill.

John A. Williams, of the Marvin Coal Company, Matewan, has organized a company which has purchased the Sprigg plant from the Belvedere Coal Company, and is getting ready to reopen the mines. It is working the Alma seam.

Wyoming

Albany County

The Medicine Bow company will commence milling by July. This property is between Holmes and Albany. The Lake Creek and Topeka companies have considerable developed ore and will ship from Lake Creek station. William Benton is secretary of the Lake Creek company.

Canada

British Columbia

New Dominion—The British Columbia Copper Company interests have practically secured control of the company. Julius A. Lewisohn and J. H. Susmann have resigned as president and secretary respectively and been succeeded by E. Summerfield and C. A. Starbuck representing the British Columbia company, giving the latter company four members on the board. Lucius W. Mayer is mentioned for successor to Mr. Lewisohn as president. A contract has been approved for the trial treatment of New Dominion ores at the British Columbia smeltery to enable the two companies to determine what terms will be fair for both.

British Columbia Copper—A labor strike is threatened owing to the activity of the Western Federation.

Ontario

The shipments from Cobalt for the week ended April 15 are: La Rose, 313,782 lb.; Kerr Lake, 238,444; Nipissing, 208,631; McKinley-Darragh, 148,550; Crown Reserve, 83,800; Townsite, 68,000; Chambers-Ferland, 64,300; Buffalo, 62,650; Cobalt Lake, 64,000; total, 1,252,157 pounds.

Cobalt Central—This company will issue $300,000 of bonds.

Little Nip—Another rich oreshoot has been opened up below the 160-ft. level.

City of Cobalt—A new vein carrying 1000 oz. of silver to the ton has been located on the 165-ft. level.

Merger Mines Company—This company, capitalized at $3,000,000, has acquired control of the Laurentian gold mine in the Manitou Lake district, western Ontario, and other properties, amounting to 1200 acres. Preparations are being made to resume active development work at the Laurentian. E. E. Hedges, Boston, is president; J. P. Kaiser, Detroit, vice-president, and John B. Corliss, Detroit, secretary. F. Hille has been engaged as consulting engineer.

Nova Scotia

Dominion Iron and Steel Company—At a joint meeting of the directors of this company and the Dominion Coal Company at Montreal, April 20, a proposition for the accomplishment of the merger was adopted for submission to the shareholders. It is proposed to form a holding company, to be entitled the Dominion Steel and Coal Corporation, Ltd., which will take over the common shares in both companies, share for share at par, and will in addition give the holders $4 for each share, to be paid in quarterly instalments, the first payment to be made July 1. The plan is understood to meet the approval of the larger shareholders.

Quebec

Eastern Canada Steel and Iron Works, Ltd.—This company, recently organized with a capital of $200,000, has secured land at St. Malo, on the outskirts of Quebec city, for the erection of a plant for the manufacture of structural steel. Work will be started during May. It is intended to issue bonds for $50,000. The directorate includes Rodolphe Forget, president; Charles Donohue, vice-president; J. T. Donohue, secretary-treasurer, and L. H. Gandry, managing director.

Mexico

Chihuahua

San Pablo—This newly organized El Paso company has begun development on silver properties near Ojo Caliente station north of Chihuahua. The properties are said to have produced from little working upward of $100,000 since 1893. Machinery will be purchased.

Plomosas—This productive lead mine in the eastern part of the State is reported by its owner Jose Lago to have been sold to French parties who will make a first payment on the $200,000 price soon.

Palmarejo-Mexican—The properties of this company near Chinipas are reported acquired in large part by the Oceana Consolidated Company, an English concern which has operated successfully in South Africa for several years.

Batopilas—A recent bullion shipment consisted of 40 bars silver worth about $22,000. The enlargement of the cyanide plant is planned.

Los Americanos—El Paso parties have lately organized this company to operate in the Duende mountains 50 miles southwest of Juarez.

San Francisco del Oro—Definite announcement comes from London that this company has perfected plans for the immediate building of a 300-ton milling plant in the Parral section.

Sierra Madre—At this property in the northern part of the State a large central power station is being installed. P. H. Durack is manager.

Congress—This property in the San Pedro camp on the Mexico Northwestern in the northern part of the State is shipping daily to El Paso over 100 tons of lead-silver ore.

Durango

Avino—London advices are to the effect that this company has not arrived at a definite decision as regards the ore-treatment problem. Tests have been made on two or three processes in London, and the results will shortly be submitted to the board. As regards the results obtained by the use of water concentration, the officials are as yet unwilling to give any information, but say they expect to do so shortly.

Guanajuato

La Tula—This property, W. H. Puffer, manager, will soon start work on installing a 10-stamp mill.

Sonora

Lucky Tiger Combination—Plans for the construction work drawn by D. L. H. Forbes and have been accepted by the directors. They cover the erection of a steam power plant at Ysabel station on the Nacozari railroad and a 31-mile electrical transmission line to the mines; a 250-ton cyanide plant, and the enlargement of the mill from 100 tons daily capacity to 200 tons. The power plant is to deliver 1000 h.p. The year's tonnage is expected to reach 75,000 tons.

Cerro Prieto—This is the Mexican holding corporation for the Black Mountain Mining Company, which will temporarily close down May 1. The company has spent $2,568,000 at the property, other than operating expenditures, and has about $150,000 in supplies and merchandise at the mine. Ore was mined and milled for a few cents less than $2.20 per ton last year, and gross recoveries approximated $497,000 in gold and silver. The company is capitalized with 500,000 shares at $5 par value.

Greene-Cananea—A tunnel has been started at an outcrop in a virgin zone south of the Oversight mine.

Asia

India—Mysore

Kolar Goldfield—The production of gold in March is reported at 47,035 oz. bullion, or 1571 oz. more than in February. For the three months ended March 31 the output was 135,008 oz. bullion in 1909, and 139,047 oz. in 1910; an increase of 4039 oz. The bullion reported this year was equal to $2,586,685, or 125,142 oz. fine gold.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, April 27—The seaboard bituminous trade shows very little change, and is not affected by the wage-scale disputes, especially since the settlement in the Central Pennsylvania district, which has a large trade in the East. In that district there is an advance of 3c. per ton to 69c. for pick mining, and of 4c. to 40c. for machine mining; besides an increase of 5.55 per cent. on day work of all kinds. A new clause in the agreement provides for the appointment of a commission consisting of two representatives from the operators and two from the miners, and a fifth selected by the four, to keep watch on competitive fields, and when wages are reduced in them to make a corresponding reduction in this field. This was a concession to the operators, although the miners generally were granted practically all they asked.

In the West the course of settlement is uneven. The Pittsburg district is making its agreements gradually, and Indiana seems near a close, but Illinois is still far from an end. The Illinois miners have agreed to furnish the operators with men to make the changes in the mines required by the new State law.

West of the Mississippi the situation is chaotic, except in Iowa, and the resumption of mining is still uncertain.

The situation in various districts is shown in the local letters which follow.

West Virginia Coal Lines—Suits have been begun in Ohio to enjoin the transfer of Hocking Valley and Kanawha & Michigan stock to the Chesapeake & Ohio company, on the ground that the sale will be practically a consolidation of competing lines.

It is reported that negotiations are pending for the sale of the Virginian Railroad, owned by the estate of H. H. Rogers, to the New York Central & Hudson River Company. The object of that company, if the report is true, is probably to offset the Pennsylvania control of the Norfolk & Western.

COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, three months ended March 31, short tons:

	1909.	1910.	Changes.
Anthracite	2,928,963	2,822,612	D. 106,351
Bituminous	9,193,532	11,267,286	I. 2,073,754
Coke	2,829,097	3,985,861	I. 1,156,764
Total	14,951,592	18,075,759	I. 3,124,164

The total increase reported this year was 23.4 per cent.

Coal report of Pittsburg Coal Company, three months ended March 31, short tons:

	1909.	1910.	Changes.
Pittsburg district.	2,130,389	3,485,055	I. 1,354,666
Hocking district...	160,084	290,752	I. 130,668
Total coal........	2,290,473	3,775,807	I. 1,485,334
Coke made........	96,046	146,867	I. 50,821

The increase in coal this year was 64.7 per cent.; in coke, 52.9 per cent.

Coal tonnage of railroads in Ohio Coal Traffic Association, two months ended Feb. 28, short tons:

	1909.	1910.	Changes.
Hocking Valley......	471,013	771,414	I. 300,401
Toledo & Ohio Cent..	174,988	276,090	I. 101,102
Baltimore & Ohio ...	172,327	373,438	I. 201,111
Wheeling & L. Erie .	406,647	587,374	I. 180,727
Cleve., Lorain & Wh.	283,800	487,543	I. 203,743
Zanesville & Western	206,456	250,247	I. 43,791
Toledo Div., Pen. Co.	308,205	435,677	I. 127,472
L.Erie,Alliance&Wh.	177,751	203,960	I. 26,209
Marietta, Col. & Clev.	6,882	25,825	I. 18,943
Wabash-Pitts. Term.	....	8,839	I. 8,839
Total..............	2,208,069	3,420,407	I. 1,212,338

Total increase this year, 54.9 per cent. Only the Ohio lines of the Baltimore & Ohio are included; the main line tonnage is given elsewhere.

Bituminous coal and coke tonnage of leading railroads in Pennsylvania and West Virginia two months ended Feb. 28, short tons:

	Bituminous.	Coke.	Total.
Pennsylvania......	7,256,090	2,654,301	9,910,391
Balt. & Ohio........	4,168,536	770,993	4,939,529
Buff., Roch. & Pitts.	1,240,391	116,849	1,357,240
Buff. & Susqueh'na	209,009	51,868	260,877
Penn. lines, N. Y. C.	1,619,710	11,627	1,631,337
Pitts. & L. Erie.....	1,641,582	1,251,555	2,893,137
Pitts.,Shawmut&N.	160,336	4,821	165,157
Norfolk & Western.	2,596,201	538,287	3,134,488
Ches. & Ohio.......	2,511,040	84,900	2,595,940
Virginian	....	....	....
Total..............	21,402,895	5,485,201	26,888,096
Total, 1908........	16,214,305	3,643,240	19,857,545

Total increase this year, 7,030,551 tons, or 35.4 per cent. Anthracite tonnage of Pennsylvania and Baltimore & Ohio is not included.

Anthracite tonnage of Baltimore & Ohio, two months ended Feb. 28 was 163,824 tons in 1909, and 204,301 in 1910; increase, 40,177 tons.

New York

ANTHRACITE

April 27—There is no change in the anthracite market except that there is a little rush to get in orders before May 1, and so save the addition.

Schedule prices for domestic sizes are $4.25 per ton for lump and $4.50 for egg, stove and chestnut, f.o.b. New York harbor. On May 1 there will be an advance of 10c. per ton. For steam sizes current prices are $3@3.25 for pea; $2.15@2.50 for buckwheat; $1.70@2 for No. 2 buckwheat or rice; $1.25@1.50 for barley. These prices are f.o.b. New York harbor, according to quality, the lower prices being for washery coals.

BITUMINOUS

The seaboard bituminous trade is steadier and shows a little more activity. The settlement of the wage scales in the Central Pennsylvania district, signed this week, has removed some of the apprehensions of strike trouble. Contracts are being still slowly closed. Orders from the Sound and the far East are coming in a little more freely. New York harbor trade is fair and all-rail business is doing pretty well.

Car supply is better than it has been, though not quite up to the mark. Transportation is generally good, coal coming through about on schedule.

Prices are firm, the better grades of steam coal bringing $3@3.15, f.o.b. New York harbor, with lower grades at $2.75@2.85. The lower priced coals seem to be most in demand.

The coastwise-vessel market is in pretty good shape. Boats are to be had without difficulty, and there is no change in prices.

Birmingham

April 25—There is a fairly good demand for coal in Alabama and the production is being kept up. The home consumption is strong while quite a lot of coal is being shipped away from the State. New Orleans dealers are figuring on more contracts for Alabama coal and it is believed this trade during the summer will help out when conditions become slack in the home market. The railroads are giving good service in the way of handling the product.

Coke demand and production are about equal. But few coke ovens in shape are out of commission. The prices of coke are a little weaker than they have been.

Chicago

April 25—Cold weather throughout Chicago territory for the last three days has caused an active demand for domestic coals, particularly anthracite. Stores of lump bituminous have been drawn on, but no pressure for coal has resulted, despite the fact that hardly any coal for steam purposes is available. So far as the steam market is concerned, there is still hardly any buying, except of the West Virginia coals that are in the market. The users of steam coals have by no means come to the bottoms of their storage piles yet, nor do they seem likely to do so for two weeks more at least. Illinois and Indiana have used up their surplus stock, so that they have practically no more to send until the resumption of mining. The users of small amounts of coal are beginning to show anxiety and to seize eagerly available lots.

For such occasional lots of screenings as can be had, $2.40@2.60 obtains; other Illinois and Indiana coals have no market and quotations are only nominal. Smokeless brings $3.55 for lump and egg and $3.15 for run-of-mine and sells very well, all kinds bringing these prices. The supply is not more than enough to keep pace with the demand.

Cleveland

April 25—The coal market is practically dead for the time being. Sales are very few and large consumers are running on their stored coal. Some of them are approaching the end of their supplies. Practically the only coal sold during the week has been some No. 8 district slack, which brought high prices, as that grade is very scarce.

Indianapolis

April 25—The Indiana mining situation has been waiting this week on the next move. The miners as well as the operators are getting tired of the strike that has dragged out for three weeks. They have heard of the revival of business in the block coalfield, and believe that the storage coal is almost exhausted and that factories and railroads are hard pressed. The miners continue to quibble over the Cincinnati agreement to work pending a settlement. The majority are anxious to resume work but the officials refuse to order them back to work. The operators say they do not expect President Lewis to order the men back to work and do not know if he has the power to do so.

Another joint conference between the miners and operators has been arranged to be held in Terre Haute this week. There is some hope that a settlement will be effected. The suspension of mining in this State has resulted in the curtailment of production in some factories because of the lack of coal.

Pittsburg

April 26—Eight mines in the district have signed the wage scale provisionally, with the advance from 90 to 95c. for pick mining, advances for machine mining, and 5.25 per cent. advances on day work. These signatures are provisional upon the rest of the district signing later. At six of these mines the men have already gone back to work. The operators who have not signed are almost wholly those having one or more gaseous mines in which black powder is not permissible, and as the men will not permit these to sign unless they sign for all their mines, with a mine-run basis, at the 65 per cent. ratio, for those in which black powder cannot be used, the matter rests at this point. A meeting of the Pittsburg Coal Operators' Association will be held tomorrow afternoon at which some step may be taken. While definite statements are lacking, prospects are that the whole matter will be adjusted before the end of the week so that the mines can run next week.

A sharper scarcity of coal has developed in the past four or five days, as a number of consumers ran out of stocks. Coal is to be had from nonunion mines, at 10 or 20c. premium over the regular market, and it is only a relatively small proportion of consumers who have to pay a large advance in delivered prices, through their being inconveniently located as to nonunion mines. The market for small lots for immediate shipment is quotable at $1.15@1.30 for mine-run, and at $1.20@1.30 for slack, the market for the latter being a trifle stiffer than for mine-run, there being a number of consumers in the market equipped to use slack only. Occasionally as high as $1.50 has been paid for an odd carload.

Connellsville Coke—The market has been very quiet. Late last week there was a little inquiry for prompt furnace coke, developing many sellers at $1.70. Quotations this week are $1.75@1.85, although actual inquiry might again develop $1.70. Contract furnace coke is quotable at $2.15@2.25, but $2 could probably be done on negotiation. Foundry coke is quotable at $2.25@2.35 for prompt and at $2.35@2.50 for contract.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending April 16 at 438,374 tons and shipments at 4452 cars to Pittsburg, 7512 cars to points west of Pittsburg and 838 cars to points east of Connellsville, a total of 12,802 cars.

St. Louis

April 25—The operators disbanded in Chicago again without doing anything and will not meet for another week; consequently, there is no chance of work being resumed before the middle of May at least. Even should the other States sign up it will have no effect on the conditions in Illinois. After the general scale is agreed to there is another point which will come up in the Illinois convention which will undoubtedly cause a good deal of delay and trouble—both the miners and operators of the central and northern Illinois districts insist that the differential of the Southern Illinois or Carterville group be changed and that the mines be put on an equal basis with the Belleville, Standard and Springfield districts. The Carterville operators now enjoy an advantage of 7c. per ton in the mining rate over these districts; also in the Carterville district the miners do the slate cleaning and other dead work which amounts to 5c. per ton more. Carterville coal has eaten into the market of the northern coals to such an extent during the last 18 months that not only the operators in the northern districts, but miners themselves realize the necessity of making this change. This proposed differential will be vigorously fought by the operators in the Carterville district.

Kentucky coal is beginning to move. Some has been coming into East St. Louis for the past two weeks, although the tonnage has been small. However, it begins to look as if after next week that there would be a great deal of this coal brought this way. Operators in Kentucky have been holding their coal at 80@90c. but on account of increased demand have raised their price to $1@1.10 per ton at mine on mine-run coal, which is practically the only size moving.

Prices in the St. Louis market are as follows:

	F.o.b. Mine.	F.o.b. St Louis.
Standard:		
2-in. lump	2 00	2.52
Mine-run	1 60	2.12
Screenings	1 40	1.92
Carterville:		
6-in. lump or egg	2 00	2.67
Mine-run	1.50	2 17
Screenings	1 50	2.17
Pocahontas and New River:		
Lump or egg	1 50	4 00
Mine-run	1 10	3 65
Pennsylvania Anthracite:		
Nut, stove and egg		6 15
Grate		6 20
Arkansas Anthracite:		
Egg or grate	3 35	5 35
Coke:		
Connellsville foundry		5 40
Gas house		1 50
Smithing coal		1 15

Kentucky coal brings $2.50 for 3-in.; $2.25 for 1-in.; $2 for run-of-mine; and $1.75 for screenings; all f.o.b. on Louisville & Nashville tracks, East St. Louis.

FOREIGN·COAL·TRADE

Nova Scotia Coal—Shipments of coal from Nova Scotia mines, three months ended March 31, long tons:

Companies.	1909.	1910.	Changes.
Dominion	377,167	510,111	I. 132,944
Nova Scotia Steel	81,247	103,565	I. 22,318
Acadia	57,867	64,717	I. 6,850
Intercolonial	60,911	59,283	D. 1,628
Inverness	26,412	59,468	I. 33,056
Total	603,604	797,144	I. 193,540

The total increase reported this year was 32 per cent.

German Coal Production—Production of German Empire, two months ended Feb. 28, metric tons:

	1909.	1910.	Changes.
Coal	23,562,253	24,141,063	I. 578,810
Brown coal	10,892,060	10,872,315	D. 19,745
Total mined	34,454,313	35,013,378	I. 559,065
Coke made	3,428,731	3,697,953	I. 269222,
Briquets made	2,884,356	3,016,768	I. 132,412

Of the briquets reported this year, 2,331,253 tons were made from brown coal, or lignite.

IRON·TRADE·REVIEW

New York, April 27—Very much has been said about decreasing consumption of iron and steel, which does not take existing conditions into account. As a matter of fact the consumption is large in some lines, and good in nearly all, but it is not up to the increase in producing capacity which has been made in the last three years. A large part of the apparent dullness may be traced to this cause. If we predicate production on a boom year and then increase it 20 per cent., some mills are bound to be short of work. Sales of small building material are reported very large, which is an encouraging point.

In pig iron there is more inquiry for third-quarter and second-half supplies. Furnaces seem to be gradually adjusting themselves to the situation and are more ready to accept small reductions in price. Moreover, though there is no concerted movement, some stacks are going out of blast and thus reducing the surplus which has been weighing on the market.

In finished material bars and plates are in good demand, and there is much small business in structural steel and bridge material, which makes up a fair total. The railroad people have been giving a few more orders, especially for bridge work.

United States Steel Corporation—The report made public for the quarter ended March 31 gives the following figures; net earnings being the amount remaining after paying all expenses, repairs and ordinary charges:

Net Earnings:	1909.	1910.
January	$ 7,262,605	$11,316,014
February	7,669,336	11,616,861
March	7,989,327	14,684,001
Total	$22,921,268	$37,616,876
Depreciation, replacement, etc.		$6,113,682
Interest and sinking funds		7,311,963
Total charges		$13,425,645
Surplus		$24,191,231

Appropriations from surplus were $6,304,919 for 1¾ per cent. dividend on preferred stock; $6,353,781 for 1¼ per cent. on common; $5,000,000 for additions to property; total, $17,658,700, leaving an undivided surplus of $6,532,531. The common stock dividend is increased from 1 to 1¼ per cent.

Net earnings decreased by $3,354,433 from the quarter ended Dec. 31. Unfilled orders on the books, March 31, were 5,402,514 tons; a decrease of 524,517 tons from Dec. 31, but an increase of 1,859,919 tons over March 31 last year.

Baltimore

April 25—Iron ore imports for the week were 28,150 tons, all from Cuba. Exports included 1,384,787 lb. castings, bars and pipe to Panama.

Birmingham

April 25—While there are some sales of pig iron being made in the Southern territory, the market is still quiet. A curtailment of production has started in, one or two furnaces having already been blown out and one more is going out. Quotations are a little better than they have been. Furnace companies are not willing to sell under $12.50 per ton, No. 2 foundry, as far as can be ascertained. A few sales have been made at $12.75 and iron for delivery during the fourth quarter of the year was booked at $13 per ton. There is nearly 200,000 tons of pig iron on the furnace and warrant yards in the Southern territory but this does not alarm producers. The smaller iron companies in the South appear to be making the greater concessions and also the greater number of sales. Reports are current now that some of the largest consumers in the South are figuring on buying for their probable needs during the latter part of the year. Inquiries are being received right along but little business is resulting. Business of recent acceptance is practically for immediate delivery.

The steel activity remains unchanged. The plant of the Tennessee company at Ensley and the rolling mills of the same company at Bessemer are producing a good quantity of steel and it is being shipped as quickly as it is manufactured.

Chicago

April 25—Conditions in the pig-iron market seem to be improving. Both sales and inquiries are increasing. Buyers appear to be ready to place large contracts as soon as they feel convinced that prices will not go lower. That they will not go under $12 Birmingham ($16.35 Chicago) for Southern No. 2, and $17 for Northern No. 2 is asserted by furnace agents. There are rumors, however, that on both Southern and Northern these quotations have been shaded 25 or 50c. on some sales. In any event most of the iron sold is in small lots, at or near these quotations. The ordinary melter of pig iron adheres to his policy of buying for short-time requirements—one to three months ahead. Inquiries are much more numerous and for good-sized tonnage. Much iron is needed to fill last-half requirements. Railroad supplies and structural iron show no increase of sales, but much business is in sight. Coke is somewhat stronger, the surplus on track having been largely reduced.

Cleveland

April 26—Nothing is doing in the iron-ore market, as might be expected from general conditions.

Pig Iron—There is little new business and prices are weaker. Several furnaces in this district are expected to go out soon. Bessemer pig can be bought at $18, Cleveland, while $16.50@16.75 is quoted for No. 2 foundry; $16.35 for No. 2 Southern; $16.25@16.50 for gray forge.

Finished Material—Some small contracts for structural steel have been let and others are pending. Bars are selling fairly well, but otherwise the market is quiet.

Philadelphia

April 27—A feeling of uncertainty is manifested this week in the entire pig-iron market. Reports from outside territory as to blowing out of furnaces and a curtailment of production are having a discouraging effect which may result in a general lowering of quotations. A drop in basic is believed to be inevitable. Forge iron has weakened slightly according to quotations made today. The undertone of the entire crude-iron market is not quite as strong as a week ago. Basic is quoted at $17.25; gray forge $16.75, and No. 2 foundry $18 per ton.

Steel Billets—There is a marked tendency to weakness in billets, excepting for small billets which demand full prices.

Bars—Bar iron sells freely, but in small lots. Inquiries this week for car lots show that manufacturers are willing to make a slight shading.

Sheets—A few of the large sheet consumers have submitted offers for summer and later delivery involving, of course, concessions from current quotations. Sheet manufacturers are well sold up, but they are showing an anxiety to capture desirable orders from the larger consumers.

Pipes and Tubes—There are signs of weakness in demand, but there is no restriction in consumption.

Plates—Notwithstanding the oversold condition of Eastern plate mills, outside prices are not insisted upon in some cases. Boiler plate is strong and there is no sign of weakness in the retail business.

Structural Material—The week's business has been confined to small orders for local enterprises. The mills in this territory have a smaller amount of unfilled orders than for some months. There is no admitted shading on these small orders.

Scrap—The small sales taking place are of cast scrap, cast borings and some yard scrap. The yards, as a rule, are better supplied with scrap than for some months.

Pittsburg

April 26—With a few exceptions, notably wire and pipe, actual orders for finished steel products are in excess of current production, and while the showing is favorable in a measure, it furnishes a continuance of the disappointment which has been felt for weeks, since the mills are not getting much ahead, and the inevitable dull period in the summer will set them far back. Reduced output of finished steel is inevitable, but this is not likely to be serious in the next two or three months, since there is really a good accumulation of business on books in most lines. The Pittsburg Steel Company has not started its steel and wire plant at Monessen, this being the third week of its idleness, but as soon as coal can be secured at the normal cost it will probably resume, having effected a sufficient curtailment. The McKeesport plant of the National Tube Company has closed several butt-weld departments and the 15-in. mill.

Prices of finished-steel products have been showing no material change in the past few weeks, although it seems clear that the market has lost a little of its strength. In some quarters the theory is put forth that the Steel Corporation is pursuing a very conservative course on account of the prospect of a national incorporation law, and that once it were lodged in what it seems to look upon as a safe position, it would cut the market open and take business at whatever prices were necessary, precipitating a conflict for the survival of the fittest.

Independent steel interests are laboring hard with the wage question, which has been forced upon them by the Steel Corporation's announcement of a general wage advance May 1, but it is far from certain that they will decide to advance wages. They regard the Steel Corporation's position as utterly unsound, and obviously it is off color to advance wages and curtail production at the same time. They may do nothing, leaving the Steel Corporation's advance to be attributed to its being in a peculiar position on account of the state of public feeling. The Corporation has announced its sheet- and tin-mill advances, which amount to about 4½ per cent. in the tin mills and slightly less in the sheet mills. Steel, tube, wire, etc., advances are expected to be announced in the next few days.

Pig Iron—Not enough business has been done to maintain a market, and it is possible that former prices could be shaded, but in the absence of definite movement former prices are quoted as nominally the market: No. 2 foundry, $15.75; malleable, $16; gray forge, $15.25; bessemer, $17.50; basic, $16; all f.o.b. Valley furnaces, 90c. higher delivered Pittsburg.

Steel—Open-hearth steel continues scarce and bessemer steel easy, the latter being quotable at 50c. less than last week. Open-hearth billets are $28.50@29; open-hearth sheet bars, $29@29.50; bessemer billets, $26.50@27; bessemer sheet bars, $27@27.50; rods, $32; all f.o.b. mill, Pittsburg or Youngstown districts.

Ferromanganese—The market is decidedly softer, with occasional sales at under the market on account of the limited absorbing power for odd lots which have to be moved. The market may be quoted at about $40.50@41 for prompt, and $41@41.50 for second quarter or second half, f.o.b. Baltimore, freight to Pittsburg being $1.95 per ton.

Sheets—The market is rather quiet, but most mills are busy. Here and there a slight curtailment of output has been made. Regular prices, which are frequently shaded $1 or $2 a ton, are 2.40c. for black and 3.50c. for galvanized; $1.70 for painted corrugated, and $3 for galvanized corrugated, with blue annealed, 10 gage, at 1.90c. for prompt delivery.

St. Louis

April 25—The pig-iron market has been very dull and there does not seem to be any prospect of immediate improvement. The demand is light and inquiries are few. Scarcely a contract worth mentioning has been written in the past month. Local producers have all they can do, but there is an over-abundance of Southern iron on the market. Birmingham No. 2 foundry is bringing $13 Birmingham or $16.75 St. Louis. Producers are asking an advance of 50c. over these prices for third-quarter delivery.

FOREIGN IRON TRADE

British Iron Trade—Exports and imports of iron and steel in Great Britain, three months ended March 31, as valued by Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£10,112,678	£ 2,133,798	Ex. £ 7,978,880
Machinery...	6,369,735	1,090,477	Ex. 5,279,258
New ships....	2,420,254	....	Ex. 2,420,254
Total..... ..	£18,902,667	£ 3,224,275	Ex. £15,678,392
Total, 1909..	17,175,819	3,006,283	Ex. 14,169,536

Increase in exports, £1,726,848, or 10.1 per cent.; increase in imports, £217,992, or 3.3 per cent. The quantities of iron and steel reported were in long tons:

	1909.	1910.	Changes.
Exports	931,403	1,095,786	I. 164,383
Imports.............	277,887	323,966	I. 46,079

Exports of scrap iron and steel, not included above, were 39,497 tons in 1909, and 52,515 tons this year.

British Iron-ore Imports—Imports of iron ore into Great Britain, three months ended March 31, were 1,363,042 long tons in 1909, and 1,797,292 in 1910; an increase of 434,250 tons. Of the imports this year 1,277,121 tons were from Spain.

German Steel Production—The production of steel in Germany for the full year is reported as below, in metric tons:

	1909.	1910.	Changes.
Acid converter. ..	374,100	151,148	D. 222,952
Acid open-hearth .	224,211	311,812	I 87,601
Basic converter...	6,510,754	7,517,451	I. 1,006,697
Basic open-hearth.	3,969,595	3,967,581	D. 2,014
Crucible	88,183	84,069	D. 4,114
Electric.............	19,536	17,773	D. 1,763
Total.......	11,186,379	12,049,834	I. 863,455

The total increase was 7.8 per cent.

METAL · MARKETS

New York, April 27—The metal markets are inclined to be more active and are interesting in some of their developments.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1910..	$ 1,815,329	$ 1,492,229	Imp. $ 2,676,900
" 1909..	21,252,462	5,161,648	Exp. 16,090,814
Year 1910..	10,915,595	9,686,702	" 1,228,893
" 1909..	37,978,632	12,158,275	" 25,820,357
Silver:			
Mar. 1910..	4,553,110	3,872,912	Exp. 680,198
" 1909..	5,079,287	3,279,531	" 1,799,756
Year 1910..	13,640,033	11,276,595	" 2,363,438
" 1909..	14,473,930	10,453,218	" 4,020,712

Exports from the port of New York, week ended April 23: Gold, $6,797,600, to London and Brazil; silver, $474,500, chiefly to London. Imports: Gold, $52,131; silver, $10,036, from the West Indies and Mexico.

Gold—The price of gold on the open market in London was 77s. 9d. per oz. for bars. The price for American gold coin was 76s. 5d. per oz., but for two days the Bank of England offered a premium of 1d. per oz. for coin. A large amount—about $12,500,000—was taken early in the week for shipment to London.

Platinum—Business is good for this time of year. Prices are unchanged, dealers asking $29@29.50 per oz. for refined platinum and $34.50 per oz. for hard metal.

Our Russian correspondent writes, under date of April 14, that prices are still increasing. At Ekaterinburg quotations are 6.40 rubles per zolotnik—$24.06 per oz.—for crude metal, 83 per cent. platinum; at St. Petersburg 25,500 rubles per pood—$24.99 per oz.—for the same grade. Demand is good and the market strong.

Silver—The market has ruled steady for the past week with advancing tendency, owing to the good demand from India and China, and the promising crop outlook; also the probability of Indian Government purchases in the near future.

SILVER AND STERLING EXCHANGE

Apr.	21	22	23	25	26	27
New York....	53⅜	53¾	53¾	53⅝	53¾	54
London..	24 11/16	24¾	24¾	24 11/16	24¾	24⅞
Sterling Ex..	4.8775	4.8780	4.8780	4.8785	4.8790	4.8810

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to April 14, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India	£1,175,400	£1,896,800	I. £ 721,400
China	983,200	1,088,500	I. 105,300
Straits	82,800	....	D. 82,800
Total	£2,241,400	£2,985,300	I. £ 743,900

Average paid for India Council bills in London was 16.09d. per rupee.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Apr.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
21	12⅞ @13⅛	12½ @12¾	56¾	33¼	4.35 @4.40	4.20 @4.25	5.22½ @5.25
22	12⅞ @13⅛	12½ @12¾	56¾	33¼	4.35 @4.40	4.20 @4 25	5.20 @5.22½
23	12⅞ @13⅛	12½ @12¾	. .	33	4.35 @4.40	4.20 @4.25	5.15 @5.20
25	12⅞ @13	12½ @12⅝	56⅜	33	4.35 @4.40	4.20 @4.25	5.15 @5.20
26	12⅞ @13	12½ @12⅝	56¼	32¾	4.35 @4.40	4.20 @4.25	5 10 @5.15
27	12⅞ @13	12½ @12⅝	56¼	32⅞	4.35 @4.40	4.20 @4.25	5.07½ @5.10

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—While domestic consumers have shown a singular indifference to the low prices at which the metal is selling, European buyers have been steadily in the market but are necessarily endeavoring to get their supplies on a scale downward. In this they are supported by the tendency of the standard market, which brings electrolytic copper out of warehouse right along into competition with shipments from this side. The market closes barely steady at 12⅞@13c. for Lake copper, and 12½@12⅝c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12⅜@12⅝ cents.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c. base, carload lots at mill.

Business in the London standard market has been rather dragging and prices have been hovering around bottom for several days, closing steady at £56 5s. for spot and £57 5s. for three months.

Refined and manufactured sorts are quoted: English tough, £59 10s.; best selected, £60@60 10s.; strong sheets, £68 10s.@£69 10s. per ton.

Henry R. Merton & Co., of London, report under date of April 16, that the recent concessions in prices tended to clear up the situation abroad. Calumet & Hecla reduced its asking price to about £61 (13.2c., c.i.f.) while electrolytic brands were freely offered by American producers below £60 (13c., c.i.f.) "This energetic policy proved to be a timely move, inasmuch as it attracted consumers to an important extent, and gave the producers an opportunity of relieving themselves of very large quantities of refined copper for May and June delivery. The business thus consummated was of an unusually heavy description, extending to all branches of the trade and giving the best evidence of the wonderful activity which is now prevailing in the copper-consuming industry." The National Conduit and Cable Company, of New York, in its circular of April 20, takes an extremely pessimistic view of the situation, but it declares that "all the large manufacturers were busy throughout the first quarter of 1910, although being well covered ahead they were not anxious buyers."

Copper exports from New York and Philadelphia for the week were 2774 long tons. Our special correspondent gives the exports from Baltimore at 1569 tons copper.

Tin—While during the second half of last week dealings in the London market showed a lack of interest on the part of manipulators, it became evident that the spot situation was very well controlled by the bull party. In consequence, the contango between spot and futures which had right along ruled at about £1 15s.@£2, was at one time reduced to 7s. 6d. At the beginning of this week, transactions increased in volume, at the expense of values, however. Reports from this side of severe damage to fruit and vegetable crops were to a large extent the cause of the decline. At the close the market is cabled as steady at £149 17s. 6d. for spot and £150 17s. 6d. for three months.

In the domestic market, tin is being offered continuously at prices ruling below the equivalent at which it can be imported, but consumers do not take advantage of this opportunity to supply their wants for future delivery. Business is confined to spot or near-by shipment only. At the close, tin can be bought at about 32⅞ cents.

Exports of tin from the Straits in March were 2877 long tons, making a total of 12,919 tons for the three months ended March 31; a decrease of 227 tons.

Lead—The market is quiet and unchanged at 4.35@4.40c., New York, and 4.20@4.25c., St. Louis.

The London market is without any special feature and the closing quotations are unchanged at £12 12s. 6d. for Spanish lead and £12 15s. for English.

Spelter—The protracted absence of buyers is beginning to tell on the nerves of the sellers, who have been offering concessions in prices from day to day, without, however, bringing out much business. The close is weak at 5.07½@5.10c. St. Louis, and 5.22½@5.25c. New York.

New York quotations for spelter, April 21, were 5.37½@5.40c.; April 22, 5.35@5.37½c.; April 23 and 25, 5.30@5.35c.; April 26, 5.25@5.30c.; April 27, 5.22½@5.25 cents.

The London market declined to £22 for good ordinaries, and £22 15s. for specials.

Base price of zinc sheets is $7.75 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Sales and inquiries are large and there is an upward tendency. Prices are unchanged at 23¼@23¾c. per lb. for No. 1 ingots in large lots. Sales abroad are very good, especially in Germany and France, and makers look for higher quotations. The automobile industry is taking a good deal of metal, both here and in France.

Antimony—The most marked feature of the market is its dullness. Business is of a retail order only, and prices are nominally unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—The market here is steady and sales are improving. New York quotations are firm at $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for small lots. San Francisco, $47.50@48 for domestic orders, and $2 less for export. The London price has been reduced to £9 per flask; jobbers sell at the same price.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. The German price for cadmium, 99½ per cent. pure, is 500 marks per 100 kg. for large lots, and 550 marks for smaller orders—54c. and 59.4c. per lb. f.o.b. works in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, three months ended March 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.	
Copper, long tons	36,904	15,909	Imp.	20,995
Copper, 1909....	30,131	18,865	Imp.	11,266
Tin, long tons....	11,655	10,956	Imp.	699
Tin, 1909......	10,390	10,099	Imp.	291
Lead, long tons..	51,962	11,899	Imp.	40,063
Lead, 1909	52,905	11,241	Imp.	41,664
Spelter, l'g tons..	32,665	2,352	Imp.	30,313
Spelter, 1909....	27,417	1,564	Imp.	25,853
Quicksilver, lb...	1,311,792	243,177	Imp.	1,068,615
Quicksilver, '09	893,993	270,196	Imp.	623,797
Ores:				
Tin ore and con.	6,021	....	Imp.	6,021
Tin ore, 1909...	5,137	....	Imp.	5,137
Pyrites..........	203,142	....	Imp.	203,142
Pyrites, 1909...	205,547	....	Imp.	205,547

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1910, the United States furnished in all 73 tons copper matte, 13,529 tons fine copper, and 5423 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., April 23—The highest price paid this week for zinc ore was $43.50; the base price, 60 per cent. zinc, was $41@42.50 per ton. No sales of lead ore were reported.

SHIPMENTS, WEEK ENDED APRIL 23.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	748,300	....	....
Highland	312,000	....	....
Platteville	298,230	....	51,900
Galena	165,740	....	....
Dubuque	75,000	....	....
Linden	63,450	....	....
Cuba City	55,000	....	52,000
Total	1,717,720	....	103,900
Year to date	25,727,620	1,747,939	4,610,290

In addition to the above there was shipped during the week to the separating plants, 1,294,470 lb. zinc concentrates.

Joplin, Mo., April 23—A base price of $45 per ton of 60 per cent. zinc was paid in settlement for zinc sulphide ore this week—ore purchased at the end of last week for early delivery. The highest base offering this week was $43, and from this it ranged down to $38. One purchasing agency that has been paying a base of $44 per ton of 60 per cent. zinc for ores carrying over 4 per cent. of iron was instructed this week to drop the price to $38. Another agency that was paying a $44 base dropped its price to a $42 base. Zinc silicate sold on a base of $21@25 per ton of 40 per cent. zinc with the highest price at $30. The highest price, all grades, was $46 and the average was $40.20 per ton. Lead of 80 per cent, grades and better is still selling at $50 per ton, with deductions of $1 per ton for each 1 per cent. under 80. The average price, all grades, was $49.70 per ton.

Miners from the coalfields of Kansas, out of employment on account of the strike, are being attracted here by the high wages, and as the mines are well supplied with natural gas no reduction in output is occasioned by shortage in the supply of coal.

SHIPMENTS, WEEK ENDED APRIL 23.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	5,012,950	625,630	$118,406
Joplin	2,347,380	214,850	54,612
Duenweg	961,370	47,830	24,023
Oronogo	681,930	......	14,466
Galena	618,680	67,560	14,337
Alba-Neck	594,280	......	12,862
Granby	642,400	3,750	9,470
Miami	583,060	70,230	8,168
Carthage	366,710	......	8,067
Spurgeon	391,890	77,500	7,067
Badger	262,070	2,390	5,553
Sarcoxie	329,550	......	5,403
Quapaw	75,660	96,660	3,891
Aurora	230,490	12,670	3,772
Carl Junction	114,690	......	2,523
Cave Springs	74,790	......	1,421
Greenfield	63,670	......	700
Totals	13,151,570	1,219,070	$294,741
17 weeks	190,246,380	27,409,820	$4,643,582

Zinc value, the week, $264,443; 17 weeks, $3,907,728
Lead value, the week, 30,298; 17 weeks, 705,854

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	......	37.01	......	55.63	......
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	.....	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore: the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, April 27—The general market is still quiet, with only a moderate amount of new business.

Copper Sulphate—Business is steady and the market shows no change. Prices continue $4.10 per 100 lb. for carload lots and $4.35 for smaller orders.

Arsenic—The market is dull and no large sales are reported for the week. Quotations are $2.40@2.50 per 100 lb. for white arsenic.

Phosphates—Shipments of hard rock phosphates from the Florida mines for the three months ended March 31 are reported at 78,281 tons, a decrease of 36,081 tons from last year. Shipments of land pebble were 213,016 tons, an increase of 8125 tons.

Sulphur—Best unmixed seconds are quoted at $22@22.50 per ton, New York.

Nitrate of Soda—The market is much slower than it has been. Spot nitrate still holds at 2.15c. per lb., but futures are quoted at 2.02½@2.05c. per lb., a slight weakening.

MINING · STOCKS $

New York, April 27—The general stock market has not materially changed since last week. Chiefly a professional market, it has been weak and uncertain, with a general downward tendency, and a disposition to make the most of all news that might be considered unfavorable. It has been a bear market for the most part, with no apparent effort on the part of anyone to sustain it or turn its course.

The increase in the dividend rate on Steel common from 4 to 5 per cent. yearly, had no marked effect on the market beyond a short-lived and small advance.

The Curb has followed the Exchange with a weak and uncertain market and declining quotations. The copper stocks were on the decline, but on moderate dealings. Outside of the coppers there was some activity in Cobalt Central, which declined on heavy sales. Other mining stocks received little attention.

Boston, April 26—Copper shares have shown very little animation of late. North Butte had an active spell and a $4 break, touching $31, which is within $1 of its low price of $30 made earlier in the year. Although the minority interest did not succeed in getting representation on the board of directors at the annual meeting broker C. A. Clark accomplished some good in that the company's officials have promised to make public reports and have allowed an Eastern mining man the privilege of going down into the mine. The price of the stock recovered to above $34.

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	January.	February.	March.
Arizona, Ltd	2,646,000	2,658,000	2,886,000
Boleo (Mexico)	2,644,800	2,331,832	2,148,383
Copper Queen	10,001,000	8,927,203	10,809,488
Calumet & Ariz	2,331,000	2,024,000	2,820,000
Cananea (Mexico)	3,500,000	3,586,000	3,700,000
Detroit	2,166,156	1,486,400	1,698,975
Imperial	850,000	750,000	825,000
Nevada Con. (Est.)	3,800 000	5,000,000	5,600,000
Old Dominion	2,130,000	2,035,000	2,674,000
Shannon	1,510,696	1 526,000	1,468,000
Superior & Pitts	2,166 000	1,864,000	2,370,000
Utah Copper Co	4,745,066	5,798,819	8,190,000
Butte District	19,250,000	13,758,620	24,000,000
Lake Superior	19,260,127	18,250,000	19,250,000
Total production	77 000,845	69,995,874	88,439,846
Imports, bars, etc	24,305,526	14,093,381	....
Imp. in ore & matte	7,053,522	6,063,764	....
Total	108,359,893	90,153,019	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report for March includes for the first time the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
IV, 1909	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767

VISIBLE STOCKS.

	United States.	Europe.	Total.
IV, 1909	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,203,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

It is the general opinion that copper stocks have been sold to a standstill and that all offerings of the better class have gone into a bag.

There has been no news from the newer Lake Superior properties, although Lake stock shows wide variations according to the buying or selling. During the week it has had an extreme fluctuation of $8, making a low at $49.50, from which it has recovered to $52. North Lake went off $2 to $14.25 and Indiana over $5 to below $25. Offerings of Calumet & Arizona, Granby and Utah Consolidated have ceased and the market for each has steadied.

Butte Coalition directors have declared the usual quarterly 25c. dividend, yet the stock is heavy around $21.

Curb prices have been weak, noticeably so for New Baltic, Bohemia, South Lake and Rhode Island Coal.

Assessments

Company.	Delinq.	Sale.	Amt.
Blue Bell, Idaho	Mar. 14	June 1	$0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Central Eureka, Nev	Mar. 13	Apr. 23	0.02½
Columbus Con., Utah	....	May 11	0.25
Con. Imperial, Nev	Apr. 19	May 12	0.01
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal	....	....	1.25
Hancock, Mich	May 2	....	3.00
Hector, Idaho	Mar. 28	May 26	0.00¼
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	....	2.50
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich	Mar. 10	....	1.00
Ojibway, Mich	Mr.Oct.	....	2.00
Opex, Utah	Apr. 12	....	0.03
Ophir, Nev	Apr. 22	May 16	0.25
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21	....	0.03
Utah, Nev	Apr. 22	May 3	0.05
Utah Con. of Tintic, Utah	May 15	....	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	......	23.708	......
May	52.905	......	24.343	......
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	[illegible]	[illegible]	[illegible]	13.870	[illegible]	[illegible]
February	[illegible]	[illegible]	[illegible]	13.719	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	[illegible]		[illegible]		[illegible]	
May	[illegible]		[illegible]		[illegible]	
June	[illegible]		[illegible]		[illegible]	
July	[illegible]		[illegible]		[illegible]	
August	[illegible]		[illegible]		[illegible]	
September	[illegible]		[illegible]		[illegible]	
October	[illegible]		[illegible]		[illegible]	
November	[illegible]		[illegible]		[illegible]	
December	[illegible]		[illegible]		[illegible]	
Year	[illegible]		[illegible]		[illegible]	

New York, cents per pound. Electrolytic is [illegible] ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	......
February	28.978	32.920	August	29.942	......
March	30.577	32.403	September	28.815	......
April	31.702	......	October	29.444	......
May	30.015	......	November	30.348	......
June	28.024	......	December	29.154	......
			Av. Year	29.465	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	......	4.051	......	13.297	......
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	......	4.815	......	21.531	......
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$ 6.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	......	15.05	......	15.06	......
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.10	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.14	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS Apr. 26

Name of Comp.	Bid.
Listed	
Acacia	.05
Cripple Cr'k Con.	.02
C. K. & N.	.10
Doctor Jack Pot	.07
Elkton Con.	.62¼
El Paso	.74
Fannie Rawlins	.05
Findlay	.07
Gold Dollar	.10
Gold Sovereign	‡.04
Isabella	.16
Mary McKinney	‡.16
Pharmacist	.09
Portland	1.07
Vindicator	.76
Work	.03
Unlisted	
Golden Cycle	1.[illegible]0
United Gold Mines	.07

SALT LAKE Apr. 26

Name of Comp.	Clg.
Carisa	.50
Colorado Mining	.76
Columbus Con.	.54
Daly Judge	‡4.00
Grand Central	1.60
Iron Blossom	1.02
Little Bell	1.40
Little Chief	.45
Lower Mammoth	.56
Mason Valley	8.25
Maj. Mines	2.32½
May Day	.06
Nevada Hills	.63
New York	‡.13
Prince Con.	.82
Red Warrior	6.00
Silver King Coal'n	2.30
Sioux Con.	.31
Uncle Sam	.35½
Victoria	2.00

SAN FRANCISCO. April 26.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.13	Belmont	2.55
Belcher	.95	Daisy	.07
Best & Belcher	‡.25	Jim Butler	.16
Caledonia	.48	MacNamara	.28
Challenge Con.	.28	Midway	.28
Chollar	.20	North Star	.03
Confidence	1.00	West End Con.	.36
Con. Cal. & Va.	1.22	Atlanta	.13
Crown Point	.96	Booth	.14
Exchequer	‡.25	C.O.D. Con.	.07
Gould & Curry	.29	Columbia Mt.	.05
Hale & Norcross	.42	Comb. Frac.	.45
Mexican	1.37	Great Bend	.02
Ophir	1.57	Jumbo Extension	.30
Overman	.91	Oro	.06½
Potosi	‡.50	Red Hill	.04
Savage	.27	Sandstorm	.04
Sierra Nevada	.33	Silver Pick	.09
Union	‡.75	St. Ives	.10
Yellow Jacket	.96	Tramps Con.	.05

N. Y. EXCH. Apr. 26

Name of Comp.	Clg.
Amalgamated	73⅜
Am. Agri. Chem.	45
Am.Sm.&Ref.,com	80½
Am. Sm. & Ref., pf.	104⅞
Anaconda	43⅞
Bethlehem Steel	30
Col. & Hock. C. & I.	‡13⅛
Colo. Fuel & Iron.	38
Du Pont P'd'r, pf.	‡87½
Federal M. & S.	41
Great Nor., ore ctf.	65
Nat'nal Lead, com.	80
National Lead, pf.	108
Pittsburg Coal	19
Republic I&S, com.	34
Republic I & S, pf.	99
Sloss Sheffi'd, com.	73½
Sloss Sheffield, pf.	117½
Tennessee Copper	30
Utah Copper	45
U. S. Steel, com.	82⅞
U. S. Steel, pf.	119¾
Va. Car. Chem.	82⅞

N. Y. CURB Apr. 26

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19½
Braden Copper	4⅜
B. C. Copper	6¼
Buffalo Mines	3½
Butte Coalition	21¼
Chino Copper	11⅞
Cobalt Central	.10
Combination Fra.	.46
Con. Ariz. Sm.	2¼
Cumberland Ely	‡9
Davis-Daly	2
Dominion Cop.	7
Ely Con.	.58
El Rayo	3
Florence	3⅛
Gila Copper	6
Giroux	7⅞
Gold Hill	1⅜
Goldfield Con.	8
Greene Cananea	8⅞
Guanajuato	1⅝
Guggen. Exp.	187
Kerr Lake	.08 11/16
La Rose	4½
McKinley-Dar-Sa.	.90
Miami Copper	22½
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	⅞
Newhouse M. & S.	‡3½
Nipissing Mines	9⅞
Ohio Copper	3½
Pacific Sm. & M.	⅞
Silver Queen	.12
Standard Oil	638
Stewart	¾
Tonopah	7¼
Tonopah Ex.	.84
Tri-Bullion	⅞
Utah Apex	3½
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4 7/16

LONDON Apr. 27

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	12	6
Esperanza	2	10	0
Tomboy	0	18	0
El Oro	1	7	6
Oroville	0	10	0

BOSTON EXCH. Apr. 26

Name of Comp.	Clg.
Adventure	6
Allouez	45
Am. Zinc	25
Arcadian	5½
Arizona Com.	17
Atlantic	7½
Boston Con.	18
Butte & Balak.	9¼
Calumet & Ariz.	64
Calumet & Hecla	580
Centennial	18
Con. Mercur	.10
Copper Range	69
Daly-West	8¾
East Butte	8
Franklin	12⅛
Granby	47
Greene—Can.	9
Hancock	19½
Helvetia	3
Indiana	24⅞
Isle Royale	16¾
Keweenaw	4¼
Lake	52½
La Salle	13½
Mass	7¼
Michigan	5½
Mohawk	51
Nevada	20½
North Butte	34¼
North Lake	14¼
Ojibway	8
Old Dominion	35½
Osceola	138
Parrot	15⅛
Quincy	81½
Shannon	12
Superior	43
Superior & Bost.	11⅛
Superior & Pitts.	12⅞
Tamarack	58
Trinity	6
U. S. Smg. & Ref.	42½
U.S.Sm. & Re., pd.	49
Utah Apex	3½
Utah Con.	23
Victoria	3
Winona	7¾
Wolverine	125
Wyandotte	2

BOSTON CURB Apr. 26

Name of Comp.	Clg.
Ahmeek	170
Bingham Mines	3⅛
Boston Ely	2¾
Calaveras	5⅞
Champion	.09
Chemung	9½
Chief Cons.	1⅝
Chino	11¾
Cons. Ariz.	2¼
Corbin	.07⅜
Cactus	3¼
Crown Reserve	3¼
First Nat. Cop.	2½
Gila Copper	‡6⅝
Indiana	34½
Inspiration	7⅛
Majestic	.72
Nevada-Douglas	2⅝
New Baltic	7½
Oneco	3¾
Ray Central	2 13/16
Ray Con.	18⅛
Rawhide Coal	30
Rhode Island Coal	8
San Antonio	‡10
Shattuck-Ariz.	25⅛
South Lake	6¼
Superior & Globe	‡ 60
Trethewey	1.34
Tuolumne Copper	‡3¾
Vulture	9⅜
Yuma	.90

‡Last quotation.

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May 7................ 11,000

None sent free regularly, no back numbers. Figures are live, net circulation.

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**Illustrated.*

Rossiter W. Raymond

The celebration of Doctor Raymond's 70th birthday makes an appropriate occasion for the JOURNAL to express its appreciation of the high services that in a professional career of nearly 50 years he has rendered to the mining industry of the world, its recognition of his help in advancing the standing of the profession of mining and metallurgical engineering, and finally its own respect that is due to him as a father, because, although he was not the first editor of the JOURNAL, it was certainly he who shaped its editorial policy into that form which has come down as tradition and precedent. Raymond became editor of the JOURNAL on July 13, 1867, and continued in that position until 1874, when the multiplication of his other duties necessitated his withdrawal from sole editorial control. He became, then, joint editor with R. P. Rothwell, this arrangement extending into the '80s, and finally a special contributor. Up to the present time no volume of the JOURNAL has ever been published which has not contained some contribution by him.

The major portion of Raymond's sole editorship of the JOURNAL was contemporaneous with his filling of the position of U. S. Mineral Commissioner, and during that time he produced those wonderful volumes upon the mineral resources west of the Rocky mountains, which are the admiration of everyone who has had occasion to study them. Respecting them, the present editor of the JOURNAL can speak with peculiar appreciation, because of the minute examination of them that was necessary in connection with a historical investigation. No one better than he can praise the beauty of their style, their language always clear, incisive and easily flowing, the accuracy of the descriptions, the keenness of the perception manifested throughout, and the remarkable prophecies that had to await only a few years for their fulfillment. Written 40 years ago, when the Pacific railway had just been completed, and the Great American Desert was receiving the first strokes of development, especially as to its mining industry, these volumes can be read with almost as much interest today as when they were penned, and they may be read also with profit. No other country possesses such a chronicle of the development of its mining industry, and we may rightly esteem these volumes as classics of mining literature.

In his subsequent career as secretary of the American Institute of Mining Engineers, Raymond has added to the archives of mining and metallurgy more than any other one man, not so much by his personal contributions, although they have been important, always valuable and always highly appreciated, but as the extractor and the producer of the records, views and opinions of other men, who have done things. The profession which has witnessed and valued the results has perhaps had but scant appreciation of the thoughtfulness and tireless energy that have drawn out these contributions and have smoothed them into the clear and creditable essays and monographs of which the authors have been proud.

Doctor Raymond remarked last Saturday evening that he had not done those things that he had in mind to do and wanted to do, fate having directed his activity into other channels, but as it was decreed he set his hand to the plow and has had joy in his work. This is the principal thing, because he who enjoys what he is doing, is apt to do it well. Whatever may have been Doctor Raymond's former aspirations, in looking back over his long and richly varied career, he may feel a satisfaction in the knowledge that the mining industry and profession value enormously high the results in their behalf that he has achieved.

The Copper Market

It must be admitted that the European copper statistics for the second half of April are disappointing, there having been no reduction in the visible supply. This is somewhat surprising in view of the lightness of the exportation from this side in March and April, and is explainable only by a failure of the demand from consumers on the other side to maintain itself at the rate expected. Statistics due next week will undoubtedly show an increase in the accumulation on this side. Consequently the situation will appear statistically less favorable at the end of April than it was a month previous.

While we are optimistic in a broad view, especially with respect to increasing consumption, it must be recognized that for the moment the prospect for the copper market is inauspicious. Although the world's visible supply is proportionately less than some previous accumulations the existence of a large stock has created a pessimistic popular impression which apparently cannot be dispelled. Although manufacturers may recognize that copper ought to fetch upward of 13c., they evidently are not interested in laying in supplies under present conditions. The outcome will probably be such concession in price by the leading producers as will interest speculators in taking over large blocks of the accumulation with a view to carrying the metal for a long pull. After that the market may be in a position for an upward turn. At what price speculators will be interested remains to be seen.

Connellsville Coke Production

The weekly figures of coke production issued by the Connellsville *Courier* are usually so nearly correct and are so generally accepted that when they apparently showed a drop of over 100,000 tons in the production, we sought to assign reasons for such a drastic reduction. It now appears that in some unexplained way an error was made in the figures, and that the falling off in the week ended April 16 was really only about 9000 tons. We may add that for the week ended April 23, the figures for which have since been received, there was a further drop of about 13,000 tons.

The production for last week was, therefore, the smallest reported this year, and was 38,500 tons below the weekly average for the first quarter. This, though very much less than the supposed reduction, is in itself a considerable decrease; and some of the reasons given in our comment will apply to the lesser actual decline in the production.

Charles F. Chandler

High testimonials were paid to Prof. Charles F. Chandler at the dinner given in his honor by his friends and the chemical fraternity on April 30, in New York, on the occasion of his retirement from active work at Columbia University. Those tributes were well deserved. Beginning over half a century ago when chemistry was not far past the first stages of its present development, he has not only kept pace with, but helped to lead that development. An indefatigable worker, he also rendered excellent service as a professor, as a member and president of the Board of Health of New York and in other public capacities. With all this, he was able to continue the studies and investigations which kept him in a high rank among the chemists of his time.

Among mining men he will be best regarded and esteemed for the work which he, with Professor Egleston, did in organizing the Columbia School of Mines, and in developing it from its small beginning to its present high standing. No small part of its success has been due to his work, and to the faculty which he possessed of holding the interest of his students and gaining their respect and personal attachment.

Professor Chandler retires from his official positions, but he is not a man to lose interest in his profession, and he will doubtless remain a student and a worker during the years left to him, which we all hope may be many.

Coal Mining Wages and Prices

The inevitable result of the Western wage settlements is an increase in the cost of mining. In several important districts an increase of 5c. per ton in the mining rate has already been agreed on, and it seems certain that others must follow. Besides this, increases are being made in day wages, deadwork and other items, which will bring the advance in the cost of coal at the mines well up to 10c. per ton. This is an increase which operators in many districts are hardly able to carry under existing conditions. Unless there is a corresponding general advance in selling prices, many mines will have a hard time to make ends meet, to say nothing of profits. That such an advance can be secured under the competition of the nonunion States is by no means certain.

The great weakness in spelter during the last month has been due to the overbought condition of the principal manufacturers and the continued large production by the smelters. Operations of the latter have been stimulated by the liberal supplies of ore. This industry is fortunately one in which demand and supply can be quickly adjusted, operations in the zinc mines, as a rule being conducted upon a relatively small scale, permitting quick closure, while similarly among the smelteries it is a comparatively easy matter to put furnaces upon "dead fire," or let them go cold. Mines in the Joplin district are already being closed, and doubtless also the smelters will shortly begin to relax their pace, unless there be a speedy revival in demand.

The bill creating a bureau of mines has passed the Senate, and doubtless will promptly become a law by the President's signature. Although we have not been of the opinion that this bureau is necessary, we bow to it as an organization about to be established and are wishful that it may have a successful and useful career. If Doctor Holmes becomes its head, we are sure that its affairs will be directed with sincerity of purpose, a high order of intelligence and a capacity for management that has been well proved. The Geological Survey is to be congratulated upon the removal of interests that are foreign to its proper field.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Fifth Annual Report of Utah Copper Company

The 1909 report of Utah Copper Company gives the means of calculating some of the costs and production percentages, which, in view of the great interest in porphyry coppers, may prove instructive.

Probable Grade of Ore

The total ore treated was 2,674,271 tons. The total production of copper contained in concentrates was 54,472,845 lb. This equals 20.3693 lb. per ton of ore, or 1.0185 per cent. If the ore treated was of the same grade as the stated average grade of the reserves, or 1¾ per cent. copper, the mill saving in concentrates was but 58.2 per cent. No authoritative statement of the actual grade of ore milled has been published, but as the saving in concentrates may be taken to be between 65 and 70 per cent., the ore probably has averaged between 1.45 and 1.55 per cent. copper. The production of copper at 8.787c. per lb. from material of such extremely low grade would have been considered impossible upon this character of ore if it had not actually been done, and reflects great credit upon the engineers in charge.

The concentrates yielded 20,862 oz. gold, or 0.00780 oz. per ton of ore treated, or 0.806c. per lb. of net copper production. They also yielded 198,943 oz. silver, smelter returns, or 0.0744 oz. per ton of ore treated, with a value of $102,511, or 0.198c. per lb. of net copper production. As the smelter return for the silver was 95 per cent. of the actual silver in the concentrates, as per assay, the total silver in the concentrates was 209,414 oz., or 0.0783 oz. per ton of ore treated. Excluding the smelter returns of the gold and silver (1.004c.), the cost of the copper (net production) was 9.791c. per pound.

The net copper production of 51,749,233 pounds of copper is equivalent to 19.3508 lb. of copper per ton of ore reated, or 0.9675 per cent. This shows melter deductions and allowances of 2,723,612 lb. of copper from the ontents of the concentrates for melting losses, or precisely 5 per ent. As the copper content of the oncentrates is stated to be 26 per cent., the total copper content of the concentrates divided by 0.26 will give the weight of the concentrates. This is 209,510,942 lb., or 104,755 tons dry weight. Freight paid on ore is stated to be $762,081, or 28.497c. per ton of ore treated. But as the freight rate on ore is 27c., the difference, 1.497c. per ton, amounting to $40,034, may be assumed to be the freight on concentrates from the mills to the smeltery, or 38.2c. per ton of dry concentrates. As the concentrates contain about 14 per cent. moisture, the average freight on them from the two mills may be taken as about 34c. per ton.

Mining and milling at 94.43c. per ton of ore treated equals $2,525,314, and may be assumed to include the items in the income account; "operation," "mine development," "prepaid expense, ore stripping," and "New Jersey annual license tax," which sum up $3 less. There is not sufficient information in these reports to be able to calculate what the mining costs and milling costs separately were. However, the quarterly reports that have been published from time to time give a division of the mining and milling costs which, while showing considerably lower costs than shown in the annual report, may be used by increasing the amounts proportionally to give an approximate figure which cannot be far wrong. Two of these reports, which I have at hand, give an average of 66 per cent. milling and 34 per cent. mining, which applied to the figure 94.43c., gives milling 62.40c. and mining 32.03c. per ton treated.

"Treatment and Refining" may be assumed to include smelting charges, converting, and freight, refining and selling charges on the blister copper returned by the smeltery. These charges amount to $1,779,866, or 3.44c. per lb. of net copper production. According to the Utah Consolidated report for 1908,[1] its cost for "freight, refining and selling" for that year was 1.328c. per lb. of copper, and from the dividends paid by the Raritan refinery it is apparent that there was an ample profit in the operation at that price. If we assume that the Utah Copper Company had as good a rate, then the smelting and converting charges amounted to 2.112c. per lb. of net copper produced, or $10.433 per ton of dry concentrates.

In smelting the concentrates some fluxes will have to be added to produce a fusible slag and it may be calculated that the slag produced will amount to about 84 per cent. of the weight of the concentrates, equal to 88,000 tons. The copper in the slag probably amounted to 0.5 per cent. or 880,000 lb., which was lost by the smeltery. There was an additional copper loss in the smeltery from stack losses and dust which may be approximated as 800 lb. of copper per day, or 292,000 lb. for the year, making with the slag loss a total of 1,172,000 lb. of copper lost in the smeltery. The difference between this amount and the amount deducted for smelting losses from the content of the concentrates is 1,551,612 lb., which, after deducting converting, freight and refining costs, was worth 11½c. per lb., or $178,435, at the smeltery.

If we add to this the difference between the amount paid for the gold at $20 per oz., and the price ordinarily paid for gold in blister copper, $20.50 per oz., making $10,431, we have $188,866 to be added to smelter charges, or $1.803 per ton of concentrates, making a total smelting charge of $12.236 per ton. No allowance should be made for any gain to the smelter in the silver contents, as the silver losses on such low-grade material will fully equal the deduction.

Cost of Smelting

The cost of smelting these concentrates at Garfield, including calcining, general expenses, taxes, insurance, salaries, etc., may be taken to be $2.50 per ton. To this must be added the cost of 9.3 per cent. iron at 7c. per unit, 2.5 per cent. lime at 6c. per unit, or 80c. per ton for fluxing, and the cost of converting 494 lb. of copper at $7 per ton of copper, or $1.73 per ton of concentrates, being a total of $5.03 per ton. This leaves a net profit per ton to the smeltery of $7.206 per ton of concentrates, equal to $754,865, or 1.459c. per lb. of net copper produced.

No allowance is made for interest as it is apparent that the mine is carrying the metals during treatment. Amortization of the smelting plant is not considered, but it is evident that sufficient profits are being made to provide a surplus that would amortize the plant in a short time.

Redick R. Moore.

New York, May 2, 1910.

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[1] "The Mineral Industry," Vol. 17, p. 213.

Determination of Sulphur in Cyanide Solutions

A correspondent inquires if some reader of the Journal will describe an accurate method of determining sulphur existing as sulphide in cyanide solutions or in commercial cyanide.

April Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during April, 1910, by a number of mining and industrial companies in the United States, Canada, and Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Am. Sm. & Ref., pf.	U. S.	$1.75	$875,050
Am. Zn. Lead	Kan.	0.50	40,060
Anaconda, c	Mont.	0.50	600,000
Arizona Copper	Ariz.	0.047	59,485
Boston & Mont., c	Mont.	3.00	450,000
Boston-Sunshine, g	Utah	......	3,004
Bunker Hill & Sul	Ida.	0.25	75,000
Caledonia, s.l	Ida.	0.02	20,000
Champion Copper	Mich.	2.00	500,000
Copper Range, c	Mich.	1.00	384,185
Daly-West, s.l	Utah	0.30	54,000
Florence-Goldfield, g	Nev.	0.10	105,000
Gladstone, g	Cal.	......	3,000
Goldfield Con., g	Nev.	0.50	1,779,424
Guggenheim Expl.	U. S.	2.50	519,832
Hecla, s.l	Ida.	0.01	10,000
Homestake, g	S.Dak.	0.50	109,200
Iron Silver, s.l	Colo.	0.10	50,000
Kennedy, g	Cal.	......	30,000
New Idria, g	Cal.	0.30	30,000
Portland, g	Colo.	0.02	60,000
Sioux Con., s.l.g	Utah	0.04	29,855
Snowstorm, s.l	Ida.	0.01½	22,500
Stratton's Independence, g	Colo.	0.50	500,000
Tonopah of Nev.,g.s.	Nev.	0.35	350,000
U. S. Min. & Sm., pf.	Utah	0.87½	307,033
U.S. Min. & Sm.,com.	Utah	0.50	243,022

Foreign Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Cia. Met. de Torreon	Mex.	......	$300,000
Crown Reserve, s	Ont.	$0.15	265,000
Hedley Gold, g	B. C.	0.30	36,000
Hudson Bay, s	Ont.	3.00	23,283
La Rose, s	Ont.	0.10	149,840
N.Y. & Hond.Ros.,g.	C. A.	0.10	15,000
Nipissing, s	Ont.	0.36¼	435,000
Pinguico, s	Mex.	3.00	60,000
Right of Way, s	Ont.	0.02	33,710
Temiskam'g & H.B.,s	Ont.	3.00	23,283

U. S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
Amer. Ag. Chem	U. S.	$3.00	$544.590
Consolidation Coal	Md.	1.50	285.370
Genl. Chem., pfd.	U. S.	1.50	150,000
National Lead	U. S.	1.25	258,192
Pittsburg Coal	Penn.	1.25	371,263
Republic I. & S.	Ill.	1.75	359,296

Chronology of Mining for April, 1910

April 1—All of the organized coal workers of the Eastern and Central coalfields quit work.—Wages of iron miners in Lake Superior region increased by U. S. Steel Corporation from 6 to 8 per cent.

April 4—Mount Hope washery near St. Clair, Penn., burned.

April 5—Accident to engine at the Neversweat mine, Butte, killed engineer McNabb and caused extended shutdown.

April 9—Fire at Consolidated mill, Goldfield, Nev., destroyed refinery, conveyer and trestle to mill and damaged 20 stamps, causing cessation of all milling operations for seven days.

April 10—Receivers appointed for Mitchell Mining Company, owning La Dicha mine, Guerrero, Mexico.

April 13—Shipping from open pits began on Mesabi range, Minnesota.—U. S. Steel Corporation advances wages of its 200,000 employees.

April 14—Ten men killed in Santa Gertrudis mine, Pachuca, Mex., by failure of air compressor to supply ventilation.

April 16—Consolidated Arizona company resumed smelting at Humboldt, Arizona.

April 20—British Columbia Copper Company secures practical control of the New Dominion Copper Company—Merger of Dominion Iron and Steel and Dominion Coal companies approved at joint directors' meeting.

April 21—Forty-one men killed by explosion in coal mine at Mulga, Alabama.

April 22—Mine explosion at Amsterdam, O., kills 18 men.

April 25—Compromise effected between Bunker Hill & Sullivan and Federal companies, the latter relinquishing the Last Chance mine in Idaho in exchange for 27,000 Bunker Hill shares.

April 24—Accident, caused by a cave, in the Camelia mine, Pachuca, Mex., kills seven miners.

April 30—Coal strike practically settled in Indiana, Ohio and Pittsburg.

The Clancy Cyanide Patents

Owing to the extensive discussion relative to the nature of the Clancy process and the reticence of the controlling company in furnishing the details of same prior to the issuing of patents, the texts of the patents issued on April 19, 1910, to John Collins Clancy, (U. S. Pats. 955,318 and 955,319) contain some specific statements of interest.

Treating Refractory Ores without Preliminary Roasting

The Clancy process is designed particularly to treat, without preliminary roasting, refractory ores, especially those containing reducing agents or tellurium. Mr. Clancy states in his first patent that he has discovered that ores containing the precious metal may be advantageously treated by the use of a cyanide solution containing a soluble iodide and a suitable substance capable of yielding nascent oxygen in said solution. He suggests using, as an example, a potassium-cyanide solution with a soluble persulphate such as sodium or ammonium persulphate, and iodine or a soluble iodide such as potassium iodide. The desired result is said to be prevented if the solution is substantially acid, although it will take place if the solution be neutral or alkaline or only slightly acid. The following proportions of these chemicals are suggested as answering the purposes of the process. A solution containing one pound of potassium cyanide, one-half pound of potassium iodide, three pounds of sodium persulphate, and one-half pound of lime or soda dissolved in one ton of water and used in the proportion of two parts of the above solution to one part of ore. The solution can be used repeatedly by keeping up the requisite strength in cyanide and sodium persulphate, but no further addition of potassium iodide is necessary except to compensate for mechanical losses as the persulphate regenerates the iodide.

Mr. Clancy also suggests another way of carrying out his invention by substituting ozone for the persulphate, recommending a solution of one pound of potassium cyanide, one-half pound of potassium iodide, and one-half pound of lime or soda dissolved in one ton of water. The amount of ozone to be passed into the solution, with or without the admixture of air, is to be determined by titration or otherwise. He found that 200 grams of ozone per ton of solution gave good results, although with some ores as little as 15 grams was successfully used. When the ozone is used, no further addition of potassium iodide is necessary except to compensate for mechanical losses, the ozone regenerating the iodide. Peroxide of nitrogen may also be used as an oxidizing agent. It is stated that instead of applying said oxidizing agents to the solution in the presence of the ore, they might be applied, although less advantageously, to the solution after it has been separated from the ore. It is claimed that it is not necessary to roast the ore, since the reducing agents such as sulphides of iron, etc., do not act upon the solution to decompose it, and the tellurium is dissolved simultaneously with the precious metal.

The Specific Claims of the Patents

Mr. Clancy's specific claims under Pat. 955,318, are:

1. The process of treating pulverized ore containing precious metals, which consists in subjecting said ore to the action of a cyanide solution, a soluble iodide and a substance capable of yielding nascent oxygen in the presence of said solution.

2. The process of treating pulverized ore containing precious metals, which consists in subjecting said ore to the action of a cyanide solution, a soluble iodide and ozone.

The specific claims under Pat. 955,319 are:

1. The process of treating pulverized ore containing precious metals, which consists in subjecting the ore to the action of a cyanide solution, a soluble iodide and a soluble persulphate.

2. The process of treating pulverized ore containing precious metals, which consists in subjecting the ore to the action of a cyanide solution, a soluble iodide, and persulphate of sodium.

3. The method of treating ores containing tellurides of gold, which consists in applying thereto a cyanide solution, a soluble iodide and a soluble persulphate.

Two Sides of the Consolidation Question

Special Correspondence

The Crown Mines, Ltd., and Jupiter-Simmer Deep present two interesting contrasts among the numerous amalgamation schemes that have lately been brought about on the Witwatersrand. The Crown Mines comprises a number of properties that had already been laid out as separate mines and equipped with separate reduction works prior to amalgamation, whereas the Jupiter-Simmer Deep amalgamations were able to start work with a single central reduction plant. Much doubt has been cast on the wisdom of the policy of amalgamating under one management old producing mines, separately laid out and separately equipped, and the career of the Crown Mines, Ltd., is therefore being watched with keen interest.

Of the wisdom of amalgamating adjoining areas not possessing separate power and reduction plants, there can be no doubt, and the career of the Jupiter-Simmer Deep has already demonstrated this practically.

The results obtained so far by the Crown Mines are fully dealt with in the annual report just issued. During the first six months of this period the mines were working as separate concerns, but during the second six months they were operating as an amalgamated concern. During the first half of the year 829,400 tons were milled at a profit of £723,000. The recovery grade was 32s. 6.7d. ($7.92), the costs 15s. 1.5d. ($3.68), and the profit 17s. 5.2d. ($4.23) per ton milled. During the second half of the year 740,900 tons were milled at a profit of £627,135. The recovery grade was 33s. 8.9d. ($8.20), the costs 16s. 9.8d. ($4.08), and the profit 16s. 11.1d. ($4.12) per ton milled.

The separate producing companies which comprise the Crown Mines were doing better a year ago than they are today, although the ore is not poorer now than it was then; the scarcity of native labor during the last six months, however, has been a great handicap, and the consulting engineer, G. E. Webber, maintains that the improved results anticipated will yet be realized. The ore reserves are estimated at 3,916,500 tons of a value of 7.7 dwt. per ton.

The advantages of amalgamating a large area when it is able to start fresh with a single central reduction plant are well demonstrated by the year's results of the Jupiter-Simmer Deep. In spite of its lower grade, the relatively large proportion of unpayable ore and greater depth, its working costs are 15s. ($3.65) per ton milled as compared with the 17s. ($4.12) of the Crown Mines—the stoping conditions, it should be mentioned, are approximately the same in these two areas. About 70,000 tons per month are being crushed by the Jupiter-Simmer Deep. The profit for the year was £234,700. The ore reserves are estimated at 2,508,000 tons of an average value of 5.5 dwt. per ton.

Alexander Agassiz

Alexander Agassiz, whose likeness is reproduced herewith, and a sketch of whose life and services was published in the Journal of April 16, was known chiefly in his later years as a scientist and investigator. Most of his time in those years, indeed, was spent in the study of natural history and of scientific problems. Comparatively few remember that over 40 years ago he began the work which brought out and proved his ability as a mining engineer. He went out to the Lake Superior region, and it was under his direction and on his plans that the Calumet and the Hecla mines, then struggling through their first stages, were united and developed into the great Calumet & Hecla property, the most successful and one of the largest copper mines in the world. He was for a number of years in immediate charge of the mines; and, as president of the company up to the time of his death, 40 years, he was in close touch with its affairs and in control of its general management. Its great success was due in large part to his work as an engineer, and his clear-headed business ability also contributed materially.

Alexander Agassiz

Professor Agassiz will probably be remembered chiefly from his scientific labors, which were best known to the world; but the admirable work he did as a mining engineer should not be forgotten.

Anaconda and Amalgamated

The application to list $75,000,000 additional Anaconda stock calls attention to the singular positions now occupied by Amalgamated and Anaconda, says the *Evening Post.* Hitherto the Amalgamated Copper Company was the holding concern for a number of Butte properties. It held among other assets, a majority of Anaconda stock; the minority of Anaconda was left to be traded in on the Stock Exchange. Now the Anaconda increases its stock in order to take over by exchange of shares the assets formerly held by the Amalgamated Copper Company, and it is proposed to list the additional stock. If it is listed, Amalgamated Copper and Anaconda will be traded in side by side on the Stock Exchange, one owning the other, and the other owning all that was formerly owned by the Amalgamated. So much Anaconda will equal so much Amalgamated; or so much Amalgamated will equal so much Anaconda, and the buyer may choose as to the color and beauty of his certificate. In order to obtain admittance to the listed department of the Stock Exchange, before the unlisted department was finally abolished, the Amalgamated Copper Company agreed to submit yearly an income account and balance sheet for each of its constituent companies. Now the Anaconda will be its only constituent; all the others will be constituents of the Anaconda. The matter of consanguinity becomes, therefore, more complicated.

Coal Mine Explosion in Ohio

Of the 23 men who were entrapped by an explosion of gas in the Amsterdam mine of the Youghiogheny & Ohio Coal Company, at Amsterdam, Ohio. only seven men were rescued alive. The bodies of the remaining 16 miners have been recovered. The cause of the explosion has not yet been definitely determined; however, it is presumed that a pocket of gas was ignited by a miner's lamp. Engineer J. W. Paul, of the United States Geological Survey station at Pittsburg, arrived at the mine shortly after the accident occurred. Mr. Paul brought with him four oxygen helmets to aid in the rescue of the entombed miners.

Antimony in the United States

According to statistics collected for The Mineral Industry, the production of antimony ore in the United States in 1909 was 95 tons, valued at $4700, as compared with 360 tons valued at $19,800 in 1908. Under the Payne tariff, the existing duty of ¾c. per lb. on antimony was doubled, with the idea of stimulating the production of domestic ore.

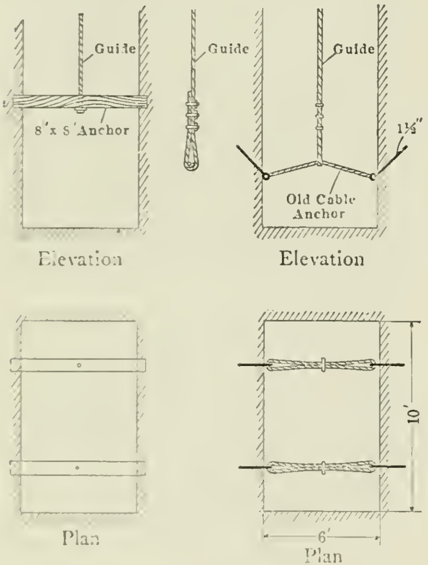
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Anchoring Wire Rope Guides in Shafts

By T. Skewes Saunders*

The method most commonly employed for anchoring wire rope guides in shafts is that of beams placed across the shaft, firmly set in suitable hitches cut in the sides of the shaft. A heavy iron washer is then slipped over the end of the rope guide after which the end is doubled back on itself and held in position by means of a heavy clip. Tension is then applied to the upper end at the head frame, the clip and washer preventing the guide from being pulled, or working its way through the timber anchor.



The Engineering & Mining Journal

Method of Anchoring Rope Guides in Shafts

Another method of anchoring wire rope guides which I have extensively used during shaft-sinking operations, is that of using old cables as anchors. In this method four holes, two on each side of the shaft, are drilled into the walls, inclined upward at an angle of about 45 deg. These holes are drilled to a depth of about two feet, and have a diameter of 1½ in. Eye bolts are driven in as shown in the accompanying sketch. The eye bolts are made of 1¼-in. iron, two feet long outside of the eye, and have their points split for about four inches of their length to allow of the insertion of an iron wedge of one-quarter inch thickness. When the eye bolt together with the wedge is well driven in no amount of strain or vibration upon the guide or anchor will loosen it. A piece of old cable is inserted in the eye of each bolt connecting two opposite anchors. The ends of this old cable are pulled together and held in position by means of cable grips. The wire rope guide is then passed under the old cable, bent back upon itself for about two feet, and secured by cable grips also. The guide is then given the necessary tension at its free end.

The advantage of the cable and eyebolt anchor over the usual timber anchor is that they are less liable to injury by blasting operations, and the ease with which the anchors can be placed as compared with the cutting of the necessary hitches for the timber anchor. I have occasionally seen the eye bolts barbed in order to get a better hold on the rock but when the iron wedge is used and the holes inclined upward at an angle of 45 deg., barbing is unnecessary. The old cable anchors may be used any number of times as one lowers the guides in accordance with the progress in shaft-sinking, but the eye bolts cannot be thus utilized as they are too firmly fixed. Should the eye of the bolt project into the shaft and disturb subsequent timbering or other operations it may be cut off by a hack saw.

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*Mine superintendent, Teziutlan Copper Company, Aire Libre, Puebla, Mexico.

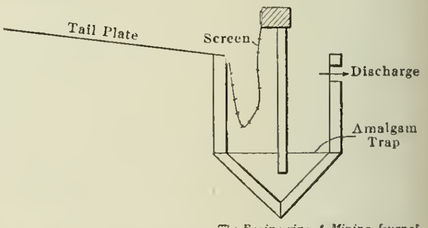
Stoping at Goldfield Consolidated

On the 900-ft. level of the Clermont mine of the Goldfield Consolidated the Clermont stope is opened for about 150 ft. on the strike of the vein and shows a width averaging 40 ft. On account of its high grade, all of the ore must be recovered but it is desirable to use the minimum amount of timber. Under the present stope practice, introduced by J. Donnelly, mine superintendent, 8x8-in. material is used for the square sets and no trouble has been experienced from the timbers swinging. Square sets and waste filling are used.

The orebody is opened in sections eight sets long, and at each eighth set a manway is maintained. Every fourth set is used as a chute. The stope is filled with waste obtained from hanging-wall crosscuts, filling being kept up to the second floor below the back of the stope. Sill sets are 8 ft. in the clear and are framed of 10x10-in. material, but the stope is carried up with 8x8-in. timbers, the sets being 7 ft. high. The end set of each section of stope is left open so that there will be no danger of filling crowding in and wrecking the manways. Where necessary, cribbing is resorted to for confining the filling. By working the orebody in such short sections the danger from timbers swinging is eliminated and it is possible to work successive sections instead of alternate ones as must often be done.

Screen in Amalgam Trap

In the Florence mill, Goldfield, Nev., amalgam traps of the type shown in the accompanying drawing are used below the battery amalgamation plates. A piece of wire cloth is secured to the end of the tail plate and top of the dividing par-



The Engineering & Mining Journal

Amalgam Trap with Screen

[illegible]

tition of the trap and serves to catch lime scale, bits of wood, etc., that have passed through the battery screens. The removal of this lime scale is found to assist the later table treatment.

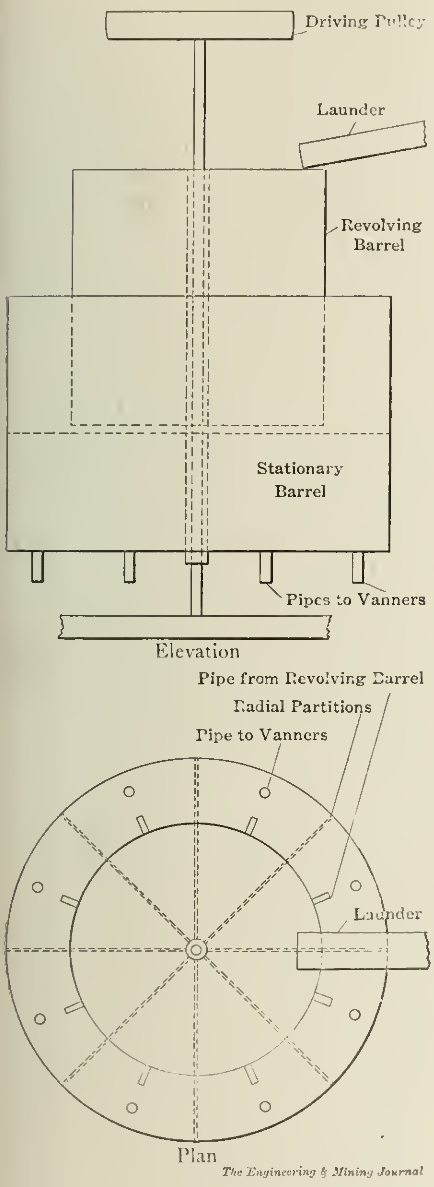
Renewing Filter Leaves

A number of the mills using vacuum fifters of the Butters type find it convenient and cheap to rebuild the worn leaves. The usual practice is to discard the expensive cocoa matting and substitute grooved wooden strips. These strips may vary in lateral dimension but extend the full hight of the leaf. Strips, 2 in. wide with ¼x¼-in. grooves on both sides, are satisfactory. The canvas filter cover is stitched between the strips so that each one slips in a separate pocket. Filter leaves constructed in this manner are thoroughly satisfactory, wear well and can be built at a reasonable cost at the works.

During the last year three additional steam shovels have been provided by the Utah Copper Company, making eleven in all; four locomotives, making a total of 21 now in service; and twenty dump cars, making a total of 145. There were also added 6.4 miles of standard-gage railway track for stripping and mining purposes, making a total of about 16 miles.

Pulp Distributer

The accompanying sketch shows a pulp distributer in use at several mills. The machine shown is driven by a belt from a vanner line shaft, but by turning the spouts horizontally it may be made automatic, although the feed will not be positive and the machine will stop when the pulp discharge is low. The machine consists of a barrel, the bottom of which is divided into as many radial segments as there are vanners or tables to feed. Inside this barrel another barrel revolves, carrying in the side near the bottom as many radial pipes as there are divisions in the outer stationary barrel. This is not arbitrary, since as many pipes may be used as necessary. The pulp is fed into the inner barrel, which revolves at about 50 r.p.m. and distributes the pulp evenly into the compartments of the outer stationary barrel. This arrangement will satisfactorily feed 10 tables.



Pulp Distributer used in the Joplin District

Inaccuracies of Churn Drill Sampling

By Horace A. Fuld*

In the development of the low-grade copper deposits, it has become the custom to prospect for ore by means of churn drills. The results are averaged and the worth of the property thus approximately determined. The accuracy of the method may be questioned for the following reasons:

In looking over the assay returns from any hole, one will notice the gradual change in mineral content; no sudden jump as in mine sampling is apt to show. This is probably due to the jarring loose of material from above by the rope and string of tools. In bailing out each five feet of hole, the bailer pumps out the bottom first, and theoretically the ore will concentrate at the bottom. The bailer will pick up not more than, say, 90 per cent. of the churned material, and the sample would thus be increased over the actual mineral content of the five feet of ground.

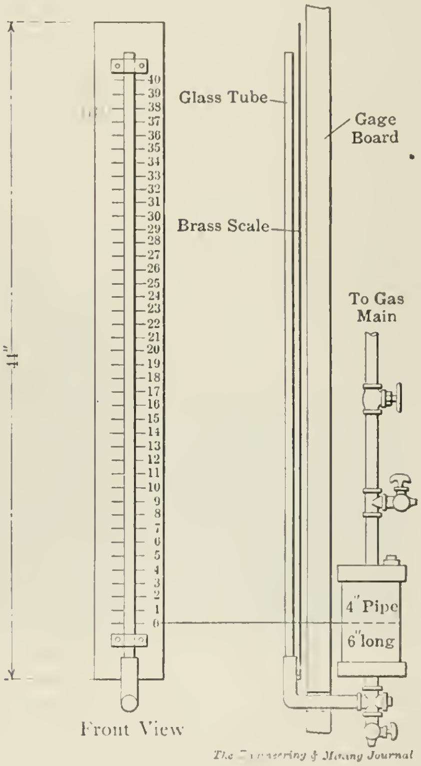
For a distance of 100 ft., drilling through copper sulphides, I took samples of the first and last bailing of each five feet. These showed a difference of but 0.01 per cent., and it was concluded that this departure from the theoretical concentration was due to float mineral and slimes. The mineral was assumed to have been ground up in the hole and then, through the medium of the circulating ground water or that from local fissures, was dissolved or floated away. This supposition is borne out by the fact that where raises have been cut around drill holes, the ore from the raises averages several tenths of a per cent. higher than the results obtained from the drill holes. Were this loss by float mineral negligible, the fact that not all the churned material is bailed up would give a false value for that particular sample although the average for, say, 50 ft. would be correct.

In the foregoing discussion I have concerned myself with a dry, non-caving hole. If the hole be wet or caving, the above inaccuracies still hold good and many new ones are introduced. A wet hole would tend to "slough off" material from above; in the bottom, more so than when the sludge is thicker; it would carry off a greater percentage of float mineral; and, finally, it would dissolve out the ore minerals in preference to the gangue, especially if the water were acid.

By careful panning, much can be learned concerning conditions in the hole. Each district has peculiarities of its own, and only by constant vigilance can accurate results be hoped for. In places where the zone of secondary enrichment is being sought, or where a more or less blank capping overlies the ore, the holes should be cased when the desired ore is encountered.

An Improved Water Pressure Gage*

In rearranging the indicating and recording instruments in a blast-furnace gas-cleaning plant, it was necessary to overcome the frequent blowing out of the liquid in a U-tube water-pressure gage. This gage is used to show the pressure of the gas as it enters the scrubbers, and on account of sudden changes in pressure when the furnace slips, frequently goes for a few seconds as high as 40 in. of water.



Improved Water Gage

With the old U-tube gage the quick rise in pressure would cause the water to move so fast that it would blow out and then the gas would have to be shut off the gage and the latter carefully refilled to the zero mark.

A gage was made consisting of a single 1/8-in. glass tube with a rubber connection through the gage board to a piece of pipe, 4 in. in diameter and 6 in. long, on the back of the gage board. The pet cocks shown are for adjusting the gage to zero.

To prepare the gage for use, the pet cocks and valve are closed and the 4-in. pipe is filled with water; then the lower pet cock is opened until enough water runs out to allow the water in the glass tube to stand at zero. The filling plug is then replaced and the valve in the pipe leading to the gas main is opened. To test the gage for zero, close the valve and open the upper pet cock.

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*Miami Copper Company, Miami, Ariz.

**Power*, April 5, 1910.

On account of the lowering of the surface of the water in the larger pipe, the scale of 40 graduations should be only

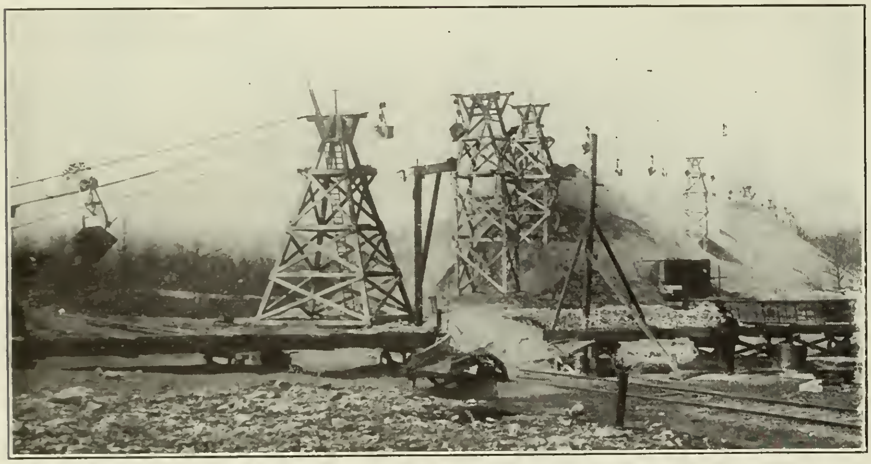
$$\frac{40 \times (4^2 - \frac{1}{8}^2)}{4^2} = 39.96$$

inches long, but for ordinary work this error could be neglected.

The large body of water in the 4-in. pipe "chokes" the tendency toward a sudden rush of water through the tube and with the compression space above the water makes it almost impossible to blow out any water under working conditions.

Tailings Tramway of the Federal Lead Company

The handling of tailings from a mill treating 3000 to 4000 tons of ore per day is a problem that is of utmost interest to mill operators. The plant in use by the Federal Lead Company, Flat River, Mo., consists of an aërial tram 2500 ft. long. The towers are 100 ft. high and a 1⅝-in. lock-coil cable is used for the loaded buckets and a similar cable 1⅛ in. in diameter for the empty buckets. The traction cable is ⅞ in. in diameter and has six strands of seven wires each. The speed of the traction cable is 260 ft. per minute, and the buckets are spaced 110 ft. apart. There are 45 buckets, each having a capacity of 22 cu.ft. or about 2300 pounds.



Aerial Tram and Tailings Dump, Federal Lead Company, Flat River, Missouri

This system has been in use 2½ years and handles approximately 3000 tons per day. Nearly all of the available space for dumping beneath the cable is now taken up, and in order to provide more space it will be necessary to build the towers still higher. The accompanying illustration shows the plant in operation. Four men are required to operate the system.

Notes on Drilling Placer Ground

In boring dredging ground not deeper than 40 ft., it is possible to do the work with hand tools. Many "sample" bores have been put down without casing, or if casing was used, its function was merely to prevent the sides of the hole falling from above the tool. A derrick, described by Ernest K. Hall, in *Aust. Min. Stand.*, composed of three light, round sticks and giving 17 to 18 ft. head room is set up over the station, and a windlass set across two of the legs for raising and lowering the rods and tools. Suitable windlass rope is 5/16-in. flexible plow steel.

In raising the casing after a hole is finished, the dead weight of the pipes is a small matter compared with the friction to be overcome. It is handy to have always hanging from the derrick head a 1½-ton chain hoist. In pulling the casing, give it a turn or two just before pulling with the hoist. If this is insufficient, two sapling poles, like that used for turning, may be attached to the casing near the ground by close link chain, and opposite one another. These then add their pull as levers, using logs or anything else suitable and convenient for a fulcrum.

The core of ground is cut and removed by whatever tools are appropriate, to a depth of from 6 to 10 in. above the bottom of the casing. Since the accuracy of the whole operation depends greatly on the care used in not letting the tool penetrate below the casing, it is advisable to always leave as much as possible of the core near the bottom of the casing untouched, until this is lowered another stage.

In New South Wales last year 1677 tons of stream tin, valued at $714,630, were recovered by dredging. This was an increase of 115 tons over 1908, and was 69.5 per cent. of the total production of tin ore in the State.

The Electrolytic Determination of Copper at Tennessee Copper Company

By T. W. Cavers and J. P. Chadwick *

To determine rapidly and accurately the copper contents of the numerous ores and furnace products which are daily brought to the smeltery laboratory for analysis, the chemist has, in the majority of cases, adopted the electrolytic method. The various authorities on electrochemistry have discussed this subject mainly from the scientific standpoint, and although accuracy has been attained, the time factor has been treated as unimportant, so that the conditions under which their determinations have been made, are manifestly impossible to the technical chemist. It is hoped that the methods practised in the laboratory of the Tennessee Copper Company may prove both interesting and helpful.

Laboratory Equipment

The laboratory equipment includes two electrolytic cabinets of different types: The rotating and the Guess-Haultain, which will be referred to as the stationary. The rotating type has been fully described[1] by A. M. Fairlie and A. J. Bone, so that a brief description will suffice. The cabinet is made up of eight units in series, and connected with a 220-volt circuit which will be replaced by a 550-volt circuit to insure steadier current. The cathodes are perforated platinum cylinders, 2 in. in diameter, with approximately 100 sq.cm. plating surface. Propeller-shaped platinum anodes revolving at about 500 r.p.m., agitate the electrolyte. By employing variable resistances, a current may be obtained ranging from 0.1 of an ampere, up.

The Guess-Haultain cabinet consists of 30 units in series, and takes the current from a 550-volt line. The main distinctive features of this cabinet are: (1) A cathode suspended between two stationary anodes, the cathode being made from corrugated sheets of sand-blasted platinum, and having a plating surface of approximately 65 sq.cm.; (2) a small container for the electrolyte with a consequent concentration of the copper solution. Other minor features make the manipulation simple. For a detailed description of this cabinet, reference may be made to the paper by G. A. Guess.[2] The range of current at present employed on the Guess-Haultain is from 0.1 to 1.5 amp. and is obtained by using unit and variable resistances.

The daily routine of the laboratory includes the determination of copper in the following: Tennessee Copper Company ores; custom ores; blast-furnace slags; mattes and blister copper. The slag and blister-copper assays are made on the rotating, and the others on the stationary cabinet.

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*Chemists, Tennessee Copper Company, Copperhill, Tenn.

[1] *Electro-Chemical and Metallurgical Industry*, Jan. and Feb., 1908.

[2] *Trans.*, A. I. M. E., 1905.

ROTATING ANODE CABINET

An average analysis of the slag is as follows: Cu, 0.21; SiO_2, 40.3; FeO, 41.1; Al_2O_3, 5.4; CaO, 7.8; MgO, 2.6; ZnO, 1.2; and S, 1.1 per cent. This slag is the product of pyritic smelting and does not yield to the ordinary treatment with nitric acid, so the following method has to be resorted to:

A 3-gram sample of the chilled material, ground to 100 mesh, is weighed into a 4-in. casserole and treated with 15 cc. concentrated HCl (concentrated acids only are used). After standing for a few minutes the mass is broken up and detached from the bottom of the casserole by means of a stirring rod, the casserole covered, placed on the hot plate and allowed to come to a boil. From a burette, without removing the cover, 10 cc. HNO_3 are added, followed almost immediately by 5 cc. H_2SO_4. The covers are removed and the solution evaporated until dense white fumes are evolved. (This procedure is followed in order that all chlorides may be expelled, and also that the definite amount of free nitric acid, necessary for electrolysis, may be obtained.) The casserole is removed from the hot plate and the soluble salts are taken up with 2 cc. HNO_2 and 30 cc. water and boiled a few minutes. After filtering and washing with hot water, the clear solution is diluted to about 175 cc. in a 250-cc. beaker and electrolyzed for nearly an hour with a current of from 0.8 to 1 ampere.

The blister copper averages 99.4 per cent. copper. The drillings, having been ground to pass a 12-mesh screen, are thoroughly rolled and spread out on a mixing cloth. A 5-gram sample is weighed and treated in a 400-cc. beaker with 10 cc. of water and 20 cc. of HNO_3, the latter 5 cc. at a time. When the copper is all in solution, 5 cc. of H_2SO_4 are cautiously added and the HNO_3 all expelled by evaporation and fuming as in the case of slags. The copper, now in the form of sulphate, is taken up with 7 cc. of HNO_3, 1 cc. of H_2SO_4 and 300 cc. of water. When all the salts are dissolved, the solution is electrolyzed at 4 amp. until it becomes colorless, when the current is cut down to 2 amp. and the precipitation completed. The first stage is finished in about one hour and the second in 30 minutes. Duplicates must check within one-tenth of 1 per cent.

STATIONARY CABINET

The ores mined by the Tennessee Copper Company are of the following general analysis: Cu, 2 per cent.; S, 15 to 30; SiO_2, 30 to 12; Fe, 25 to 38; Al_2O_3, 3; CaO, 6.5; MgO, 2.5; and Zn, 1.8.

A 1-gram sample of 100-mesh ore is weighed out and treated in a tall 200-cc. beaker with 10 cc. of HNO_3 on a moderately hot plate until the brown fumes are expelled and sulphur separates, when 4 cc. of H_2SO_4 are carefully added, the covers and sides of beaker washed down and the free nitric acid expelled. After cooling, about 40 cc. of water, 2 cc. of HNO_3 and a few drops of H_2SO_4 are added and the soluble salts dissolved by gentle heating. The solution with a few drops of "dope" is then transferred to a 90-cc. beaker almost filled with water, and a current of 1.5 amp. passed through for three or four hours. If, for any reason, it is desirable to run the assays overnight, the copper can be completely precipitated by a current of 0.15 amp. in the presence of 1 cc. of free nitric acid.

The custom ores treated at the smeltery are highly silicious and range from 60 to 80 per cent. SiO_2, with from 3 to 12 per cent. Cu. Triplicate samples of 2 grams each are treated in the manner described above except that but 1 cc. of HNO_3 is added before electrolysis. Results must check to 0.03 of 1 per cent. Either the overnight or the short-time treatment may be given.

MATTE ASSAYS

The metallurgical practice is to smelt in two stages. In the first stage the copper in the ore is concentrated into a 10 per cent., matte, which is resmelted to obtain a product suitable for converting; consequently the mattes run between 10 and 40 per cent. copper. One gram of the 100-mesh sample is digested with nitric acid and evaporated to dryness with sulphuric acid. It is then taken up with 1 cc. of HNO_3 and 0.5 cc. of "dope," diluted to 85 cc. and the solution electrolyzed at 1.5 amp. for from 3 to 7 hours, according to the grade of the matte. Occasionally it is found convenient to start the assays in the evening, running over night at 0.15 amp. and finishing at 1.5 amp. the following morning.

GENERAL REMARKS

Each month, composites are made from the daily samples of the different ores and furnace products mentioned above, with the exception of blister copper. For copper determination, triplicate samples of 2 grams each are treated in the manner indicated under the different headings, and subjected to a current of 0.15 amp. over night. The results must check within 0.03 of 1 per cent.

When all the copper has been precipitated, as shown by a negative test with strong H_2S water, the cathodes are removed from the cabinet and washed by dipping first in water, then in three separate jars of alcohol. After standing for a few seconds on a blotting paper, they are dried over a small spirit lamp, then weighed, and the results reported to 0.01 of 1 per cent.

The "dope" referred to in the foregoing is made from hard oil or vaseline, and nitric acid. To prepare: About 10 grams of vaseline and 100 cc. of HNO_3 are gently heated together, and when all action has ceased, the resulting compound is diluted to about 300 cc. On standing 24 hours, the straw-colored liquid, after filtering, is ready for use. The addition of "dope" to the electrolyte makes it possible to obtain firm and bright deposits when using a current of high density, and but small quantities of nitric acid; consequently, the time necessary for electrolysis is greatly reduced. Experiments are now being conducted in which small amounts of boric acid are used instead of "dope." The results are encouraging, but it is too soon to make a definite statement regarding any special advantages this treatment may at present seem to possess.

COMPARISON OF THE CABINETS

Ordinarily, the classes of work assigned to the different cabinets are as mentioned above, but no rigid lines have been drawn. When speed is unimportant, slags, for instance, are occasionally put on the stationary, but a "hurry up" determination on any sample whatever is always made on the rotating cabinet.

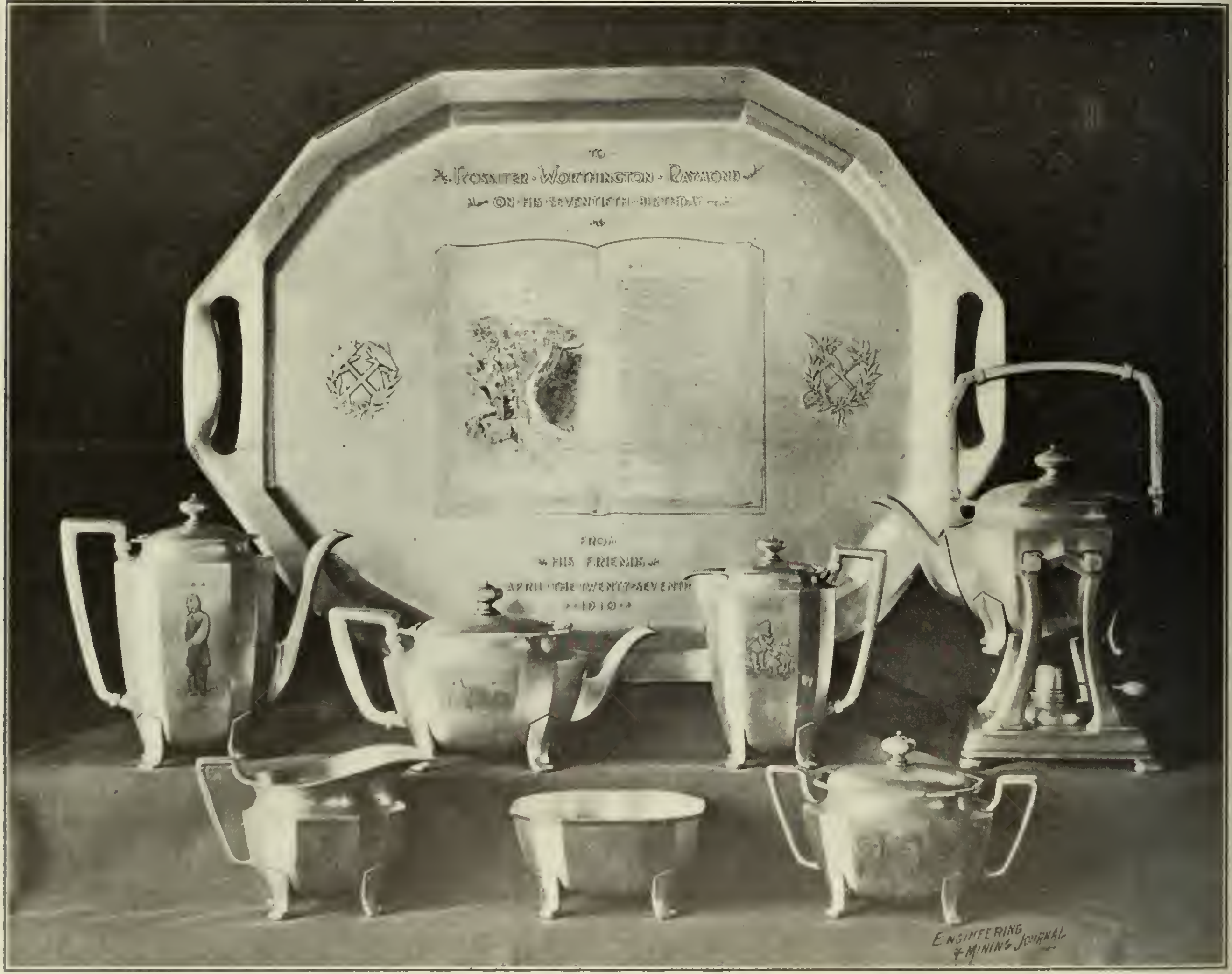
Equally accurate results on slag samples can be obtained from either cabinet, but the rotating one shows a decided advantage in point of speed. In the case of blister copper, determinations can be made more accurately, and much more rapidly, on the rotating cabinet. On ores and mattes, the stationary gives more accurate results and no difficulty is experienced in making the results check, while, upon the rotating, assays of the same sample not only vary, but average a trifle low.

It is also easier to obtain good bright deposits upon the stationary cabinet. In this respect, it might be mentioned that the heavy sulphide ores of this district have always given a great deal of trouble, because of their high-iron and low copper contents. The use of dope in assays on the ordinary stationary cabinet partially overcame this difficulty, but it was not until the Guess-Haultain cabinet was introduced into the laboratory a few months ago that good deposits became the rule.

In general, it may be stated that the rotating-anode cabinet will be found satisfactory where the number of daily copper determinations is small, and useful as an auxiliary in any laboratory. Where the number of determinations is large, we believe that a cabinet of the Guess-Haultain type, on which a great many coppers may be run at the one time, is almost indispensable.

The Dinner to Dr. R. W. Raymond

The dinner in honor of Dr. Rossiter Worthington Raymond at the Plaza hotel on the evening of April 30, was partly in celebration of his 70th birthday (April 27) and partly in appreciation of his 30 years of service as secretary of the American Institute of Mining Engineers and his contribution to the promotion of the profession of mining and metallurgical engineering. The dinner and the accompanying testimonial were given to Doctor Raymond by his friends, no organization figuring especially in the matter, although the mining and metallurgical engineers were naturally prominent.


To
Rossiter · Worthington · Raymond
on his seventieth birthday
From
his friends
April the twenty-seventh
1910
Engineering & Mining Journal

Silver Service Presented to Doctor Raymond by His Friends

The dinner was attended by about 225, who were seated at small tables in the banquet hall of the hotel. At a long table at the end of the room were the toastmaster, Dr. James Douglas, guests and speakers. Doctor Raymond sat at Doctor Douglas' right and Mrs. Raymond beside Doctor Raymond. Among others at this table were Dr. Lyman Abbott, George Westinghouse, R. T. Bayliss, vice-president of the Institution of Mining and Metallurgy; Sorzano de Tejada, of Paris, representing the Société des Ingenieurs Civils de France; Capt. Robert W. Hunt, John Fritz, John A. Bensel, president of the American Society of Civil Engineers; Frank D. Adams, president of the Canadian Mining Institute; E. G. Spilsbury, W. L. Saunders and T. C. Martin.

In opening the exercises after the dinner, Doctor Douglas spoke in a delightful way of Doctor Raymond's career as sailor, soldier, engineer, editor, lawyer, poet, story writer and critic, and the circumstances under which his friends were brought together to do him honor. He then called upon Mr. Spilsbury, who read numerous letters of congratulation from friends of Doctor Raymond who were unable to be present. He also read a highly appreciative set of resolutions adopted by the Verein Deutsche Eisenhüttenleute, expressing the indebtedness of the technical industry of Germany to Doctor Raymond.

R. T. Bayliss, of London, was then introduced. "My appreciation of Doctor Raymond's useful life," said Mr. Bayliss, "can best be expressed by saying that I have crossed the Atlantic for the sole purpose of attending this dinner. When I heard of what was contemplated in honor of his 70th birthday, I felt that my trip to be present was the least I could do."

Mr. Bayliss then read a set of resolutions adopted by the Institution of Mining and Metallurgy, expressing the recognition of Doctor Raymond's work by the council of the Institution, and presented to Doctor Raymond the gold medal of the Institution, its highest honor, the previous recipients having been Sir Archibald Geikie and Dr. James Douglas.

M. de Tejada, being then called upon, began to tell in English of how much French engineers think of Doctor Raymond's achievements. While he was speaking, a voice from the rear of the room yelled "louder," just as M. de Tejada was about to read a set of resolutions of congratulations by the Société des Ingenieurs Civils de France. His eyes twinkled as he turned and said, "It's all right; the rest of my remarks will be a reading of the tribute to Doctor Raymond in French." Whereupon the audience laughed and applauded.

Dr. Lyman Abbott, in a short and excellent address, said that he would waive aside all of the many accomplishments of the guest of honor, which were so well appreciated, and would talk of him "merely as the friend of his pastor." In doing so, Doctor Abbott made a very happy address, which was warmly applauded.

Doctor Adams, Mr. Westinghouse and Mr. Martin also spoke. Captain Hunt was particularly witty, and Mr. Saunders made a brilliant address to Mrs. Raymond, in conclusion of which he presented her with a magnificent bunch of roses. These addresses having been concluded, Doctor Douglas made some interesting remarks respecting the romance of the early days of mining west of the Rocky mountains, with which Doctor Raymond was so closely identified, and called attention to a representation of a Western mine standing upon the table before him. This showed in miniature a mountain with rocks, crags and pine trees, with mine buildings and representative scenes of surface work in mining. At the conclusion of his remarks, upon a signal, ribbons were pulled from each end of the table and the mountain parted in the middle, disclosing a magnificent silver service designed and made by Tiffany & Co., which was the testimonial presented to Doctor Raymond.

This service is shown in the accompanying engraving. The individual pieces are handsomely etched with scenes recalling phases of Doctor Raymond's life. Some of these are shown in the accompanying engravings, including the good ship "Great Western," of the Black Ball line, of which Doctor Raymond was third mate in 1858, and a view of Heidelberg, where he was a student in 1859. Another engraving shows him as a student at Freiberg, in 1860-61; another as captain in the United States army, 1861-64. Another shows the Grand cañon, with the following lines that Doctor Raymond wrote in July, 1889;

THE GRAND CANON

A thought of God, on earth expressed!
The silence of His perfect rest;
The patience of eternal power;
The ceaseless change from hour to hour
Forms in alternate gloom and flame
That bide yet evermore the same,
And do but wear such fitful guise
Reflected in our human eyes.
Which compass only in their range
The things that change, or seem to change
The blended hues of heavenly birth
Beyond the tenderest tints of earth,
That fill and flood her spaces wide
With surges of celestial tide;
The beauty of that awful brink
Where meaner thoughts in rapture sink
And souls see clear, though eyes grow dim
While space and time are lost in Him!

Methinks I could not faint or flee
In any conflict yet to be.
Whatever pathway must be trod,
May I but keep this thought of God!

MRS. RAYMOND AND DOCTOR RAYMOND

GRAND CANYON OF THE COLORADO

DOCTOR RAYMOND AS A SOLDIER

"THE GREAT WESTERN"

To the presentation and the previous addresses. Doctor Raymond responded with deep feeling. He was visibly impressed by the depth of the friendship that so large a circle of his associates displayed toward him, the spontaneity of their meeting to do him honor, and the high marks of esteem of the foreign technical societies. It was planned to conclude the evening with some brief addresses by friends present, but the lateness of the hour made this impossible and the meeting ended at 12.30 a.m.

HEIDELBERG, 1859

The dinner and subsequent exercises were characterized by a delightful informality and friendliness, which added to the charm of the occasion, and bringing together many friends from all parts of this country and from abroad, it constituted a memorable event, which, as one speaker happily remarked, we all hope will be repeated in honor of Doctor Raymond every ten years until the allotted three score and ten extend to a century.

DOCTOR RAYMOND AS A STUDENT AT FREIBERG

In addition to its net output of 51,749,233 lb. of copper the Utah Copper Company last year recovered, after all smelter deductions, 20,862 oz. of gold and 198,943 oz. of silver, or an income of over $516,000 from the gold and silver contained in its ore.

Gold Dredging in Bolivia

It has long been known that there is a rich unexplored goldfield in the interior of Bolivia. The following is condensed from a report of Secretary of Legation Alexander Benson, La Paz, Bolivia. Since the times of the Incas, rough trails have existed between the ancient Inca centers of Titicaca and Cuzco and the forest-clad ravines of the eastern Cordilleras, which culminate in the important river of Kaka close to the small village of Guanay. The most important of these precipitous valleys have been formed by the rivers Tepuani, Mapiri, Challana and Coroico. It is accepted that the ancient trails leading into these valleys were built by the Incas for extracting gold from the immense deposits of gravel existing in every one of these valleys.

A great amount of work was done by these people, but nothing has been done in modern times save by an occasional hardy prospector. It is impossible to ascertain what production was made by the earlier workers, but it is a well known fact that large amounts were taken out by them. The gold was probably derived from ancient glacial deposits.

The upper rivers are difficult to work because of the great boulders with which they are strewn, their torrential nature, and the floods which sweep their course each year. They come together to form the river Kaka, just below Guanay, and there the river runs through a succession of narrow cañons, where there is but little opportunity for the gold to settle. After about 20 miles of these cañons, Incahuara is approached, and the Andean slates give place to a sandstone formation. Below Incahuara the cañons of the Kaka give way to comparatively open, rolling country, and the river widens out into great flats of shallow depth, often a couple of miles wide, depositing its gravel in large islands and bars surrounded by sluggish backwaters and covered by dense vegetation and heavy timber. Here the current flows only at about four miles per hour, and the gold and heavier particles of sand and gravel find a resting place.

This district may be easily prospected by drills. The operation of a dredge on the river would be perfectly feasible, as it is rare that a boulder is encountered which could not be easily lifted by the buckets of a modern dredge. The depth of bedrock below the water level is not now known, but it probably does not lie at any great depth. The bedrock consists of sandstone, an ideal bottom for dredging operations as it can be cleaned and thoroughly scraped by the buckets. The most serious difficulty in the way of developing this auriferous belt is that transportation is difficult and the cost high. Rough mule trails are the only means of entering this region, and the transportation of heavy machinery is well nigh impossible until roads of some kind are built.

The Bureau of Mines Bill

SPECIAL CORRESPONDENCE

The Bureau of Mines bill, passed by the House some time ago, was acted upon favorably by the Senate on May 2. This puts the measure through both houses, though with minor alterations in the Senate, and sends it to conference for the further working out of points of difference.

Plans had been carefully laid in advance by the bureau advocates in order that the coup of May 2 might be made successfully when the proper moment arrived. Late last week the consent of the Senate was obtained to the shifting of the bill from the calendar under Rule IX to the calendar under Rule VIII. This gave it a semi-privileged status analogous to that of bills on the "unanimous consent calendar" of the House and made it possible to bring up the measure during the morning hour, whenever the assent of the upper chamber could be obtained.

When the favorable opportunity for demanding a vote arrived early on May 2, opponents were not well prepared for resistance, as the early pressing of the bill to passage had not been anticipated. Opposition has not been firmly organized. The principal speech in opposition to the bill was made by Senator Root, of New York, who, while he had comparatively little to say in opposition to the functions now proposed for the bureau, thought the step taken a dangerous precedent and to be objected to on the ground that it constituted an evasion of the field of States' rights. Mr. Root was not particularly well prepared to deal with the question on its own merits, and this was obvious as he gradually developed his argument. The advocates of the bill were, however, too well organized to admit of effective resistance and the bill passed with only a comparatively brief discussion. This was by no means as thorough a consideration of the measure in any aspect as that which had been afforded in the lower House some weeks ago.

That some agreement on the Senate amendments will be reached, no one appears to doubt, inasmuch as the differences between the House and Senate drafts are not very great. The Senate draft is the one which is expected to be sent in substantially its present form to the President. Little doubt that Mr. Taft will give it his approval is entertained. There is already some tentative speculation as to the personnel of the new bureau, and especially as to the choice of a chief.

The Pittsburg Coal Wage Agreement

Special Correspondence

The wage scale for the thin-vein district of Western Pennsylvania was settled at midnight April 29. Eight mines had signed provisionally, most of their miners going back to work, and the remaining mines resumed this week. The advance from 90 to 95c. per ton for pick mining with corresponding advances for machine mining, day work, etc., had presented no difficulties, the issue being wholly as to conditions to govern mines using the new or "permissible" explosives. In a recommendation by the State Mining Bureau, 14 mines had been designated as gaseous, and the use of black powder in them was prohibited, certain "permissible" explosives being designated for use. There are prospects that from time to time other mines will be so designated by the State department.

The issue was as to these mines. The men claimed the new explosives so broke the coal as greatly to reduce the proportion passing over the standard 1¼-in. screen, and demanded payment on a mine-run basis in these mines, the screened-coal rate to be converted into a mine-run rate on the traditional basis of 65 per cent. of 1¼-in. screened coal to mine-run. The operators claimed (1) that to go on a mine-run basis would produce carelessness on the part of the men, resulting in excessive breaking up of the coal and the loss of the Lake trade, since it is on a screened basis, and at a season when the resultant slack is in poor demand; as to coal for local commercial use it was admitted that such an issue has been relegated to the background through the rapid introduction in recent years of automatic stokers; (2) that the men have not used the new explosives intelligently and that with proper use the coal is not necessarily broken more than with black powder.

The compromise was effected on a basis proposed by National President Thomas L. Lewis, who is considered to have scored a victory over District President Francis Feehan, who has opposed Lewis at all points since their rupture some time ago.

The compromise as to the mines at issue is on the basis that payment shall be put on the mine-run basis as soon as mine-run scales are installed, this to be within 15 days. Thereafter, and within 60 days, tests are to be made, the men to do their best in using the new explosives, and if as to any mine such test shows that 64.64 per cent. of lump coal is produced, such mine shall go on the screened-coal basis.

It has been clear that the real issue hinged upon the manner of use, by the men, of the new or "permissible" explosives, and the operators have accepted a responsibility in leaving the settlement to tests which will depend directly upon the character of the men's work. No doubt this will be performed under very close supervision, so as to avoid a repetition of the unfortunate experience of the Charleroi test. The full text of the agreement reached at midnight April 29 is as follows:

The Agreement

(1) That the price of mining from April 1, 1910, to April 1, 1912, shall be 95c. a ton of 2000 lb. for pick-mined, 1¼-in. screened coal in the thin-vein district of western Pennsylvania, and a relative advance for mine-run coal.

(2) That the price for machine mining be increased 4c. per ton on screened lump coal in western Pennsylvania thin-vein.

(3) The inside day wage scale shall be advanced 5.55 per cent., with the conditions of the Columbus day-wage scale agreement of 1898.

(4) That all narrow deadwork and room-turning and all other day labor shall be paid a proportionate advance with the pick-mining rate.

(5) All mines where new or permissible explosives are used shall operate on a mine-run basis. At the operators' request a practical test shall be made at any of the mines where the new or permissible explosives are now used. Should such tests show that 64.64 per cent. lump coal is produced with proper shooting of coal by the use of new or permissible explosives, then such mines may return to the 1¼-in. screened-coal basis; tests shall be made as soon as possible or within 60 days after the installation of scales; to keep operating 1¼-in. coal until run-of-mine scales are put in. Run-of-mine scales shall be installed as soon as it is possible to secure the same, or within 15 days. The conditions under which tests shall be conducted shall be mutually agreed to by the district officers of the United Mine Workers of America and the operators affected, under the following general conditions: (1) That the test be interpreted to mean that the coal shall be properly shot; (2) that it be handled with care, both parties recognizing the fact that the coal must be marketed, and that the wages of the miners depend upon the marketability of the coal and also the profits of the operators; (3) that it shall be weighed run-of-mine on the tipple and also weighed screened coal; (4) the tests shall be made when the mine is in ordinary operation. At all mines where new or permissible explosives are used, the companies shall furnish them to the miners at the same cost per ton of coal produced as black powder.

(6) The prices and provisions of the general contract shall apply to all mines operating in what is known as the Pittsburg district, operated by companies parties to this agreement. The prices to be paid at the Scott Haven mine to be referred to and decided by the International executive board of the United Mine Workers of America.

(7) Pending final negotiations of the details of the wage agreement for this district, the mines shall resume operations.

(8) That a joint meeting of the representatives of the operators and miners shall be held at the earliest possible date to agree upon the details of the wage contract.

Reverberatory Practice at Cerro de Pasco

In connection with the discussion of Dr. L. D. Rickett's paper on "Reverberatory Practice at Cananea," presented before the Institution of Mining and Metallurgy, S. J. Gormly, superintendent of the Cerro de Pasco smeltery, submitted[1] the following interesting information regarding reverberatory-furnace operations at La Fundicion, Peru.

"Early in 1907, the building of a reverberatory plant for treating the flue dust and a portion of the fines from the Cerro de Pasco ores was proposed and approved by General Manager R. H. Channing, Jr., although the operation of a reverberatory furnace at an altitude of 14,000 ft. was seriously questioned by many.

Furnace Dimensions

"Orders were placed in the United States for the necessary brick in May, 1907, and the first furnace was completed and started operation on April 26, 1908. The principal dimensions of this furnace were: Hearth, 19 ft. by 60 ft.; grate, 17 ft. by 7 ft.; smallest section in flue, 4 ft. 2 in. by 4 ft. 6 inches.

"Owing to the high volatile content of the coal used (the approximate analysis being: water 6.2 per cent., volatile 39, fixed carbon 33.7, ash 21.1), and the unusual atmospheric conditions under which we were working, it was considered advisable to build the furnace with an exceptionally large area, to permit the free passage of the gases at a slow velocity, in order to get a complete combustion inside the furnace. Consequently the furnace was built with a clearance above the bridge wall of 3 ft. 5 in., and a clearance above the slag line of 4 ft. 5 in. The opening under the verb (i.e., the opening at the throat of the furnace) above the working slag line, was 6 ft. by 2 ft. 1 in. This dimension was subsequently increased to 7 ft. by 2 ft. 1 inch.

"Owing to the free coking quality of the coal, it is necessary to rabble the fire constantly, and to facilitate this there are in the back of the furnace five circular openings which are closed by rolling doors, held in place by suitable guides. The furnace first built was connected to the main stack and was intended to operate on natural draft, but in this it failed, and it was necessary to equip it for forced draft.

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[1] *Bull.* 67, I. M. M.

Water Jacket at Bridge Wall

"Under forced draft the high ash content of the coal made it clinker badly, the clinker adhering to the sides of the firebox, particularly to the bridge wall, so that it required two or three hours to grate, and even in that time it was not possible to remove it all. This difficulty was satisfactorily overcome by putting in a water jacket at the firebox side of the bridge wall, extending the entire width of the furnace, so that the feed-water and overflow connections are outside of the furnace. The jacket has a 4-in. water space and extends below the grate bars, so that the heavy laps and riveted joints do not come in contact with the fire.

"The jacket answers a double purpose in that it protects the bridge wall and at the same time prevents the adhesion of clinkers. The introduction of steam under the grate was tried for a time, in hopes that it would soften the clinkers and thus aid in the grating, but this was finally abandoned, when a tilting grate, designed by Mr. Ross, assistant superintendent, was introduced. By means of this tilting grate, by which the entire fire is dropped from one-half of the firebox at once, the grating can be accomplished in 15 to 20 minutes.

A Nine Months' Campaign

"This furnace in nine months' operation, after which it was closed down for repairs to the flue and roof, smelted 19,383 tons of calcines, 1996 tons of McDougal flue dust, 3833 tons of blast-furnace flue dust and 595 tons of limestone. There were burned 10,847 tons of coal, a ratio of coal to dry charge smelted of 1 : 2.38. The coal here given includes the coal used in firing the boiler for generating steam to be used under the grates.

"The working of the experimental furnace was so satisfactory that it was decided to increase the plant to five furnaces. The four additional furnaces were built on the same general dimensions as the No. 1, except that the firebox was made 6 in. deeper, to accommodate the water jacket, and 2 ft. longer, so that the firebox on these furnaces is 7x19 ft. Each furnace is equipped with a No. 9 Sturtevant fan, driven by a 20-h.p., alternating-current motor, at 1000 r.p.m. The bricks for the extension of the plant were all made at the company's own brick plant at Cerro de Pasco, and have the following analysis: SiO_2, 95.6; FeO, 2.1; Al_2O_3, 1; MgO, 0.2 per cent.

"These furnaces are now smelting, on an average, 120 to 130 tons per day on a ratio of 2.75 : 1, producing 35 per cent. copper matte and slag of the following composition: SiO_2, 36; FeO, 41.8; CaO, 5.3; Al_2O_3, 3.1; MgO, 0.4; PbO, 2.1; ZnO, 3.4; S, 0.3; Cu, 0.42; Ag., 0.16 ounce.

Furnace Bottoms and Fettling

"The furnace bottoms were put in of local sand of the following partial composition: SiO_2, 94.7 per cent.; FeO, 1.3; Al_2O_3, 2.3. The bottoms have never required any repairs or attention. The same material is used for fettling, when such is required, which is seldom, and then only on the top of the bridgewall and in the angles formed by the bridge and side walls. This, no doubt, is due to the position in which the charge-hoppers are placed, being 8 ft. 6 in. between the centers of the discharge openings, and delivering the charge well toward the sides of the furnace, thus keeping the sides from getting excessively hot, as is the case in furnaces where the charge is delivered more in the center.

"I do not feel at liberty to give any detailed cost figures, but will state that our costs compare favorably with those obtained in the best modern practice in the States."

California Oil

Special Correspondence

The Refining and Producing Oil Company has taken over the refining plant built by the California Petroleum Refineries, Ltd., at Oilport, near San Luis Obispo at a cost of $1,000,000 and intend to enlarge the plant, besides building another pipe line from Bakersfield to Oilport. In addition, extensive tracts of oil lands in Santa Barbara and Kern counties pass into the hands of the new company. A $4,000,000 bond issue has been authorized for building new pipe lines and for the purchase of tank steamers. The principal stockholders are J. I. Lamprecht, of Cleveland; T. N. Barnsdall, of Pittsburg; Henry J. Crocker, of San Francisco and J. C. Yancey, of Portland, Oregon.

The Kern River Oil Fields of California, Ltd., a British syndicate, has purchased the holdings of the Imperial Oil Company and the Thirty Three Oil Company at Bakersfield for about $2,500,000. This is said to be the largest oil deal in the history of the State. These two companies have paid to date $2,670,000 in dividends and the yearly product is stated to be about 2,000,000 bbl. W. S. Boggs will be retained as manager. It is claimed that only one-third of the land purchased is drilled.

The Producers Transportation Company has contracted with the Llewellyn Iron Works and the Lacy Manufacturing Company for steel tanks with a total capacity of 1,250,000 bbl. Ten large storage tanks will be installed at once in the Midway-Maricopa field where the production exceeds the present capacity of the tanks and pipe lines. Large storage tanks will also be provided at Santa Margarita in San Luis Obispo county, within 25 miles of the coast and beyond the reach of the big guns of warships. Storage here will have the additional advantage of a comparatively cool climate. It was originally intended to build concrete storage tanks at Santa Margarita, but a drop in the price of steel decided the company to build 55,000-bbl. steel tanks instead.

The companies in the Independent Agencies have looked forward with much interest to the announcement of the price of oil to the producers for February. The delay was due to bookkeeping difficulties and hereafter the price will be given out on the fifteenth of the month and the checks mailed on the twentieth. The price for February was 44.4c. net to the producers and this low price was largely due to certain old contracts, some as low as 19c. per bbl., which will soon expire, and will not be renewed. The average price of fuel oil may not exceed 50c. per bbl. for some months as the production now exceeds the capacity of the present pipe lines although the market has not been glutted. The Associated pipe line into the Midway-Maricopa field will soon be finished.

During March, the output of oil in California was 5,598,745 bbl., the greatest monthly output in the history of the State.

Of the yearly fuel-oil product, the Southern Pacific Railroad Company consumes about 11,000,000 bbl., the Santa Fe 5,000,000 bbl. and it is estimated that the Arizona towns and mines will consume 4,500,000 bbl. yearly when it can be supplied through a pipe line, not taking into account the oil used by the railroads. The Western Pacific will soon also be a large consumer. Even now in Arizona with coal from New Mexico at from $6.50 to $8 per ton, oil is used in nearly all the large plants.

The oil in the 300,000-bbl. concrete reservoir of the Standard Oil Company at Point Richmond caught fire on April 21, forming one of the most spectacular fires seen here in the last few years. The water in the bottom of the reservoir finally became heated and the burning oil bubbled over the sides of the reservoir and ran down, a seething mass of flame, for over a mile, destroying a part of the Santa Fe track. A loss of $170,000 was sustained.

A deposit of soda has been found at the terminus of the projected road of the Uganda railway, Central Africa. It is described by the discoverer, F. Shelford, as being a lake about ten miles long by two or three wide. The water is only a few inches deep and covers a hard surface of soda resembling pink marble. The soda was found to be of considerable depth.

Old Mining Camp of Pozos, Guanajuato, Mex.

Little Attention Has Been Paid to This Camp, Though It Has Produced Several Bonanzas; Patio Process Now Being Replaced by Cyanidation

BY H. A. MEGRAW*

In the present state of metal mining in Mexico, with so many of the large properties in the hands of foreign interests and strangers searching in every corner of the republic for mines, new or old, which may be worked profitably, it is rather rare to find a well worked district which has never received that careful examination which is generally accorded the more important camps by those in search of real mines. According to the best obtainable data, the camp of Pozos has never even been visited by many foreigners, and none of these have inquired into it thoroughly. This seems strange in view of the fame the district has enjoyed from time to time due to the production of bonanzas, several of the large mines having enjoyed periods of production of rich ore which attracted the attention of the whole republic.

The mineral district of Pozos is situated in the eastern part of the State of Guanajuato, 10 km. south of the town of San Luis de la Paz. The latter is the *cabecera*, or capital of the district of Cerro Gordo, which includes the district of Pozos and several other less known camps. Pozos is about 120 km. northeast of the city of Guanajuato at an elevation of about 7500 ft. above sea level. The climate is temperate, but the winter season generally brings rather cold weather, due to the north winds to which the camp is exposed, the temperature often falling below the freezing point.

Generally speaking, the district is dry, rains being rare and even the rainy season failing to bring the heavy showers usual in the plateau of Mexico. Communication is established by means of a branch of the Ferrocarril Nacional, which connects Pozos and San Luis de la Paz with Rincon, a station on the main line just north of the city of Dolores Hidalgo.

History of the Camp

The mines of Pozos have been known since the early part of the eighteenth century, the tradition being that several of the mines, notably the Santa Brígida and Ocampo, were worked by the Jesuits, their possession being terminated by the expulsion of their order from the country in 1767. After this time, the mines were worked in a desultory fashion, until 1844, when they were completely abandoned. In 1871 work was again undertaken, the first step being the denouncement and active development of Santa Brígida, which in 1873 passed into the hands of the Parkman family.

The Parkmans, a family established by the settlement of an American in the city of Guanajuato, became a powerful factor in local mining circles and acquired large interests, not only in Pozos, but in the district contiguous to the city of Guanajuato, where they were best known as the owners and operators of the Sirena mine and the Hacienda San Francisco de Pastita, both of which are now owned by the Guanajuato Consolidated Mining and Milling Company, an American corporation with its home office in New York. The Parkman family has long since ceased to be of importance in commercial circles, although they still hold a large part of the Santa Brígida mine.

The fame of Pozos as a producer, began to grow in about 1880, and by 1888 many companies had been formed and were progressing successfully. Among these were the Cinco Señores company, which included the mines of La Joya, Nayalito and Justicia. Up to 1895, this company had divided among its stockholders more than 3,000,000 pesos. To the same epoch belong the mines of Angustias and Argentina, which are credited with dividends amounting to over 2,500,000 pesos. Many other mines have been more or less worked and have paid various sums to their owners.

Pozos Valley. Valley Mines in the Foreground, Town of Pozos to the Right and Santa Brígida in the Distance

Patio Process Employed Until Recently

The main dependence of the Pozos mines has always been the high-grade ore, which was shipped to San Luis Potosi and Aguascalientes, involving large expense before the railroad was completed in 1902. Due to high freight and treatment charges, the operators were forced to contemplate treatment of the ores on their own account and the result was that several *haciendas de beneficio* were established, two in Pozos and several in San Luis de la Paz.

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*San Luis de la Paz, Guanajuato, Mexico.

One reason for the selection of the latter town for the establishment of the reduction plants was that water and labor were available, while in Pozos the only water obtainable was that from the lower levels of the mines. This water, being acid and heavily charged with iron salts in solution, was not well suited for reduction work, and, in fact, it is found at this time to be quite unsuitable for use in cyanidation. Possibly the main reason, however, might be found in the fact that San Luis was a well established town, large in comparison with Pozos, and offered commercial and social advantages which made the living there much more comfortable than in the mine town where conditions were naturally more crude.

The earliest plant to be established in San Luis de las Paz was the Cinco Señores, after which the Ojo de Agua, San José and Santa Elena followed, the latter being the property of the Angustias company. Ore and fuel was delivered to the plants by burros until the establishment of the Ferrocarril del Bozo, a miniature railroad, which connects the mines of Pozos and the *haciendas* of San Luis de la Paz with the *hacienda* del Bozo a ranch in the nearby mountains. A lower transportation charge was thus assured on ores, with advantages in the economical supply of fuel.

All of these plants were designed to treat ores by the patio process, some operated entirely by animal power, and others grinding and concentrating by steam power and utilizing the mules only for the amalgamation process.

Cyanidation Coming Into Use

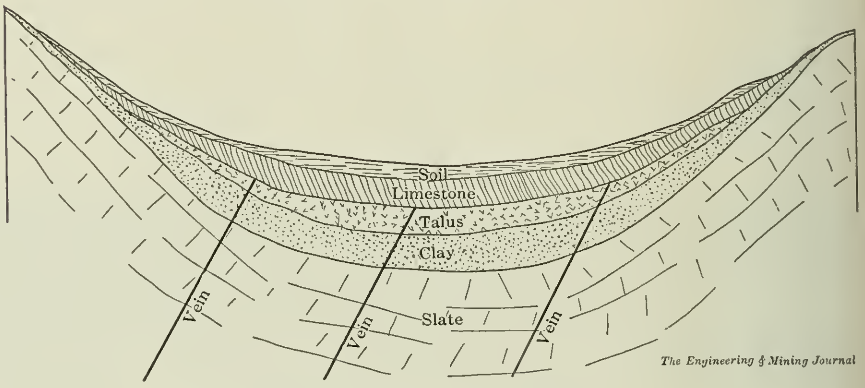
Following the history of all the Mexican camps, the ores at length became too low in grade to permit working by such expensive processes, interest in the camp began to lag, development fell off, and practically all work ceased. In a paper presented to the Sociedad Geológica Mexicana in the early part of 1909, Manuel Balarezo, a mining engineer of the country, said of Pozos:

"This camp had its period of mining delirium from 1890 to 1896, during which period the mines of Cinco Señores, Angustias and Argentina reached their greatest production. Claims were denounced on every hand, reaching parts where the veins were notable only for their absence, following mythical 'continuations or extensions.' Their owners, guided only by the fever of speculation which possessed them, organized more than 50 companies, of which more than 30 were performing actual work. It is needless to say that these companies vanished as soon as the interest stimulated by the bonanza production of the larger mines had ceased, accomplishing the ruin and discredit of the entire district."

In 1909 the Cinco Señores company, desiring to profit by the large tonnage of low-grade ores existing in its workings, established a plant in Pozos for treating these ores by cyanidation, this being the first systematic attempt to apply modern methods to the ores of the camp. This plant is now at work and shows every indication of successful operation.

The Angustias company joined forces about two years ago with the owners of the Dolores mine adjoining, thus making a strong company owning valuable mines and the Santa Elena reduction plant at San Luis de la Paz. The mill had been formerly rearranged in a fashion for cyanide treatment but without any brilliant results and the company redesigned and rebuilt it in the latter part of 1909. It is now successfully and profitably treating the lower grade ores from the mines.

The *hacienda* Ojo de Agua has also been remodeled for use as a cyanide plant, and is about ready to begin work. This mill treats custom ores daily from the Pozos camp, having contracts with many of the smaller mines for the ore supply. The Garibaldi mine is equipped with a simple cyanide plant, which, as the ore consists largely of chlorides and bromides of silver, gives good results.



Ideal Section of Pozos Valley

The Santa Brígida company has equipped its property with furnaces for reducing the ores, but these are not at present in operation, the high-grade ore only being mined and shipped.

Experiments are being carried out with the idea of concentrating the lower grade ores, and possibly devising some economical method of recovering the metals from the tailing.

Occurrence of the Ores

The district of Pozos lies in a small valley between the higher hills. This valley measures about 8 km. north to south, and about the same east to west. The veins are fissures in the argillaceous slates, with strike northwest and southeast, and dip toward the southwest. The bedding planes of the slates of the western part of the valley are inclined toward the northwest, and in the eastern part toward the northeast. These bedding planes are often filled and in some places replaced with lime deposits, and occasionally these deposits are so marked as to seem veins although they carry no gold or silver. The veins are usually filled with quartz, which carries the valuable metal deposits.

A bed of clay covers the slates for practically the entire extent of the valley. Over the clay there is a bed of talus, consisting of fragments of porphyry and basalt in some places and in others largely mixed with broken vein matter from the old crests of the veins. This bed is in some places impregnated with the clay and has been so cemented by lime impregnations as to form a sort of conglomerate. Above the talus appears a bed of limestone, thick in the valleys and thinning out near the summits of the hills. The present soil is thick in the valley but does not exist on the higher points.

The veins rarely outcrop, the limestone covering them in most beds, but erosion has exposed them in the cañons where the limestone beds have been sufficiently worn away. The veins of the camp can be divided into two classes, according to the nature of their contained mineral.

In the Western group the ores near the surface consist principally of chlorides and bromides of silver with comparatively large proportion of gold. At depth these veins change their characteristics, the ores being antimony-bearing silver sulphides. The principal examples of this group are the veins of La Joya, Escondida, Trinidad, Dolores, Angustias, San Rafael, Mina Grande, etc.

The Eastern group, including the mines of Santa Brígida, La Reforma, etc., is distinguished by the presence of oxides and carbonates of lead and copper near the surface, and at depth galena, chalcopyrite, native and gray copper with some blende.

The veins are of various widths, the narrowest being a little more than one meter wide, and the stronger veins reaching a total width of 20 m. in some places. The camp contains 17 shafts more than 100 m. deep, the deepest at present being 240 m., or about 780 ft. The veins are found in good condition and in good ore at the greatest depth, which speaks volumes for the permanency of the camp. The topography is generally not favorable for tunnel development, but there is one tunnel, that of Dios Nos Guie, which has a total length of 1060 m., or about 3450 feet.

At present the camp of Pozos seems to be experiencing a sort of mild revival, interest being taken in the work and the reopening of several old properties being considered. That the district is worthy of careful attention seems to be undoubted.

The Whitehorse Copper Belt, Yukon Territory

The Geological Survey branch of the Canadian Department of Mines has issued the report of R. G. McConnell on the Whitehorse copper belt of Yukon territory. This report embodies the result of an investigation of the geology and mineral resources of the Whitehorse district, where important discoveries of copper were made during the early rush in 1897, development work being begun two years later. Little progress was made, however, until 1906, when the rise in copper attracted the attention of capitalists to the possibilities of the district. The Whitehorse copper belt is situated in the southern part of Yukon Territory, about 45 miles north of the British Columbia boundary, and extends along the valley of the Lewes river from a point east of Dugdale on the White Pass railway northwestward to the base of Mount Haeckel, a distance of about 12 miles. Whitehorse, the distributing point of this district, in addition to being the terminus of the railway from the coast is the head of navigation on the Yukon.

TOPOGRAPHY

The main feature of the topography of the district is the great valley of the Lewes river. Opposite Whitehorse it has a width of fully four miles bordered by inclosing mountains. The Lewes river is capable of furnishing extensive water power, as the fall of the river at Miles cañon, four miles above Whitehorse, is 16 ft., and in the Whitehorse rapids, nearer the town, 9½ ft.; additional fall could be obtained by damming the head of the cañon. A second possible source of water power is Fish lake, six or seven miles long, situated in a high valley west of Mount McIntyre at an elevation of about 1450 ft. above Whitehorse.

The Whitehorse ores at the time of the investigation in 1907, were being shipped for treatment to smelteries on the coast, transportation charges amounting to from $8 to $10 per ton. These will be reduced when the branch line along the belt from the White Pass railway is completed.

IRREGULAR DISTRIBUTION OF ORES

The width of the copper belt seldom exceeds one mile, and in places is confined to a single line. The distribution of the discoveries along the belt is exceedingly irregular. The croppings follow a series of limestone areas inclosed in granite or lying between granite and porphyrite. Where the limestone is absent the belt is practically barren, and considerable stretches of it otherwise favorable are hopelessly buried beneath heavy accumulations of drift. The rock formations consist, in order of age, of limestone, porphyrites, granites and granodiorites, an extensive system of porphyrite dikes, and finally basalts. Of these only the limestones and granitic intrusives are important economically. The principal orebodies now being developed occur in the limestone close to or adjoining the granite. Though discoveries have been made in the granite at some distance from the limestone, the limited amount of work done on these has so far disclosed no orebodies of commercial value.

BORNITE AND CHALCOPYRITE THE MOST IMPORTANT MINERALS

The principal economic minerals are the two copper sulphides, bornite and chalcopyrite. Tetrahedrite occurs at the Arctic Chief and small branches of chalcocite at the Best Chance and other places. Copper minerals resulting from the oxidation of the sulphides are conspicuous at all the workings, but, except at the Pueblo, are seldom important as ores. Bornite is the leading copper mineral occurring in nearly all the mines and prospects. In the large magnetite orebodies it occurs disseminated in grains and small patches throughout the mass. The distribution is always irregular, certain areas of the magnetite carrying a much higher percentage than others. Lenses of bornite and chalcopyrite, inclosed in a tremolite-garnet-augite gangue, occur at many places along the lime-granite contact. Chalcopyrite is, next to bornite, the most important copper mineral, occurring at all the mines and prospects examined. It is found in grains and small masses, disseminated through the iron orebodies, and is also conspicuous in the altered limestone zones in association with bornite, garnet, augite and tremolite. It is often intimately intergrown with bornite, and both minerals were evidently deposited together.

While the greater part of the chalcopyrite is primary, a small quantity is of secondary origin. Native copper occurs sparingly in grains and small scales along the walls, and in the oxidized portions of many of the lodes. It nowhere forms large masses and is not of economic importance. Cuprite is common at the Pueblo, where malachite and azurite also are found in commercial quantities, largely replacing the primary sulphides in the developed portion of the mine.

CLASSIFICATION OF ORES

The Whitehorse copper ores possess all the characteristics of ordinary contact metamorphic deposits, and are referred with little hesitation to that class. The orebodies are irregular in outline, are occasionally banded, and vary in size from small lenticles a few inches across—often completely inclosed in limestone—to masses measuring hundreds of feet in length. Veins, with the exception of thin seams, evidently of secondary origin are unknown.

Magnetite and hematite are widely distributed and occur in large masses, magnetite being especially abundant. Lenses of this mineral ranging from a few inches to 360 ft. in length are found all along the belt, mostly in the altered limestones, but also occasionally in the altered granites. The magnetite aggregates are granular in structure, and as a rule are comparatively pure. Hematite is less common. It occurs in large tabular crystals at a number of the exposures and is the principal mineral in the great Pueblo lode. Limonite exists sparingly at all the mines, but is nowhere abundant.

GOLD AND SILVER CONTENT

Gold in some quantity is present in all the ores, ranging from traces up to several dollars per ton. Free gold in visible grains, though not common, occurs occasionally. Silver is also universally present, the percentage being usually low, ranging from 1 to 3 oz. per ton. Other metallic minerals of less frequent occurrence are arsenical pyrite, stibnite, galena, sphalerite and molybdenite.

The orebodies fall into two classes; those in which the copper minerals are associated with magnetite and hematite, and those in which various silicates are the chief gangue materials. The copper percentage in the silicious ores is higher as a rule than in the iron ores, those shipped up to the time of Mr. McConnell's investigation probably averaging over 8 per cent. None of the orebodies had then been followed to a greater depth than 100 ft. and the question of their downward extension remained to be settled. At the depths reached some of the lodes showed increased and some decreased volumes, while the character of the ore remained unchanged. Being dependent on the limestone, the deposits found in the larger areas were regarded as likely to prove more permanent than those in the small inclusions. The concluding portion of the report is devoted to a comprehensive description of the leading mines and prospects of the district, the geological relationship and extent of the prominent lodes being shown by a number of maps.

Petroleum Development in San Joaquin Valley

Coalinga, McKittrick, Midway and Sunset Fields Contribute to the Production; Encouragement for Capital to Drill Deep Ground

LIMITS NOT YET PROVED

Under the direction of State Mineralogist Lewis E. Aubury, a general reconnaissance of the oil districts of the San Joaquin valley, Cal., has been completed by Paul W. Prutzman, assistant in the field. The State Mining Bureau is now engaged in preparing maps of all the different oil districts in California, and is also at work on a large report in which detailed information will be given of the different districts. The first of these reports is herewith given.

Four Divisions in Coalinga District

To understand conditions in the Coalinga oilfields of California, it is necessary to bear in mind the topography of the country. From the southern extremity of the developed field, the foothills run due north for about seven miles, then turn sharply to the east and run almost due east for about three miles, where they again bend to the north. From the apex of the curve thus formed, a spur of the hills extends in a southeasterly direction for several miles.

This topographical arrangement leaves a plain about six miles square, between the foothills and the spur, surrounded on three sides by the hills and bounded on the south by the railroad. The town of Coalinga is on the railroad and close to the foothills, and, therefore, near the southwest corner of this plain, which is smooth and slopes gently from northwest to southeast.

Oil has been found on the lowest portion of the foothills and extending out for a varying distance from them, on the north and west sides of this plain as well as on the outer or valley face of the foothills where they turn to the north. The East field is that portion lying on the valley slope of the north limb; the Southeast extension on the east or valley slope of the spur; the West field lies on the inner portion of the hills west and south of the plain; the South field is the prospective territory south of the railroad, following the hills for an indefinite distance.

The length of the developed field is about 13 miles and the extension to the southeast is proved for a length of approximately a mile and a half. The width of the actually proven belt varies from three-fourths of a mile at the lower extremity to about two and one-half miles at the widest part, with an average of perhaps two miles.

Extension of the Coalinga field to the north seems to be pretty definitely barred by the operations of the Imperial in sec. 4, T. 19, R. 15, which are said to have resulted in dry holes and in finding an order of formation quite different from that found farther south. Some maintain, however, that the sands at this point lie farther back in the hills, and at least one company is drilling on section 8 in this township on such a theory.

To the northeast, the operations on sec. 12, T. 19, R. 15 have resulted mostly in water wells, but whether this is due to flooding of the sands from above (that is, from higher up on the formation), to the diffiulty of handling surface water, or whether the actual water line has here been reached, it is yet too soon to tell. To the east of the old wells on sec. 29, T. 19, R. 15, operations are slowly being pushed farther out, and it does not appear that any limit has yet been set to drilling in this direction. The same may be said of the work along the outer face of the spur; work is gradually being carried south and east, and while drilling here is deep and correspondingly expensive, the new well of the Coalinga Mohawk offers encouragement in this direction to operators with means enough to carry on this heavy work.

West of sec. 28, T. 19, R. 15 the new well of the Empire on 32 has bridged, in part at least, the gap supposed to exist between the east and west fields, and proves the territory lying immediately west. Figuring from the depths of the Limited wells on 29 and of the Empire (about 2700 ft.), it is evident that the sands here have a sharp pitch to the southeast, and as the formation on 28 also pitches in the same direction, but on a much higher level, more work will be required to finally prove whether the Empire sands pass under those on 28, or whether they rise again to meet them and form an anticline; and in the latter case, whether it will be productive on the west slope. There is still a gap of almost a mile between the Empire well and the nearest producer on the east. When visited this well was producing about 500 bbl. of 18 deg. oil but there was a great deal of sand in the casing, and as this has since been cleaned out it seems likely that reports of considerably larger production at present are correct.

Possibilities of the West Field

The northern line of the old West Side field, along the north line of sec. 31, T. 19, R. 15, is definitely marked by old work, some of the original Coalinga wells having been here; but to the south, the limit has not been set. The Aztec, in the southeast corner of 31, has lately gone into the first sand, and both the California Coalinga and M. K. & T. have lately brought in good producers on sec. 8, T. 20, R. 15. The latter wells are 2800 and 2940 ft. respectively, which indicates a normal degree of dip to the sand both from the north and the west.

This work is the farthest out on the flat, and the old argument as to whether the producing sands extend across the flat and to the wells on the outer side of the spur is yet unsettled. The 2800-ft. well of the Peerless Consolidated on 10, and the deep test of the Claremont on 4, said to be 4100 ft. or more, without oil, would seem to indicate that the western limb of this anticline will not be productive, which corresponds well with the theories in the case.

On the upper, or west side of the West field, production has been carried back beyond the center line of secs. 1 and 12, T. 20, R. 14. These wells are shallow, only 700 to 800 ft., but are good producers of heavy oil, and there is no way of determining how much farther back the profitable sands may extend. On the south side of Los Gatos creek, the formation seems to be rather lower than elsewhere along this back edge, and here drilling has been carried back with good results, well toward the center of 14, and no definite bound to the field so far in sight in this direction.

On sec. 25, T. 20, R. 14, the Coalinga Western has undoubtedly gone back to the upper edge of the productive sands, and while work along the east line of 26 has resulted in some good wells, it seems doubtful whether profitable drilling can be carried much farther to the west here unless, indeed, a lower sand can be found, of which some indications appear in the last well drilled on the old Blue Diamond twenty, in section 26.

Due east of this work, on the eastern frontier, the Nevada Petroleum has a string of good wells down the center line of sec. 30, T. 20, R. 15, at about 2400 ft. Adverse water conditions were encountered here, and No. 1, which had generally been counted as a lost hole, has finally been cemented and put on the pump; these wells appear to be producing 200 to 400 bbl. each, of a medium-grade oil.

Just in the edge of the town of Coalinga, the Valley has a 3200-ft. well which has some oil, but which up to the present has not been freed from water enough to determine its value as a producer. If this well can be finished, an area of at least two square miles will be added to known productive territory.

Trouble from Haste and Carelessness

On the much boomed section 6, T. 20, R. 15, operations are rather at a stand. This territory suffered greatly at the hands of certain operators who seemed more anxious to raise the value of their stock than to conserve the value of their property, with the result that haste and careless drilling have brought about serious water troubles. It seems a great pity that such promising territory should be abused and perhaps ruined in this offhand manner, but there is reason to hope that if the operators can be brought to unite on protective measures, a greater part, if not all, of the damage can be undone.

Section 6 is surrounded on three sides by lands of the K. T. & O. company, on which nothing is being done, and the nearest prospecting has been on sec. 12, T. 21, R. 14, where in addition to several old holes, two or three have been drilled within a short time but without result. Opinions differ as to the reasons for this failure, but it seems to be generally accepted that the formation is too much broken to hold out hope for any profitable production. There is now no work under way on the north side of Warthan cañon.

On the south side of the cañon, on sec. 18, T. 21, R. 15, several rigs are at work, and up Jacalitos cañon, but near its mouth, four or five others, but none of this work has yet reached the conclusive stage. Further up, the 1600-ft. hole of the Jacalitos, and the 2800-ft. test of the People's Associated, both dry, seem to stop any extension in this direction, though one rig is still at work on sec. 32, T. 21, R. 15.

Out from the mouth of Jacalitos cañon, but one rig, the Blair, is at work, but this hole is expected to prove up quite a stretch of country if successful. It is now 2000 ft. deep. Two rigs are said to be at work on the Lake side of the Kettleman hills. The Southfield Oil Company has two holes at 1600 and 1400 respectively on the Kreyenhagen ranch, sec. 33, T. 22, R. 16; this is on the old Black Mountain lease, where a little oil is still in evidence in the old hole. South of this, and considerably farther out, the El Cerrito lately quit at 4100 ft. with a dry hole.

Narrow Productive Zone at McKittrick

At McKittrick there is little that is new. This field has had the reputation of being spotty, but later work has shown that it is merely narrow and that the producing strip is not altogether straight. The upper or southwest boundary of the field was shown years ago, a string of dry holes having been drilled all along this side, and extension to the southeast sems to be barred by the deep dry holes of the Provident on the old Dabney lease.

Many of the shallow wells at this end of the field have gone over to water, but the old Shamrock gusher, one of the most profitable wells ever drilled in this State, is still putting 800 or 900 bbl. of clean oil into the tank every day. All the property north of this has held up remarkably well, and acre for acre there is probably no better producing ground in any of the fields than a narrow strip running northwest from the Shamrock to the East Puente on 11. The Jackson has a good heavy-oil producer at this end, and the K. T. & O., a couple of fair wells on the old Foltz lease, but north of this all work has resulted in absolute failure and there seems little or no hope of extending production in this direction. Some prospecting is being done a little to the northeast and therefore farther out toward the flat, and some five miles northwest on the Tembler ranch a small, shallow sand pool has been found, but this seems to be limited in extent and is almost surrounded by deep failures.

The topography of the McKittrick field somewhat resembles that of Coalinga in that there is a spur from the main range of hills extending in a southeasterly direction from the main range north of the developed field. Some prospecting has been done on the west, or inside of this spur, but without encouragement. On the outer or valley side of this spur, the United States Oil and Mining brought in a small producer some time since, and lately the Nacirema got a 40- or 50-bbl. well of 12-deg. oil in this same section (sec. 6, T. 30, R. 22), and there seems some hope of a narrow belt of heavy-oil territory on the outside of this spur. The wells drilled between the spur and the main range of hills on the flat near Olig station, got nothing but water, and it seems quite certain that the rising limb of the outer anticline is barren.

The Midway Field

From the southernmost wells in McKittrick to the low divide which separates McKittrick from Midway, is but a couple of miles, and from this divide an uninterrupted view of a most remarkable scene of prospecting is presented. Midway, like Coalinga and McKittrick, consists of a stretch of the lowest foothills with a spur extending in a southeasterly direction, leaving a generally flat plain falling toward the south; in Midway, however, this plain is of much greater extent than at either of the other fields.

The most northerly development which has produced any oil is on sec. 14, T. 31, R. 22, where the Bear Creek has an oil of about 14-deg. gravity at about 1500 ft. A mile southwest of this, at about the center of the south line of 15, the Barnsdall, Drake & Yancey Company has a heavier oil at about the same depth. The development farthest up the sand is on the east line of 27, where the Cunningham and Maxwell outfits have each a very heavy oil at about 1600 ft. Southeast of these wells the Amber has a well and the Santa Fe and Associated have several, all at a depth not much greater, and with oil ranging about 16 deg. The strike of the producing formation is apparently about southeast; and following northeast down the dip from any point the depth, of course, increases, production per well appears to increase and the gravity of the oil rises. The Pioneer Midway has a 2500-ft. well on the southwest corner of sec. 30, T. 31, R. 22, while the Mays Oil Company's flowing well, lately brought in, is one-half mile east, on the center of the south line of this section: this is said to produce oil of 24-deg. gravity.

The southwest corner of this township, sec. 31, T. 31, R. 23, seems to be well up toward the edge of the producing sand. Here a Santa Fe well is flowing about 800 or 900 bbl. of 21-deg. oil from a depth of 1400 ft. The formation appears to dip sharply here, as the nearest well to the east, less than a quarter of a mile distant, is about 2000 ft. deep, and a Hawaiian well near the center of the section is over 2300 ft. Near the center of the west line of 32, the next section, the California Midway has a well flowing by heads at about 2800 ft. In fact, all the wells in this ground flowed more or less when first brought in, though this does not seem to last long. There is no production in township 31 east of this well.

Midway Oil Belt One Mile Wide

The producing belt extends across T. 32, R. 23 almost from corner to corner, and has been proved for a width averaging a mile. Here are the older Midway wells; Chanslor & Canfield, Burks, Crœsus, Mountain Boy, Mascot and others. Sections 23, 24, 25 and 26, comprising what is locally known as "Twenty-five Hill," are thickly drilled, but some trouble has been met in handling this territory and the actual production of parts of it have hardly met the first expectation of the operators.

The most interesting new developments in the Midway section are at the southern extremity, where the Standard has a fine flowing well and a couple of smaller ones at about 2400 ft. near the center of sec. 30, T. 32, R. 24, and northeast, or directly across the formation, a well near the center of 28 about which little could be learned. All sorts of extravagant stories are afloat about the production of this well on 30; it appeared to be doing about 1000 bbl. per day and is said to be a steady producer. The well of the Honolulu, which started off as a gasser and turned to oil, is almost due northeast on section 10. This well is still being worked on and flows by heads; it is said locally to be making about 500 bbl. and is producing a 28-deg. oil. This well is on the outer flank of the spur range, and hardly proves up the territory intervening between this section and Moron, though taken in connection with the Standard's gas well on sec. 26, T. 31, R. 23, it creates a strong probability that production will be had along this side of the spur. This gas well would appear rather to be on the crest of the secondary anticline.

The Sunset District

At Sunset the hills bend sharply to the east, and there is no spur range. The original wells were in the corner of this bend and rather high up on the formation. Most of these old wells, south of sec. 2, T. 11, R. 24 have been abandoned, though the Union is still pumping a few which have been stripped of their derricks. These wells were shallow, from 600 to 900 ft., and as there was a good deal of pressure the sand appears to have blown itself out. New development has been largely to the north, the best of the new wells being those of the Wellman, Ethel D, and K. T. & O. along the north line of sec. 1, T. 11, R. 24. The production of these wells has been exaggerated, yet making due allowances they are indeed healthy producers, and as they are brought in at about a thousand feet, the territory looks good. A short distance to the southeast, two or more operators have gone to about 2200 ft. before reaching the sand, and have not yet reached the stage where the capacity of the sands at this point is known; but if this sharp dip is maintained work in this direction does not look as promising as it did some time since. However, it is quite possible that this drop in the formation is only local, and extension to the east will not be barred until further results are obtained.

Several rigs are now working along the easterly turn of the hills, following in general the center line of T. 11, R. 23 and T. 11, R. 22, and while no oil has yet been found, there are hopes of an extension in this direction. Some of the old work, while it was probably too far back to have ever been profitable, indicated that the formation which produces at Sunset extends unbroken in this direction, though whether it carries profitable quantities of oil cannot, of course, be known.

Zinc Smelting Capacity of the United States

The accompanying table gives the number of furnaces and retorts of the active zinc-smelting works of the United States at the end of 1909. The list includes two or three works that were not in operation in 1909 and will soon disappear doubtless from the active list.

There was but little increase in the smelting capacity in 1909, the capacity being already in excess of the immediate requirements and conditions being unfavorable to lead any of the smelters to make provisions for the future. Such additions as were made in 1909 were chiefly for the completion of new plants of which the construction had been begun in previous years. Thus, at Depue, Ill., two blocks, comprising 1520 retorts, were added, and at Danville, Ill., one block, comprising 900 retorts; at Caney, Kan., half a block, comprising 288 retorts, was added. The Lanyon-Starr Company, of Bartlesville, Okla., has two blocks, comprising 1152 retorts, which have never been fired. So far as we are aware, no plans for the construction of new works, or further additions to smelting capacity are now on foot.

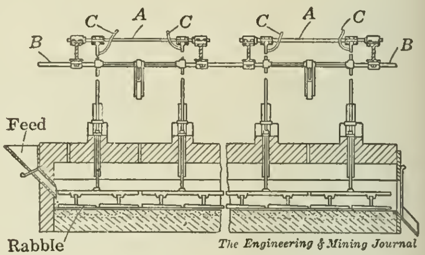
ZINC SMELTING CAPACITY OF THE UNITED STATES.

Name.	Location.	Furnaces.	Retorts.
American Zinc, Lead and Smelting Co......	Deering, Kan.	6	3,840
American Zinc, Lead and Smelting Co......	Caney, Kan.	6	3,648
Bartlesville Zinc Co....................	Bartlesville, Okla.	6	3,456
Bertha Mineral Co......................	Pulaski, Va.	10	1,400
Chanute Zinc Co........................	Chanute, Kan.	4	1,280
Cockerill Zinc Co........................	Altoona, Kan.	6	3,840
Cockerill Zinc Co........................	Bruce, Kan.	4	896
Cockerill Zinc Co........................	Gas City, Kan.	4	2,560
Cockerill Zinc Co........................	La Harpe, Kan.	3	1,856
Cockerill Zinc Co........................	Nevada, Mo.	3	648
Cockerill Zinc Co........................	Rich Hill, Mo.		
Edgar Zinc Co..........................	St. Louis, Mo.	9	2,000
Edgar Zinc Co..........................	Cherryvale, Kan.	24	4,800
Granby Mining and Smelting Co...........	Neodesha, Kan.	6	3,840
Grasselli Chemical Co....................	Clarksburg, W. Va.	10	5,760
Hegeler Bros............................	Danville, Ill.	2	1,800
Illinois Zinc Co.........................	Peru, Ill.	7	4,640
Lanyon-Starr Smelting Co................	Bartlesville, Okla.	6	3,456
Lanyon Zinc Co..........................	Iola-La Harpe, Kan.	15	9,740
Matthiessen & Hegeler....................	Lasalle, Ill.	5	4,380
Mineral Point Zinc Co....................	Depue, Ill.	5	3,920
National Zinc Co........................	Bartlesville, Okla.	4	2,432
New Jersey Zinc Co......................	Palmerton, Penn. Bethlehem, Penn.	30	5,104
Pittsburg Zinc Co........................	Pittsburg, Kan.	4	910
Prime Western Spelter Co................	Gas, Kan.	14	8,584
Sandoval Zinc Co........................	Sandoval, Ill.	4	896
United States Zinc Co....................	Pueblo, Colo.	6	1,440
United Zinc and Chemical Co.............	Iola, Kan.	6	2,784
United Zinc and Chemical Co.............	Springfield, Ill.	2	640
		211	90,550

Hall Roasting Furnace

A roasting furnace of the reverberatory type in which the ore in the form of concentrates is conveyed across a hearth by a system of mechanically-operated rabbles was patented by Benjamin Hall, Nevada City, Cal., Jan. 4, 1910, (U. S. Pat. 945522.) The accompanying figure is a longitudinal section of the furnace.

The ore is fed from a hopper to the roasting chamber across which swing pendulums with rabbles. It will be noticed that the rabbles are tapered with the wider and thicker end toward the feed hopper, and as they pass through the ore, it slides forward from one rabble to the next, until the ore reaches the discharge door of the chamber. The pendulums are secured to a shaft *A*, and given the swinging motion by eccentrics driven from the shaft *B*. Metallic tubes are used for the pendulums, which are kept cool by connecting them with a flexible hose to cold air or water-supply pipes *C*. The furnace bottom is shaped to conform to the arc of the pendulum.



HALL ROASTING FURNACE SHOWING RABBLES

Prussian Silver Mines at St. Andreasberg to be Closed

It is reported that the Prussian Secretary of Commerce and Industry has ordered the fiscal silver mines at St. Andreasberg in the Harz mountains to be permanently closed this spring. The mines had been run at a loss for a number of years and were kept going at heavy expense solely for the purpose of furnishing employment to the mining population of the town. As all prospecting work gave negative results, it was found necessary to take this step and find other work for the men. The water power heretofore used for mining and ore dressing will be leased for manufacturing purposes.

According to Lindell P. Bates, oil-bearing strata extend for many miles along the western shores of Peru, where they have been worked for oil in several localities. The present producing fields are those of Negritos, about 40 miles north of Payta; Lobitos, 60 miles north of Payta, and Zorritos, 30 miles south of Tumbez.

Ore Dressing in the Coeur d'Alene District—X

Concentrates Handled in Wheelbarrows and Carts. Installation of Tailings Plants. Overloaded Machinery. Résumé of General Practice

BY EDWARD S. WIARD*

Having covered in detail the milling methods used in the Cœur d'Alene district, in this last section I shall treat of the methods of handling the concentrates, and give a brief résumé of the previous articles.

LOADING CONCENTRATES

At the old Last Chance mill the jig concentrates discharged into double square bins resting on the lower floor of the mill. The sides of the bins were 5 ft. high. The entries to the bins were closed by removable boards, held in place by a scantling wedged against the edge of the top board and a floor timber above. The boards were set in grooves at the sides of the entries, and to prevent leakage strips of burlap were laid on the edges. By driving the scantling against wedges placed on the top board, the boards were pressed down firmly on the burlap strips and the entry was thus made water tight. Each bin was capable of taking care of 24 hours' accumulation of coarse concentrates. The overflow water passed to an outdoor tank for further settlement.

When the bin was full it was drained by drawing plugs; the boards closing the entry were removed and the concentrates taken out with a wheelbarrow. These wheelbarrows were massive affairs made in the mine shops. Some of the loads the loaders wheeled to wagons on wagers were staggering. I remember seeing one wheelbarrow which with its load weighed 2350 lb. As the wagons backed up to the mill it was necessary for the loader to turn the wheelbarrow over its end without tipping sidewise, so some idea can be gained of the strength and dexterity required for trundling out this load.

In the Last Chance bins it was frequently necessary to use false spouting to fill all parts of the bin uniformly. At the Mammoth mill bins of a similar type are made sufficiently deep so as to render this unnecessary. The Mammoth bins are closed by two heavy sheets of timbering made of a double thickness of 1½-in. lumber, each being reinforced at the back by two vertical 6x6-in. timbers. After the contents of a bin are removed the doors are placed in position with their outer edges behind 8x8-in. posts. The doors are tightened to place by two wooden swing bars swiveled on bolts projecting from the face of one of the doors near the top and bottom. These bars swing into slots cut in the sides of the 8x8-in. timbers and are driven home with a sledge. The doors are about 3x6 feet.

TYPE OF CONCENTRATE BIN NOW USED

The most popular form of concentrate bin is a long narrow affair separated into pockets at the supporting bents, which are placed 5 or 6 ft. apart and framed from 8x8-in. to 12x12-in. timbers. The bins are double and placed back to back. They are built with the bottom sloping from back to front but there is no side or false hoppering. The bins are raised a sufficient hight above the floor so that the cart shown in the accompanying illustration may be run under the edge.

At this point and midway between bents a circular hole is cut about 4 in. in diameter. The hole is closed by a circular disk of steel plate which is riveted to a handle swiveled on a pin placed back of the bin opening. The gate handle projects from the front of the bin and in addition to the pin is supported by two horizontal adjustable guides which keep the disk pressed against the bin. To open the gate the handle is swung to one side or the other. The bins are drained by pulling plugs. The hoppers are filled successively by adding pieces of curved liner to the fixed spout entering the end of the bin. The sloping bottoms of the bins do not come down to a sharp point but end in a horizontal board of sufficient width to accommodate the circular bin opening and the gate apparatus.

ORE CARTS

The spokes in the concentrate cart should be observed. Round spokes for this style of cart were tried but they were found to give away when the wheels were twisted in turning the cart into the box car. The bottom of the cart is provided with a small section of fine screen to further assist in draining the water from the concentrates. The function of the rockers mounted on the front of the cart will be readily understood—the cart is dumped by turning it end over and rolling it on the rockers. In front of the bins a drain is provided to carry off to settling tank drainings from the cart and leakages from the bin. The coarse concentrates as loaded in the box cars contain between 3 and 4 per cent. moisture.

SLIME CONCENTRATES

The slime concentrates are run into shallow bins which are filled alternately. At the Mammoth mill one of these slime bins was 4x15 ft. and 3 ft. deep at the discharge end. At the end where the stream of concentrate poured in, the tank had been built up to a depth of 4 ft. inside. This permitted the bin to be filled at the discharge end without overflowing at the receiving end. The overflow was through a passage 22 in. wide. The bin was built of 2¼-in. dressed lumber reinforced by 4x6-in. timbers placed about 4 ft. apart along the sides, and two ½-in. tie rods passed through each pair of timbers and the body of the tank. When these tanks are full they are beaten by a ball suspended from the floor above by a rope. This assists in settling the slime and bringing the water to the surface. At the Morning mill a buffer, on the plunger rod of an air drill, is used for the same purpose. The drained contents of the slime bins are shoveled into carts or wheelbarrows. Loading of concentrates is done entirely by contract, at 9 to 17c. per wet ton. At most of the properties more is paid for loading slime than jig concentrates because it generally has to be shoveled out of the bins, whereas the latter does not; in others a flat rate of from 9 to 12c. per ton is paid regardless of the difficulties of loading.

The Federal Company's shipping products go to the sampling works at Wallace. At this place the Federal company maintains an assayer and the American Smelting and Refining company does likewise. Differences in checking results above a certain limit are submitted to an umpire; below this limit they are split. The other properties either maintain a watcher at the smelteries and check the sample which he forwards to the mine or else dispense with him and content themselves with checking the samples which the smelters return to them.

RETREATMENT OF JIG TAILINGS

This subject has gained in importance in the district of late years for it has begun to be recognized that the bullion loss from the jigs may be twice as high as that from the sands and slime department. At the Last Chance mill and at the Bunker Hill plant nearby there are enormous accumulations of jig tailings. About 1905 the Bunker Hill company began to experiment with its dump, estimated to contain 800,000 tons of tailings. Twenty-eight samples were taken. The sample pits were from 4 to 28 ft. deep. A sizing test of the samples taken showed that the material increased in richness with decrease in size, but that the quantity of material decreased as the size decreased. The greatest amount of lead and silver was found in the material which would pass a 10-mm. round hole and be retained on a 7-mm. screen.

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*Mining engineer, Boston building, Denver, Colo.

Experiments Conducted

Four sets of experiments were undertaken:

(1) Whole tailings were fed to a bull jig with a single compartment 36x60 in. The best recovery obtained by this operation was 65 per cent. The tonnage treated varied from 165 to 265 per 24 hours. The percentage of saving varied inversely as the ratio of concentration. Ultimately the best ratio of concentration was set at about 3.3:1, which corresponded to a saving of about 55 per cent. I might add parenthetically that the guiding idea in these experiments was to determine whether or not a method could be devised by which (preferably by jigging) the tailings could be brought up cheaply to a grade which would pay to grind and concentrate on tables and vanners.

(2) The whole tailings were screened on a four-mesh screen, the oversize passing to the bull jig as before and the undersize to Wilfley tables and vanners.

(3) The whole tailings were passed over a 12-mesh screen, the oversize passing to the bull jig and the undersize to Wilfley tables and vanners.

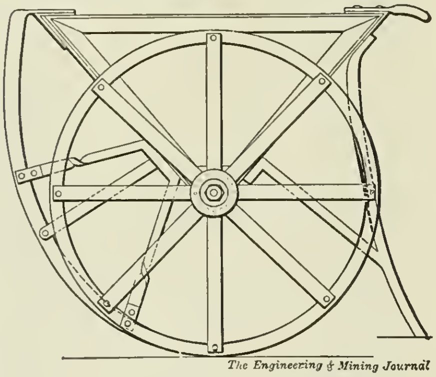
(4) In this series of tests the slime was washed out of the tailings and the residue thrown on the bull jig. The experimenters reached the conclusion that, all things considered, the treatment of the tailings as in method (1) gave the best results.

The dump was made up of four distinct kinds of material: (1) Flat scaly pieces of milky quartz containing small amounts of sulphides so disseminated that excessive grinding would be required for their liberation. This material was of about the same specific gravity as the clean quartzite which formed the major part of the tailings mass. (2) The clean quartzite, just mentioned, which frequently contained a little galena. (3) True pieces of middling which contained noteworthy amounts of sulphide with a large intermixture of spathic iron. (4) Spathic iron the separation of which from other materials containing less than 10 per cent. lead was impossible.

In order to obtain a greater recovery than named above it would have been necessary to take in a part of classes (1) and (2) which were regarded as worthless. The concentrate from the jigging operation obtained by method No. 1, containing between 3 and 5 per cent. lead, was ground in a Huntington mill to 20 mesh, this being found by experiment to be the proper size of screen. The product so made was sized on Callow screens, the oversize being fed to Wilfley tables. The final undersize passed to conical tanks and was thickened for vanner treatment.

Bunker Hill Tailings Plant

The mill for treating these tailings is shown as the North mill on the flow sheet of the Bunker Hill mill in section 2 of these articles. With the new West mill in operation, jigs will be placed in this building and it will serve the function for which it was designed. The present uses will be seen by reference to the flow sheet mentioned. The tailings will be gathered by a self-filling and self-dumping two-yard scraper on the cable of a double-drum hoisting engine. The scraper discharges on a belt conveyer, which fills the tailings-plant storage bins. The capacity of the tailings mill is expected to be 1000 tons per 24 hours. The jig concentrate will amount to about 300 tons per 24 hours and the average net profit is expected to be $0.27 per ton of tailings.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Cart for Handling Concentrates

At the time of my last visit to the district a mill was being erected by private capital near the Last Chance mill to treat the accumulation of tailings from this plant. I understand that an effort was to be made to make a shipping product by direct jigging. Beyond this statement I could obtain no information concerning the project. At the Morning mill the tailings from 9 mm. down to the limit of trommel screening are ground in three 6-ft. Huntington mills with 30-mesh screens. From this point the stream passes to a slough-off tank. The plug product from this tank passes to three duplex Callow screens and the undersize as well as the oversize goes to Wilfley tables. The dirty water from the 12 Wilfley tables treating the undersize passes to 12 Callow tanks, which thicken the pulp for twelve 6-ft. vanners. A portion of the dirty water from the oversize tables also passes into the Callow tanks.

I understand that ultimately all the jig tailings may be ground and treated as above. I cannot forbear the reflection that the regrinding of all this low-grade material is a mistake and that by jigging operations properly conducted, a noteworthy proportion of commercially worthless material might be sent to waste. The field for such a plant is not tailings but low-grade middlings.

Overcrowding Machinery

References to the evil of returning the middlings back to the machine from which they came by way of crushing machinery, elevators and screens run through many of the articles. This is one of the chief reasons why actual mill operations fall short of the expectations aroused by small-scale tests. It crowds the screens and jigs. There is bound to be an oversize return from rolls, the percentage being greater in the case of fine material than coarse. But even with the smallest return the burden of ore passing to the jigs will keep increasing until finally the rolls choke or, as most commonly happens, the jig sends the middlings over the tail board of the jig. These are the conditions existing in dozens of mills to my certain knowledge.

Millmen would gain a great deal of information of real value if they would prepare complete flow sheets of their mills. By these I mean trees showing the amount of water and the tonnage of ore and its grade flowing in every launder of the mill. They would then often find comparatively small proportions of the original stream entering the mill swollen to enormous tonnages by uncrushed and unsized middlings. I suppose it will be said in extenuation of this practice that the separate jigging of the middlings would often not yield any concentrate. In this case what is the use of returning them to the jig from which they came? If the middlings are low in grade the secondary jigging of them will often allow of noteworthy amounts of worthless material being eliminated by way of the tail board. If the middlings are of low grade and with the mineral so disseminated that light crushing will not unlock any concentrate then the proper procedure is fine grinding followed by sand and slime-concentrating machinery.

In mentioning under section 2 that the upper limit of screening was high, I gave examples of the size of opening of the holes in a number of the head trommels. The Bunker Hill and Hercules were given as 36 mm., but at these properties the oversize from the head trommel is sent to rolls, then returned to the trommel, so all the ore is crushed to a limiting size of 36 mm. At the Mammoth, 15 mm., and the Morning, 22 mm., the oversize from the head trommel passes directly to bull jigs. In these properties, then, jigging begins at the limit of the set of the No. 1 rolls, which is about 1¼ inch.

Crushing and Screening

In section 3 my argument on Blake crushers was that capacity increased with breadth of jaw rather than width of opening, and that as the majority of ores came to the mills with maximum-size pieces which would enter a crusher 9 in. wide the millman using a crusher of greater width would have paid for cast iron that did not give any service. With a crusher of greater size than 9x15 in. some form of shaking grizzly would have to be used. In the Cœur d'Alene district the crusherman rakes the ore from the bin over a gently sloping round-hole grizzly and he usually comes off shift worn out with his exertions.

In discussing trommels I indicated the line along which I believe these machines could be improved for wet screenings. Richards says in his last volumes on "Ore Dressing" that the tendency of the continental practice is away from the close sizing which has prevailed in the past. This cannot be due to a wrong principle but to poor screening. Here is a giving up of a good principle instead of attacking the difficulties which beset it. For screening coarse sizes of wet ore I have recorded my conviction that the trommel is the best device we have today. I believe the securing of a screening device immeasurably superior to it is obtainable by careful study. Such a machine could not be as simple as the trommel. Is it better to have a machine which does its work perfectly, but requires a certain modicum of attention, or to have another which does the same work imperfectly but requires no attention until it wears out? This question is squarely up to the ore-dressing world today. It means a higher standard of labor in the mills if we say "yes" to the first part of the question. In other manufacturing lines progress has come by greater refinements in the machinery used, and labor has advanced equally in skill. Possibly the preparation of mineral products is an exception to this statement!

Additional Jig Compartments

Under the head of jigging, I dealt principally with the evil of too few compartments when treating complex ores. I concluded that with the ore which I analyzed, a three-compartment jig was at least required; even a greater number than this might be necessary, the decision as to how many, in any case, being dependent on results obtained by test. I will add further that the making of a number of grades of middlings might be of decided advantage as the highest grade might for example be further treated by light crushing followed by rejigging while the others would only be amenable to treatment after fine grinding. In the new Bunker Hill mill the number of compartments of the jigs has been increased over the usual practice in the district. This is required to some extent by the departure from the usual screening practice. Many of the hutches of the fine jigs in the mills would make almost ideal feed for Wilfley tables, but instead of sending them directly to the tables they pass to the rolls, elevators and classifiers from which they came.

Colloids

Under the heading of slime settlement my argument against the colloidal theory is that with the majority of concentrating ores it is not of practical importance. The colloidal matter that does form does not seriously interfere with settlement. Some of the authorities tell us that all matter finely divided in water is in the colloidal state. Much of the experimental work on colloids has been done on material from the surface of the earth, where there has been formed by atmospheric agencies, in the decay of rocks, comparatively large amounts of colloidal matter. In these cases the colloids preëxisted and grinding merely liberated them. The more grinding the more liberation of colloids. Surface conditions are not, however, comparable to those in the unaltered deep. We would not expect to find gelatinous silica at a depth of some thousands of feet below the surface. In one breath the advocates of the theory tell us that prolonged crushing will increase the percentage of colloids while roasting will prevent the formation of colloids. If both of these statements be true they can only be so when the colloids preëxist.

Testing Plants

I will close my articles with a plea for ore testing, where the conditions will permit it, on a full-sized scale. Anyone who has read my articles closely will see that the difficulties which confront us today in mill work are more mechanical than metallurgical. If an old property decides to build a new mill, the old mill will often be the best possible testing laboratory. The practice of building small experimental mills where future operations on a large scale are contemplated is growing. The building of such a mill with full-sized machinery does not imply that the plant must be large. What is needed is a test plant equipped with a few standard machines in such a way as to allow each step to be studied separately and thoroughly. It goes without saying that each ore requires different methods.

Résumé of Previous Articles

In these closing remarks I shall briefly review the preceding chapters, stating some of the lessons to be learned from the district as I see them, and picking up some of the errors of statement into which I have inadvertently been betrayed. If anyone has gathered from my criticisms that the practice in the district is any worse than the average practice elsewhere they are in error. My aim has been to touch on milling faults which are continent-wide. I have omitted any reference to the financial results obtained in Cœur d'Alene mills; an admirable statement of this aspect of the practice will be found in J. R. Finlay's "Cost of Mining." I have also steered as clearly as I could of the question of betterments in the mills simply because this must be answered differently in each mill and by detailed work in it. I have not touched on the new Bunker Hill mill because I believe it too early to offer any comment upon it. Some of its departures from the orthodox district practice seem to me to be admirable. Unless otherwise stated all assays are fire assays.

The error of not hand sorting ore is far more general than is generally suspected. I have in mind a number of properties where the feasibility of this operation is not even suspected, and yet I am confident that the installation of properly designed picking plants would pay handsomely.

German Steel Production

The German Iron and Steel Union reports the make of steel of all kinds in Germany in 1909 at 12,049,834 metric tons. The different kinds and quantities of steel are shown in the accompanying table, in comparison with the figures for 1908. The ratio of steel to pig-iron production, which was 94.7 in 1908, decreased a little, to 93.3 in 1909, but is still higher than that of any other country.

STEEL PRODUCTION OF GERMANY.

	1908		1909	
	Tons.	PerCt.	Tons.	PerCt.
Acid converter......	374,100	3.3	151,148	1.3
Acid open-hearth..	224,211	2.0	311,812	2.6
Total acid........	598,311	5.3	462,960	3.9
Basic converter....	6,510,754	58.2	7,517,451	62.4
Basic open-hearth..	3,969,595	35.5	3,967,581	32.9
Total basic.......	10,480,349	93.7	11,485,032	95.3
Crucible.............	88,183	0.8	84,069	0.7
Electric.............	19,536	0.2	17,773	0.1
Total..............	11,186,379	100.0	12,049,834	100.0

Of the total reported, 63.7 per cent. in 1909 was made in the converter; 37.5 per cent. in the open-hearth furnace; and 0.8 per cent. by other methods. Direct castings, amounting to 192,883 tons in 1908 and 206,486 tons in 1909, are included in the figures. In 1909 there were 17 works making acid steel, 87 making basic steel, 24 crucible steel, and 8 electric steel. There were 30 works using converters and 74 using open-hearth furnaces.

The total increase last year was 863,455 tons, or 7.8 per cent. The gain was wholly in basic converter steel, the make of which increased 1,006,697 tons, or 15.5 per cent. Acid open-hearth steel increased 87,601 tons, or 39.1 per cent., while acid converter steel decreased 222,952 tons, or 59.6 per cent. The other classes of steel showed small losses. The basic converter remains the great steel maker of Germany.

Brier Hill Concrete Lined Shaft, Vulcan, Mich.

Seven Compartment Circular Shaft 850 ft. Deep, 14 ft. in Diameter; Total Cost Less Than $100 per ft. Steel Sets and Wooden Guides Used

BY WILLIAM KELLY*

The Brier Hill shaft was originally planned to be sunk to a depth of 850 ft., but it is expected that in the future the shaft will be sunk deeper as the conditions of the ore deposits demand. The shaft is lined throughout with concrete. Concrete was adopted for safety and permanence, to avoid the danger of fire and the expense of timber replacements. A circular section was adopted so as to use the concrete in compression and avoid the necessity for reinforcement. Even with a circular section there might be conditions of ground which would require the use of reinforcement in a shaft lining, but these conditions did not appear in this shaft, except at some points in the roofs of the stations at the different levels.

The shaft is 14 ft. in diameter and is divided into seven compartments: Cage; a six-ton skip; a ladder way; a pipe way; two balance ways, and a compartment which can be used for a small cage or other purposes as later requirements demand. The cage will be large enough for a car to carry mine timber. Fig. 1 illustrates the shaft compartments. For the conditions presented this circular section is quite as economical of space as any rectangular section would be.

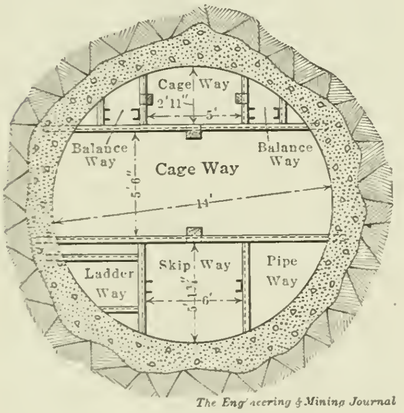

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FIG. 1. PLAN OF BRIER HILL SHAFT

STEEL SETS

Steel sets have been put in 10 ft. 8 in. between centers, as shown in the plan and vertical section of the shaft, Figs. 1 and 2. The main horizontal members are composed of 8-in. channels, 13¾ lb. to the foot, placed on edge. These sets support the runners or guides of the cage, skip and balance roads, the ladders, pipes and wires and have nothing to do with bracing or reinforcing the concrete. Between the sets are studdles of steel channels to which the wooden runners for the cage are bolted. The vertical members are attached to the horizontal pieces in such a way as to allow for expansion and contraction due to changes in temperature. Ship channels are provided to guide the skip and there will be hardwood pieces attached to the skip to run in the channels. The severest strains to which these sets might be subject would arise in case the hoisting rope broke and the safety catches of the cage operated. The ladders are built of steel and the ladder way and skip compartment are to be lined with galvanized corrugated sheet steel.

PRELIMINARY OPENING ENTIRE LENGTH OF SHAFT

The shaft is to serve a territory which has been explored and partly developed by drifts from another shaft. Some stoping has been done and there are drifts at a depth of about 400, 500 and 600 ft. It was, therefore, feasible to make a preliminary opening throughout the entire length of the shaft by raising from these levels and sinking from the surface and the bottom level. This opening was made six by eight feet. The ledge is about 60 ft. below the surface, the overburden consisting of gravel and hard pan. After the preliminary opening in the upper part was completed a timbered shaft 20 ft. square was sunk to the ledge. The sets of this shaft required diagonal bracing. Excavation was then carried down for a short distance in the rock and concreting started at a depth of about 79 ft. below the surface. The concrete from this point to the surface was put in during the winter of 1908. The method of concreting proved to be a success and further work was suspended until spring when the mixing plant was amplified by the addition of a cement shed with runway from the railroad siding. A car with a cross division in it is used to measure the sand and broken rock for a charge and tram them to the hopper of the mixer. The mixer is set below the surface and a tunnel 35 ft. long connects the mixer pit with the shaft. The mixer dumps the concrete into a kibble which stands on a tram car in the tunnel. The car is trammed to the shaft and the bucket lowered. As with the preliminary opening no mucking was necessary for the upper 600 ft., it was cheaper to bring the rock from another point than to shovel and hoist the rock from the shaft. The accessibility of the material suitable for concrete was a favorable feature of the situation. The mixing plant is available also for construction of foundations for other buildings.

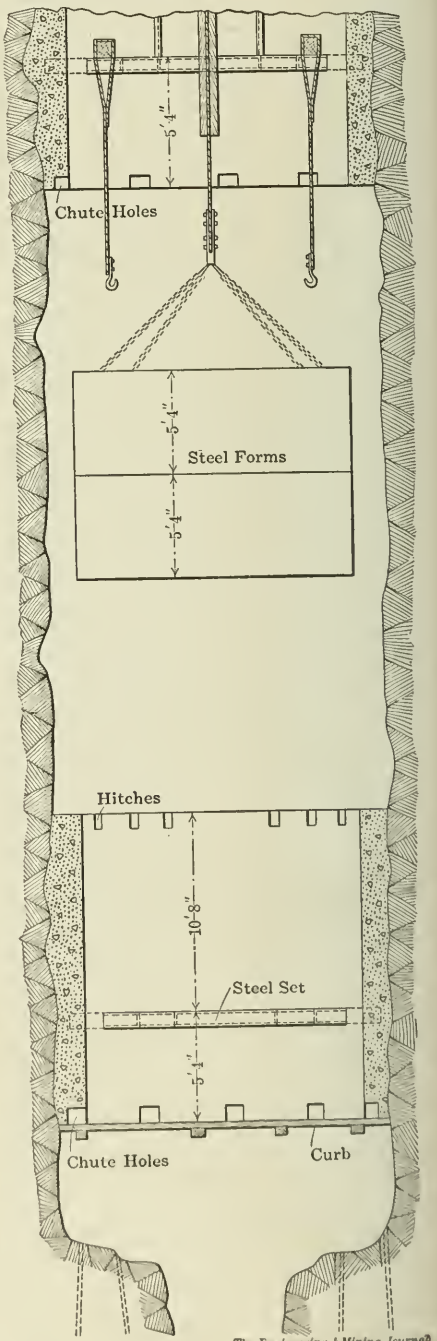

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FIG. 2. SECTION SHOWING CONSTRUCTION OF BRIER HILL SHAFT

NOTE—Abstract of a paper read before the Lake Superior Mining Institute, Aug., 1909.

*Vulcan, Mich.

CONCRETE MIXTURE

It was aimed to mix the material for the concrete in the proportion of one part of cement, to three of sand and six of stone. The sand contained a varying amount of gravel and the fines in the stone varied. Tests of the voids were made by the engineers from time to time and the proportion of the ingredients in the mixture was changed to correspond.

The plans for the completed shaft in the rock called for an average concrete lining of 18 in. thickness with a minimum at any point of six inches. No attempt was made to trim the walls smooth as the irregularities of the rock are the support for the concrete. On the other hand too great irregularities in the excavations entail a waste of concrete. Measurements of the actual excavation taken by the surveyors every three feet vertically give an average thickness of the concrete of a little over 19 in. This is equivalent to a little less than three cubic yards of concrete to a vertical foot of shaft.

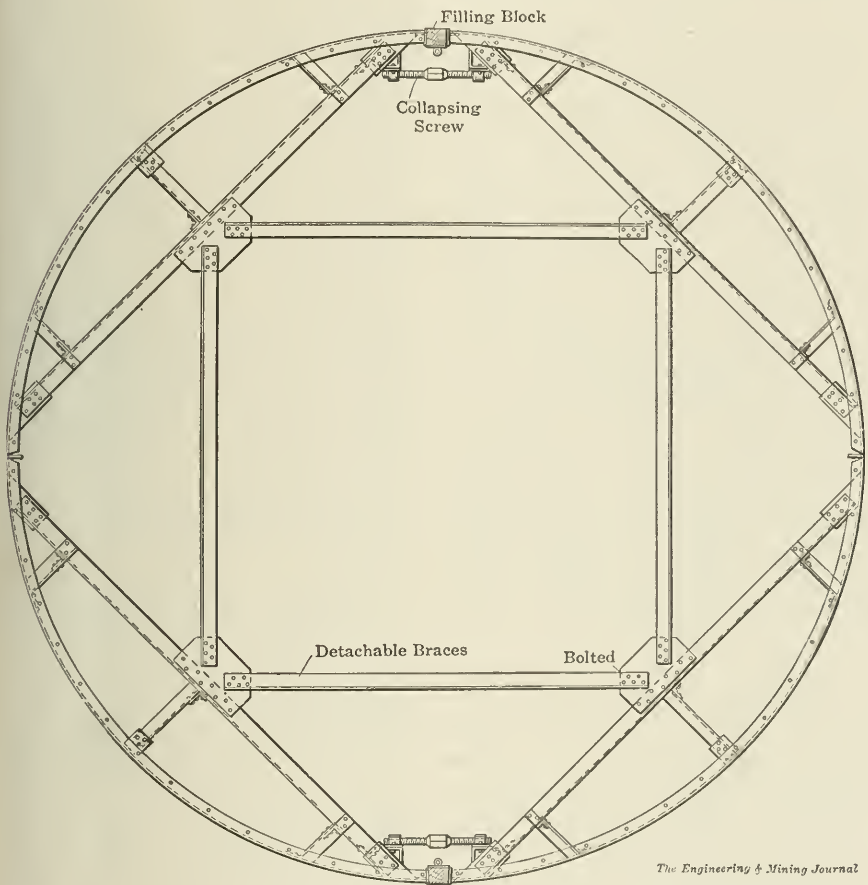

FIG. 3. PLAN OF STEEL FORMS SHOWING BRACES IN PLACE

STEEL FORMS

Steel forms were used in concreting. These are made of ⅛-in. sheet steel with appropriate bracing as illustrated in Fig. 3. Four forms are used in the circle and in two of the joints pieces of timber or "filling blocks" give space to facilitate the collapsing of the forms after the concrete is set. One round of four forms has a hight of 5 ft. 4 in. and two rounds are used. The outside of the forms is smooth and is painted with black oil each time they are used.

After the excavation of the shaft to the proper size has been carried downward for a distance sufficient to put in three or four sets of steel, a platform or "curb" is laid on the outside edge of the shaft all around near the bottom at the proper distance from the concrete above to allow for the number of sets proposed. One round of forms is then set upon this platform. Empty boxes are put in at the bottom to form "chute holes" for putting concrete into the form below at the proper time and a platform of 3-in. plank is laid over the top of the form. The concrete is then lowered in the kibble, dumped on the platform, slushed off and tamped in around the outside of the forms completely filling the space between the forms and the rock. Before the concrete is quite up to the edge of the top of the forms, boxes are put in just inside the forms to core out hitches for the steel sets. As soon as the concrete is set the forms are collapsed by taking out the vertical strips of wood or "filling blocks" in the two openings. The round of forms is attached to the hoisting rope by chains, hoisted up and suspended from the steel framework in place above.

A set of steel is then lowered, laid in the hitches left in the concrete and cemented in. The round of forms is lowered upon this new set, expanded to the proper size and the second round of forms is set up and bolted to the first so that this time concrete is deposited for a hight of 10 ft. 8 in. This can be done in an eight-hour shift, and 12 hours are sufficient for the concrete to set so that it is possible to concrete 10 ft. 8 in. of shaft and put in the steel work in less than two days. As the space between the steel sets is 10 ft. 8 in. and in starting only half this amount of concrete is put in before a set is laid, the work is joined to the older concrete above by one round of forms of 5 ft. 4 in. This is filled through the spaces or "chute holes" left by the empty boxes previously mentioned.

COST AND RATE OF CONSTRUCTION

No attempt was made to make a record of speed. The best work was done in September and October, 1909, which resulted in the excavating (enlarging the original opening) concreting and putting in the steel of 138⅔ ft. of shaft or an average of 69⅓ ft. per month. At that time the men were working two shifts a day or 11 shifts a week of 10 hours each. Six men constituted the regular shift in the shaft either for excavating or constructing. In addition to the shaft work proper three stations have been cut out and concreted.

In keeping the record of the cost, the shaft has been divided into three parts: from surface to ledge, 62 ft.; from top of ledge to 7th level, 549.5 ft.; and from the 7th level down, ultimately, about 238.5 feet.

COST OF CONSTRUCTION.

	Surface to Ledge, 62 Ft.	Ledge to 7th level. 549.5 Ft.
Preliminary excavation...	$13.07	$18.46
Final excavation.........	18.19	15.10
Steel shaft frames.......	7.90	7.90
Steel forms..............	0.83	0.83
Temporary surface structures and equipment...	10.18	10.18
Construction	56.29	25.26
Estimated charge for compressed air............	1.00	1.00
Total per foot.......	$107.46	$78.73
Estimated salvage on shaft timbers	0.50	0.50
Estimated salvage on temporary surface structures and equipment...	2.95	2.95
Net total per foot...	$104.01	$76.28

The item "construction" includes the handling of the steel forms, depositing concrete, and setting and erecting the steel frames. These figures include estimates of power and every charge except for general management and engineering. The cost of the first 85 ft. below the 7th level was $87.19 per foot. The cost of this circular concrete-lined shaft is about the same as a rectangular shaft of the same capacity with steel framing. The small additional cost over a rectangular shaft with timber framing is abundantly justified by the increased safety and permanence.

The Vortex Copper Converter

BY HERBERT HAAS *

From Mr. Shelby's note on copper converters in the JOURNAL of Jan. 29, 1910, it is evident that he has misinterpreted my remarks. There was no attempt at "treading on one's toes," and the statement that the air efficiency of the present copper converter is low, was not made in the spirit of a criticism, either of Mr. Shelby, or any other equally able workers in that field of metallurgy. In the development of any process or apparatus sooner or later a stage is reached where a further mechanical or metallurgical efficiency is obtained at the expense of commercial economy, and we must then move in a new direction and use other means to accomplish further economies.

AN AGE OF PROGRESS

By way of illustrating I know nothing better than the steam engine. In 1860 more than 11,000 calories were required to furnish one horsepower in a single cylinder steam engine with 35 lb. boiler pressure. By increasing the boiler pressure to 80 lb., the heat consumption of the single-cylinder steam engine was reduced to 7600 calories per horsepower in the year 1874. With the introduction of the compound engine in the same year improvements followed in rapid succession, and resulted in lowering the heat consumption to 6400 calories. Gradually the thermal efficiency was increased until only 5000 calories were required to produce a horsepower, due to increase in boiler pressure to 120 lb. A further improvement was obtained with the triple expansion engine in 1890, with the simultaneous increase in boiler pressure to 160 lb. An increase in boiler pressure above 190 lb. being limited by manufacturing difficulties the engineer turned his attention to the possibilities resulting from superheated steam, which was first tried in a single-cylinder engine. The use of superheated steam in a triple expansion engine in 1900 brought about a further reduction in the heat consumption to 3300 calories.

A further increase in temperature was prevented by the difficulties of building superheaters for such high temperatures. The development, therefore, again took a new direction, and economies resulted from the introduction of the steam turbine, to the extent of lowering the costs for buildings, maintenance, and lubrication, although the heat consumption of the first steam turbines was higher than that of piston engines, on account of operating the turbines at low pressure and temperature. By using superheated steam the heat consumption of the turbines was lowered to that of the most advanced type of piston engines. Thus from the year 1860 to 1908 the loss of heat due to imperfections in the engine was lowered from 9000 calories to 2000 calories, which is the amount between theoretical and actual heat requirements of the engine.[1]

It may be further stated, that of the total heat value of the fuel used, only from 18 to 20 per cent. of it goes toward generating power, when using the highest type of double or triple expansion engine of 3000 h.p. and over, with 185 lb. boiler pressure, 315 deg. C. superheat, and operating condensing, or using the exhaust steam in low pressure turbines (12 to 14 per cent. net thermal efficiency when deducting power used in operating boiler and condenser equipment, such as feed, water circulating, vacuum pumps, etc.). The largest modern gas engines use from 28 to 30 per cent.; alcohol motors 33, and Diesel engines 36 per cent. of the fuel value.

These statements of facts surely cannot be taken as a criticism of the wonderful progress made in the building of steam-engine and steam-power generating appliances; nor can it be considered a criticism of the copper metallurgists who have brought the Manhes-David converter to the present stage of perfection, if the statement is made that its air efficiency is low.

CONSUMPTION OF AIR IN CONVERTERS

There is, however, no reason to rest satisfied with what has been accomplished. The engineer will not stand still where there is room for further improvement, and Mr. Shelby will not deny that these were the considerations which led him to design the converter he described in the JOURNAL, just as similar considerations caused me to design one which I believe has a few valuable features. Mr. Shelby has not, as he stated in that article, tried his converter in practice, nor have I done so with mine, and though results, not promises, are the final test of any process, an engineer can, by careful analysis, make certain deductions and design machinery which in actual operation will perform the work expected of it. Mr. Shelby certainly has no doubt that his converter would be quite successful in operation. I have the same conviction about my converter, although I am quite willing to admit that some of its features are more radical than those embodied in Mr. Shelby's spherical shell converter. Before dwelling on these features, however, I shall give a few figures, "that will locate the 'low' air efficiency of the present converter."

At present the average air consumption in copper converting can be placed at 200,000 cu.ft. per ton of copper produced. To furnish this air at the required pressure, one indicated horsepower-hour is needed for 4 to 5 lb. of copper produced. This is approximately 50 per cent. efficiency, based on the theoretical combining requirements (for oxygen) of the constituents to be oxidized, and the amount of oxygen in the air actually supplied. I have official figures for one entire year of the average air consumption per ton of copper in one of the largest and most ably managed copper-smelting works in the United States, producing 10,000,000 lb. of copper monthly, so that these figures may serve as a fair basis of computation. Here they used 183,000 cu. ft. of air per ton (2000 lb.) of copper (5713 cu. m. per 1000 kg.). One indicated horsepower-hour was required to furnish this air for every 4.88 lb. copper produced, exclusive of hydraulic or electric power used to tilt converters, operate cranes, or other machinery in the converter department.

For the purpose of figuring the amount of air required, we can limit ourselves to the following average composition of matte: 45 per cent. copper, 25 per cent. sulphur and 30 per cent. iron. This represents roughly the average matte treated at most American copper works. With the exception of a few plants where pyritic smelting is practised and a large supply of marginal silicious ores are available, smelters find it cheaper to concentrate the matte in the blast-furnace rather than blow a matte low in copper to blister. As the sulphur in the above matte is somewhat higher (1 to 2 per cent.) than what is usually contained in the average matte converted, it more than compensates for omitting any of the usual impurities present in minor quantities, such as lead, arsenic, antimony, bismuth, selenium and tellurium. To bring 1000 kg. of this matte forward to blister copper we require: $\frac{250 \times 32\ (O_2)}{32\ (S)} = 250$ kg. oxygen; $\frac{300 \times 16\ (O)}{56\ (Fe)} = (85.7)$ 86 kg. oxygen, making a total of 336 kg. oxygen, which is mixed with $\frac{336 \times 76.4}{23.5} = 1092$ kg. nitrogen, giving a total of 1428 kg. air for 450 kg. copper, and for

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*Metallurgical engineer, San Francisco, Cal.

[1] Kammerer, Entwicklungslinien der Technik, *Technik und Wirtschaft*, III, 1, 1910.

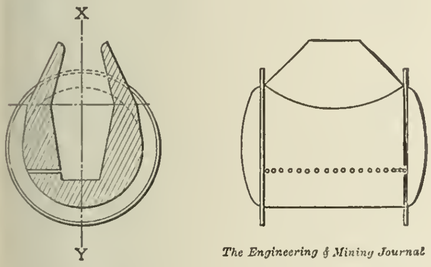
1000 kg. of copper, 3173.33 kg. air equals 100 per cent.

The 5713 cu.m. air actually used per 1000 kg. copper, with an average mean temperature of 20 deg. C., at an altitude of 5000 ft. (barometric pressure of 635 mm.), weighs, when reduced to standard conditions of temperature and pressure (0 deg. C. and 760 mm. pressure):

$$5713 \times \frac{1.2934}{1 + (0.003665 \times 20)} \times \frac{635}{760} = 5752 \text{ kg.; i.e.}$$

5752 kg. dry air were actually furnished per 1000 kg. of copper, or an efficiency of the air used of $\frac{3173}{5752} = 0.5516 = 55.16$ per cent.

This does not take into consideration any water vapor contained in the air. But as the air is dry in this particular locality, the above figures are sufficiently accurate for our purpose. A considerable portion of this air is lost in the distributing system and in punching tuyeres, so that the effect of the air actually introduced into the converter is around 70 per cent.



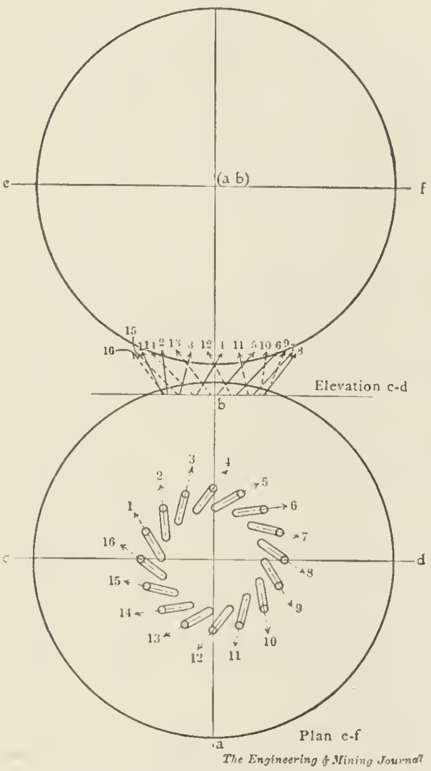
ARRANGEMENT OF TUYERES IN BARREL CONVERTER

ARRANGEMENT OF TUYERES

I give herewith a sketch of the tuyere arrangement of the converter now commonly used as well as that of my vortex converter. It will be seen that the tuyeres in the trough converter introduce the air blast in a direction normal to a plane through the line *X Y*. This direction will be maintained through the entire process of blowing, even if the converter is tilted; the air is introduced at the angle of greatest resistance, and the force of the air current is spent largely in overcoming frictional resistance, due to impact in encountering the wall of liquid matte. Aside from maintaining sufficient pressure to withstand that offered by the converter contents and to prevent the clogging of the tuyeres, the power stored up in the many air currents is used to little advantage.

It occurred to me that this power could be used to set up a rotation of the converter contents and thereby insure a more thorough mixing of the various constituents, and simultaneously a more rapid oxidation, hence shortening the time of blowing. To do this I made use of the vortex principle. I use a spherical bottom-blown converter, the circles representing cross-sections through the sphere, giving the tuyeres in plan and elevation. The converter can be tilted around the axis *ab*, thereby turning the tuyeres around the same axis. The riding rings permit a complete revolution of the converter. The tuyeres can be used also with a vertical converter.

It will be noted that each tuyere has three distinct angle functions, their direction being forward, outward, and upward. These directions are the same for every tuyere, and follow the line of least resistance, thereby imparting momentum to the mass, uniform in magnitude and direction. This would tend to rotate the mass, giving it a swashing motion, by which the converter lining would be evenly corroded. It would also eliminate the necessity of punching the tuyeres. I had frequent occasion to observe long noses extending from tuyeres in the present form of converter which can be traced to the chilling effect of the air. In the vortex converter the contents, moving constantly over the tuyeres, with the attendant rapid oxidation, prevent the forming of noses.



ARRANGEMENT OF TUYERES IN VORTEX CONVERTER

A criticism that is likely to be made by converter men, is that the copper will chill in a bottom-blown converter. Matte has, however, been successfully brought to blister copper in an upright bottom-blown converter, 13 ft. high, 7 ft. in diameter, with sixteen ¾-in. tuyeres, at Great Falls, Mont., the only difficulty having been the floating up of the bottom, and the critical periods in blowing were less easily noticed. Experience has shown that the charge is more quickly blown and that the wear on the lining is more even, bearing out the points I had in view when designing my vortex converter. The tendency with side-blown converters also has been to place the tuyeres lower. The first failures in attempting to blow white metal to blister copper likely were due to the small converters used, the correspondingly smaller mass chilling more quickly than charges of several tons now being blown.

EXOTHERMIC REACTIONS

In this connection it is well to consider the reactions in the copper converter, which with one possible exception are all exothermic, i.e., heat producing. The caloric values herein used are those given by Professor Richards.[2]

(1) $FeS + 3\,O = FeO + SO_2 + 111$ calories
$-(21) \qquad 65.7 + 69.3$

(2) $Cu_2S + 3\,O = Cu_2O + SO_2 + 92.8$ calories
$-(20.3) \qquad 43.8 + 69.3$

This cuprous oxide, as well as any copper oxide formed, will react with sulphide of iron, and furnish additional heat:

(3) $Cu_2O + FeS = Cu_2S + FeO + 18.2$ calories
$-(13.8 + 24) \qquad 20.3 + 65.7$

(4) $CuO + FeS = CuS + FeO + 14.1$ calories
$-(37.7 + 24) \qquad 10.1 + 65.7$

(5) $FeO + SiO_2 = FeSiO_3 + 8.9$ calories
$-(65.7 + 180) \qquad 254.6$

The above reactions take place in the first stage of the process, during which there is little danger of chilling. The critical period is that of blowing the white metal to blister copper, after the slag has been skimmed off.

But here also we have a powerful exothermic reaction between the cuprous sulphide and the oxygen of the air:

(6) $Cu_2S + 2\,O = 2\,Cu + SO_2 + 49$ calories
$-(20.3) \qquad 69.3$

The chilling of the copper during the second stage of blowing has been explained by an endothermic reaction between cuprous sulphide and cuprous oxide:

(7) $Cu_2S + 2\,Cu_2O = 6\,Cu + SO_2 - 38.6$ calories
$-[20.3 + 2\,(13.8)] \qquad 69.3$

This heat absorption is, however, continuously counteracted by a corresponding heat production from the oxidation of the cuprous sulphide to cuprous oxide. We have therefore in the last stage of the process the following simultaneous reactions which are combined in 10:

(8) $Cu_2S + 2\,Cu_2O = 6\,Cu + SO_2 - 38.6$ calories

(9) $2\,Cu_2S + 6\,O = 2\,Cu_2O + 2\,SO_2 + 185.6$ calories

(10) $3\,Cu_2S + 2\,Cu_2O + 6\,O = 6\,Cu + 2\,Cu_2O + 3\,SO_2 + 147$ calories

or

(11) $3\,Cu_2S + 6\,O = 6\,Cu + 3\,SO_2 + 147$ calories

which is equal to

(12) $Cu_2S + 2\,O = 2\,Cu + SO_2 + 49$ calories

which shows the correctness of reaction 6).

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[2] "Metallurgical Calculations," Vol. I.

When it is further considered that the Cu_2S, being the lightest substance, is nearest the top, then next the Cu_2O and at the bottom the copper, it is at once apparent how beneficial a thorough mixing of the converter contents would be, to insure a continuous exchange between Cu_2O and Cu_2S, thereby producing a more rapid oxidation, a higher reaction temperature, and keeping the reduced copper from chilling, which is apt to occur if the air were forced through vertical tuyeres into the reduced copper above.

It is of course permissible to tilt the vortex converter during the second stage of blowing, raising the tuyeres somewhat from the bottom position occupied in the first stage of converting. This would give it all the advantages enumerated above as well as those of the trough converter.

Miners' Liens in Alaska

SPECIAL CORRESPONDENCE

The Committee on Territories of the House of Representatives has reported a bill (H. R. 24,149) to establish a miner's labor lien law with recommendation that it pass. Section 262 of the present civil code, gives the laborer a lien upon a mine for labor or material used in the construction, development, alteration or repairs of the mine plant, but none upon what his labor produces, that is, upon the product of the mine. The committee urges that at present the miner who mines the minerals has no protection. As 90 per cent. of all labor used in working placer mines in Alaska is digging out and removing gold-bearing gravel, this large percentage of labor is without a lien to protect it.

In reporting in favor of the bill, the committee says: "It is proposed by the bill to permit the lien holder to file his lien and to foreclose it either in the district court or in the justice's court established by an act of Congress known as the 'Code of civil procedure in Alaska.' A commissioner is appointed by the district judge in each precinct in Alaska, which in practice provides one in every mining camp. The commissioner is (1) the recorder, (2) the coroner, (3) the justice of the peace, and (4) the probate judge for that precinct. His is a court of record, with a seal and a clerk, and records are kept and provided by law.

"It is proposed that these liens upon the 'dumps' may be foreclosed before justice courts, and this method, of procedure is proposed by the delegate, who presided in that territory as United States district judge for eight years, and it has the approval of the Attorney General and others familiar with the local system."

Fluorspar

According to statistics collected by F. Julius Fohs, of the Kentucky Geological Survey, the production of fluorspar in the United States in 1909 amounted to 45,801 short tons. A detailed statement of the production for 1908 and 1909 is given in the accompanying table.

The average prices of domestic fluorspar for 1909 were: Gravel, $4.74; lump, $5.94; ground, $9.99; and the average for all grades, $5.94 per ton. Barrelled fluorspar retailed in quantities of from 50-lb. to ton lots, as follows: Crude, $10@20, and ground from $20@32 per ton. Crude foreign fluorspar was quoted at $8.50 per long ton, ex-dock. New Mexico lump fluorspar sold at $5.25 per ton.

FLUORSPAR STATISTICS FOR 1908 AND 1909.

District.	Mined Tons.	Marketed.					Stock, Dec. 31.
		Gravel.	Lump.	Ground.	Total.	Value.	
1908 (*a*)							
Colorado and Arizona (*b*)	745	745	.....	......	745	$4,518	......
Illinois (*b*)	33,912	21,332	6,189	4,206	31,727	172,838	3,965
Kentucky	12,010	2,840	307	3,176	6,323	48,642	12,899
Total	46,677	24,917	6,496	7,382	38,795	225,998	16,864
1909.							
Colorado and New Mexico	1,700	650	850	......	1,500	8,840	200
Illinois	39,762	31,020	2,188	8,335	41,543	239,631	920
Kentucky	4,339	4,835	336	2,629	7,800	53,233	10,116
Total	45,801	36,505	3,374	10,964	50,843	301,704	11,236

(*a*) The statistics for 1908 differ slightly from those collected independently by "The Mineral Industry" which reported a production of 39,389 tons for that year. (*b*) Statistics of the United States Geological Survey.

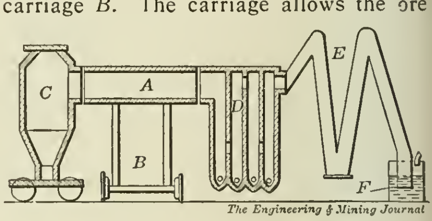
Large Scale Trenching at Cobalt

The Nipissing mines at Cobalt have now discovered a total of 132 veins on the property. Nearly all these veins have been found by trenching and Manager R. B. Watson comments on the fact that trenching is far superior to underground exploration as a means of finding new veins. He says: "It would take many years to completely trench the property and then many veins would probably be missed. The only sure way to find all outcrops is to entirely remove all the overburden on the rock surface, and preparations are now under way with this end in view." Both the La Rose and Nipissing companies are making preparations for extensive trenching operations.

Reduction of Zinc

An improved process for producing zinc or other metals, the oxidized ores of which are reduced by carbon monoxide has been patented by Oscar Loiseau, of Sclaigneaux, Belgium. (U. S. Pat. 947,831, Feb. 1, 1910.) In Mr. Loiseau's process the carbon monoxide is generated at a temperature slightly above that at which the ore is reduced, the gas being applied directly to the ore, so the heat generated in the manufacture of the gas serves to heat the ore for the purpose of reducing it.

The ore mixed with carbon is placed in a refractory chamber *A*, supported on a carriage *B*. The carriage allows the ore to be brought between the gas generator *C* and the condenser *D* which is connected to metal pipes *E*, that precipitate the last traces of zinc and conduct the carbon monoxide to the hydraulic main *F*. The latter collects the gas and keeps the entire apparatus at a fixed pressure. When the charge in chamber *A* is reduced, it is withdrawn by removing the carriage *B* and replaced by another charged with fresh ore.



LOISEAU GAS FURNACE

The gas collected in the hydraulic main will be carbon monoxide, which only differs from that produced in the gas generator, by its lower temperature and by the presence of impurities from the treatment of the ore and the carbon.

Cape to Cairo Railway in Congo Territory

According to a Reuter despatch, locomotives are now running on the Cape to Cairo Railway to a point 40 miles beyond the Congo frontier. By the end of April it is expected that railhead will be 100 miles within Congo territory. From the Star of the Congo, or Elizabethville, the next section of the railway will be to Kambove, 110 miles to the north. Beyond Kambove it has been decided that the rails will next go to Bukana—a section of about 100 miles—situated on the navigable head waters of the Congo. When Bukana is reached there will be connection by river and road with the Atlantic at the mouth of the Congo. Through trains are now running twice weekly between Cape Town and the Victoria Falls and between Victoria Falls and Broken Hill.

Accidents in the Coal Mines of Great Britain

But Little Progress Has Been Made in the Reduction of Deaths During the Last Few Years. Suggestions and Views of Government Experts

DEATH RATE 1.324 PER 1000

In Great Britain the operations of coal mining are of considerable magnitude. That is demonstrated by home office reports, from which it may be ascertained that at the 3338 mines at work last year under the Coal Mines Regulation Act, no fewer than 987,813 persons were employed, raising 261,512,214 long tons of coal having an approximate value of $582,500,000.

In addition to coal, other minerals are raised from the pits under the Coal Mines Act. Of ironstone, last year's product was 7,890,814 long tons, oil shale from the Scottish mines amounted to 2,891,564 tons, while all the inspection districts made contributions toward the 2,814,411 tons of fireclay; the grand total of minerals produced was 275,540,746 long tons. Compared with 1907, there was a decline of 62,000,000 tons in the production of mineral and as 47,195 more persons were working at the mines, the output per person below ground was only 346 tons, while per person below and above ground it was only 278.9 tons.

More Coal-cutting Machines in Use

It is conceivable that but for the use of coal-cutting machinery, the record would have been even less favorable. There were 1659 machines in use as against 1493 in 1907. The quantity of mineral obtained by the aid of the machines being 13,590,359 compared with a total of 12,931,256 long tons in the previous year. One of the Government experts has expressed the opinion that coal-cutting machinery under the act limiting the working hours of collieries in British mines to eight a day, will prove a powerful factor in the manntenance of the coal output, and there is a tendency to accept the total output attained last year as a healthy indication of the future prospects of machinery. As regards the driving power, compressed air was employed in 922 machines, the remaining 737 machines being driven by electricity. The average output per machine works out 8142 long tons, and it is interesting to note that whereas the coal got by machine in British mines in 1902 was only about one ton in 50, last year it was one ton in 20. Looking at these figures there would seem to be some justification for the statement made by W. H. Pickering, the Yorkshire mines inspector, that the development "points to the conclusion that eventually the machine will beat the hand at the coal face, as it has already done in other mining work."

From returns voluntarily furnished by mine owners, it would appear that 23,586,132 lb. of explosives were used at the mines; 33.9 per cent. consisted of permitted explosives; gunpowder constituted 60.8 per cent. of the total weight of explosives used. The estimate is made that more than one-half pound of explosive was used for each shot fired in British mines, but the amount varied in the different districts, as evidenced by the use of 4,226,117 lb. of explosives in firing 5,514,996 shots in East Scotland; whereas only 4,508,290 lb. were used in firing 8,608,850 shots in the Newcastle district.

More Safety Lamps Used

Throughout the United Kingdom, the safety lamps in use totaled to 644,068 in 1908, or 35,716 more than in the previous year. According to the reports of the mines inspectors there is still much need for enlightment regarding the employment of safety lamps in preference to naked lights. Statistics show that Wales, Monmouthshire and Scotland though employing only about 58 per cent. of the number of men employed in England and producing only 55 per cent. of the output, had more than four times as many explosions from the use of naked lights. Last year only seven explosions were due to safety lamps, as compared with 130 caused by naked lights, and the official reports say: "So long as mines which occasionally produce firedamp are worked with naked lights, explosions of this class will continue to occur and existing rules are inadequate to prevent them. Thus in the East of Scotland out of a total of 35 explosions, 32 were due to ignitions of firedamp by naked lights."

Careful Examinations of the Roof Are Necessary

Seemingly it is an error to assume that in Great Britain the accident rate is becoming less serious. The report for the Midland inspection district, where the record is held for tonnage of coal, may reasonably be quoted. Therein Arthur H. Stokes says: "All must frankly recognize that no progress has been made in the reduction of deaths during the last few years, and that this calls for such remedial measures as scientific and practical knowledge can suggest. Many lives are lost by subsidiary causes, but when one class of accident causes more than 50 per cent. of the whole, that class should have special attention. It is upon the application of timber and a frequent and careful examination of the roof, both by sight and by rapping, that we must depend for the reduction of deaths from falls. The problem must be dealt with by well considered methods, and an attempt made by patient effort to obtain a security which men rely upon while following their daily labor."

Emanating from the pen of so high an authority as Mr. Stokes is acknowledged to be, the foregoing statement deserves the attention of all engaged in the industry. Under the British Mines Act last year, there were 1138 separate fatal accidents and two falls of ground, 563 deaths, or practically one-half are attributed. Regarding the contention that recent years have not witnessed any improvement in the death roll, statistics may be brought together for the purpose of comparison as follows:

BRITISH COAL-MINE FATALITIES.

Year.	Deaths.	Death Rate for 1000 Persons.	Deaths per 1,000,000 Tons of Mineral Raised.
1900....	1012	1.30	1.25
1901....	1101	1.36	4.76
1902....	1024	1.24	4.27
1903...	1072	1.27	4.41
1904...	1055	1.24	4.29
1905 ...	1159	1.35	4.64
1906....	1142	1.29	4.31
1907...	1245	1.32	4.41
1908...	1308	1.32	4.75

Special reference may be made to the fire that broke out on March 4, 1908, at Hamstead colliery in South Staffordshire, owing to the ignition of a quantity of candles stored in a wooden box, resulting in the loss of 25 lives. Hugh Johnstone, the inspector in this district, says the following points suggested by the disaster claim the serious consideration of mining engineers and managers:

1. The inadvisability of having considerable quantities of inflammable materials near the top or bottom of downcast shafts. It is true that in one sense these points are not more dangerous than others, inasmuch as there are usually people in attendance there and consequently they are under fairly constant observation; but in another sense they are more dangerous, as a fire occurring in a downcast shaft must necessarily poison the air in every split and section of the mine, and render escape much more difficult.

2. The advisability of having fire extinguishing apparatus at these points in constant readiness for use. At Hamstead

here was an abundant supply of water nder a head of 400 yd., conveyed in ipes down the downcast shaft and for a ong distance along the main roads. It as introduced for the purpose of dealng with gob fires, to which this mine is eculiarly liable; but the possibility of re breaking out at the shaft bottom does ot appear to have occurred to anyone, onsequently there were no arrangements or dealing with it. A tap had been inerted at the shaft bottom for the purose of drawing off water for the horses, ut to prevent its being tampered with y unauthorized persons it had been purosely placed at such a hight above the oor that it could not be reached without short ladder and no other arrangements xisted for drawing off water at or near his point.

3. Where the shafts are comparatively lose to each other and the communicaion road is close to the bottom of the hafts, the advisability of having the eparation doors made of incombustible naterials, and the roof and sides of this oad so constructed or lined with such naterials that fire could not travel hrough it.

4. The hoisting engines to be so set hat no crank is on its dead point at the ift.

5. In new sinkings, and especially vhere the downcast and upcast shafts are omparatively close to each other, the dvisability of so arranging matters that he ventilating current could be promptly eversed if necessary. Mr. Johnstone loes not suggest that in all cases of imilar disaster a reversal of the air urrent would be expedient, or that it hould ever be done without the most areful consideration of all the circumtances by those in authority. Under ertain conditions it might be most disstrous, but under the conditions which btained at Hamstead, he does not think here can be any doubt that it would have een the means of saving the mine and he lives of most, if not all, of the men.

The British reports for last year emrace the list of nonfatal accidents, comiled from the returns which colliery wners are now required to make under Section 1 of the Notice of Accidents Act. Thus for the first time, accurate figures f nonfatal accidents occurring in mines nder the coal mines acts afford a reiable basis for statistical purposes. The umber of persons injured was 141,851 evealing an appalling total of accidents. Commenting upon the disablements, Henry Hall, the Liverpool inspector infers that they might be very much reduced in number seeing that as matters stand, apparently one person in every ive employed meets with an accident enailing more than 7 days inability to vork during each year of his employment. The fact that so many of these accidents ccur, in the view of Mr. Hall, "sugests either that the mines are very rough places to work in, or that there is a want of method and care in carrying on the operations."

BRITISH COAL-MINE STATISTICS.

Persons employed	987,813
Persons killed	1,308
Persons disabled more than 7 days	141,851
Death rate per 1000 employees	1,324
Deaths per 1,000,000 tons mineral produced	4.75

The above table shows at a glance the most important statistics relating to accidents last year.

Prevention of Ankylostomiasis

By C. Harpur[*]

The ankylostoma, or miner's worm, has been for over two years the subject of experiments at the College of Medicine, Newcastle, England, by Sir Thomas Oliver and Hermann Belger. The chief object was to find a way to prevent infection of wet and ill-ventilated mines. On January 21, 1910, Sir Oliver read a paper before the Society of Tropical Medicine. According to the statements in this paper, of the 41 disinfectants tried by Mr. Belger, the best was sulphate of iron. This costs $39 a ton. A 1 per cent. solution of it would cover 100,000 sq.yd. of floor 1 cm. deep. It would prevent the development of any eggs that might be present and kill larvæ within a day. Almost equally effective are cinders. Old cinders are better than fresh, because richer in sulphate and poorer in chlorides. Ankylostoma larvæ are often found in the grooves at the sides of main entries; these grooves should be filled with cinders. Cinders should be sprinkled round the sanitary pails, both above and below ground.

OTHER DISINFECTANTS

Sea water is a third possible disinfectant; it kills larvæ within an hour. Creosote also kills larvæ quickly. Hence, where the air is moist and there is no danger of fire, the lower end of props should be creosoted to a hight of about half a yard. Ankylostoma larvæ are fond of climbing, and wooden props easily become reservoirs of them.

Managers of collieries and brickfields in cold climates are apt to think that their winter secures them from the ankylostoma, but Oliver and Belger found that larvæ frozen for six days revived and were little the worse. Tenholt found larvæ in miner's worn boots, although these had not been in the mud in which the men had been working; this suggests that the larvæ may migrate in boots from one mine to another. The interval between the infection of a man (through his mouth or skin), and the appearance of eggs in his feces, is 30 to 35 days.

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[*] Nenthead, Alston, Cumberland, England.

A Novel System of Signaling

By Alfred Gradenwitz[*]

A novel pit-signaling scheme with incandescent-lamp board and checking gages has been designed by Siemens & Halske. As represented in Fig. 1, this scheme comprises five stations, that is, the winding engine, pit mouth, and three pit bottoms.

At each signaling station are installed an incandescent-lamp board *G T*, consisting of three parts, and which at the pit mouth and in connection with the winding engine, is combined with a checking gage *K Z*, as well as a trembling alarm fixed on the board case, and a single-stroke alarm *E W*. The intelligence case *V T* and the order key *A T*, respectively, are used for giving out signals. Each of the three pit bottoms further comprises an incandescent-lamp switching key *G E T*, whereas at the pit mouth is provided an additional key, the pointer back-shifting key *Z R T*.

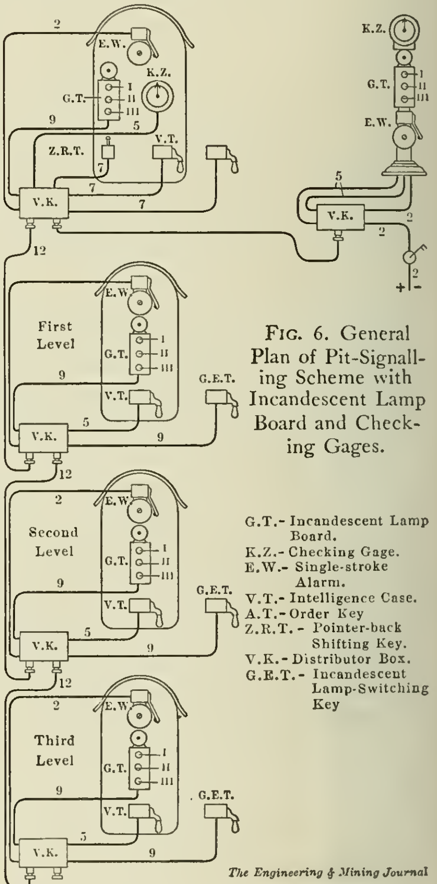

FIG. 6. General Plan of Pit-Signalling Scheme with Incandescent Lamp Board and Checking Gages.

G.T.- Incandescent Lamp Board.
K.Z.- Checking Gage.
E.W.- Single-stroke Alarm.
V.T.- Intelligence Case.
A.T.- Order Key
Z.R.T. - Pointer-back Shifting Key.
V.K.- Distributor Box.
G.E.T.- Incandescent Lamp-Switching Key

The Engineering & Mining Journal

FIG. 1. GENERAL PLAN OF SIEMENS & HALSKE PIT-SIGNALING SYSTEM

The usual bell signals of the single-stroke alarms *E W*, actuated in connection with the intercommunication of the various pit bottoms with the pit mouth and *vice versa*, by the keys *V T*, are used for transmitting hauling signals, whereas the definite signal is given by the onsetter of the pit mouth, by means of the key *A T*.

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[*] Berlin, W. 50, 3 Regensburgerstasse.

Before giving out an intelligence signal to the pit mouth, the incandescent-lamp switching key *G E T*, of the pit bottom actually worked should be pressed down, thus switching in permanently at all the posts the corresponding incandescent lamps, while the blocking of the corresponding intelligence key is relieved by special relays, and the trembling alarms are sounded for a short time at all five stations.

These bell signals as well as the lighting of the lamps serve to inform all the stations that winding is performed at a given pit bottom.

The circuit of each incandescent-lamp set, corresponding to a given pit bottom, is closed by a relay located in its distributing box. This relay will remain under current after the intelligence key has retroceded, until the incandescent-lamp circuit is opened temporarily by pressing down the intelligence key of another pit bottom, thus putting out the corresponding lamps. This operation is thus performed automatically. The lamps of each circuit are connected up in series.

Special relays, in accordance with the above, serve to block against one another the various pit bottoms, so that only the onsetter of the pit bottom marked on the board is able to give out a signal. However, any other pit bottom can put itself into circuit at any moment without any loss of time, while cutting out automatically the preceding pit bottom. The incandescent lamp boards, after commutation by means of the *G E T* key, always indicate automatically the marking of the new pit bottom. The two checking gages work as follows:

On an intelligence signal being given out to the pit bottom, the single-stroke alarms *E W* of the pit mouth, and the signaling-pit bottom are sounded, while the checking gage at the pit mouth is operated. The pointer of the latter will advance through one division with each stroke of the bell, that is, with each operation of a key, and thus serves to check the acoustical signal. Whenever the stop of the pit mouth transmits the definite signal to the winding engine by actuating the key *A T*, the single-stroke alarms *E W* in the winding-engine room at the pit mouth and the pit bottom actually in operation, will be sounded, while the checking gage in the engine room advances by steps, and that of the pit mouth retrocedes, likewise by steps, to zero. The onsetter of the pit mouth thus is compelled to transmit to the engine the very signal he has received from the pit mouth in operation, in order to reduce its pointer to zero; that is, any mistake as to the number of the bell strokes is excluded as the onsetter has to press down the key as many times as are required for the checking gage to reach the zero of the scales. In connection with any new intelligence signal being given from the pit bottom, the pointer of the apparatus in the winding-engine room then immediately retrocedes to its position of rest, whereas that of the pit mouth again advances by jumps.

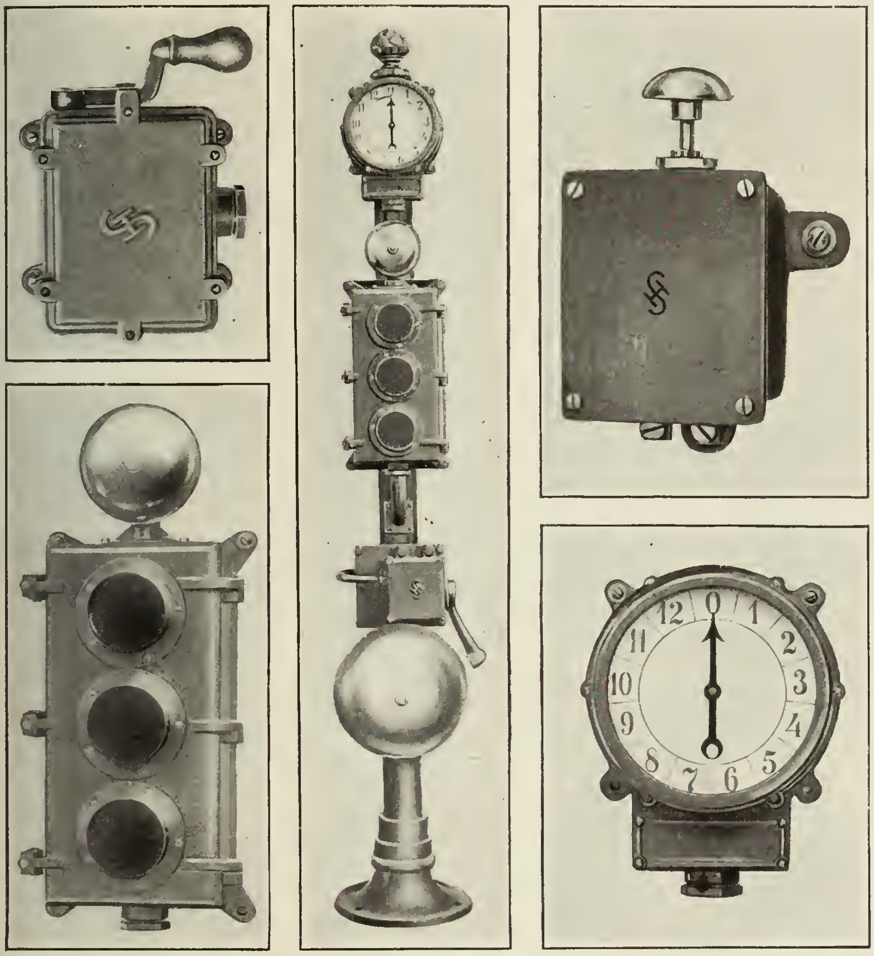

Fig. 2. Details of Apparatus for Pit Signaling

Use of the Back-shifting Key

The back-shifting key *Z R T*, located at the pit mouth, further allows the operator to reduce the pointer of both checking gages to their position of rest, without actuating the single-stroke alarms.

In addition to the signaling plant above described, there is mostly provided between the pit bottom and mouth, and between the latter and the winding engine, a communication by loud-speaking telephones. In this case there is installed at the pit mouth and each of the pit bottoms a loud-speaking telephone with lateral receivers, connected with an intercommunication key, whereas in the winding-engine room a post mounted on a pillar without lateral receivers is provided. The current for microphone operation is supplied by a battery installed at each telephone post, whereas the alarms of the various stations are connected to a common signaling-current generator.

The pit mouth then can communicate by pressing down a given key of the intercommunication switch, with each of the pit bottoms, or the winding engine and each pit bottom with the remaining pit bottoms of the pit mouth. A specially marked calling key is used for calling. The intercommunication switch of the pit mouth accordingly comprises six, and that of the pit-bottom stations, five keys.

Plants according to the above scheme have been installed at quite a number of German mines.

German Coal Miners' Wages

A German official report, based on coal mines employing a total of 335,358 persons in 1908, and 334,143 in 1909, gives the average daily wages at $1.065 for the last quarter of 1909, against $1.73 for the corresponding quarter of 1908. By classes of workers, the average daily wages in 1909 were $1.26 for miners, who formed 49.5 per cent. of the total; 93.5c. for underground laborers (27.9 per cent.); 91.5c. for surface workers (19 per cent.); and 31c. for boys, who were 3.6 per cent. of the total number. The average time worked in the quarter was 77 days.

The Mulga Mine Explosion

As the result of a terrific explosion, supposedly from a "windy" shot, 43 miners were entombed in the No. 2 mine of the Birmingham Coal and Iron Company, at Mulga, Ala., at 9 o'clock on the evening of April 20.

Immediately following the explosion, which was heard for miles around, the flames from the shaft shot up several hundred feet in the air and for a brief moment, illuminated the surrounding valley. Pieces of flying timber were thrown for a distance of a quarter of a mile.

Superintendent Johns at once telephoned the news of the disaster to the Wylam mine of the Tennessee Coal, Iron and Railroad Company, and a force of rescuers, recently equipped and drilled by Drs. McDonald and Rountree, of the Tennessee Company, were gotten together. The band of rescuers were put aboard the special hospital car of the Tennessee Coal and Iron Company, and with their equipment, were rushed to the scene of the disaster.

At 4 o'clock the following morning, the rescuers had cleared the shaft sufficiently for the men to enter the mine. Superintendent Johns, with a selected party of rescuers, descended in the cage to the first level. At this point their path was blocked by masses of wreckage, besides encountering much smoke and firedamp. One by one the men on this first rescue party were overcome by the gases and were hoisted to the surface. Other miners quickly took the place of those brought out, and the men worked in relays of 20 min. each. The oxygen helmets were brought into use at 10 o'clock on the morning of April 21, and with these safety devices, the miners were enabled to stay underground for longer intervals. The helmets used were equipped for a stay of 120 min. in a poisonous atmosphere.

The main body of miners, consisting of 13 white men and 30 negroes, were on the lower level and at least one-half of a mile from the main shaft. At 7 o'clock in the evening, 196 miners, a majority of them colored, came out from their daily work as the smaller number of men were just going in. Had the explosion occurred before 7 o'clock, the accident would probably have been the worst horror ever occurring in an Alabama coal mine.

The mine officials went about their business with calmness and despatch, and the work of rescue was well organized. It was soon apparent to the rescuers that before they could penetrate far into the mine a vast amount of wreckage would have to be removed. This task of removing débris was undertaken immediately and was carried on with great rapidity.

Many Bodies Recovered

On the morning of the second day following the explosion, 36 bodies had been taken from the mine. Twelve of the men recovered were white men, while the remaining dead were negroes. At the point where the bodies were recovered, the entries showed the terrible force of the explosion, great rocks being blown down and timbers shattered.

The latest advices state that the death list will run over 38. The officials say that the bodies of the two Italian laborers will be the last which will be found, as the mine has been almost completely explored. The mine is in poor shape for working in the immediate future. The timbers underground will have to be almost entirely replaced and a large amount of bratticing must be done before the pit can be worked again.

The Mulga property is supposed to have been a model mine. Many of the miners who worked underground stated after the explosion, that they had never entered a coal mine where the chances for dust and gas explosions were more remote. These men also stated that the air was so fresh and the current so strong that it was positively cold in the mine.

It is a strange coincidence that during recent years, our worst coal-mine explosions have occurred in properties that have been considered the best examples of modern coal-mining practice. The Monongah mine in West Virginia, and the Marianna mine in Pennsylvania were both considered as examples of the best practice in their respective districts. Still, these mines were visited by terrible explosions, causing the loss of several hundred lives.

Clifford Wins Mine Fan Suit

The prolonged patent litigation by William Clifford, of Jeannette, Penn., against George M. Capell, of England, has come to an end by the surrender of Capell. The United States Patent Office has pronounced Mr. Clifford to be the real inventor. In foreign countries, England in particular, Mr. Clifford has been forestalled by Capell, who holds the invention in Great Britain by virtue of being the first importer into that country.

On April 19, 1906, an agent of Capell is alleged to have surreptitiously entered the Clifford shops at Jeannette, the workmen supposing him to be a machinery inspector, and saw the new fans built and building. On May 2, 1906, Capell took out a patent in England for this fan under the statute of monopoly, which is the foundation of British patent law.

It is said that within one year 667 square miles of timber land have been stripped and put into the coal mines of the United States.

COLLIERY·NOTES

Many practical miners claim that less damage is done to coal, when permitted explosives are employed, by using cartridges of considerably smaller diameter than shot holes, thus allowing a portion of the initial explosive energy to be lost by expansion.

The French committee on explosives, after conducting experiments with sand and clay for use in tamping shot holes, leaned toward the conclusion that sand gave better results in practice. It is stated that blown-out shots are not so likely to occur with sand as when clay is used.

In firing shots underground, the firing line must always be payed out from the shot hole to the place of safety, where the exploder (unless it is a belt or pocket battery) has been previously deposited. If the shot firer has occasion to leave the firing line, even momentarily, after having payed it out, he must take the exploder with him.

The largest producing coal mine in Alaska at the present time is in Seward Peninsula, on Chicago creek, in the Fairhaven district, 360 miles north of Nome. The mine is worked only in the winter and supplies the Candle Creek Placer mine, in the development of which it has been an important factor since the opening of the mine in 1902.

It is reported from Shenandoah, Penn., that on March 30 all records for speedy hoisting were broken at the Maple Hill colliery. The shaft at this mine is 800 ft. deep and the engines used are of the first-motion type. The record made was an average of two cars hoisted in 47 sec.; this average continued for an hour, according to officials who held a watch.

Recent accidents have disproved the common idea that electrically ignited shots cannot hang fire. Practically all mine laws provide that no person shall be allowed to go near a misfire shot until after the lapse of a certain specified interval of time. In practically all cases, an electrical misfire is exempted from such regulation. Recent investigations have proved that hang-fire or retarded ignition, when electric firing is employed, may occur in the electric detonator or in the explosive. A damp detonator might readily hang fire. The retardation may be caused by increased resistance in the circuit through broken wires, bad joints, grease or dirt on spring contacts and terminals, permitting the passage of only just sufficient electrical energy to warm the fuse bridge. The latter has then to be kept heated during several seconds. It is also true that delayed ignition may be caused by defects in the fuse, such as badly mixed, damp or insufficient priming, or by a wet charge.

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COAL AND COKE

COKE—Apparatus for Watering Coke in Coke Ovens. William L. Affelder and Mark Gorton, Brownfield, Penn. (U. S. No. 954,241; April 5, 1910.)

COKE—Leveler for Coke Ovens. Alexander E. Brown, Cleveland, Ohio, assignor to Brown Hoisting Machinery Co., Cleveland, Ohio. (U. S. No. 952,558; March 22, 1910.)

COKE—Process of Coking Coal. Samuel B. Sheldon, Buffalo, N. Y. (U. S. No. 953,351; March 29, 1910.)

COKING PROCESS. Leland L. Summers, Chicago, Ill., assignor to Continuous Process Coke Co., Chicago, Ill. (U. S. No. 951,786; March 8, 1910.)

CONVEYERS—Improvements in and Relating to Coal Conveyers for Mines. David M. Ritchie, Prestwich, Eng. (Brit. No. 9817 of 1909.)

MACHINE MINING—Improvements in and Connected with Machines for Use in Mining Minerals Particularly Adapted for Use in Mining Coal and the Like. Mavor & Coulson, Ltd., Samuel M. Mavor and Henry A. Mavor, Glasgow, Scotland. (Brit. No. 6051 of 1909.)

RESPIRATION APPARATUS for Use in Coal Mines and Other Places. William E. Garforth, Normanton, England. (U. S. No. 953,462; March 29, 1910.)

SAFETY LAMPS—Improvements in or Applicable to Miners' Safety Lamps. Joseph Prestwich, Eccles, Lancaster. (Brit. No. 12,751 of 1909.)

SCREENING — Coal-screening Apparatus. Alexander W. Crawford, Girard, Ill. (U. S. No. 954,935; April 12, 1910.)

WASHING—Improvements in Apparatus for the Washing of Coal and Other Minerals. John Shaw, Kirby Moorside, Yorks, England. (Brit. No. 16,056 of 1909.)

COPPER

BRIQUETTING CONCENTRATES — Improvements in Agglomerating or Briquetting Copper Ore Concentrates Preparatory for Smelting. Thomas Rouse, London, England. (Brit. No. 4914 of 1909.)

HYDROMETALLURGY—Improved Method of Separating Copper and Other Metals from Liquors Containing the Same Obtained in Wet Metallurgical Processes. John H. Thwaites and Stephen J. Ralph, Peterborough, Eng. (Brit. No. 4167 of 1909.)

GOLD AND SILVER

DRY GOLD WASHER. George W. Palmer. Redlands, Cal. (U. S. No. 954,580; April 12, 1910.)

FILTERING—An Improved Apparatus for Filtering and Washing Ores and the Like. Albert Grothe and Herbert F. Carter, Mexico City, Mexico. (Brit. No. 18,060 of 1909.)

PULP AGITATOR. Robert W. Gordon, Denver, Colo., assignor to Stearns-Roger Manufacturing Co., Denver, Colo. (U. S. No. 954,511; April 12, 1910.)

SLIMES TREATMENT—Extracting Gold and Silver from Ore Slimes. Andrew F. Crosse, Johannesburg, Transvaal. (U. S. No. 951,940; Mar. 15, 1910.)

IRON AND STEEL

CHARGING BLAST FURNACES—Method of Charging Blast Furnaces. Thomas McDonald and Jacob C. Barrett, Youngstown, Ohio. (U. S. No. 951,144; March 8, 1910.)

CONCENTRATION—Method of Concentrating Oolitic Ironstone and Similar Iron Ores. Gustaf Grondal, Djursholm, Sweden. (Brit. No. 18,826 of 1909.)

DRY-AIR BLAST—Apparatus for Extracting Moisture from Air for Blast-Furnaces and Converters. James Gayley, New York, N. Y. (U. S. No. 953,525; March 29, 1910.)

MANGANESE AND CHROMIUM ORES —Improvements in or Relating to the Treatment of Manganese and Chromium Ores Containing Iron. Marcus Ruthenburg, London, England. (Brit. No. 6529 of 1909.)

MANGANESE STEEL—Process of Making Manganese Steel. Henry M. Howe, Bedford, N. Y., assignor to Taylor Iron and Steel Co., High Bridge, N. J. (U. S. No. 954,188; April 5, 1910.)

REDUCTION OF IRON ORE—Improved Process for Reducing Iron or Other Ores and Refining the Metal Obtained. James J. Reed, Newark, N. J. (Brit. No. 6821 of 1909.)

STEEL ALLOY, Containing Manganese, Nickel, Chromium, Vanadium and Copper. Samuel S. Wales, Munhall, Penn., assignor to the Carnegie Steel Co., Pittsburg, Penn., a Corporation of New Jersey. (U. S. Nos. 952,391 and 952,392; Mar. 15, 1910.)

LEAD, ZINC AND OTHER METALS

ALUMINUM — Electric - Furnace Product and Method of Making Same. George N. Jeppson, Worcester, Mass., and Lewis E. Saunders, Niagara Falls, N. Y., assignors to Norton Co., Worcester, Mass. (U. S. No. 954,808; April 12, 1910.)

ANTIMONY—Apparatus for Treating Antimony Ores. Henri L. Herrenschmidt, Paris, France. (U. S. No. 953,142; March 29, 1910.)

LEAD AND ZINC—An Improved Method of Recovering Lead and Zinc from Compounds Containing Those Metals. H. W. Hemingway, London, England. (Brit. No. 4471 of 1909.)

NONMETALLIC MINERALS

ARSENIC—Treating Arsenide Ores. Frederic P. Dewey, Washington, D. C., assignor to Dewey Ore Reduction Corporation, of Virginia. (U. S. Nos. 954,263 and 954,264; April 5, 1910.)

PHOSPHATE MILL. William F. Duncker, Washington Boro, Penn. (U. S. No. 951,368; March 8, 1910.)

MINING—GENERAL

DRILL—Mining Drill. George W. Nixon, Chattanooga, Tenn., assignor to Nixon Mining Drill Co., Inc., Chattanooga, Tenn. (U. S. Nos. 953,855 and 953,969; April 5, 1910.)

MINER'S CANDLESTICK. John J. Cluin, Chicago, Ill. (U. S. No. 951,595; March 8, 1910.)

MINER'S LAMP. Robert Seippel, Bochum, Germany. (U. S. No. 953,491; March 29, 1910.)

PROPS—Improved Method of and Means for Propping Mines. Wilhelm Reinhard, Krefeld-on-the-Rhine, Germany. (Brit. No. 20,472 of 1909.)

SHAFT SINKING—Improvements Relating to Shaft Sinking. Internationale Bohrgesellschaft of Erklenz, Germany. (Brit. No. 28,998 of 1909.)

ORE DRESSING—GENERAL

AGITATING — Apparatus for Agitating Liquid Material. Robert S. Towne, New York, N. Y. (U. S. No. 952,222; March 15, 1910.)

AGITATING APPARATUS for the Treatment of Ores. John E. Rothwell and Randall P. Akins, Denver, Colo., assignors to Colorado Iron Works Co., Denver, Colo. (U. S. No. 951,742; Mar. 8, 1910.)

CONCENTRATION — Apparatus for Ore Concentration. Theodore J. Hoover, London, England, assignor to Minerals Separation, Limited, London, England. (U. S. No. 953,746; April 5, 1910.)

CONCENTRATION—Improvements in or Relating to Apparatus for Ore Concentration. Theodore J. Hoover, London, England. (Brit. No. 4911 of 1909.)

CONCENTRATION of Ores. Henry L. Sulman, London, England, assignor to Minerals Separation Limited, London, England. (U. S. No. 955,012; April 12, 1910.)

FILTRATION OF SLIMES—Apparatus for Recovering Values from Ore Solutions. Cyrus Robinson, Mount Vernon, N. Y. (U. S. No. 954,466; April 12, 1910.)

GRINDING MILL. Elias T. Lansdowne, Copper Cliff, Ontario, Canada, assignor to International Nickel Company, New York, N. Y. (U. S. No. 952,820; March 22, 1910.)

MAGNETIC ORE-SEPARATING APPARATUS. Quincy Bent, Lebanon, Penn. (U. S. No. 954,016; April 5, 1910.)

MAGNETIC SEPARATION of Ore. Quincy Bent, Lebanon, Penn. (U. S. No. 954,015; April 5, 1910.)

ORE SCREEN. Randall P. Akins, Denver, Colo., assignor to Colorado Iron Works Co., Denver, Colo. (U. S. No. 952,061; March 15, 1910.)

PULP EXTRACTOR. William H. Janney, Bingham Cañon, Utah. (U. S. No. 955,077; April 12, 1910.)

SEPARATION—Apparatus for Separating Solids from Liquids. Lamartine C. Trent, East Auburn, Cal. (U. S. No. 952,590; Mar. 22, 1910.)

SEPARATION—Centrifugal Separating Apparatus. Lamartine C. Trent, Auburn, Cal. (U. S. No. 952,653; March 22, 1910.)

SLIMES SEPARATION—Method of Dressing Ores. Frans H. A. Wielgolaski, Kragerö, Norway. (U. S. No. 953,309; March 29, 1910.))

STAMP MILLING—Improvements in Ore Feeders for Stamp Mills. George A. Mower, and Frederick W. R. Williams, London, England. (Brit. No. 14,400 of 1909.)

METALLURGY—GENERAL

BLAST-FURNACE SLAG CEMENT—Ore Briquetting. Wilhelm Lessing, Troisdorf, Germany. (U. S. No. 952,914; March 22, 1910.)

ELECTRIC FURNACE—Transformer Furnace. Eugen A. A. Grönwall, Axel R. Lindblad and Otto Stalhane, Ludvika, Sweden. (U. S. No. 953,030; March 29, 1910.)

ELECTRIC SMELTING FURNACE. Eugen A. A. Grönwall, Axel R. Lindblad, and Otto Stalhane, Ludvika, Sweden. (U. S. No. 953,029; March 29, 1910.)

FURNACE - CHARGING APPARATUS. Adolph C. Clark, Perth Amboy, N. J., and Frank L. Antisell, New York, N. Y. (U. S. No. 951,304; March 8, 1910.)

FURNACE-COOLING JACKET. John Lawson, Copper Cliff, Ontario, Canada, assignor to International Nickel Co., New York, N. Y. (U. S. No. 951,647; March 8, 1910.)

LIXIVIATION — Method of Lixiviating Ores. Gottfried Vervuert, Imsbach, Germany, assignor to Eugen Abresch, Neustadt-on-the-Hardt, Germany. (U. S. No. 952,484; March 22, 1910.)

RECOVERY—Improvements in or Relating to Means or Apparatus for the Recovery of the Metallic Contents of Ores and the Like. Gillmore Goodland, Wilhelm K. Ferro and William A. Thornton. (Brit. No. 1677 of 1909.)

REDUCTION—Process of Treating Ores and Metals. James H. Reid, Newark, N. J. (U. S. No. 950,116; Feb. 22, 1910.)

REDUCTION PROCESS—Process of Reducing Metallic Oxide Ores. Herbert E. T. Haultain, Toronto, Ontario, Canada. (U. S. No. 950,595; March 1, 1910.)

RETORT FURNACE. Nat H. Freeman, Boulder, Colo. (U. S. No. 949,178; Feb. 15, 1910.)

SINTERING—Apparatus for Treating Ores. Walter G. Perkins, London, England, and Mark L. Requa, San Francisco, Cal., assignors to Perkins Sintering Co., San Francisco, Cal. (U. S. No. 951,199; March 8, 1910.)

SINTERING—Process of and Apparatus for Treating Ores. Walter G. Perkins, Smelter, Nev., and Mark L. Requa, San Francisco, Cal., assignors to Perkins Sintering Co., San Francisco, Cal. (U. S. No. 951,198; March 8, 1910.)

SMELTER—Fume Arrester. Claude C. Whitmore, Butte, Mont. (U. S. No. 952,970; March 22, 1910.)

SMELTER FUMES—Smoke Condensing and Gas or Fume Absorber. Peter Marron, Butte, Mont. (U. S. No. 952,992; March 22, 1910.)

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

S. F. Shaw is at Los Angeles, California.

Edwin E. Chase has returned to Denver, Colo., from Mexico and has gone to Butte, Montana.

T. H. Trethewey, of Goderich, Ont., has gone to Prince Rupert, B. C., to make an examination of mining claims.

Arthur W. Jenks has been examining a copper deposit in Ontario, Canada, and will return to Berkeley, Cal., early in May.

Henry Long has been appointed general manager and J. E. Anderson superintendent of the Mammoth Vein Coal Company, at Everist, Iowa.

Alexander Imhoff has been appointed superintendent of the San Juan mines of Taviche. His address is Mina San Juan, Ocotlan, Oaxaca, Mexico.

L. B. Sutton, of New York, has been appointed consulting engineer for the Esperanza Mining Company, in place of Pope Yeatman, resigned.

Harry J. Wolf, of Denver, has been appointed general manager of the Japan-Flora Mines and Tunnel Company, with office at Telluride, Colorado.

Kazaye Kibe, an engineer connected with the Ashio copper mines of Japan, recently visited the mines and works of the Nevada Consolidated company.

Duncan McVichie has been chosen general manager of the Nevada-Douglas Copper Company, in place of Walter C. Orem, who becomes managing director.

Arthur C. Cole has been appointed superintendent of reduction for the Greene-Cananea Copper Company, in place of C. F. Shelby, who resigned recently to go to Peru.

Lee Fraser has resigned his position at the Aguacate mines, Costa Rica, and has been appointed engineer of the Abangarez Goldfields, of Costa Rica, his address being at Puntarenas, Costa Rica.

Hermann A. Keller has returned to New York from a Western trip on professional business that has occupied him for the last six months. He expects to remain in New York for about a month.

Charles Taylor Law and Frank Maxwell Wichman have opened an office in the firm name of Law & Wichman, for the practice of mining engineering, at 514 Felt building, Salt Lake City, Utah.

George G. Goodale, recently with the Albany and Centennial, has been appointed chief engineer of the Elm River, Mayflower, Old Colony and Union Land companies in the Lake Superior region.

P. B. Lamb, of the C. L. Constant Company, New York, has retired from that organization to become associated with the Proprietary Mines Company of America, offices at 15 Broad street, New York.

Jules Labarthe, recently smelter manager of the Consolidated Mining and Smelting Company, of Canada, has been appointed general manager of the Mason Valley Mines Company at Mason Valley, Nevada.

George A. Packard, having undertaken the management of property at Butte, Mont., will for the present make his headquarters there. He will continue consulting work and retain his office at 50 Congress street, Boston, Mass.

Joseph Gallup, formerly superintendent of the open-hearth department of the Worth Brothers Company, Coatesville, Penn., has accepted the position of general superintendent of the Ontario Iron and Steel Company, Welland, Ontario.

H. Boholm, director of the Tromsösund ironfields, Roktdalen zinc and lead ore deposits and Mok and Gulstad copper mines, Trondhjem, Norway, and Alex. Christiansen, mining engineer, Christiania, Norway, are in the United States.

Parish J. MacDonald, who for years has had charge of the cyanide plant of the Guanajuato Mining and Milling Company, has accepted the management of the Zacatecas Mining and Metallurgical Company at Zacatecas, Mexico, and is now in charge.

William E. Renshaw, of Idaho Springs, Colo., has been appointed general manager of the Specie Payment mine, on Bellevue mountain, succeeding A. M. Welles, who has been in charge for the last seven years. Mr. Welles retires in order that he may devote more time to his professional work.

Weed & Probert are examining the Shattuck-Arizona mine at Bisbee, Ariz., preparatory to the listing of the stock on the Boston Stock Exchange. Walter Harvey Weed has just finished an examination of the Wolverine-Arizona and has left Bisbee for Kingman for a brief examination of a mine there.

Daniel W. Talcott, Jr., has been elected general manager of the Burden Iron Company, Troy, N. Y., to succeed the late John L. Arts. William E. Millhouse has been chosen as assistant manager, to succeed the late Nicholas J. Gable. Both of the new officers have been in the employ of the Burden Iron Company for over 30 years.

Col. George F. Huff, for over 10 years past representative in Congress from the Westmoreland district of Pennsylvania, has announced that he will not accept a renomination. Colonel Huff was formerly a coal operator, and in the present and preceding congresses has been chairman of the Committee on Mines and Mining.

OBITUARY

P. C. Brady died at Virginia City, Nev., April 25, aged 85 years. He was one of the pioneers of the Comstock, and had been connected at different times with nearly all the prominent mines on the lode.

SOCIETIES *and* TECHNICAL SCHOOLS

State University of Kentucky—The new building for the College of Mining Engineering was formally dedicated April 21, when a number of speeches were made and the building was inspected by a number of visitors. The building has been under construction for some time, under the direction of Prof. J. Norwood, dean of the faculty.

Mining and Metallurgical Club—At a recent meeting in London this club was organized as a result of the work of a committee appointed about a year ago. The object is to provide a social meeting place in London for members of the mining and metallurgical professions. The club will start with about 500 members. Premises have been secured. S. H. Farrar is president; W. McDermott, vice-president; C. McDermid, secretary.

Kingston School of Mining—On April 27, the foundation stone of the new chemistry building of the School of Mining in connection with Queen's University, Kingston, Ont., was laid by Sir James Whitney, Premier of Ontario, in presence of a large gathering. The sum of $100,000 was granted by the Ontario government for the erection of the building. The Kingston School of Mining has now 36 professors and 320 students.

International Electro-Technical Commission—A Canadian branch of this body has been formed at Montreal, of which Prof. L. A. Herdt, head of the electrical engineering department, McGill University, was elected chairman. Other members are Dr. H. T. Barnes, McGill University; Prof. T. T. Rosebrugh, Toronto University; Prof. L. W. Gill, Queens University, Kingston; O. Higman, Electrical Standards laboratory, Ottawa; John Murphy, Ottawa; W. A. Duff and A. B. Lambe, Winnipeg.

American Society for Testing Materials—The thirteenth annual meeting will be held at the Hotel Traymore, Atlantic City, June 28 to July 2. Members have been invited to coöperate with the executive committee in its endeavor to make the program for the approaching meeting the best in the history of the society. Inasmuch as the present dues of $5 per annum are insufficient to meet financial requirements, it has been suggested to increase the dues to $10 per year. The society now has 1266 members.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

May 2—In the White River district, Kern and Tulare counties, many quartz claims have been located and some work done from year to year. Disappointed at the apathy of the miners in making productive mines from these prospects, a number of farmers of the region requested the U. S. land office to send an inspector with a view of restoring to homestead entry certain lands now classified as mineral. J. F. Burkhart, special agent for the Department of Commerce and Labor, reported that there are 27 mines there, but made no statement as to their value. Mr. Burkhart was also at Hot Springs, but found few mineral claims there worth reporting to the department.

A revival of mining is anticipated in Mono county from the installation of a water-power plant at Jordan, near Mono lake. In this general field are the Crystal Lake gold mine, the Bodie mines, the old camp of the Aurora and the Lucky Boy silver-lead mine near Hawthorne. It is stated that the mines at Aurora will be reopened. This camp produced about $16,000,000 in the '60s, and then was quickly abandoned. This is said to have been due to the heavy water flows encountered. The Detroit copper mine, near Jordan, is another abandoned property. At one time there was a small smeltery in operation here and ingot copper to the value of about $60,000 was produced. The rich silver-lead Lucky Boy mine, near the road to Bodie, although in the State of Nevada, has drawn attention to this field. In recent years the only mines of consequence that have been in successful operation are the Standard mine at Bodie and the Crystal Lake (formerly the May Lundy) near Lundy.

Denver

May 2—The affairs of the Ferris-Haggarty mine are about to be thrashed out in the courts, and charges of a sensational character are being brought out in an intervening petition filed in the Federal court at Cheyenne, Wyo., April 27. The charges are in connection with the Ferris-Haggarty copper mine, Encampment, Wyo., the Penn-Wyoming Copper Company and the United Smelters, Railway and Copper Company. Cobb, Norton and Draper, Chicago promoters, are the main parties mentioned in the action. The mine is about two miles west of Bridger Peak, and 16 miles from Encampment, to which point there is a branch railroad from the Union Pacific at Walcott. It was discovered September, 1898, by Edward Haggarty, a prospector employed by Deal & Rumsey, and these two, with a friend named Ferris, "chipped in" enough money to open up the vein and it was called the Rudefeha, composed of the two first letters of their names. The outcrop was gossan, which they sunk in for 35 ft., when rich copper ores came in, chiefly chalcopyrite and chalcocite, associated with bornite and covellite. For some time the owners shipped the ore, carrying 22 per cent. copper. The richest ores were in the upper workings, and when the owners sold out to the companies mentioned above, the latter worked to about 300 ft.

A drill dust-catcher has been patented by Thomas Gallagher, of Leadville, and a company organized to manufacture and sell it, John Cunningham, Jr., manager. A contract has been let for the manufacture of 50 of the machines.

Everyone here seems to expect a "boom" in Cripple Creek when the deep drainage tunnel shall leave the granite and enter into the main breccia area of the district, and what everyone expects is likely to happen, for these financial excitements called "booms" are largely a matter of sentiment. However, the persistence of rich ore at great depth in the big mines warrants these expectations. This will be still further aided if, as has been stated, the new Portland mill, which is expected to begin May 1, can treat $2 ore at a profit. The result is being closely watched.

Salt Lake City

May 2—The output of Utah mines during 1908 is given by Victor C. Heikes in the advance chapter from "Mineral Resources," published by the U. S. Geological Survey. The total value of the gold, silver, copper, lead and zinc produced in Utah for 1908 amounted to $23,441,280. Nearly half of this value was in copper. Utah produced 86,843,812 lb., valued at $11,463,383. Mr. Heikes shows that the ore mined in 1908 amounted to 3,658,957 short tons of an average value of $6.40 a ton. Bingham produced 68.7 per cent. of the total tonnage sent to the smelters, and 85.2 per cent. of the total concentrating ores milled. Silicious ores with their principal value in gold were produced in greatest quantity in Tooele county. Salt Lake county produced the most copper and copper-lead ores, while Summit and Wasatch counties produced the greatest quantity of lead and lead-zinc ores. Regarding the geology of the Utah ore deposits, Mr. Heikes makes an interesting classification of the percentage of ores and metals mined from three types of deposits. These are disseminated ores in monzonite porphyry or allied rocks, replacement deposits in limestone, and fissure veins. This classification has heretofore not been attempted.

An order was received by the United States Land Office April 25 restoring certain public lands in Utah to entry. Most of the lands, however, are unsurveyed, and are open only to settlement. The lands were withdrawn last October under a "temporary petroleum withdrawal order" pending an investigation by the U. S. Geological Survey as to the existence of petroleum. It was found after field investigation that these were not oil lands. The land restored includes parts of townships 32, 34, 35, 36, 40, 41, 42, 43, 44, south, in Iron, Kane, and Washington counties. A notice of the temporary withdrawal of another lot of land accompanied the list of restored lands. Those withdrawn will also be examined for petroleum. Part of these lands extend into Arizona.

The hearing in the case of the Silver King Consolidated vs. the Silver King Coalition was twice postponed during the past week, but the taking of testimony was resumed on April 18. The Coalition company requested that a joint survey be made with the engineers of the Consolidated company of places where a large discrepancy in the submitted mine maps exists. This was agreed to by the plaintiff, and an order of survey was granted by Examiner Christy. The survey is now being made.

Butte

May 2—The report of R. M. Atwater, Jr., on the North Butte property seems to be the first candid statement from a reliable source of the true condition of that property. Mr. Atwater, who is general manager of the Butte & Superior company, and upon whose opinion Duluth interests originally took up the North Butte property, states that while the Edith May vein was very rich from the 1200- to the 1800-ft. levels, the 2000-ft. level showed a marked decrease in value, while at the 2200 the vein only carried pay ore for 300 ft. as against 1000 on the 1800-ft. level. On the 2200 a pair of cross faults was encountered which form a wedge-shaped section of ground with the point upward, and within this section the ore is of high grade while outside of it the vein is barren.

A winze is now being sunk to explore this body. On the Jesse vein, good ore was also encountered between the 1200- and 1800-ft. levels, while on the 2000-ft. and 2200-ft. levels the ground has become relatively barren.

In the Emery district, Deer Lodge county, preparations are being made for operations this summer. Frank Veneer has an option on the Emery mine and mill, which, if taken up, will result in the active operation of that property. From the Blue-eyed Maggie a recent shipment of 40 tons averaging over $80 per ton, has been made. Shipments have been begun from the Emma Darling to East Helena. Placer operations in the Champion and Pioneer districts are beginning.

Ely, Nev.

April 30—The tungsten deposits in the foothills of Mt. Wheeler, southeast from Ely in the Snake range, are being developed. These veins, about 3 ft. wide are disclosed and about 100 tons of 60-per cent. ore is on the dump. E. L. Fletcher is in charge. This operation is about five miles from the old gold camp of Osceola, at which some quartz-lode mining is now being undertaken. A Scranton, Penn., company has control of the tungsten deposits at Round Mountain and is planning to undertake large operations.

Engineers supposed to be in the interest of the United States Smelting, Refining and Mining Company, have been making preliminary surveys from Ely down the Steptoe valley to the Ward district. The engineers of this company have returned from the Western Utah Copper Company in Deep Creek, from which a large number of samples were taken with the end in view of purchasing this property. The property has been partially developed and about 130,000 tons of 5 per cent. smelting ore demonstrated.

El Paso, Texas

May 2—An oil excitement of short duration caused a stampede to the scene of the reported "gusher," 75 miles north of El Paso, and 10 miles south of Alamagordo, N. M. Nearly 5000 acres were located. It was noticeable that none of the mining engineers in El Paso, conversant with the geology of the Sacramento valley, considered it worth while to go to the "strike." Some of the men who have returned from the well failed to even detect a "smell" of oil. The entire Sacramento valley consists essentially of a tertiary clay, sand, gravel and *caliche*, about 200 ft. thick, which overlies Cretaceous and Sub-carboniferous limestone. A well 6 miles north of El Paso, bored for artesian water to 2285 ft., failed to penetrate the Quaternary and Tertiary unconsolidated material. If hydrocarbons in any form exist in the Sacramento valley, it will probably require at least 3000 ft. to reach them.

Scranton, Penn.

May 2—The largest coal-stripping operation that has ever taken place in this section is under way at Derringer, in lower Luzerne county. The tract to be stripped is so extensive that it is estimated that it will occupy 300 men six years to complete the work.

There is a persistent rumor in Lackawanna and Luzerne counties that the mines of the Delaware & Hudson Company will shut down for an indefinite time. As a matter of fact five of the larger collieries of the company have already shut down, and this has caused the present talk. The officers decline to give any reason for the closing. The collieries where work has been stopped during the last week are the Greenwood, at Minooka, employing 1700 men; the Springbrook at Moosic; the Langcliffe at Avoca; the Lafflin at Dupont; the Last Chance at Pittston. The company has mines at Wilkes-Barre, Carbondale, Scranton, Dickson City, Olyphant, Jermyn and at other points.

Juneau, Alaska

April 25—Reports received from reliable miners who have gone to the Haiditarod (Iditarod) goldfields have aroused great interest in the new district and the greatest stampede since the big rush to Fairbanks six years ago is assured. Reports are received to the effect that 40 paying claims have been located on Otter flats and that $25 pans are common.

A shift in the population of the interior of Alaska is certain to begin with the opening of navigation about the second week in May. Eight steamboats are scheduled to start from Fairbanks as soon as navigation opens, and all cargo space has been taken. Machinery for use in the new field is piling up on the docks. Freight and passenger service has been arranged on the Yukon to Haiditarod, and steamer service has been arranged for on the smaller streams.

The mining outlook in the Ketchikan district has never been so bright as at present. At the Goodro property a small force is employed. The shaft is in ore to 135 ft. New machinery has arrived. The mill on the Rogers gold property at Hollis, is running on high-grade ore. The shaft is down 200 ft. Development is being pushed at the Victory Copper Company property, under the direction of Patrick Heaney. The Alaska Industrial Company on Prince of Wales island, has been shipping steadily during the winter. A new strike is reported on the lower level. Charles A. Sulzer has charge. The Mt. Andrew shipped during the last season 50 tons per day, or over 10,500 tons, carrying 4½ per cent. copper and $1.60 gold and silver. The It Mining Company has resumed operations. This property was one of the steady producers last summer, shipping about 30 tons a day, carrying 7 per cent. copper and $4 in gold and silver per ton. H. C. Strong is manager.

The Cinnabar mine on the Kuskokwim river has been sold to Paul Denhart, of Nome, who will install reduction works.

The Alaska Northern Railway will soon commence operation over 72 miles out of its projected 200 miles of railway, running out of Seward. The construction of the remainder will be postponed until there is some definite chance of developing the Alaska coalfields.

Cobalt

May 2—There has been a marked improvement in the conditions at La Rose. At the 88-ft. level of the Lawson, an oreshoot has been opened on the Keewatin vein. The vein is 4 in. wide and will run nearly 3000 oz. This is really the first important development on this property. In the main La Rose workings several important developments are announced that will add to the reserves. Work is shortly to be resumed on the company's outside holdings.

An important deal was made a few days ago in Elk Lake, when the Hiscock property was sold for $175,000. The first payment of $20,000 has been made. The original owner also gets a 10 per cent. interest in any company that may be formed. This property is very close to the Lucky Godfrey and has rich surface showings.

The mine owners in Gowganda have petitioned the government to build a branch railroad, or if this is impossible, that the present road from Elk Lake to Gowganda be extended to some shipping point. There is practically little possibility of the railroad being built, but it is believed that the Government may make an appropriation for the construction of a summer road from Charlton to Elk Lake. The question of a summer road into Porcupine is also up before the Government.

Toronto

May 2—The new mining law introduced by the provincial Government in the Quebec legislature, has for its principal object the excepting of stone quarries and some other non-metallic deposits from the provision reserving all mining rights to the Crown in past or future grants of land. After defining "mines" and "minerals" the bill enumerates the exceptions as follows: building stone and stone used for sculpture, limestone, calcite used as flux, mill stones and grindstones, sands and gravel for building purposes (except ferruginous sand) gypsum, slate used for building purposes firebrick, pottery, ceramic substances marl, ochers, mineral waters, kaolin, infusorial earths, tripoli or fuller's earth The working of quarries and the othe minerals declared to belong to the surface owner, remain subject to the provisions of the mining law respecting statistics, police, employment of women and children and the sale of liquor. The bill provides that the royalty on asbestos, when imposed, shall be levied by taking as a basis the quantity and value of the asbestos produced, deducting such of the cost of the extraction and treatment of the asbestos-bearing rock as the mining inspector may think just and reasonable.

Mexico

April 29—The Madero interests, of Monterey and Torreon, have taken over the concession for a railroad from Camacho, on the Mexican Central, to Mazapil, and will build the line. It will be financed by the Franco-Español Bank, the Zacatecas Government guaranteeing 5 per cent. on the mortgage bonds to be issued. A branch will be built to the Bonanza camp, where the American Smelters Securities Company is principally interested. The Mazapil Copper Company, the principal concern of the Mazapil district, owns and operates the Coahuila & Zacatecas Railway, extending from Concepcion del Oro to Saltillo. Construction of the new line will start before June 1.

The Torres & Prietas road, extending from Torres, on the Sonora line of the Southern Pacific to Represo, 27 km., has been transferred to the Mexican Union Railway Company, Ltd., of London, by Mrs. M. T. Seymour. It is announced that the English corporation will extend it to a connection with the Yaqui river line of the Southern Pacific.

Men behind the El Paso & Southwestern railway are reported to be financing the Arizona & Gulf road, projected to extend across the Altar district from a point near Sasabe, on the border, to Point Lobos, on the Gulf of California. The line will connect with that extending from Red Rock, on the Southern Pacific in Arizona, to Sasco where the Imperial smeltery is situated.

Southern Pacific construction is being rushed south to the Santiago river in an effort to complete the extension to the Tepic capital before the rainy season is advanced. South of the capital the line will open the Compostela district.

The Transvaal Copper Company, of Cincinnati, will build a narrow-gage road to connect its smeltery at Cumpas and its mines. Principal stockholders recently visited the properties, and as a result capital for the railroad and for further development will be available. The Southern Pacific has completed the roadbed of its Yaqui river line through the cañon south of Nacozari, and its concession calls for the building of the line as far south as Cumpas within the next few months.

The Chapala Hydroelectric and Irrigation Company, of Guadalajara, which promised power in the Hostotipaquillo and Etzatlan districts, Jalisco, by June, will be unable to make good. It will be possibly the end of the year before current can be supplied. The Chapala company entered into an agreement with the Guanajuato Power and Electric Company for a division of territory, and a clause in the agreement provides for the supplying of power by one company to the other in case of emergency. To make this exchange of power possible it will be necessary for the Chapala company to change its voltage plans, necessitating changes in equipment, and as a result the transmission of power will be delayed several months.

London

April 25—In a recent anniversary address by the president of the Mine Managers' Association of the Transvaal, the question of the advisability of publishing monthly statistics was one of the subjects discussed and the remarkable statement was made in the name of the Association and not of the president alone that the present system of working the mines did not tend to the maximum profit from any given area of ground, or in other words, that the mines were not being worked to the best advantage. The explanation given was that the mine managers were instructed by the directors to produce monthly returns that did not vary, and that, in order to carry out this policy, it was necessary for them to scatter the labor force about the mine instead of concentrating them and working out the mine in regular sequence, which would result in a lower cost of working. It is a curious admission to make, and one which shareholders in the Transvaal mines will doubtless not pass unnoticed. The public are now told by an authoritative body that the profits in the mines have been sacrificed for the sake of an arbitrary policy of regular returns, and they will naturally ask what advantage there is in these so called regular returns and what harm would be done if the monthly returns did vary. Mines in other parts of the world are not worked in this way, and the publication of a poor monthly return does not create a panic. Shareholders in mines know well enough that ore deposits vary in richness and that a certain amount of fluctuation in the profits must occur. On the Rand, the large size of the mines tends to produce regular returns and even on the smaller mines, the president of the Mine Managers' Association does not anticipate a larger variation in the recovery than two pennyweights per ton. The argument that fluctuating returns will frighten or unduly elate shareholders is a weak one for proposing the abolition of monthly returns, and any attempt to withhold information will certainly meet with strong opposition from the public, as, indeed, happened when it was advocated some time ago to publish quarterly instead of monthly returns. It is interesting to notice that the argument that the cost of clerical labor involved in the preparation of monthly statistics made a change desirable is dismissed by the president as one of no weight whatever.

The charge that the president of the Mine Managers' Association brings against the financial houses is a serious one. As to what losses have occurred through this mistaken policy, no estimate is made. Perhaps it is not much, but it is a loss which ought not to be allowed to occur in the future.

On the subject of working costs, the president had also something to say. According to his view, the tonnage basis for the preparation of statistics was not satisfactory and some scheme of recording results according to the area exploited seemed to him a better way of doing things. The change proposed is so remarkable that it may be well to quote him *verbatim,* especially as these revolutionary proposals appear to be being seriously considered by the most influential mining house on the Rand.

He says: "If a system were generally adopted whereby a comparison of profit derived from areas exploited were made the basis of comparison, we would, I know, show higher cost per ton crushed, but the Rand would also, I believe, show a greater profit per area denuded of its valuable product, and that, I feel sure, is the thing we are all, or should all, be striving for. The scheme outlined above is, I understand, being introduced into the Corner House mines at once at the suggestion of H. F. Marriott, and we may therefore hope that before long the bogy of 'cost per ton milled' will have been permanently scotched, to be replaced by the much more accurate 'square fathom exploited.' But when all is said and done as regards basis of comparison, the main thing to remember is that in no two mines, or even the same mine at different periods, are conditions really similar; and that, therefore, comparison on a cost or a profit basis is most dangerous except to those fully informed of the circumstances of both, and that the financial inclusion of two mines under one control does not of itself make comparison possible where conditions remain dissimilar."

With the concluding portion of this quotation most mining men will agree, but not so with the other proposal that areas rather than tonnage are the best unit for comparison. The tonnage basis of recording results has been from time immemorial the accepted method. It is a basis which can be well understood by the general public, and until some better reasons than those given are advanced, it is not likely that mining engineers will take kindly to such a fanciful unit as the square fathom exploited.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Arizona

Gila County

Superior & Boston—Work in the drift on the 400-ft. level has been discontinued, while two winzes are being sunk on the Black Oxide vein. Both winzes and the drift, measuring 225 ft. long, are in ore assaying 8 per cent. copper, or better. The ore at these, as at the McGaw workings farther north, is carbonate. J. D. Wanvig is superintendent.

Arizona-Michigan—The development at the Blackbird shaft has shown a 5½-ft. vein at 180 ft. Some copper carbonate is present on the hanging wall of the vein, where the vein carries iron and manganese. Crosscutting is in progress at the 100-ft. level, and a second level will be established at 200 ft. At the 500-ft. level of the Telfair shaft, the south crosscut is in shale 755 ft. southward. N. A. Nelson is superintendent.

Superior & Globe—The work in the west drift on the 650-ft. level has been temporarily discontinued while a winze is being sunk on the fault. The fault is being drifted east of the north crosscut. H. V. Snell is superintendent.

Live Oak—Five drifts are being advanced, of which four are on the 300-ft. level and one is on the 200-ft. level. The shaft is in chalcocite at 80 ft. below the third level. Sinking will be continued to the bottom of the orebody. North of the shaft a churn drill is putting down a hole, which will connect with the third level drifts.

Arizona Commercial—Owing to the fact that the ore reserves could not easily meet the demands of the smeltery, the company has shut down its smeltery, and of its former 350 employees has retained only about 70 men, who are now engaged in development to open new ore deposits. President Amster and J. Morgan Clements are now at the property. The flow of water on the seventh level is about 2,000,000 gal. daily and developments cannot be instituted on the eighth level until this flow of water diminishes greatly.

Pinal County

Sultan-Arizona—The Baldwin Syndicate of Chicago has acquired this property and will begin active development.

Yavapai County

George A. Treadwell—The stockholders of this company are meeting in New York to devise some plan to protect their interest.

California

Amador County

Bunker Hill—An oreshoot has been opened up on the 1750 level. The drift on the 1950 level is in 300 ft. A cyanide plant under charge of William E. Darrow is treating the mill tailings.

Little Amador—This mine, between Keystone and Bunker Hill, purchased about three years ago by the Original Amador Mines Company, of Oakland, W. F. Deaner, manager, has started the mill.

South Eureka—A new drift on the fifth level has entered pay ore. The vein is now opened from the fifth to the 27th level. The mine has been recently sampled by a prospective buyer.

49-Flat—This mine, near Volcano, will erect a mill.

Calaveras County

Carson Hill—This mine near Irvine, credited with several million dollars production and with the production of a single mass of gold valued at $75,000, is the property of the Vanderbilt family and was recently inspected by Mrs. W. K. Vanderbilt. Last fall the mine was reopened and development work has been in progress since.

Eldorado County

Montezuma—This mine on the Mother lode north of Nashville, is being opened by the Senator Flint Exploration Company.

Adams Gulch—These claims adjoining the Montezuma are under bond to Senator W. A. Clark. A small force of men is at work arranging to drive a tunnel to strike the lode at about 500 ft. below the croppings.

Good Luck—This mine, Diamond Springs district, is under bond to Robert Mitchell, who is prospecting it.

Inyo County

Tecopa—A branch railroad from the Tonopah & Tidewater is under construction to this silver-lead mine, in which much ore is developed.

Sierra County

Oakes—This quartz mine, Sailor ravine, adjoining the Standard, has been bonded by Homer Gould.

Gold King—Daniel McDonigal has bonded this mine on Kanaka creek. It is equipped with a 15-stamp mill. The 40-ft. tunnel is being extended.

Eastern Cross—In the 300-ft. tunnel rich ore has been encountered. The property is near Kanaka creek. A. and Leon Bovee are the owners.

Oriflamme—This mine, near the Irelan group in the Alleghany district, has been purchased by the Oriflamme Mining Company.

Twenty-One—The tunnel on the vein is being extended and milling ore extracted. F. M. Phelps is manager.

Sierra Wonder—The mine has a crosscut tunnel to the vein and considerable drifting has been done on the vein.

Bear Creek—The mill installed last fall near American hill, was operated with satisfactory results. John Andrews is manager.

Slate-Castle Jaffa—At this mine high up on the south slope of the North Yuba cañon, south of Downieville, a new lower tunnel has been started. Sol. Camp is foreman.

General Sherman—This property at Alleghany is reported to be bonded to Daniel McDonigal.

Haskell Peak—A tunnel is being extended to tap the gravel channel high up on Haskell peak. Henry Goering is superintendent.

Jersey—At this mine, formerly the Slattery, west of Forest on Oregon creek, the tunnel is in 2100 ft. and a contract has been let to extend it 100 ft. farther.

Colorado

Clear Creek and Gilpin Counties

War Dance—This mine, Russell gulch, has ended its litigation and the lessees will sink and open up reserves.

Lake County—Leadville

Bohn—C. E. Dickinson and others of Leadville, leasing on the Bohn, in the downtown district, are mining some unusually high-grade silver ore at 420 feet.

Silent Friend—This property, on Breece hill, has been proved to contain large bodies of smelting ore, and much was shipped, but ultimately being of low grade, it would not pay with the increased cost of pumping and hoisting. Now, however, it is to be operated through the Yak tunnel, and will be operated on a large scale, with William Doran, manager.

Big Four—The Crawford Mining Company, of Chicago and Boston, has secured control of this mine, Breece hill, and will start work. The old levels will be exploited and the shaft, which is 780 ft. deep, will be sunk to 1000 ft. Isaac N. Jones is manager.

San Juan District

Camp Bird—The March proceeds were $190,289 and the net profit £28,317. The final payment to the late Thomas F. Walsh was made March 25.

Teller County—Cripple Creek

Rubie—In this mine, Bull hill, high-grade gray copper has come in at the 1500 level, where a discovery of rich ore was lately made. The same ore was found at about the same level in the Blue Bird mine, nearby. The streak is about 2 in. thick and selected specimens carry 1000 oz. silver to the ton.

Granite—This mine, C. C. Hamlin, manager, operated entirely under the leasing system, during 1909 shipped 19,191 tons of gold ore, which averaged $22.15 per ton, from which the company received royalties of $97,406.

Monitor and Proper—Vetter & Co., and Reed & Co., lessees on these mines, on Globe hill, have opened a large deposit of surface ore, which it is estimated will ship at about 1½ oz. gold per ton.

Dante No. 2—M. B. Rapp, leasing, is shipping 400 tons per month of high-grade ore.

Thomas Fraction—Bodfish & Terry, lessees on this mine, have discovered a vein in the workings through the Victor tunnel from which they are shipping ounce ore.

Trilby—Superintendent Syer is shipping milling ore which is giving returns of $17 per ton in car lots.

Idaho

Cœur d'Alene District

Stewart—This company has leased from the Federal company the Mammoth mill and is shipping. M. W. Bocar is in charge.

Black Bear—The company will erect a mill soon.

Indiana

Vanderburg County

Winifred Mining Company—This Evansville company has been adjudged bankrupt. The indebtedness consists of a bond issue of $20,000.

Vermilion County

Benjamin R. Whitcomb has bought the coal and mineral rights under 1500 acres adjoining a tract of 194 acres already owned by him west of Clinton.

Michigan

Copper

Keweenaw—The drill 1000 ft. from the new shaft, in the hanging-wall side, has reached the Kearsarge lode at 925 ft. The core shows the lode to be about 22 ft. wide and well charged with copper throughout. The shaft sinking on this lode is down 170 ft. in the hanging-wall. This company is operating a drill at the bottom of its Medora shaft, driving in the direction of the Calumet conglomerate lode.

Phœnix—This company, controlled by the Keweenaw Copper Company, has let a contract for drill work, particular attention being given the Ashbed lode, which was worked in the early days and from which a large amount of copper was extracted. The last work done on this lode was 10 years ago.

Ahmeek—The two new shafts, Nos. 3 and 4, are down 750 ft. each. These shafts are sinking at an angle of 80 degrees and start with a common collar at surface and diverge with depth. These shafts will command the northern and central portions of the land and should reach the Kearsarge lode at 1250 ft. No. 1 shaft is down to the 14th level and No. 2 to the 15th. Rock shipments averaging 1700 tons daily are being made to the Franklin and Tamarack mills. The stamp mill will be ready June 1.

Oneco—No. 6 drill hole is down 1675 ft. and has encountered an amygdaloid lode carrying a small amount of copper. No. 7 hole is down the same depth. These holes will soon be discontinued and the drifts moved to the eastern portion of the tract. They will go down vertically to cut the New Baltic lode, as exposed on the New Baltic.

Lake Superior—This development company has its drill in the lode after passing through 100 ft. of overburden. Explorations on this tract are being carried on in virgin ground.

Lake—This shaft is down to the seventh level. The crosscut from the sixth level has recently entered a rich run. Operations at the other parts of the mine continue with the same good results. More drills will be started.

St. Claire County

Port Huron Salt Company—The company will sink a deep shaft to mine rock salt. Otto Huette is manager and Charles A. Harkin, engineer.

Missouri

Boston Mining Company—This company, capital $250,000, has been listed on the Boston Curb. It is building a 600-ton mill in the Joplin district and will mine by steam shovel. Franklin Playter is manager.

Montana

Butte District

Raven—On the 200- and 300-ft. levels sets of leasers are at work. The crosscut on the 1500-ft. level is in about 200 ft. and is expected to reach the vein in a short distance.

Butte & Ballaklava—First-class ore is being shipped exclusively at the rate of 70 tons per day. In May, shipments of second-class ore will be begun and it is expected 300 tons will be shipped daily.

Anaconda—It is believed that the next news of importance about this company will be to the effect that it has absorbed the properties at Butte of W. A. Clark. Some surprise has been expressed that in the consolidation already consummated the North Butte was not included. However, it is now quite obvious that North Butte could not have been taken in at any reasonable price that would not have raised an uproar from its stockholders who had been kept in the dark as to the real condition of that property.

Broadwater County

Keating—The shaft is now 500 ft. and will be sunk to the 600 when crosscutting and drifting will be begun.

Black Friday—The shaft is 500 ft. and drifting is in progress at that depth.

Ohio Keating—Operations will be resumed when the electric power has been installed.

Jefferson County

Corbin Copper—The Dewey lead has been drifted 500 ft. and disclosed an orebody 30 ft. wide. The Bonanza tunnel has been in ore 111 ft.; the Dow tunnel is in 771 feet.

Lincoln County

Comet Placer—The property on Cherry creek was recently equipped with a mile of pipe line, a long flume and ditch and two giants for hydraulic mining.

Madison County

McKee—James J. Martin has succeeded R. B. McGinnis as superintendent. Work will be resumed.

Atlas—A strike has recently been made in the east vein which was intersected by a crosscut 120 ft. long.

Nevada

Esmeralda County

C. O. D.—The Gray lease at Goldfield is shipping another car of $45 ore. The copper content being high, the ore will go to Kennett, California.

Goldfield Consolidated—Seventy stamps are dropping, handling 550 tons daily.

Nye County

Montana-Tonopah—The largest semi-monthly cleanup in the history of the company resulted in 29 bars of bullion, averaging about $800 for the first half of April.

Blue Jacket—Placer operations at Round Mountain are giving satisfactory and uniform results.

Round Mountain—Interest centers around the new shaft 1500 ft. east of the main workings. The head frame is in position and the shaft timbered to 35 feet.

White Pine County

Giroux Consolidated—Concrete foundation piers are being put in for the 95-ft. steel gallows frame over the new shaft. The battery of 8 boilers for the new hoisting plant has been delivered and the engine is on the way. The work in the new shaft consists of enlarging to full size the compartment sunk from 1000-ft. level to the 1200-ft. level. This is being done by raising the broken rock falling into a chute from which it is hoisted to the 1000-ft. level and transferred to the other cage which takes it to the surface. Progress is at the rate of 10 ft. per day, which includes putting in the shaft timbers. The shaft is making only enough water to keep a small pump busy three hours per day. The 1200-gal. pump is on the way. The pump station, 40x100 ft., has been started.

Nevada Consolidated—Work on the new steam-shovel cut will be started before July 1., and five new shovels are en route. It appears from numerous holes drilled the last two years, that the new pit will extend from the south end of the present pit westerly 3000 ft. up to the side lines of the Butte & Ely. The surface has been cleared and a track extended around the north and west side of the hill to within a short distance of the proposed pit. One churn drill is at work on the Liberty claim at what will be the west end of the pit. The overburden there is from 35 to 70 ft. deep, and from present indications the general average will be about the same as in the old pit. Improvements in the mill have raised its capacity from 6000 tons per day to 8000 tons. This has been effected through modifications in the method of classifying the pulp, and other minor matters whereby but comparatively little expense has been involved.

Ohio

Canaan Coal Company—This company gives notice that its main office has been removed to the Athens National Bank building in Athens, Ohio.

Utah

BEAVER COUNTY

Majestic—Shipments are being made from the Hoosier Boy group. The vein is 4 ft. wide and carries lead and silver with some copper. Ore is being prepared for shipment at the Harrington-Hickory.

Moscow—This company is shipping two carloads of high-grade silver-lead ore per week and arrangements are being made to increase shipments. The orebody has been developed along its strike for 300 ft., and has been followed 90 ft. or more below the 400-ft. level.

Cedar-Talisman—The orebody on the 500-ft. level is opening larger with development. In places a breast of ore 8 ft. wide is reported. Some of the ore is first class lead-silver ore of shipping grade.

Blackbird—Work on this company's holdings near Newhouse is to be resumed. Prospecting will be carried on by drills under the direction of J. R. Steele.

King David—It is reported that this property is to be closed.

Cave—W. J. Merritt, of the Red Warrior company has taken a lease on this property, and is mining iron ore which is shipped for flux. Ore is being hauled to Milford.

JUAB COUNTY

Chief Consolidated—Drifting is being done on the 1600-ft. level to get under the orebody developed on the 1400. A raise will be driven to cut this ore. The shaft is at the 1800-ft. level. Holders of Eureka City Mining Company's stock have been told to notify the secretary of the Chief Consolidated before May 16 if they wish to exchange their stock for shares in the latter company. The basis of exchange is one share of Chief Consolidated for every five shares of Eureka City.

Opex—The diamond drill on the 2147-ft. level is being driven laterally and upward in search of ore and not downward, as has been reported.

Missouri Mining Company—This company was recently organized to control the property of the Montana Mining Company. Development work will be begun. John Roundy is manager.

Lower Mammoth—The drift on the 2000-ft. level is being driven along a break which shows mineralization. The drift is being driven for the contact with the expectation of developing the orebody opened above on the 1800 level.

SALT LAKE COUNTY

City Rocks—This company at Alta has developed a new silver-lead fissure in the 500-ft. crosscut from its lower tunnel.

Bingham-New Haven—This company has closed its mill for repairs. The jigs will be replaced by tables and vanners.

TOOELE COUNTY

Ibex—This property at Mercur closed on April 14. It is reported that the Ibex and Vindicator are to be consolidated.

Utah Metal—This company, which is driving an 11,000-ft. tunnel into Carr fork from the Tooele side, has its machinery installed and work on the tunnel will be pushed.

Virginia

The Stonega Coal and Coke Company has obtained control of the mines and coke ovens of the Keokee Consolidated Coke Company in Wise and Lee counties. This purchase gives the Stonega company control of the larger part of the developed property in the Wise county field.

Washington

FERRY COUNTY

A large custom mill for handling Republic ores is being designed and will be erected by the Hess Cyanide System Company, of Spokane.

Pacific Ore Company—This company has leased ground for a cyanide mill in West Republic. E. R. Davidson is representative.

Hercules—At this claim of the Buckskin company, E. J. Cheatham, president, development will be started.

OKANOGAN COUNTY

Molson—Preparations are made to start the new mill and work will be carried on extensively. J. Plomert is manager.

West Virginia

The Hope Natural Gas Company has struck one light gasser on Flint creek and another on Israel's fork, near a gasser of the Carter Oil Company. On Buckeye fork, the Luck Gas Company has a new gasser on the Heaton farm. Along Rock run, the Eastern Oil Company has found a 2,000,000-ft. gasser on the McCain farm and the Sun Oil company, a 3,000,000-ft. gasser on the place of W. J. McMillan.

In the Shinnston field the production continues to decline; few of the old wells will now yield without pumping, and all the recent wells drilled in outlying territory, with the hope of finding an extension of the pool, have been dusters or gassers. A liberal gaging would only show an output around 5000 bbl. per day for the whole pool.

On Upper Two-mile creek in Lincoln county the Jennings Oil Company has a gasser on the Solderby farm, of 2,500,000 ft. daily. On the Holderberry estate, the Pure Oil Company has a 3,000,000-ft. gasser and another of equal output has been struck on the farm of Jennie Jones, by the Hamlin company.

About 50,000 acres in Monongalia county have been leased near the Cheat river for gas and oil prospecting. It is understood that a good part of the leases will be controlled by subsidiaries of the Standard. On Dunkard creek, the South Penn company has struck a 275-bbl. oil well in the fourth sand on the Wilson Haught farm.

On the G. W. Hammer tract, along Indian run in Ritchie county, No. 2 well of the Frimier Oil Company produces 150 bbl. and the No. 4 well, 125 bbl. per day. From the Keener sand, the Fisher Oil Company has a 160-bbl. producer on the P. R. Tharp farm, while Rasel & Co. and Dollman & Co. have brought in light pumpers in the same neighborhood.

Dusters have been the luck of the Philadelphia Company on McElroy creek, Tyler county, but on Middle Island creek the Melrose Gas and Oil Company has brought in a 50-bbl. flowing well; while Urquhart & Bailey have completed a 15-bbl. pumper on the J. W. Kyle farm. On the tract of Oliver Gorrell, the Gorrell Farm Oil Company has now a 15-bbl. pumping well.

Wisconsin

The zinc-oxide plant at Mineral Point will be enlarged at a cost of about $250,000.

Wyoming

Suit has been begun at Cheyenne by a stockholders committee alleging fraud in the affairs of the Penn-Wyoming company, and the United Smelters Railway and Copper company and subsidiary companies successively in control of the Ferris-Haggarty mine at Grand Encampment.

Canada

British Columbia

Canadian Collieries (Dunsmuir), Ltd.—This company with a capital of $20,000,000 has been chartered to take over the Dunsmuir coal mines and properties on Vancouver Island, B. C., the sale of which to the Mackenzie & Mann—the Canadian Northern—interests was announced some time since. These collieries ship a large part of their production to San Francisco.

British Columbia—The company has suspended operations owing to labor troubles.

Nova Scotia

The strike of the employees of the Dominion Coal Company belonging to the United Mine Workers, which commenced on July 6, 1909, was called off April 29, the men returning to work unconditionally. It is stated that the leading officials of the union have for some time been in favor of this course, while the local leaders opposed it. The union is now fighting against a reduction of the wages of the coal miners at Frank, Alberta, and the desire of the officials to concentrate their efforts upon this struggle is believed to have hastened the settlement of the Cape Breton strike. That strike, however, has been practically a failure, and this had been conceded for several months past.

Ontario

The shipments from Cobalt for the week ended April 22 are as follows: Nipissing, 332,745 lb.; Kerr Lake, 240,000; Crown Reserve, 200,700; La Rose, 151,900; Right-of-Way, 42,000; Trethewey, 64,000; Coniagas, 78,000; Buffalo, 58,000; O'Brien, 66,040; Chambers-Ferland, 41,950; total, 1,275,325 pounds.

E. Jones and Frank Blackburn, the two prospectors instrumental in starting the stampede into the Caribou Lake district, have been committed for trial at North Bay on charges of false pretenses and perjury.

Rochester—Another new vein 4 in. wide, and carrying high-grade ore, has been discovered on the 75-ft. level.

Trethewey—The new concentrator will start in a few days. A new high-grade vein has been found on the 65-ft. level of the No. 2 shaft.

Provincial—In sinking the shaft near the Savage property at 80 ft. a high-grade vein was cut. A crosscut will be run from the 100-ft. level to intercept it.

Maidens—A small steam plant will be installed shortly at this South Lorraine property. The Gilles and Grier lots, near the Maidens property, have been sold to Buffalo men for $30,000.

Hollinger—Returns from Ledoux & Co., New York, who have sampled 30 tons of ore shipped, give the value of the consignment as over $6000, or $200 per ton. The car shipped was engineer's sampling of each shooting down to the 60-ft. level, where crosscuts were made in two shafts 350 ft. apart.

Mexico

Chihuahua

La Republica—The quarterly statement to March 30 shows: Tons milled, 3870; production, 187,163 pesos; operating costs, including unwatering, 120,107 pesos; construction and equipment, 27,602 pesos.

Guanajuato

Guanajuato Consolidated—The return for March is as follows: Crushed 7790 tons of dry ore; concentrates shipped to smeltery 157 tons; gross value in products, 100,700 pesos; estimated profit, 25,400 pesos. Of this, 16,200 pesos has been expended on 554 ft. of development.

Guanajuato Amalgamated—This property, developed by L. P. Adams, has been sold to the Oro Grande Mines Company, affiliated with the Guanajuato Securities Company of New York. The property is at La Luz.

Guerrero

The Sultepec Light and Power Company has agreed to transmit electric power to Taxco on a guarantee of 600 horsepower.

Atlixtaca—This Taxco company will erect a cyanide plant.

Jalisco

Casados—Plans are drawn for a 225-ton mill to be erected in units of 75 tons each at this mine, owned by Consolidated Mining Company, W. R. Ramsdell, president.

Amparo—The three-compartment shaft, sinking from the 700-ft. level, is down 200 ft. The shaft will be sunk to 1300 feet.

San Antonio—This property, on the Real Alto, San Sebastian district, has been secured by J. B. Wilson, of Louisville, Ky. An option on the Carmen mine, Cuale district, has been surrendered.

Neuva Leon

Cruz de Aire—This lead-silver mine at Sabinas Hidalgo has been sold to A. Bueno, of Mexico City, on the basis of 354,000 pesos for one-half of the stock.

Sonora

North Tigre—About 35,000 tons of milling ore is blocked out for extraction. The installation of a 100-ton concentrator and a cyanide plant of the same capacity is under advisement.

Dawson—This concern, which has held claims in the Moctezuma district, has gone into bankruptcy.

Otate—New hoisting and pumping equipment is being set up at the mine near Llano.

Moctezuma-Arizpe — The reorganization has been completed, 350,000 shares having been turned into the new corporation.

Cabibas—A 10-stamp mill has been moved from the Quiptoa range to the Rochester camp in the Cabibas mountains.

Minneapolis Copper Company—This company has properties 28 miles southwest of Cumpas. Several hundred thousand tons of sulphide ore are now in sight as a result of 5000 ft. of development. The company is actively engaged in developing.

Africa

Rhodesia

Gold production in Rhodesia is reported at 54.277 oz. in March. For the three months ended March 31, the total was 156,633 oz., or $3,237,604; an increase of $321,400 over last year. Other productions in March included 18,267 oz. silver, 8 tons copper, 56 tons lead, 1714 tons chrome ore and 12,272 tons coal.

West Africa

Gold output of the Gold Coast and Ashanti in March was 17,627 oz. For the three months ended March 31, the total was 67,406 oz. bullion in 1909, and 51,960 oz. in 1910; a decrease of 15,446 oz. The bullion reported this year was equal to $1,027,460, or 49,708 oz. fine gold.

South America

British Guiana

Gold exports from British Guiana for the three months ended March 30 were 12,957 oz. bullion in 1909, and 11,059 oz. in 1910; a decrease of 1898 oz. The bullion reported this year was equal to $192,695, or 9323 oz. fine gold. Exports of diamonds were 1153 carats, valued at $5255; an increase of 704 carats.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, May 4—There is little to be said of the coal trade in the East. The only effect which the Western troubles can now have on the seaboard bituminous trade is to withdraw some West Virginia supplies, and that will not be unwelcome. The anthracite trade is quiet and steady, as usual.

In the West, conditions remain disturbed and uneven. In the Pittsburg district a settlement has been reached and mining is being gradually resumed. In Ohio slow progress is being made in finishing up the district contracts. In Indiana a settlement of differences is in sight, and the same may be said of Iowa. In Illinois, however, operators and miners are as far apart as ever, and in the Southwest there is no approach to a settlement. Operators are anxious to resume work; in some districts the miners are tired of idleness and approaching the end of their funds. This may hasten matters a little.

A full account of the Pittsburg agreement is given on another page, and notes on other districts will be found in the correspondence which follows.

Meantime, the stocks of coal carried over are being gradually exhausted, and in many places some scarcity of coal is being felt. Kentucky and West Virginia coals are beginning to be important in the markets.

Coal Rates in Ohio—In response to a question submitted by the State Senate, the attorney-general of Ohio gives his opinion that the railroads in the Ohio Coal Traffic Association have violated the anti-trust law, but that they cannot be reached under the present law. He recommends an amendment to the law under which they can be sued.

COAL TRAFFIC NOTES

Norfolk & Western coal shipments, nine months of fiscal year July 1 to March 31 short tons:

District	Commercial.	Company.	Total.
Pocahontas	7,079,775	945,966	8,025,741
Tug River	1,106,893	143,308	1,250,201
Thacker	1,084,614	521,682	1,606,296
Kenova	488,657	138,161	626,818
Clinch Valley	484,709	43,098	527,807
Total	10,244,648	1,792,215	12,036,863

The total shipments show an increase over 1808-9 of 2,783,846 tons, or 30.1 per cent.

The Consolidation Coal Company reports its tonnage for the year 1909 as follows:

	Coal.	Coke.
Maryland division	1,649,457	.....
West Virginia division..	4,125,300	45,013
Pennsylvania division...........	1,550,366	17,428
Total..	7,325,123	62,441
Total, 1908......................	7,159,492	37,931

Increase in coal mined last year, 165,631 tons, or 2.3 per cent.; in coke made, 24,511 tons, or 64.6 per cent.

New York

ANTHRACITE

May 4—Spring weather has quieted down the domestic trade. A large part of the local trade, however, consisting in the supply of electric light and power stations, and of factories, shows little change.

On May 1 the discount was reduced 10c. per ton, and schedule prices for domestic sizes are now $4.35 per ton for lump and $4.60 for egg, stove and chestnut, f.o.b. New York harbor. Prices of steam sizes show no changes.

BITUMINOUS

The seaboard coal trade is quiet, but in fair condition. Orders are again coming in a little more freely both from the far East and from nearer New England territory. Inquiries are good, and some result in business. All-rail trade is reported about as usual.

New York harbor trade is steady, but still shows a preference for the lower-priced coals. Prices are about the same as they have been for several weeks past. There is some talk of smaller supply of West Virginia coal, owing to the demand for that coal from the West; but no shortage has yet developed.

Car supply has held up a little, but is still better than it was a few weeks ago. Transportation is generally good, with only occasional delays.

In the coastwise-vessel market, boats are in fair supply and there is no material change in rates.

Birmingham

May 2—Coal production in Alabama shows very little difference, though the demand has slackened up a little. The larger mines in the State are being operated on full time and the coal is being handled promptly. Coal prices are off a little but contracts are not being made beyond the summer months. The Pratt Consolidated Coal Company, through a subsidiary company in New Orleans, is handling 10,000 tons of coal per month from this district, which is being used mostly on steamships and for railroads in Mexico. A large trade through New Orleans is being worked up with the coöperation of the railroads, which have made a low rate from the Birmingham district to New Orleans.

Following a meeting of the Alabama Coal Operators' Association the past week, announcement was made that the coal miners and mine workers in the Birmingham district would receive an advance in wages of 5 per cent. effective May 1. About 20,000 men are affected by the increase in wages.

Chicago

May 2—The coal market is still hardly in existence, with something more of demand each day for supplies from the small consumers, but with no evidence that large consumers have yet reached the bottoms of their storage piles. It seems probable that the greater number of large consumers can hold out for another half month. Activity exists in the smokeless market and in such Western fine coals as reach market, for the consumer buying in the open market is insistent upon getting fine coals. Anthracite has had a fair April sale, due both to the approach of the end of the month and to the cool weather which has continued over Chicago terrietory. Considerable Western lump might be sold for domestic purposes if it were available, but it is not in the market.

Screenings are active when obtainable, at $2.40@2.60; run-of-mine and lump from Illinois and Indiana mines are out of the market. Smokeless is active and not in oversupply, generally at $3.55 for lump and egg and $3.15 for run-of-mine. One result of the market's short supply in April is an increased use of screenings and run-of-mine by consumers who formerly used lump, so that some dealers predict a lasting increase in the consumption of fine coals and corresponding decrease in the use of lump.

Cleveland

May 2—Since the opening rush, the Lake trade has been dead. Boats are waiting for cargoes, but coal is not coming to the ports.

Locally, there is little trade. Factories are running on their stocks and are not buying coal. The only apparent demand is for slack, and there is little of that to sell. Prices are wholly nominal in the absence of sales.

Indianapolis

May 2—Two more conferences by committees from the Indiana Miners' convention and the Indiana Operators' Association were held during the past week, the last one resulting in a temporary agreement. A report on a tentative agreement was rejected by the mine workers when first presented but was subsequently taken up again and amended in such a manner as to leave only one question in dispute.

The miners are opposed to returning to work pending negotiations while the fine clause remains. They say if they do the fight against the fine of $1 a day for stampede strikes will be weakened. The wage contract contains an arbitration method of adjusting local grievances at a mine and the fine is for failure to comply with this method which requires the men to continue at work at that particular mine while the arbitration proceeds. The operators are anxious to open their mines and there are strong indications that the miners will return to work this week. The settlement of the wage agreement in the Pittsburg field has helped the settlement in Indiana.

The situation is growing serious. There is little coal left in Indiana and in places factories and contract work have shut down for the lack of coal. The independent mines are producing a little coal but not enough to supply the demand.

Pittsburg

May 3—Most of the coal miners in the district have already gone to work, pursuant to the compromise agreement reached at midnight last Friday. The terms are given on another page.

The coal market is not regularly developed as yet, coal producers being engaged in resuming shipments to their regular customers. The supply of cars today was satisfactory, and no trouble is expected on this score. Lake shipments are to be started at once. We quote tentatively as the market: Mine-run and nut, $1.25; ¾-in., $1.35; domestic 1½-in. lump, $1.50; slack, 85c. per ton.

Connellsville Coke—The market has been quiet. Prices have not yielded since the settlement of the wage matter in the union district, but the market has not been seriously tested, and is quotable at $1.75@1.80 for prompt furnace, $2.10@2.25 for contract furnace, $2.25@2.35 for prompt foundry and $2.35@2.50 for contract foundry, for standard grades. The coke subsidiary of the Steel Corporation put out about 2000 ovens during April and will doubtless need to put out about 2000 more, considering the blast furnaces it is putting out.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended April 23 at 425,152 tons, a decrease of 13,000 tons from the preceding week, and shipments at 4856 cars to Pittsburg, 7562 cars to points west of Pittsburg and 925 cars to points east of Connellsville, a total of 13,343 cars. The high point in production was about Feb. 1, when the weekly production was 475,000 tons.

St. Louis

May 2—The situation in St. Louis remains unchanged. Prices have remained about stationary for the past week for Kentucky coal. The demand has been fair for coal, though there has been no particular rush and no one has suffered. It is estimated that there are 100 cars per day approximately coming into St. Louis from outside sources. This amount is apparently taking good care of the market. From this it can be seen that buying is comparatively light, as the daily consumption is approximately 800 cars exclusive of the railroads, which consume another 800 cars per day. The railroads, however, have still over six weeks' supply on hand and have bought nothing since the shutdown.

The Illinois operators are now in joint conference with the miners in Chicago, and reports from them would indicate that very little is being done toward effecting a settlement. There seems to be very little chance of work being resumed for another month yet.

The anthracite trade has been better toward the end of the month, as dealers were able to clear out their bins, which were filled with soft coal, during the cold spell last week.

On this account a number of them were able to get additional supplies of hard coal, which they had not expected.

Current prices for coal are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	2.50	3.02
2-in. lump	2.25	2.77
Mine-run	2.00	2.52
2-in. nut	2.00	2.52
2-in. screenings	2.00	2.52
Pea and slack	1.75	2.27
Staunton, Mt. Olive & Springfield:		
6-in. lump	2.50	3.02
3-in. lump	2.25	2.77
Mine-run	2.00	2.77
2-in. nut	2.00	2.77
2-in. screenings	2.00	2.77
Carterville:		
6-in. lump or egg	2.50	3.17
3-in. nut	2.50	3.17
Mine-run	2.00	2.67
1½-in. screenings	2.00	2.67
Franklin County:		
6-in. lump or egg	2.50	3.17
3-in. nut	2.50	3.17
2-in. nut	2.00	2.67
1½-in. screenings	2.00	2.67
Trenton:		
6-in. lump	2.50	3.02
6-in. egg	2.50	3.02
3-in. nut	2.50	3.02
Pennsylvania Anthracite:		
Nut, stove and egg		6.55
Grate		6.30
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	2.50	5.30
Gas house		4.40
Smithing coal	1.65	4.15

Kentucky coal sells at $2.50 for 2-in. lump, $2.35 for run-of-mine, and $2.20 for screenings; all f.o.b. Louisville & Nashville tracks, East St. Louis.

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, three months ended March 31, long tons:

	1909.	1910.	Changes.	
Anthracite	428,971	731,252	I.	102,278
Bituminous	1,516,160	1,898,209	I.	382,049
Total exports	1,945,131	2,429,461	I.	484,327
Steamer coal	1,387,767	1,501,535	I.	113,768
Total coal	3,332,901	3,930,996	I.	598,095
Coke	216,791	210,841	D.	5,950

Canada took this year 1,598,182 tons coal, or 65.8 per cent. of the total. The coke went chiefly to Mexico and Canada. Cuba took 210,398 tons of coal. Of the bunker coal this year 1,497,859 tons were loaded at coast ports and 3676 tons on the Lakes.

United States Coal Imports—Imports of coal and coke into the United States, three months ended March 31, long tons:

	1909.	1910.	Changes.	
Anthracite	3,115	17	D.	3,098
Bituminous	308,354	475,655	I.	167,301
Total coal	311,469	475,672	I.	164,203
Coke	54,573	31,703	D.	22,870

Canada furnished this year 410,246 tons of coal and nearly all the coke; Australia, 18,851 tons of coal; Japan, 42,212 tons of coal. Imports are chiefly on the Pacific Coast and in the far northwestern States.

British Columbia Coal—The Crow's Nest Pass Coal Company reports for 1909 a total of 899,045 tons mined, a decrease of 52,600 tons from 1908; coke made was 250,254 tons, a decrease of 12,304 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on April 23: Best Welsh steam, $3.90; seconds, $3.78; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.42; best steam smalls, $2.16; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, May 4—The iron and steel markets show few changes from the position reported last week. Buyers are apparently waiting for further reductions in prices, and are not yet satisfied that the bottom has been reached, while sellers are not yet pressing for trade to the point of making any large concessions.

In pig iron transactions have been of a moderate order only. Production is being gradually curtailed, and a number of furnaces have gone out of blast; not enough yet, however, to reduce the make of iron below a pretty high level. In the Central West, both foundry and steel irons have been sold only in a small way. In Eastern territory foundry iron has sold a little more freely, but the market is still disturbed by offers of cheap Southern iron.

In finished material there are some heavy contracts for structural steel pending, but not yet concluded. Other structural business has been of a small order, but there are reports of low prices. Plates are in a little better demand. The railroads are placing few orders, either for bridges or equipment. The Boston & Maine has given a considerable order for rails, divided betwen the Steel Corporation and the Maryland Steel Company. Some export orders for rails are also noted, for Mexico and Australia.

Depressed conditions in Wall Street and the suspension of coal mining in the West are both tending to influence the iron markets unfavorably.

Wage Increases—It is announced that the Jones & Laughlin Steel Company and the Republic Iron and Steel Company will follow the example of the Steel Corporation and grant a general increase in wages. It is understood that the independent companies take this action reluctantly, but believe that it is necessary in order to avoid trouble.

New wage rates have not been figured out fully, but it can be stated that the wage advances being made, on the initiative of the Steel Corporation, do not figure out as large a percentage as was at first expected. Common labor is advanced 10c. a day, except that in some cases the advance is made 1c. per hour, on a 12-hour day. Other advances are largely to bricklayers, machinists, carpenters, etc., the wages in which crafts have been advanced outside the mills, and the present advance is really simply a readjustment. The Steel Corporation has advanced its tonnage men in the sheet mills by about 3 per cent. and in the tin mills by about 4½ per cent., but the outside mills are not following this advance.

Baltimore

May 2—Imports for the week included 369 tons spiegeleisen, 1509 tons ferromanganese and 7 kegs ferrotitanium from Great Britain; 2050 tons spiegeleisen, 100 tons ferromanganese and 600 tons manganese ore from Rotterdam; 33,200 tons iron ore from Cuba. Exports included 2150 tons steel rails to Brisbane, Australia; 605,700 lb. zinc dross to Liverpool.

Birmingham

Some spot sales in the last few days has had a buoying effect on the iron market. The blowing out of a couple of furnaces recently has reduced the make and there is no further accumulation of iron noted. Prices in this section are a little weak yet. Inquiries are being received here for iron to be delivered during the last quarter of the year and some business is expected to result. The price is $12@12.50 for delivery during the third quarter. Spot iron has been selling at $12 per ton, No. 2 foundry. Some large consumers are said to have recently made a bid for a good quantity of iron, but the quotation desired was not met by the manufacturers. Low-grade irons have been in steady demand recently by cast-iron pipe makers. There is no hesitation at the pipe plants in the South. The home consumption of iron has not changed. Furnace companies are not willing to sell under $12.50 per ton, No. 2 foundry, for iron to be delivered during the fourth quarter of the year. The Tennessee Coal, Iron and Railroad Company gave its employees, miners, mine-workers, furnacemen, steel workers and others an advance on May 1, in line with the policy of the United States Steel Corporation.

Chicago

May 2—Sales of pig iron continue to be light and seem destined not to increase until the founders shall conclude that the market is not overstocked. Buying is in small lots mainly, for delivery one to three months hence, and last-half requirements are still largely uncontracted for. Southern No. 2 foundry remains at $12 Birmingham on nearly all sales, with perhaps a few contracts made 25 or 50c. less. This means $4.35 more in Chicago, or $16.35, against $17@17.50 for Northern No. 2. The reduction of Northern output will do much to stimulate the market, for at bottom the present holding off of buyers is due to a belief in overproduction. Sales of iron and steel products are fair, though by no means brisk, and no extensive new business seems in sight. The pig-iron requirements for the last half are not being met and are the subject of much inquiry from large and small interests. If the large interests meet their needs by heavy purchases as soon as they consider the bottom point of the market reached, there no doubt will be an upward turn. Otherwise, a dull and dragging market for an indefinite time seems in order.

Cleveland

May 2—Nothing doing in iron ore sales. The first starters from Lake Superior have been delayed by bad weather, and ore is slow to arrive.

Pig Iron—The market is dull, with few sales. Several furnaces in this district have gone out of blast, and several more are going. Bessemer can be had around $18; No. 2 foundry, $16.50@16.75; No. 2 Southern, $16.35; forge, $16@16.25; all Cleveland delivery.

Finished Material—Some small orders for structural and bridge work make up the total for the week. Except for bars and plates, the mills are not at all crowded, and are looking for more work.

Philadelphia

May 4—Some of the pig-iron makers of this territory have been anxiously soliciting business, especially in forge and foundry irons. It has not transpired on what terms and basis the business is sought for, as the furnace interests now assert that there has been no general drop in prices and at present no occasion for it. The furnace banks are practically clear of iron, shipments being made according to contract terms. Inquiries which have come to hand, mainly from New England sources, indicate that only small quantities of iron are wanted at present. Reports from salesmen who have just been over New England territory make it clear that there is comparatively little iron in the yards and very little anxiety to purchase at this time beyond what will be needed to cover work in hand. Basic pig is not quoted as strong and orders are unimportant. No. 2 foundry has been sluggish; small sales of malleable iron are reported.

Steel Billets—New work calling for small billets has been falling off recently and there is a disposition among buyers to go slow.

Bars—Bar iron has dropped off, both at stores and mills. This is, no doubt, a temporary dullness and quotations are still held up.

Sheet—The week shows a falling off in the amount of business done and especially in the size of the orders placed. Business is not rushing at the mills.

Pipes and Tubes—Additional business in cast pipe has just come to hand. In merchant pipe distribution has been unimportant. In tubes prices are firm at recent quotations.

Plates—Concessions have been asked for by two or three of the larger buyers of plates for material that will not be wanted until late in summer. It is believed that the slight concessions will be granted and the orders booked. In a general way, plate is strong.

Structural Material—The only reported sales this week are for lots ranging from 50 to 150 tons, much of it for small local enterprises.

Steel Rails—A few small orders for mine rails have just been sent to the mills and some good business is in sight for trolley-building purposes.

Scrap—The scrap-iron market happens to be lifeless at present, but a number of recent purchases of material have restored stocks in several of the yards.

Pittsburg

May 3—The curtailment in iron and steel production proves to be more serious than was expected. The Carnegie Steel Company is blowing out a total of 17 blast furnaces, since April 1, about a dozen of these having already gone out, while the remainder will go out within 10 days. This is out of a total of 53 furnaces. Other Steel Corporation subsidiaries are blowing out furnaces, the National Tube Company, for instance, having put out two of the four McKeesport furnaces within the past fortnight. The Steel Corporation has a total of 127 furnaces, all but a very few having been in operation, and it may be estimated roughly that from April 1 to May 15 it is blowing out close to 25 furnaces, a curtailment of close to 20 per cent. The independent steel works are also curtailing production but, on the whole, hardly as much. The merchant blast furnaces, however, are blowing out right and left, so that the Steel Corporation percentage is pretty well maintained on the outside, and it may be estimated roughly that while in March the country was making pig iron at the rate of a trifle over 31,000,000 tons a year, by the latter part of this month the rate will be about 28,000,000 tons. This, however, represents the best rate ever attained before this movement.

The market has continued stagnant as to absolutely new business in pig iron and finished-steel products, but shipments are fairly maintained by reason of the momentum at which trade was moving earlier in the year. Consumers of pig iron are taking iron fairly well on old purchases, and buyers of finished steel are specifying fairly well on their contracts.

Prices show no quotable change. There has been scarcely any business negotiated in finished steel, so that there has been no particular incentive to cut prices. It is quite certain that when business of importance is offered there will be a scramble for it, and this will doubtless result in price cutting, but for the moment it is hardly fair to quote lower prices as representing the existing market.

Pig Iron—There has been scarcely any pig-iron business done in the local market during the past week. Prices are quotable on a slightly lower level, from general information as to what could actually be done, as follows, at Valley furnaces: Bessemer, $17; basic, $15.75; No. 2 foundry, $15.50; malleable, $15.75; gray forge, $15. The bessemer average for April is announced at $17.37½, Valley, against $17.58 in March, a high point of $19 in November, December and January, and a low point last year of $14.58 in May. The basic average for April is announced at $15.9375, against $16 in March, a high point of $17.48 last November and a low point last year of $14.12, in May.

Steel—The market has been quiet. Prices on open-hearth steel are well maintained, but bessemer steel can be had at concessions. We quote $26@26.50 on bessemer billets, $27@27.50 on bessemer sheet bars, $28.50@29 on open-hearth billets, and $29@29.50 on open-hearth sheet bars, with rods at $32, all prices being f.o.b. maker's mill, Pittsburg or Youngstown.

Ferromanganese—The market is somewhat softer, owing to odd lots seeking prompt disposal. We quote prompt at $40@40.50, Baltimore, and forward at $40.50@41, freight to Pittsburg being $1.95 per ton.

Sheets—There is only a moderate amount of business. Some mills are well filled, while others are seeking business, generally at a cut of $1 a ton from the regular prices of 2.40c. on black and 3.50c. on galvanized. Corrugated roofing is fairly steady at the regular prices of $1.70 per square for painted and $3 for galvanized. Blue annealed sheets for prompt delivery are held at 1.85c. for No. 10 gage, and this insures delivery in about four weeks. For farther forward delivery the regular price of 1.75c. is done.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports pig-iron output in March at 1,250,184 tons. For the three months ended March 31 the total make was, in metric tons:

	1909.	1910.	Changes	
Foundry iron....	560,882	675,747	I.	114,865
Forge iron........	170,396	167,551	D.	2,845
Steel pig..........	277,416	314,527	I.	37,111
Bessemer pig.....	110,405	120,929	I.	10,524
Thomas(basic)pig	1,925,405	2,240,355	I.	314,950
Total........ ..	3,044,504	3,519,109	I.	474,605

The total increase this year was 15.6 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

METAL·MARKETS

New York, May 4—The metal markets have been rather irregular and inclined to lower prices. The exception is silver, which is firm at the recent advance.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.	
Gold:				
Mar. 1910..	$ 1,815,329	$ 4,492,229	Imp.	$ 2,676,900
" 1909..	21,252,462	5,161,648	Exp.	16,090,814
Year 1910..	10,915,595	9,686,702	"	1,228,893
" 1909..	37,978,632	12,158,275	"	25,820,357
Silver:				
Mar. 1910..	4,553,110	3,872,912	Exp.	680,198
" 1909..	5,079,287	3,279,531	"	1,799,756
Year 1910..	13,640,033	11,276,595	"	2,363,438
" 1909..	14,473,930	10,453,218	"	4,020,712

Exports from the port of New York, week ended April 30: Gold, $17,087,900: silver, $856,900, both chiefly to London. Imports: Gold, $114,927; silver, $130,975, both from Cuba, Central and South America.

Gold—The price of gold on the open market in London remained at 77s. 9d. per oz. for bars. The Bank of England withdrew the premium offered for American coin, and it was quoted at 76s. 5d. per oz. After last week's rush of exports from New York there was a lull, no large amount being taken.

Platinum—The market remains quiet but steady, and prices are unchanged. Dealers ask $29@29.50 per oz. for refined platinum and $34.50@35 per oz. for hard metal.

Silver—The market has been well maintained this week rising to 24 15/16d. in London, the highest quotation of the year, and closing steady at 24⅞d. India bazaars have continued large buyers and China has been the chief seller. The undertone of the market still continues good on prospects of a big wheat crop in India.

SILVER AND STERLING EXCHANGE

Apr.-May.	28	29	30	2	3	4
New York....	54¼	54	54¼	54¼	54⅛	54⅛
London	24 15/16	24 13/16	24 15/16	24 15/16	24⅞	24⅞
Sterling Ex..	4.8795	4.8775	4.8775	4.8765	4.8760	4.8700

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to April 21, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.	
India........	£1,404,400	£2,081,800	I.	£ 677,400
China........	983,200	1,088,500	I.	105,300
Straits.......	82,800	......	D.	82,800
Total......	£2,470,400	£3,170,300	I.	£ 699,900

India Council bills brought an average of 16.09d. per rupee in London.

Foreign commerce of the United States, three months ended March 31, as reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1909.	1910.
Exports................	$ 422,055,943	$ 412,719,928
Imports............	355,103,953	426,748,734
Excess................	E.$ 66,951,990	I. $14,028,806
Deduct excess of exports, silver......		2,363,438
Deduct excess of exports, gold........		1,228,893
Total import balance................		$ 10,436,475

The balance for the quarter shows an excess of import values, an unusual condition.

Gold and silver movement in Great Britain, three months ended March 31:

	Imports.	Exports.	Excess.	
Gold	£11,249,953	£12,154,389	Exp.	£ 904,436
Gold, 1909...	16,131,463	10,184,832	Imp.	5,946,631
Silver	3,580,131	3,555,220	Imp.	24,911
Silver, 1909.	3,339,828	3,156,161	Imp.	183,667

Of the silver imports this year £2,856,477 were from the United States.

Gold and silver movement in France, two months ended Feb. 28:

	Imports.	Exports.	Excess.	
Gold ..Fr.	93,196,000	F. 33,827,000	Imp.	Fr. 59,369,000
1909..	154,591,000	12,165,000	Imp.	142,426,000
Silver.	21,100,000	26,603,000	Exp.	5,503,000
1909..	21,827,000	14,951,000	Imp.	6,876,000

Imports of copper and nickel coins this year were 7000 fr.: exports, 139,000 fr.

Copper. Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
Apr.-May.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
28	12¾ @13	12⅜ @12½	57⅛	32⅞	4.35 @4.37½	4.20 @4.25	4.95 @5.00
29	12⅝ @12⅞	12¼ @12½	57	32¾	4.35 @4.37½	4.20 @4.25	4.92½ @4.95
30	12⅝ @12⅞	12¼ @12½	....	32⅞	4.35 @4.37½	4.20 @4.25	4.90 @4.95
2	12⅝ @12⅞	12¼ @12⅜	56 15/16	33	4.35 @4.37½	4.20 @4.22½	4.90 @4.92½
4	12⅝ @12⅞	12¼ @12⅜	56 9/16	32¾	4.35 @4.37½	4.20 @4.22½	4.87½ @4.90
5	12⅝ @12⅞	12¼ @12⅜	55 3/16	32⅝	4.35 @4.37½	4.20 @4.22½	4.85 @4.90

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Encouraged by the weakness of the stock market, domestic consumers continued to hold aloof, while European buyers showed more interest. There has been a steady demand from the latter quarter at lower prices, and this demand has been freely met. The market closes barely steady at 12⅝@12⅞c. for Lake copper, and 12¼@12⅜c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12¼@12⅜ cents.

Copper sheets have been reduced 1c. per lb., and are now 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c. base, carload lots at mill.

Business in the London market has been of small volume and prices have declined steadily, closing at £55 7s. 6d. for spot and £56 7s. 6d. for three months.

Refined and manufactured sorts are quoted: English tough, £58 10s.; best selected, £59@£59 10s.; strong sheets, £67 10s.@£68 10s. per ton.

Copper in April—The downward tendency in the copper market, which became prominent before the middle of March, continued practically without interruption through April. The month began at about 13 1/16c. for electrolytic with most of the agencies making strong efforts to effect sales. By April 9 the price had fallen to 12¾c. On that date the Calumet & Hecla reduced its price for Lake copper to 13c. and made some large sales. The sellers of electrolytic immediately became more urgent and sold some large blocks of copper at 12.65@12.70c., their sales being chiefly for foreign delivery. The large business continued up to the middle of the month, with a slight stiffening of price, but upon April 18 the market became weak again, demand having dwindled, and from that time onward the price for electrolytic slumped steadily to 12⅜c. as the closing for the month, a fair volume of business being transacted upon the decline.

Tin—In expectation of very favorable statistics, the market in London remained very steady; this in face of the disturbing conditions in all other metal markets. Upon the publication of the statistics, which showed a decrease in the visible supply of almost 2300 tons, prices advanced about 15s. This advance, however, was not maintained and sentiment changed, and the market closes weak at £148 12s. 6d. for spot and £150 2s. 6d for three months.

The domestic market continues to be very quiet. Retail business in Straits tin is almost nothing. Small consumers are using a good deal of low-grade tin, which is imported mostly from Bolivia and China, and this is selling at a considerable discount from the ruling quotations for Straits tin, but seems to answer fully the purposes of its uses. At the close, spot tin can be bought at about 32⅝ cents.

Visible stocks of tin on May 1 are reported as follows, including tin afloat: London, 10,287; Holland, 2076; United States, excluding Pacific ports, 5569; total, 17,932 long tons, a decrease of 2271 tons as compared with April 1; and of 893 tons as compared with May 1 last year.

Lead—The market is quiet and somewhat easier at 4.35@4.37½c. New York, and 4.20@4.22½c. St. Louis.

The London market is also somewhat lower, Spanish lead being quoted at £12 7s. 6d., and English at £12 10s. per ton.

Imports of lead material into the United States in March included 15,955 tons of ore, containing by assay 7,571,574 lb. lead; and 10,042,235 lb. base bullion, containing 9,824,579 lb. lead; total contents being 17,396,153 lb. lead, of which 17,392,573 lb. came from Mexico.

Spelter—The demand is small and has not been sufficient to take care of all the metal that is offered. In consequence, prices have suffered and the market closes weak 4.85@4.90c. St. Louis, and 5@5.05c. New York.

New York quotations for spelter, April 28, were 5.10@5.15c.; April 29, 5.07½@5.10c.; April 30, 5.05@5.10c.; May 2, 5.05@5.07½c.; May 3, 5.02½@5.05c.; May 4, 5@5.05 cents.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Base price of zinc sheets on April 28 was reduced 25c. to $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Business remains active, with numerous inquiries. Prices are unchanged, at 23¼@23¾c. per lb. for No. 1 ingots in large lots, New York. The market abroad continues strong and active.

Antimony—The market continues quiet, with sales of a retail order only, and prices are nominally unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—The market here is steady. New York quotations are $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for small lots. San Francisco, $47.50@48 for domestic orders, and $2 less for export. The London price is £9 per flask; with £8 17s. 6d. quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Imports and Exports of Metals

Exports and imports of metals in the United States, three months ended March 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.	
Copper, long tons	73,709	34,766	Exp.	38,943
Copper, 1909....	59,982	34,597	Exp.	25,385
Tin, long tons....	135	13,448	Imp.	13,313
Tin, 1909........	114	11,526	Imp.	11,412
Lead, short tons.	19,799	27,173	Imp.	7,374
Lead, 1909......	21,219	24,978	Imp.	3,759
Spelter, sh. tons.	264	1,031	Imp.	767
Spelter, 1909....	1,382	1,061	Exp.	321
Nickel, lb........	3,533,606	8,855,987	Imp.	5,322,381
Nickel, 1909....	2,618,037	4,284,113	Imp.	1,666,076
Antimony, lb.....	....	2,709,170	Imp.	2,709,170
Antimony, 1909.	2,616	2,271,460	Imp.	2,268,844
Platinum, oz.....	... .	24,494	Imp.	24,494
Platinum, 1909.	.. ... .	29,673	Imp.	29,673
Quicksilver, lb...	84,897	....	Exp.	84,897
Quicksilver, '09	10,303	....	Exp.	10,303
Aluminum, value	$93,477	....	Exp.	$93,477
Aluminum, 1909	24,340	....	Exp.	24,346
Ores, etc.:				
Zinc oxide, lb...	7,466,773	....	Exp.	7,466,473
Zinc oxide, '09..	7,353,417	....	Exp.	7,353,417
Zinc dross, lb....	1,526,410	....	Exp.	1,526,410
Zinc dross, '09..	5,014,932	....	Exp.	5,014,932
Zinc ores, lg. tons	6,394	16,964	Imp.	10,570
Zinc ores, 1909.	2,025	18,668	Imp.	16,643
Antim'y ores, lb.	....	....	....	....
Ant. ores, 1909.	504	3,171,923	Imp.	3,171,419
Chrome ore, tons	20	8,284	Imp.	8,264
Chrome ore, '09	....	7,540	Imp.	7,540

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in 1910, were 12,856,541 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported this year, only metal contents being given. Exports of copper sulphate this year were equivalent to 594,000 lb. copper.

Zinc and Lead Ore Markets

Platteville, Wis., April 30—The base price of 60 per cent. zinc ore started Monday at $41 per ton but slumped to

$39 per ton at the week end. One car of lead ore brought $50 per ton.

SHIPMENTS, WEEK ENDED APRIL 30.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point...	657,200	....	....
Platteville............	520,250	....	467,800
Galena..................	244,440	....	....
Cuba City..............	164,075	....	....
Highland..............	131,500	72,500	....
Montfort..............	64,790	....	....
Total.................	1,782,255	72,500	467,800
Year to date..........	27,509,875	1,820,439	5,078,090

In addition to the above there was shipped to the separating plants, 2,338,273 lb. zinc concentrates.

Joplin, Mo., April 30—The highest price paid for zinc sulphide ore was $44 per ton, the base ranging from $41 down to $38 per ton of 60 per cent. zinc. Zinc silicate sold on a base of $20@26 per ton of 40 per cent. zinc, with the high price at $29. The average price of zinc, all grades, was $37.86. The highest price for lead was $50 per ton, grading down $1 per ton for each 1 per cent. under 80 per cent. lead, with additional deductions for moisture. The average price, all grades of lead, was $49.36 per ton.

It can be said that the bottom dropped out of the zinc-ore market, as sales for next week's delivery have been made as low as $37 base. The result is the closing down of six of the mills in the north part of Webb City, with more reported favorable to stopping production at the end of another week if prices are not advanced. Just now the supply is greater than the demand, and the reserve stock has been increasing for several weeks, amounting to nearly 8000 tons tonight.

SHIPMENTS, WEEK ENDED APRIL 30.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,802,280	925,830	$116,789
Joplin	1,678,040	167,130	37,697
Duenweg..............	759,520	24,970	14,419
Galena.................	648,230	55,480	13,998
Alba-Neck	586,520	2,690	12,966
Aurora.................	453,960	.....	7,834
Granby	434,660	12,940	7,040
Spurgeon	198,690	134,480	6,093
Carthage..............	275,040	......	5,775
Quapaw...	286,270	....	5,295
Miami.............. ..	214,720	112,490	4,959
Carl Junction.........	101,360	27,620	2,790
Sarcoxie	191,360	......	2,634
Jackson	97,620	5,640	1,988
Saginaw...............	108,930	15,460	1,767
Badger	61,140	......	1,222
Totals	10,898,340	1,494,730	$243,266
4 months	201,144,720	28,904,550	$4,886,848

Zinc value, the week, $206,371; 4 mos., $4,114,099
Lead value, the week. 36,895; 4 mos., 772,749

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January.....	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February....	36.94	40.69	34.37	39.47	50.50	53.64
March.......	37.40	43.60	34.71	39.71	50.82	51.26
April........	38.63	41.00	37.01	39.33	55.63	49.72
May....	40.06	......	37.42	......	56.59	.....
June..... ...	44.15	......	40.35	......	57.52	.....
July.........	43.06	......	41.11	......	53.74	.....
August	48.25	......	44.54	......	57.60	.....
September ..	47.70	......	14.87	......	56.11	.....
October.....	49.50	......	45.75	......	55.02	.....
November...	51.31	......	48.29	......	53.94	.....
December...	49.45	......	47.57	......	55.26	.....
Year.......	$13.98	.....	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, May 4—The general market continues quiet, with business chiefly on the contract basis.

Copper Sulphate—There has been a slight decline in prices, and quotations are now $4 per 100 lb. for carload lots, and $4.25 per 100 lb. for smaller orders.

Arsenic—The market remains dull and prices are unchanged, $2.40@2.50 per 100 lb. being quoted for white arsenic.

Nitrate of Soda—The market has quieted down, as is usual at this time of year. Spot nitrate is still quoted at 2.15c. per lb., while 2.05c. per lb. is named for futures.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, three months ended March 31:

	Imports.	Exports.		Excess.
Copper sulph. lb.	....	2,379,816	E.	2,379,816
Copper sul., '09	....	1,719,158	E.	1,719,158
Bleach, lb	25,178,652	....	I.	25,178,652
Bleach, 1909....	22,877,205	....	I.	22,877,205
Potash salts, lb.	191,522,112	997,301	I.	190,524,811
Potash salts,'09	88,338,311	1,170,369	I.	87,167,942
Soda salts, lb....	7,839,103	150,085	I.	7,689,018
Soda salts, 1909	3,066,524	180,826	I.	2,885,698
Acetate lime, lb.	....	18,002,262	E.	18,002,262
Acetate, 1909...	....	24,844,141	E.	24,844,141
Nit. of soda, tons	148,558	2,021	I.	146,537
Nitrate, 1909...	95,864	2,051	I.	93,813
Phosphates, tons	4,194	204,272	E.	200,078
Phosphates, '09	847	247,375	E.	246,528
Sulphur, tons....	8,307	5,841	I.	2,466
Sulphur, 1909..	7,281	5,764	I.	1,517
Pyrites, tons.....	189,279	....	I.	189,279
Pyrites, 1909...	157,876	....	I.	157,876
Magnesite, lb....	75,240,494	1,540,742	I.	73,699,752
Magnesite, 1909	....	....		....

Exports include reëxports of foreign material. Figures for magnesite not reported separately prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 84,015 tons.

MINING·STOCKS

New York, May 4—The record of the week on the Stock Exchange has been generally one of depression and falling quotations. Such news as there has been was unfavorably interpreted, and the bear party had things its own way for the most part. Trading was not heavy, however, and sellers of stocks had their offerings taken, but with no particular support in sight the market closes weak and irregular.

On the Curb there was also general depression. The copper stocks suffered even more than the rest, and some low prices were made for the active issues. Cobalt stocks were rather freely dealt in, and kept up better than any others. Other mining stocks were not much noticed. The depression continued at the close, which was quite as weak and irregular as on the Exchange.

Boston, May 3—Depression still continues in copper stocks, and prices have been seriously bumped the past few days, when it was thought that they had been sold pretty much to a standstill.

There are times when the market looks as if it might be rock bottom, but the persistent break in Amalgamated has only served to cause further liquidation in coppers. Amalgamated has fallen over $10, making a low at $63.25. Lake Copper shows good action marketwise and with proper surrounding conditions would do better. At times the daily fluctuations

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	January.	February.	March.
Arizona, Ltd........	2,646,000	2,658,000	2,886,000
Boleo (Mexico).....	2,644,800	2,331,832	2,148,383
Copper Queen......	10,001,000	8,927,203	10,809,488
Calumet & Ariz....	2,331,000	2,024,000	2,820,000
Cananea (Mexico)..	3,500,000	3,586,000	3,700,000
Detroit...	2,166,155	1,486,400	1,698,975
Imperial.....	850,000	750,000	825,000
Nevada Con. (Est.).	3,800 000	5,000,000	5,600,000
Old Dominion......	2,130,060	2,035,000	2,674,000
Shannon	1,510,696	1 526,000	1,468,000
Superior & Pitts....	2,166 000	1,864,000	2,370,000
Utah Copper Co....	4,745,066	5,798,819	8,190,000
Butte District......	19,250,000	13,758,620	24,000,000
Lake Superior	19,260,127	18,250,000	19,250,000
Total production.	77,000,845	69,995,874	88,439,846
Imports, bars, etc..	24,305,526	14,093,381	20,178,202
Imp. in ore & matte	7,053,522	6,063,764	6,181,476
Total...............	108,359,893	90,153,019	114,799,524

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report for March includes for the first time the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
V. 1909.	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII.............	118,277,603	75,520,083	75,018,974
VIII...........	120,597,234	59,614,207	48,382,704
IX.............	118,023,139	52,105,955	50,077,777
X.......... ...	124 657,709	66,359,617	56,261,238
XI.............	121,618,369	66,857,873	55,266,595
XII.....	117,828,655	69,519,501	59,546,570
Year.........	1,405,403,056	705,151,591	680,942,620
I, 1910.... . ..	116,547,287	78,158,387	81,091,672
II	112,712,493	66,618,322	37,369,518
III...........	120,067,467	62,844,818	40,585,767
IV	....	....	... .

VISIBLE STOCKS.

	United States.	Europe.	Total.
V, 1909.........	186,198,073	111,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII.....	154,858,061	150,928,960	305,787,021
VIII..........	122,596,607	171,492,160	294,088,767
IX............	135,196,930	197,993,600	333,190,530
X.............	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910.........	141,766,111	244,204,800	385,970,911
II...... ...	98,463,339	218,236,800	316,700,139
III.....	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V............	....	246,870,400	....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

are wide, yet the stock shows a strong inclination to advance. The closing tonight, however, was the lowest of the week, at $49.75, which represents an extreme decline of $4.75 for the week. The other new Lake stocks have not fared so well. North Lake has lost $4.62½ to $10 and Indiana $8.87½ to $16 per share.

Arizona Commercial had a final smash to $12.50 today, which is its low record and represents a decline of $4.50 for the week. This represented the selling out of an old bull account. In the general slump almost all stocks are off.

U. S. Smelting fell $3.25 to $39.25. Copper Range liquidation has taken the price of the stock off $5 to a low of $64.

Curb stocks have shown general declines, those of Chino, Bohemia, and Ohio being the most conspicuous.

Assessments

Company,	Delinq.	Sale.	Amt.
Blue Bell, Idaho	Mar. 14	June 1	$0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Bullion, Nev	May 8	June 6	0.05
Columbus Con., Utah	....	May 11	0.25
Con. Imperial, Nev	Apr. 19	May 12	0.01
Con. Virginia, Nev	May 9	June 3	0.20
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal	....	....	1.25
Hector, Idaho	Mar. 28	May 26	0.00¼
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	....	2.50
Mexican, Nev	May 17	June 9	0.15
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich	Mar. 10	....	1.00
Ophir, Nev	Apr. 22	May 16	0.25
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev	Apr. 5	Apr. 28	0.10
Savage, Nev	May 2	May 27	0.10
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21	....	0.03
Utah, Nev	Apr. 22	May 3	0.05
Utan Con. of Tintic, Utah	May 15	....	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
Jaauary	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	......	24.343	......
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56¼	12.733	12.93¼	13.091	57.363	57.238
May	12.893	......	13.238	......	59.338	......
June	13.214	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32.403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	......	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS May 3

Name of Comp.	Bid.
Listed:	
Acacia	.05⅞
Cripple Cr'k Con.	.02½
C. K. & N.	.13
Doctor Jack Pot.	.07
Elkton Con.	.69¼
El Paso	.80
Fannie Rawlins	.04¼
Findlay	.02
Gold Dollar	.12¼
Gold Sovereign	.03¾
Isabella	.16¼
Mary McKinney	.48
Pharmacist	.02¾
Portland	1.05
Vindicator	.78½
Work	.04
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.07¼

SALT LAKE May 3

Name of Comp.	Clg.
Carisa	.48
Colorado Mining.	.74
Columbus Con.	.53
Daly Judge	4.03
Grand Central	1.25
Iron Blossom	1.02½
Little Bell	1.25
Little Chief	‡.45
Lower Mammoth.	.57
Mason Valley	8.60
Maj. Mines	‡2.32½
May Day	.08¾
Nevada Hills	.65
New York	.13
Prince Con	.82
Red Warrior	‡6.00
Silver King Coal'n	‡2.30
Sioux Con	.31½
Uncle Sam	.35
Victoria	‡2.00

SAN FRANCISCO. May 3.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.12	Belmont	2.80
Belcher	.94	Daisy	.07
Best & Belcher	.25	Jim Butler	.15
Caledonia	.46	MacNamara	.27
Challenge Con.	.28	Midway	.27
Chollar	.18	North Star	.02
Confidence	1.00	West End Con.	.33
Con. Cal. & Va.	1.12	Atlanta	.14
Crown Point	.95	Booth	.13
Exchequer	.23	C.O.D. Con.	.05
Gould & Curry	.28	Columbia Mt.	.05
Hale & Norcross	.40	Comb. Frac.	.41
Mexican	1.37	Great Bend	.02
Ophir	1.47	Jumbo Extension	.28
Overman	.90	Oro	.06
Potosi	.35	Red Hill	.04
Savage	.36	Sandstorm	.04
Sierra Nevada	.32	Silver Pick	.09
Union	.34	St. Ives	.10
Yellow Jacket	.95	Tramps Con	.04

N. Y. EXCH. May 3

Name of Comp.	Clg.
Amalgamated	64⅛
Am. Agri. Chem.	41½
Am.Sm.&Ref.,com	74¼
Am. Sm. & Ref., pf.	103
Anaconda	39
Bethlehem Steel	‡30
Col. & Hock. C. & I.	8⅞
Colo. Fuel & Iron.	35⅝
Du Pont P'd'r, pf.	87½
Federal M. & S.	‡41
Great Nor., ore ctf.	61½
Nat'nal Lead, com.	73
National Lead, pf.	107
Pittsburg Coal	17½
Republic I&S, com.	32⅛
Republic I & S, pf.	96⅝
Sloss Sheffi'd, com.	72
Sloss Sheffield, pf.	‡117½
Tennessee Copper	26
Utah Copper	41⅜
U. S. Steel, com.	79⅛
U. S. Steel, pf.	117½
Va. Car. Chem.	55¼

N. Y. CURB May 3

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	19½
Braden Copper	4¼
B. C. Copper	6
Buffalo Mines	3½
Butte Coalition	18
Chino Copper	9¾
Cobalt Central	.10½
Combination Fra.	.43
Con. Ariz. Sm.	2
Cumberland Ely.	9
Davis-Daly	$1\frac{5}{16}$
Dominion Cop.	7
Ely Con	.50
El Rayo	2¾
Florence	3⅛
Gila Copper	5½
Giroux	6½
Gold Hill	1⅜
Goldfield Con.	$7\frac{13}{16}$
Greene Cananea.	7⅞
Guanajuato	1⅝
Guggen. Exp.	160
Kerr Lake	.08½
La Rose	$4\frac{1}{16}$
McKinley-Dar-Sa.	.92
Miami Copper	20¼
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	¾
Newhouse M. & S.	3½
Nipissing Mines.	9¾
Ohio Copper	1¾
Pacific Sm. & M.	¾
Silver Queen	.12
Standard Oil	617
Stewart	$\frac{13}{16}$
Tonopah	$7\frac{3}{16}$
Tonopah Ex.	.84
Tri-Bullion	⅞
Utah Apex	‡3½
W. Va. Wyo. Cop.	$2\frac{1}{16}$
Yukon Gold	4⅛

LONDON May 4

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	9	6
Esperanza	2	8	9
Tomboy	0	18	0
El Oro	1	7	0
Oroville	0	8	9

BOSTON EXCH. May 3

Name of Comp.	Clg.
Adventure	5½
Allouez	39½
Am. Zinc	23½
Arcadian	‡5½
Arizona Com	13
Atlantic	6
Boston Con	14⅞
Butte & Balak	9½
Calumet & Ariz.	59
Calumet & Hecla.	574
Centennial	15
Con. Mercur	.10
Copper Range	64¾
Daly-West	8½
East Butte	7
Franklin	11
Granby	38½
Greene-Can.	7¾
Hancock	‡19½
Helvetia	‡3
Indiana	16
Isle Royale	13¾
Keweenaw	4
Lake	50½
La Salle	11
Mass	7
Michigan	4¾
Mohawk	46
Nevada	18½
North Butte	30
North Lake	10¼
Ojibway	6½
Old Dominion	34
Osceola	135
Parrot	13¼
Quincy	76
Shannon	9
Superior	39
Superior & Bost.	9
Superior & Pitts.	11¼
Tamarack	49
Trinity	5¼
U. S. Smg. & Ref.	39½
U.S.Sm. & Re., pd.	48
Utah Apex	3
Utah Con	20
Victoria	3
Winona	6½
Wolverine	118
Wyandotte	2

BOSTON CURB May 3

Name of Comp.	Clg.
Ahmeek	.11
Bingham Mines	3⅛
Boston Ely	2⅛
Calaveras	5⅞
Champion	.08
Chemung	9⅝
Chief Cons	1⅝
Chino	10⅛
Cons. Ariz.	2⅛
Corbin	.06
Cactus	2¾
Crown Reserve	3
First Nat. Cop.	$2\frac{1}{16}$
Gila Copper	6⅝
Indiana	‡34½
Inspiration	6⅞
Majestic	.62
Nevada-Douglas	2
New Baltic	‡7½
Oneco	$2\frac{5}{16}$
Ray Central	2¼
Ray Con	‡18⅝
Rawhide Coal	.25
Rhode Island Coal	6⅞
San Antonio	7
Shattuck-Ariz	‡25⅛
South Lake	4
Superior & Globe.	.60
Trethewey	‡1.34
Tuolumne Copper	3¾
Vulture	9¼
Yuma	‡.90

‡Last quotation.

THE MINING INDEX

A CLASSIFIED BIBLIOGRAPHY OF THE CURRENT LITERATURE OF MINING AND METALLURGY.

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print), in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons if so requested.

COAL AND COKE

12,259—ALASKA—Controller Bay Coal Field. George W. Evans. (Mines and Minerals, Mar. and Apr., 1910; 9½ pp., illus.) Location, extent of fields and quality of coal. Proposed transportation routes. 40c.

12,260—ALASKA COAL CASES. The. H. V. Winchell. (Eng. and Min. Journ., Apr. 23, 1910; 3 pp.) 20c.

12,261—ARGENTINA—Argentinien's Kohlenlager. Rasser. (Zeit. f. prakt. Geol., Feb., 1910; 2 pp.) 40c.

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" 48% "	.05½
" 52% "	.06
" 60% "	.09@.10
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60°, bulk, ton	16.00@18.00
66°, 100 lb. in carboys.	1.00@1.10
66°, bulk, ton	18.00
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Ground "	1.85
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" 26 deg. lb. "	.04¾@.05¾
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Muriate grain "	.05½@.06¼
Lump "	.09¼@.09½
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" " chem. pure "	.35
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COBALT—Oxide lb.	.80@.85

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In bags "	.60@.75
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Ground "	12.00@14.00
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Powdered "	.80@.85
GRAPHITE—Ceylon.	
Flying dust, finest to best . . . lb.	.02@.04
Dust "	.02¼@.05
Chip "	.04@.08
Lump "	.05½@.12
Large lump "	.08¼@.10½
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Fertilizer sh. ton.	5.00
Ground "	4.00@7.00
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Ground Am. Best lb.	.01¾@.02¼
German "	.02¼@.02⅝
LEAD—Acetate (sugar of) brown, lb.	.07¾@.08
Nitrate, com'l "	.09@.10
MAGNESITE—Greece.	
Crude (95%) lg. ton.	7.50@8.50
Calcined, powdered . . . . sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg M.	160@200
MAGNESIUM—	
Chloride, com'l 100 lb.	.90@1.25
Sulphate (Epsom salt) . . 100 lb.	.90@1.00
MANGANESE—	
Foreign, crude, powdered:	
70@75% binoxide lb.	.01@.01¼
75@85% binoxide "	.01¼@.01½
85@90% binoxide "	.01½@.04
90@95% binoxide "	.06½
Ore, 80%-85% sh. ton.	16.00@32.50
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MINERAL WOOL—	
Slag, ordinary sh. ton.	19.00
Selected "	25.00
Rock, ordinary "	32.00
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Guar. 97%, with 5% Thorium oxide, normal lb.	.08 and up
NICKEL—	
Oxide, crude, lb. (77%) for fine metal contained	.47
Sulphate, single lb.	.10¼@.11
Sulphate, double "	.05⅞@.08
NITRATE OF SODA—	
100 lb. 95%	2.07½@2.15
95% for 1910	2.07½@2.15
96% is 2½@7½c. higher per 100 lb.	
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Lithophone "	.03½@.07
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Red lead, American "	.06¾@.07
Foreign "	.08¼@.09¾
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White lead, Am., dry lb.	.06@.06½
American, in oil "	.07@.07¼
Foreign, in oil "	.09@.09¾
Zinc white, Am. extra dry . . "	.05½@.06⅛
French, proc's, red seal, dry "	.07½@.08
French, process, green seal, dry "	.10@.10¼
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Domestic, non-arsenical, fines, per unit, f.o.b. mines	10¾@11c.
Imported, non-arsenical, furnace size, ex-ship, per unit	.12½
Imported, arsenical, furnace size, ex-ship, per unit	.11½@.12
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Ground quartz, ord'ry . . lg. ton	7.00@15.00
Silex, ground "	7.00@15.00
Silex, floated "	35.00@40.00
Lump quartz "	5.00@5.50
Glass sand "	2.75
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"Alkali," per 100 lb., 58/48 . . .	.90@.95
Bicarb. soda, per 100 lb	1.00@1.30
Soda, caustic, per 100 lb., 78/60	1.72½@1.85
Soda, caustic, powdered	.02½@.03
Salt cake, per 100 lb., bulk . .	.50@.60
Salt cake, bbl	.85@.95
Soda, monohydrate, per lb. . . .	1.30@1.75
Bichromate lb.	.05⅝@.06¼
Bromide "	.20
Chlorate, com'l "	.08¼@.09½
Cyanide, 120-130% KCN, per 100%	
Carloads (30,000 lb.) . . . . lb.	18c.
5-ton lots "	18½c.
Less than 5 tons "	.20
Hyposulphite, Am. "	1.30@1.50
Phosphate 100 lb.	2.10@2.40
Prussiate "	.08½@.09
Sal soda, f.o.b. N. Y. . . "	.60@.75
Foreign, f.o.b. N. Y. . "	.80@1.00
Silicate, com'l "	.65@1.00
Sulphate, com'l (Glauber's salt) 100 lb.	.60@.80
Sulphate, com'l, calcined	.65@.85
STRONTIUM—Nitrate lb.	.07@.08
SULPHUR—Louisiana (prime) to New York lg. ton.	22.00 up
To Boston, Philadelphia or Baltimore "	22.50 up
Roll 100 lb.	1.85@2.15
Flour "	2.00@2.40
Flowers, sublimed . . . "	2.20@2.60
Powdered commercial, bags	1.55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York lg. ton.	$22.00
TERRA ALBA—Fr. & Eng. 100 lb.	.70@1.00
TALC—Domestic sh. ton.	12.00@20.00
French "	15.00@25.00
Italian, best "	30.00@40.00
TIN—Bi-chloride, 50° lb.	.10
Crystals "	.22½@.24
Oxide, lb "	.37@.40
URANIUM—Oxide "	2.20@4.25
ZINC—Chloride sol., com. 20° "	.02¼
Chloride, granular "	.04@.04¼
Dust "	.06⅜
Sulphate "	.02@.02½

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as a matter of private contract.

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**Illustrated.*

Progress in Publicity

The campaign for publicity as to the operations of mining companies which invite the interest of investors, and frankness in communicating all of the information to which stockholders are entitled, slowly but surely gains headway. The last reports of the Utah Consolidated, Utah Copper Company and North Butte are about all that even the most captious and inquisitive persons can ask. In each case the directors have not only reported fully as to their operations for 1909, but also have described with much detail the condition of the mines and have outlined the probabilities for the future.

Both the Utah Consolidated and the North Butte companies have incorporated in their annual statements the reports of mine examination by an independent engineer. This should always be done. Every mining company, no matter how honest be its management and how thoroughly deserving of confidence, ought to employ an entirely independent engineer to make an annual inspection of the property and report directly to the board of directors.

The Utah Copper Company has always been explicit with respect to the matter of its ore reserves. Criticism of this company has been especially directed toward its method of bookkeeping. The directors have this year met these criticisms by submitting the analysis of independent auditors.

We commend each of these companies for their progress in the policy of frankness. Perhaps the directors of the Federal Mining and Smelting Company will also take its stockholders into their confidence.

Production of Copper in North America in 1909

Our revised statistics of the production of copper in North America in 1909 are given in the accompanying table. As in previous years, these figures are based upon the Michigan production plus the fine copper content of the blister copper produced by other smelters. These statistics are based upon reports received from all the smelters. As nearly as possible these statistics represent, in our opinion, the production of the mines. The reports received by us from some smelters show copper contents of ore received in excess, or *vice versa*, of the copper contents of blister produced, but our experience has shown it to be impracticable to carry back the statistical investigation of copper production to the mouth of the mine, and consequently, we take the reports of the producers of pig copper as

PRODUCTION OF COPPER IN NORTH AMERICA.
(In pounds)

State.	1908.	1909.
Alaska	4,394,887	4,057,142
Arizona	290,167,795	292,042,829
California	36,890,353	53,357,451
Colorado	13,896,689	10,487,940
Idaho	8,749,559	7,770,010
Michigan	222,267,444	227,247,998
Montana	252,558,330	313,838,203
Nevada	12,174,269	51,835,309
New Mexico	8,523,652	5,134,506
Utah	70,978,952	100,438,543
Wyoming	2,384,356	89,654
South and East	20,822,368	22,837,962
Other States	4,387,836	3,746,895
United States	948,196,490	1,105,336,326
Mexico	89,576,464	126,169,962
Canada	53,725,213	47,677,361
Cuba	6,538,047	6,625,631
Totals	1,098,036,214	1,285,809,280

epresenting most nearly the production f the mines.

Even with the utmost care, and the nost enthusiastic coöperation of the melters, it is impossible to trace all of he copper production accurately to its ource of origin. There is some copper ncluded under "other States," that it is mpossible to allocate precisely. We beieve that the enumeration for 1909 hown in the accompanying table is the losest possible, and very close to the ruth, with the possible exception of New Mexico, which territory, we suspect, may be entitled to a larger production than is redited, any increase on its account being at the expense of some other States.

The above table does not include the production of copper originating from scrap and junk, which many of the smelters reported. The amount of this production in 1909 was 12,451,884 lb. against 10,000,000 lb. reported by the same concerns in 1908. There is, moreover, a rather large production of copper remelted from scrap and junk by concerns that confine their operations to that business. Their production in 1908 we estimate to have been 25,000,000 lb. Reports that we have received from concerns engaged in this business show 33,348,000 lb. in 1909. Both for 1908 and 1909 the statistics are probably incomplete. However, we are safe in saying that the production of remelted copper in 1909 was 45,799,884 lb., against 35,000,000 lb. in 1908. These figures are in addition to the production of virgin copper and are equivalent to about 7 per cent. of the domestic consumption in the respective years.

Iron Smelting on the Atlantic Seaboard

The reduction in the duty on iron ore, under the Payne bill, combined with recent technological improvements, gives hope that iron smelting on the Atlantic Seaboard will experience an interesting development. For many years blast furnaces have been operated at Sparrow's Point, Md., which are supplied chiefly by Cuban ore, and also the Secaucus furnace, on the Hackensack Meadows, has been running with some interruptions since 1877.

It has been reported recently in the newspapers that blast furnaces will be erected at Everett, Mass., if the State will aid in improving harbor facilities. The production of open-hearth steel in Massachusetts from scrap and pig iron is no novelty. The establishment of a blast furnace plant in that State would by no means be an irrational undertaking, inasmuch as the New England Gas and Coke Company would be able to supply the fuel, while there are also several manufacturers of sulphuric acid whose pyrites residue is available as iron ore, and foreign ore is also available.

The operation of by-product coking plants in the neighborhood of large cities, and the utilization of pyrites residue as iron ore are distinctly modern innovations. It is not unlikely that in the near future we may see the erection of blast furnaces at New York. One of the reasons for the failure of the great Milliken steel works on Staten Island, a few years ago, was probably the neglect of its owners to provide their own supply of pig iron. With the assistance of a by-product coking plant this could doubtless have been done profitably, there being within a comparatively short radius a market for all the gas, or electric power, that could be produced.

The Price for Copper in 1909

The majority of the copper producing companies having submitted their official reports for 1909, we are able to make our usual analysis of the price that they received for their product, with comparison to our own quotational averages. Thirteen Michigan companies reported as shown in the accompanying table. The list includes all of the important companies with the exception of Calumet & Hecla. Their sales aggregated about 136,000,000 lb., which is considerably upward of 50 per cent. of the total Lake Superior production in 1909. The average price received from these sales of copper was 13.221 per lb., against our quotational average of 13.335c. per lb. As usual, the Quincy company leads the list, its average having been 13.48c. This figure, however, includes its proceeds from silver, and if the latter were segregated, the average for copper would probably be in the neighborhood of 13.40c. per lb. The lowest figures are reported by the companies producing the arsenical grade of copper, their figure in each case being 13c. The arsenical copper is sometimes sold on equal terms with prime Lake copper, but sometimes it is marketed at a discount, which apparently was the case in 1909. Excluding this copper, amounting to 46,187,221 lb., the sale of 89,818,552 lb. realized an average of 13.338c. per lb., against the quotational average of 13.335c.

LAKE COPPER SALES IN 1909.

	Pounds.	Amount.	Average.
Ahmeek........	8,900,523	$1,190,000	13.37
Allouez........	3,164,608	419,628	13.26
Baltic..........	17,817,836	2,315,035	13 00
Centennial.....	2,583,793	343,050	13.277
Champion.....	18,005,071	2,339,362	13.00
Franklin......	1,651,351	221,085	13.39
Isle Royale....	5,081,910	660,440	13.00
Michigan......	1,979,305	260,551	13.16
Mohawk.......	11,248,474	1,484,292	13.20
Osceola.	24,659,729	3,279,743	13.30
Quincy........	22,511,984	3,034,810	13.48
Tamarack.....	13,118,785	1,747,422	13.32
Trimountain...	5,282,404	686,332	13.00
Totals.......	136,005,773	$17,981,750	13.221

Comparison between the price actually realized and the quotational averages for the last five years is made in the second table. The actual averages in each year are somewhat low, owing to the inclusion of the arsenical copper, the difference on its account being variable, as explained above. However, the great differences between the actual averages and the quotational averages for 1906 and 1907 were due chiefly to the exceptional conditions of those years, especially 1907, when the quotations were established upon relatively small sales and the producers were accumulating a large part of their output as unsold stock. In 1908 and 1909 conditions became normal again and the price actually received approximated closely to the quotational averages, as is usually the case.

SALES OF LAKE COPPER DURING LAST FIVE YEARS.

Year.	Pounds Reported.	Price per Pound.	Quotational Average.
1905	82,372,955	15.597	15 699
1906	113,411,645	19.146	19.616
1907	66,316,025	18.043	20 651
1908	125,949,248	13.348	13.424
1909	136,005,773	13.221	13.335

In the third table is summarized the reports of seven producers of electrolytic copper, whose sales aggregated about 216,000,000 lb., at an average of 13.008c.

ELECTROLYTIC COPPER SALES IN 1909.

Company.	Pounds.	Amount.	Average.
Balaklala.	7,944,294	$1,028,664	12.949
Calumet & Arizona..........	27,630,050	3,604,893	13 047
North Butte...	33,102,153	4,340,685	13.113
Old Dominion..	34,519,301	4,490,961	13 010
Superior & Pittsburg........	24,325,667	3,173,770	13.047
United States..	36,672,606	4,769,639	13.006
Utah..........	51,749,233	6,683,413	12.915
Totals.......	215,943,304	$28,092,025	13.008

per lb. Our quotational average for electrolytic copper in 1909 was 12.982c. per pound.

For the first six months of 1909 we have available the statistics of the constituent companies of the Amalgamated Copper Company, through its report to the New York Stock Exchange under date of Feb. 14, 1910. This report shows sales of 93,415,241 lb. of copper during that semester, at an average of 12.918c. The quotational average for the same period was 12.983 cents.

SALES IN FIRST HALF OF 1909.

Company.	Pounds.	Amount.	Average.
Boston & Montana.......	42,654,381	$5,498,097	12.89
Butte & Boston...	8,609,195	1,114,780	12.95
Parrot.......	2,968,356	383,344	12.91
Trenton......	3,267,973	423,010	12.94
Washoe......	35,915,336	4,647,665	12.94
Totals......	93,415,241	$12,066,896	12.92

The average reported by the producers of electrolytic copper in 1909 ranged from 13.11c., reported by North Butte, down to 12.92c., reported by Utah. It is unwise, however, to attempt to draw too fine comparisons among the reports of these companies, inasmuch as they are not specific as to precisely what is represented. In some cases, at least, they include the cost of time and delivery, and consequently, are in excess of the net price actually received, basis New York. These conditions do not enter into the reports of the Michigan companies to the same extent.

The Copper Statistics for April

Although the report of the Producers' Association for April was less disappointing than anticipated, it can hardly be characterized as encouraging, but perhaps it is not so bad as it looks. The accumulation increased by about 18,000,000 lb., due especially to the smallness of the exportation. As we have previously pointed out, it was not to be expected that Europe would continue indefinitely to take our copper off our hands, and we must naturally await the absorption of the supplies that have been transferred there.

The daily rate of production in April was 3,915,921 lb., which was a little larger than in March, but was 110,000 lb. smaller than the maximum, reached in February. Domestic deliveries continued at a satisfactory rate, being a little less than the average for the first quarter of 1910, but a little more than the average for the last quarter of 1909.

The total visible supply in Europe and America at the end of April was 388,854,559 lb., compared to 389,861,127 lb., the maximum, reported at the end of November, 1909.

This shows that during the last five months production and deliveries have been about equal. There is reason to believe that actual consumption has been in excess of the deliveries. At the end of 1909, American manufacturers probably had a surplus of 40,000,000 lb. in their yards, and during January, 1910, they undoubtedly added about 10,000,000 lb. to this invisible supply. At the end of April their accumulations had probably decreased materially, the outlook being that they will have to make substantial purchases this month.

It is difficult to determine the true statistical position in Europe. In the third quarter of 1909 the reported deliveries were 208,611,200 lb.; in the fourth quarter, 207,231,360; in the first quarter of 1910 they were 242,612,160. It seems improbable that actual consumption jumped from the rate of 69,000,000 lb. per month to 81,000,000, from one quarter to the next. The European statistics take into account the stocks at 10 British and French ports and depots, but apparently the arrivals at all European ports are charged out immediately as deliveries, whereof a portion may become invisible supply. The appearance of the statistics of deliveries during the first quarter of 1910, indicates that the large blocks of copper bought by European houses in this country in November last were accepted in January and to a large extent became invisible supply in Europe; and that lately consumers' wants have been filled from this source, wherefore the public stocks have so far undergone but slight reduction.

This leaves the status of actual consumption in Europe in a good deal of uncertainty. The consumption abroad has been increasing according to all advices, but apparently not to the extent expected as the natural increment, and there is probably room for a good deal larger absorption of copper in Europe.

This is, indeed, one of the great hopes for the future of the copper market, pending the appearance of the new supplies that are promised in 1911. As to the immediate prospects, the sudden change in sentiment in the stock markets last week affected the metal, and producers who were contemplating further concessions made up their minds to stand fast. Some buyers who needed to replenish their supplies deemed it unwise to defer their orders any longer and others will probably have to come into the market presently. The effect of this will be some stiffening of price, which, in fact, has been already manifested. But considering the quantity for sale, no great things in the way of an advance are to be expected.

What the "Ultimate Consumer" is Doing

Notwithstanding the present talk of dullness in the iron and steel trades, it does not appear that the depression has reached the "ultimate consumer." The universal testimony of those most familiar with the trade is that that gentleman is buying, using and building at a rate which does not indicate any dullness or apathy on his part. The jobbing sales of nails, bars, pipes, roofing and other small material have continued very large. They have been favored by last year's reductions in price and have continued at a rate which shows the consumer's ability to absorb and utilize the material.

This class of consumption is a fair foundation for trade. The "ultimate consumer" individually does not use the same amount of material as the builder of a skyscraper in New York or Chicago; but there is a good many of him and his aggregate takings make up a large quantity. Moreover, his activity shows that he has money to spend, and that is an excellent sign of prosperity.

An entirely new clause has been inserted in the wage agreement last week concluded in the central Pennsylvania district. It provides for a standing commission, to consist of two miners, two operators and an arbitrator, whose business shall be to watch the operations of competitive fields. Should wages be reduced in any of those fields, the commission is to recommend a corresponding reduction in its own district, and so give the operators a chance to secure business. This field, shipping largely to the seaboard, has been a special sufferer from competition.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Gold in the Adirondacks

An article in the JOURNAL, March 19, 1910, called attention to the Adirondack "gold sands." An experience of mine sheds considerable light on this subject. Last autumn a local syndicate was formed to investigate the electro-amalgamation treatment of these sands and if it was found to be working successfully, the syndicate intended to take up an option on a large area of sand claims, erect a mill and start treating sand on an indicated "paper profit" of one dollar per ton.

MILL TESTS

Another engineer and myself were engaged to pass on the value of the claims optioned, and the practicability and economy of the proposed treatment. A five-ton sample of sand was collected from auger borings over 360 acres and taken to the experimental mill near Croghan, where for a fee of $250, the value of our sand was to be demonstrated. This plant was in charge of a man in whom we had such confidence that we did not feel called upon to watch the sand, and we devoted our time entirely to a study of the process. The sand was ground to 80 mesh in a small Abbe mill, discharging into a settling tank. After partial dewatering, the thick pulp was charged into a 10-ft. amalgamating pan where two series of stirrers kept it agitated. Suspended in this pulp were two large lead plates through which a 5-volt current was passed. Two hours of this electro-amalgamation completed the treatment. Four tons of our sample were run and the cleanup gave a gold button worth $13.60, showing an extraction of $3.40 per ton.

Still not convinced, we secured permission from the backer of the enterprise, a Philadelphia capitalist, to use the mill; and returning late in autumn, after the experiments had been given up for the year, reopened the mill and put it in running order. We used a crew of men from Lowville, who knew nothing of the earlier operations, and treated 11 tons of sand from a nearby sand bank, running the mill night and day and taking every precaution to guard our samples. Two previous runs on this sand had given over $3 per ton, but our cleanup gave us a little copper amalgam, which failed to give more than a trace of gold. These results were communicated to all interested parties including three other syndicates that had paid $250 each for a demonstration run and had been given buttons at the rate of $3 per ton.

DEFECTIVE METHODS

During this investigation, I visited two of the "laboratories" that have been successful in getting high gold assays, and judging by the equipment and degree of technical skill displayed, the results are not at all surprising. Most of the processes used are original with the experimenters who belittle technical procedure and are firm believers in volatile gold. In making an amalgamation assay according to their methods, I was warned against getting too high a heat from the oil lamp employed for fear of driving off all the gold. Doctor Chance's explanation, for the presence of gold in small quantities, published in the JOURNAL of April 2, hardly fits these cases for a few ounces of mercury is made to do service for months.

JOHN T. ROBERTS, JR.

Buffalo, N. Y., April 20, 1910.

Process Efficiency Index

I have noticed the remarks by Ralston Bell and Mark Lamb[1] on my paper "All Slime Treatment of Ore in Cyanide Plants." The matter of the efficiency index was not intended to apply generally, but was only suggested to apply in reference to the subject of the paper, where small differences in extraction and cost might be empirically indicated in this way. I am well aware that the idea will not apply to all cases and that it is not proportional, and Mr. Bell and Mr. Lamb are quite correct in that statement. I think, however, that a little figuring will convince Mr. Lamb that he is wrong in his statement that it will apply to all cases where the value of the ore is more than $7 per ton. If this were true, I would suggest that in cases where the value is lower than the figure he indicates, one might use some smaller unit in stating the value of the ore and also the cost, say half dollars or quarter dollars, thus bringing the value over the $7 mark while maintaining the same ratio between value and cost.

If, however, an index is desired which will be proportioned and applicable in all cases, it might be simply had by considering the value of the ore as 100 per cent., finding the per cent. extracted and the per cent of cost, and subtracting the latter from the former. This would give the per cent. profit which might well be used as an index, increasing with the efficiency of the process. Or if a diminishing index be preferred, add the per cent. cost. to the per cent. discharged in tailing, this giving the total to be charged against the ore and consequently diminishing as the efficiency of the process increases.

In regard to Mr. Lamb's remarks in reference to the separate treatment of the fine sand and slime, both by agitation, this must be determined by experiment on the particular ores to which it is proposed to apply the system, and I can say only that I believe it will be productive of good results.

H. A. MEGRAW.

San Luis de la Paz, Guanajuato, Mex.,
April 30, 1910.

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[1] ENG. AND MIN. JOURN., April 16 and 23, 1910.

The Origin of Electric Shot Firing

In the JOURNAL of April 23, 1910, are extracts from a paper read by James Douglas before the North of England Institute of Mining and Mechanical Engineers on Dec. 11, 1909. This paper was a description of the electric shot-firing system employed by the Stag Cañon Fuel Company at Dawson, N. M., and one sentence reads as follows: "He describes the application of the system at Dawson, N. M., devised by David Crow, general superintendent of the Stag Cañon Fuel Company." As this is liable to create the impression that the system of electrical firing of shots from the outside was originated by the Stag Cañon Fuel Company, I would like to state briefly the origin of the system.

The system was devised in 1891 at the Castle Gate mine of the Pleasant Valley Coal Company by W. G. Sharp, then the general manager of the company; Robert Forrester, geologist, then U. S. inspector of coal mines for the Territory of Utah; together with the assistance of an electrician sent from the east to instal an electric power-generating plant, and a local mechanic and electrician. It was the outcome of a series of experiments made in the effort to eliminate dust explosions caused by blown-out shots. The system has been employed by the Utah Fuel Company, successors to the Pleasant Valley Coal Company, at Castle Gate, ever since, and at the Sunnyside since the mine was opened up in 1900.

Years after the installation at Castle Gate, when the Stag Cañon Fuel Company's mines were being opened, several of the employees of the Utah Fuel Company went to Dawson, among them David Crow, who had been mine superintendent at Castle Gate at one time, after the shot-firing system had been originated. Hence, it appears that the Stag Cañon Fuel Company did not devise the system, although it may have adapted it to its own needs; and the Utah Fuel Company's rules were modified to suit local conditions. By reference to the report of the U. S. Inspector of Coal Mines for the year 1892, the truth of these statements will become evident.

A. C. WATTS.

Salt Lake City, May 3, 1910.

Stamp Drop Sequence

I have observed the discussion relative to order of drop of stamps in the five-stamp mortar, participated in by engineers in Edinburgh and Milwaukee, and particularly the apparent difficulty of reaching some common agreement which is attributed to the confusion of a subject which seems to be no better understood now than a quarter of a century ago. Metallurgical history teems with this interminable wrangle, which, from time to time, has engaged the brightest minds in the business. It seems no closer to a settlement now than before, so far as the five-stamp battery is concerned.

I have wondered if the participants in this discussion are aware that the individual-mortar stamp has arrived and developed a capacity far in excess of any stamp in a multiple mortar by reason, largely, of the elimination of the features under discussion.

The individual-mortar stamp constitutes one of the greatest advances in stamp-mill design, and it would seem that present-day engineers could serve the public better by exploiting the many merits of this improved stamp than through a discussion of dead issues.

E. K. WARREN.

Chicago, Ill., April 29, 1910.

Clancy Cyanide Patents

Referring to the article in the JOURNAL, May 7, entitled "The Clancy Cyanide Patents," it is only fair to the mining industry that it should be informed that these patents are not by any means the main or more important inventions of John Collins Clancy.

In the light of what it knows concerning our former experience, we think that the mining public can only accord us approval in withholding the details of the new Clancy processes until such time as our patent solicitors inform us that the pending applications for patents throughout the world have been granted.

HENRY B. HAIGH,
President, Moore Filter Company.
New York, May 7, 1910.

Mineral Possibilities of the Orange River Colony,

SPECIAL CORRESPONDENCE

The most important mineral product of the Orange River colony[1] is the diamond, the famous Jagersfontein, Koffyfontein, Roberts-Victor and Voorspoed mines, being situated in that area. The report referred to gives descriptions of these and the Kimberley mines as well as of other occurrences of less economic importance, together with tables of statistics of production.

The widespread occurrence of the diamond rock is surprising in view of the few actually producing mines and it is fortunate for the diamond industry that so few occurrences prove payable. It is noteworthy that of the three payable mines that have been discovered in the last 17 years, namely, the Premier, the Roberts-Victor and the Voorspoed, the last two are situated in the area under discussion.

OIL AND GOLD

Oil indications are widespread in the Orange River colony and boring has been undertaken at several points. One syndicate is still boring near Clocolan and has already spent a large sum of money on the venture.

Gold is being sought by wealthy syndicates east of Parys, where the Free State Banket Development Company, with a capital of £150,000, is developing property.

The New Rand, Ltd., is boring on the suboutcrop of the Witwatersrand beds at the junction of the Vaal and the Wilge rivers, and has completed 11 deep bore holes. In both cases the hope is to locate the base of the upper Witwatersrand formation, in which, as on the Witwatersrand, payable auriferous conglomerates may be found. Of both oil and gold Mr. Johnson takes a pessimistic view. It is true he gives details of the bore holes of the New Rand, Ltd., but he regards them merely as interesting geological data and not as of any economic value.

"Diamonds, coal and salt are the only minerals of economic importance that have been found in Orangia. Should the Vredefort granite prove to be intrusive into the surrounding strata, then one would be justified in searching for ore occurrences in them. In any case the peripheral belt of schists is worthy of investigation. Gold is widely disseminated throughout the Witwatersrand and associated rocks, and it is possible, though not probable, that some payable patches may yet be discovered. Oil has been met with occasionally in the Karoo beds, but there is no reason for supposing it to be anywhere present in sufficient quantity to be of industrial value."

COAL AND BUILDING STONE

The coal deposits are situated at the base of the Ecca or Beaufort beds and are worked extensively. The largest deposit is that of the Vereeniging coalfield, discovered by the gelogist Stow.

"Of useful rocks, the Karoo sandstones afford good building stone, the matrix of the Dwyka boulder shale is employed in the manufacture of pottery, and valuable bodies of limestone will probably be found associated with the dolomite formation."

The report contains numerous diagrams of the diamond mines, and also contains many archœological data of considerable general interest.

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[1] "Geological and Archæological Notes on Orangia," by J. P. Johnson. Longmans, Green & Co., London.

Ex-Senator Teller on the Bureau of Mines

SPECIAL CORRESPONDENCE

Ex-Senator Teller, of Colorado, who was one of the strongest opponents of the Bureau of Mines bill while in Congress, and who has carefully followed the progress of the legislation during the current session, believes that serious harm is likely to result from the application of the measure as passed. Mr. Teller thinks that the work of the Bureau of Mines will almost inevitably bring it into conflict with the work of State authorities who now are entrusted with the oversight of mining conditions and practices. He believes that the methods of protection and control adopted in many of the States are about as good as can be enforced under existing circumstances, and cites as an example of this view the legislation and State regulations of Colorado, with which he is familiar both as a legislator and as an individual observer of mining methods. Mr. Teller states positively that the Federal government has and can have no jurisdiction whatever over the mining conditions in the several States, yet he thinks that the new bureau will not be likely to confine its attention to gathering and disseminating information, as many advocates have said it would, but will attempt to make new or additional regulations designed to control mining practice. Although these probably could not be enforced, owing to lack of authority, Mr. Teller predicts that an effort to apply them through the force of public opinion will be made and will probably have some success. He cites the experience with the Forest Service as an analogous example illustrating how a Federal bureau may succeed in invading the province of the several States in matters not technically within its scope.

DETAILS of PRACTICAL MINING

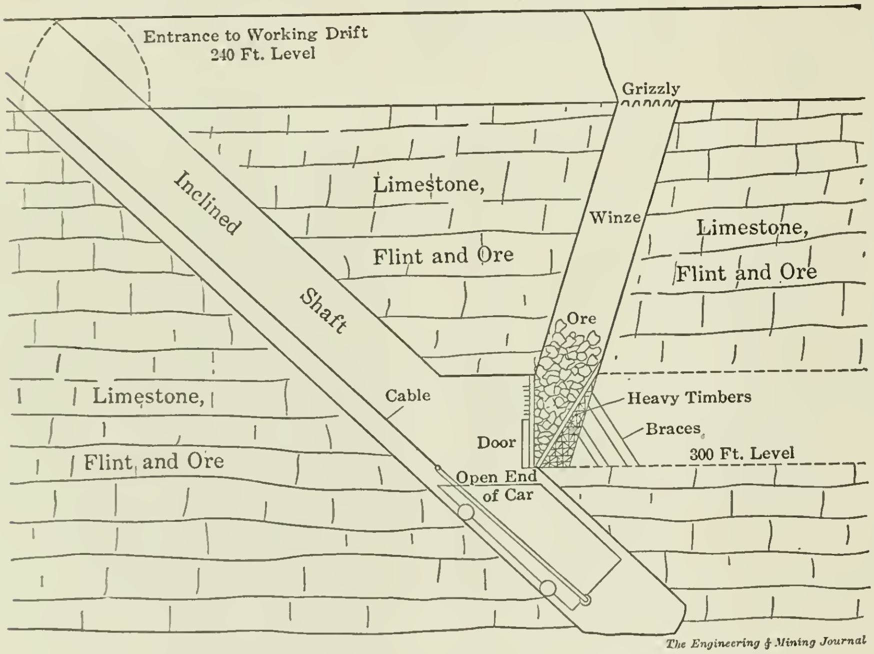
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Underground Hopper

By Lucius L. Wittich*

To abolish the necessity of a long haulage from the ore faces to the inclined shaft, the Herald Zinc and Lead Mining Company, operating at Cave Springs, Mo., has utilized a winze as a hopper. It starts at the 240-ft. level and extends at an angle of 71 deg. to the 300-ft. level, the approximate length of the winze being 60 ft.; size 8x12 ft. It has a capacity of 130 tons, thus enabling rock to be stored underground in case hoisting is temporarily delayed. At the 300-ft. level connection is made with the main shaft which runs at an angle of 45 deg. All drainage from the upper workings comes through the winze and settles to the sump at the 320-ft. level. The pump is on the 300-ft. level and is worked by a motor installed at that point.

At the top of the winze is a grizzly constructed of 60-lb. railroad rails with 6-in. space between. All rock passing through the grizzly is ready for the mill. Cars from the working drifts dump directly on the screen. The large lumps of ore are broken by sledges to pass the grizzly. One man is employed to look after the pump and load the skip. The skip has a capacity of 2 tons and is lowered to a point directly beneath the bin.



The Engineering & Mining Journal

Skip-loading Arrangement at the Herald Mine, Joplin, Mo.

The main shaft is 435 ft. long. The ore is hoisted to a surface bin from which it is drawn into cars and taken up an inclined tramway a distance of 900 ft. to the mill. The workmen get off the car at the point shown in the illustration where the working drift joins the inclined shaft. A similar system is to be adopted by the Temagami Mining Company, operating on the Continental Zinc Company's ground, west of Joplin.

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*Joplin, Mo.

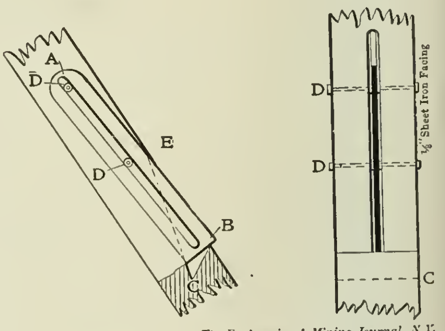
Refining Low Grade Bullion

H. T. Durant has described a novel method of refining low-grade bullion. In one case of bullion assaying 250 fine, he granulated the metal in the ordinary way of pouring it into water. It was then mixed with half its weight of sulphur and heated rapidly in clay crucibles to the melting point of gold. The resulting bullion buttons, after breaking from the cooled crucibles and matte, were melted with iron and assayed over 850 fine. The matte was quite clean. Similarly, raw cyanide slime, acid treated but not roasted, was fluxed as usual but with 3 per cent. of sulphur in addition. The bullion was 900 fine and the slag and matte were not unusually rich.

Bucket Dumping Device

By C. N. Nelson*

On a recent trip to Poland, Ariz., I noticed a bucket-dumping device for an inclined shaft. The sketch explains itself. The bucket is an ordinary shaft bucket with side lugs. The slide *a b* in the accompanying drawing is made of one piece of ½-in. flat iron, and slides easily on the rollers *d*, the rollers being merely bolts with ½-in. pipe nipples working loosely upon them. The ascending bucket lugs pull up the slides and drop into the offset *c*. When the bucket is dumped a short pull carries the lugs over the point *e*, allowing the slides *a b* to fall of their own weight and be in position to carry the lugs over the offset *c* on lowering the bucket. The device was the idea of T. J. Rataiczak, master mechanic of the Money Metals mine.



The Engineering & Mining Journal, N. Y.

Bucket-dumping Device

The Bedrock Sample from Placer Drill Holes

In the examination of dredging ground Ernest K. Hall observes (*Aust. Min. Stand.*) that the characteristics of the bed rock must be carefully noted. A hard, rough and uneven bottom will often put bucket dredging out of the question. A bottom of stiff clay, in which there is a large proportion of the gold, will also be a serious matter.

On reaching a hard bed rock it should be bored into from two to four inches. A handful of tenacious kneaded clay is pressed on the bottom of a wooden tamper tool, which is merely a cylindrical piece of wood an inch less in diameter than the borehole. The tool is then lowered and twice knocked lightly on the bottom. The tamper is brought to the surface and the clay puddled and washed, the process being repeated until no appreciable bed-rock fragments are brought up. In boring the bed rock the tamper is not used until all that can be is brought up by the usual tools, but the tamper effectually seizes coarse gold that would otherwise be neglected.

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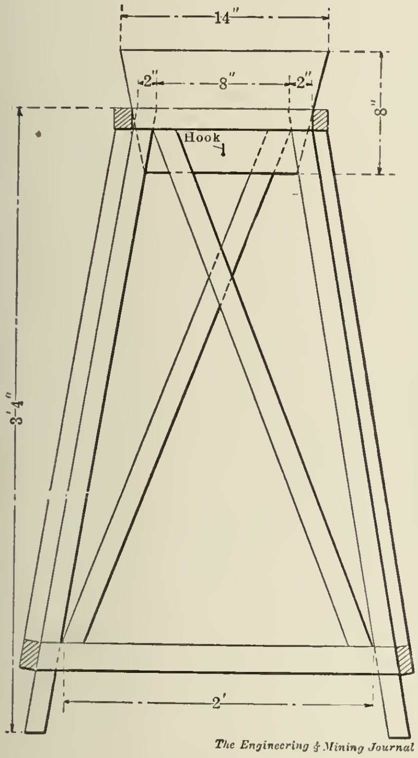
*Box 383, Tucson, Ariz.

Bag Holder for Sacking Ore

There are many bag holders on the market but the home-made arrangement shown in the sketch has been satisfactory. It is described by Cajetan Morsack, McIntyre, Ga., as consisting merely of a hopper which fits down into the top of a frame. The hopper is not fastened to the frame in any way, but by reason of its shape is held securely. The bag is suspended by a hook on each of the four sides of the hopper, allowing the bottom of the bag to just touch the floor. When the bag is full it is freed by turning down the hooks, and the frame is then lifted over the bag. The frame can be made of 1x2-in. or 1x3-in. material, and is light and easily handled. Any carpenter can construct it in an hour or two. This arrangement has several advantages, among which are: One man can bag material alone; the hopper permits the use of bags having different sizes of openings; by making adjustable legs any size bag may be used.



The Engineering & Mining Journal

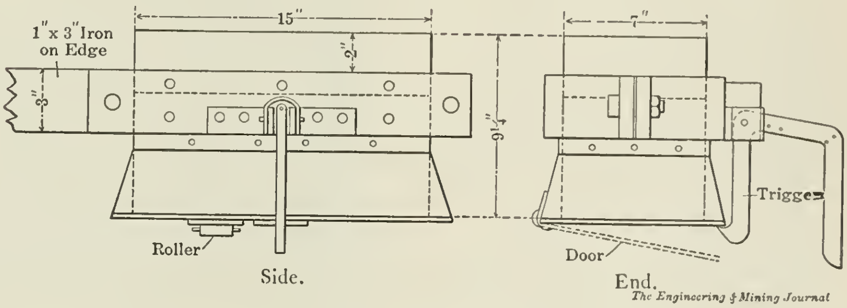
FRAME FOR SACKING ORE

A Battery Feed Sampler

By J. H. Oates *

The accompanying sketch illustrates the hopper portion of a battery-feed sampler, which is used successfully at Guanajuato, Mex. In operation, this box is attached to an arm of 1x3-in. iron, as shown. This iron, of any required length, is connected and braced to a vertical shaft mounted on a step bearing, which is revolved by any suitable mechanism. In one mill the device is used on a radius of about 6 ft. and is run at about 2 r.p.m. under which circumstances about 1/65 is taken out as a sample.

The device consists essentially of a box with a hinged bottom, held in place by a trigger. As the box swings under the stream of ore being fed to the mill, the stream is caught in the box. Then, as the box travels over the desired receptacle for the sample, a suitable tripper releases the trigger and causes the weight of the sample to open the door, thereby dumping the sample into the receptacle. The apparatus can be cheaply made in any mine machine shop and requires almost no attention, except to change the upper half of the box as it wears down. It can be used where there is but little head room.



The Engineering & Mining Journal

BATTERY-FEED SAMPLER

The box proper is made of 3/16-in. sheet iron, and surrounding it at the bottom is an outer box with flaring sides, as shown, the object of which is to keep the fines from leaking out around the contact of the door with the bottom of the sides of the box. This outer box is made of 1/8-in. sheet iron. The trigger is of 1/2x1-in. self-hardening steel. A small roller is put on the bottom of the box. After the sample has been discharged, this roller engages a guide rail, which lifts the bottom again to place, when the trigger automatically closes upon it, holding it tightly in position. It is well to have the trigger catch slightly hollowed so as to engage on a small piece of half-round steel on the bottom. This is necessary, as otherwise the ore on striking the bottom will jar the catch loose and spill the sample.

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*Apartado 55 Guanajuato, Mexico.

Cost of Churn Drilling

A drilling crew in the Miami district, Arizona, usually consists of two men, one driller and one helper or tool dresser, each crew working a 12-hour shift. The drills are generally owned and operated by the mining companies. The accompanying cost data, given by W. G. Weber in the *Wisconsin Engineer*, are based on an assumed life of four years per machine.

COST OF CHURN DRILLING

	Cost per Ft. of Hole.
Two drillers at $6 per day	$0.48
Two helpers at $1.80 per day	0.38
One sampler at $1 per day	0.16
One foreman at $6 per day (2 machines)	0.12
Total labor	$1.14
Road building at 75c. per ft. of road	0.59
Coal, coke, oils, etc	0.27
Water	0.10
Teaming	0.10
Assaying, office and incidentals, etc	0.16
Interest and depreciation	0.20
Total cost per foot of hole	$2.57

Star and Keystone machines are the ones most commonly used, and an outfit, with tools sufficient to operate four years, is said to cost in the neighborhood of $6000.

The monthly average of the cost per foot of hole drilled varies with one company from $2 to $3. In another instance, where holes are drilled further apart and the drilling is poorer, the cost per foot has run as high as $5. When drilling is the only means of development being used on a property, the cost of camp maintenance and incidentals considerably swells the cost account.

Underground Dining Rooms

A novelty in the Lake Superior region, says a correspondent of the *Iron Age*, is the underground dining rooms at Corrigan, McKinney & Co.'s Great Western property in the Crystal Falls district of the Menominee. Two rooms, one on the eleventh and one on the twelfth level, 1100 and 1200 ft. beneath the surface, are cut in solid rock. They are each 95 ft. long, 12 ft. wide and 8 ft. high. The floor is of concrete, which is flushed daily, and the walls are whitewashed.

The rooms are heated with steam and lighted with electricity. A washroom, 17 x12 ft., and supplied with hot and cold water, opens into each one. The dining rooms are each roomy enough to accommodate 200 men and they are extremely popular. The miners are privileged to have warm meals brought to the shaft each day, and at a certain time, the man whose duty it is to attend to the dining room and the blasting powder, ascends to the surface and gathers up the pails and baskets. The men generally have their dinners eaten by the time it would take to hoist them to the surface, and then they stretch out on the benches and rest. Aside from the time that is saved, the hazard of underground work is lessened, the crowding of the men in the cages when ascending or descending having occasionally resulted in an accident.

Method for Analyzing Atacamite

By F. D. Aller*

I find that the oxychloride of copper (atacamite) does not dissolve in water; that nitric acid dissolves it, but has a tendency to expel the chlorine, to a certain extent, as free chlorine; nitric acid also dissolves the copper, which interferes with the titration unless separated. Caustic potash decomposes atacamite without dissolving copper and, of course, without volatilizing the chlorine.

The standard silver nitrate solution contains 4.8 gm. per liter of water, and the standard caustic potash solution contains 100 gm. per liter of water. Treat one gram of sample with 10 c.c. of the caustic solution, boiling gently for a few minutes, then neutralize with nitric acid, adding as little excess as possible; again make slightly alkaline with the caustic solution, having not more than two or three drops in excess; add 10 c.c. water, boil, filter and wash with hot water. Add a few drops of a weak solution of chromate of potash and titrate with the solution of silver nitrate. It is necessary to make a blank assay, using the same amount of reagents and deducting the amount of chlorine obtained from the result of the assay of the ore.

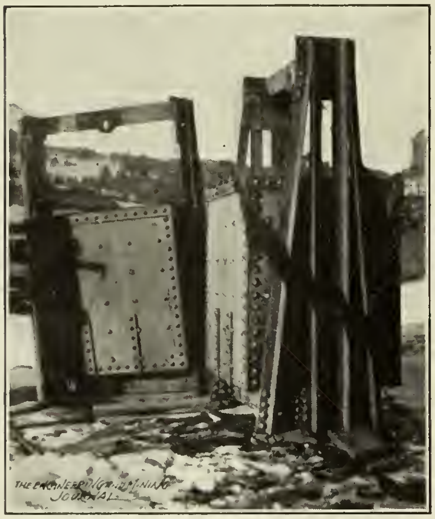
In the silver nitrate solution, 1 cc. equals about 1 mg. of chlorine, and if pure, need not be standardized against pure sodium chloride.

Drilling in Rock Salt

In diamond drilling, in rock-salt formation, trouble frequently results from the chambering of the salt formation due to the dissolving action of the wash water. The result is an insecure hole and frequently a loss of the bit. In one instance a diamond bit was lost in this manner and falling crosswise of the chambered hole was not recovered, notwithstanding skilful and long-continued fishing operations. To obviate the trouble resulting from the chambering by solution of the rock salt, the wash water used should be a saturated salt solution. This idea has been applied in connection with the Texas drilling operations with satisfactory results.

Port Henry Ore Skips

The accompanying illustration shows the type of skip that is used at Mineville, N. Y., by the Port Henry Iron Ore Company. Two balanced skips are operated in a vertical shaft, with a total capacity of 2000 tons per day. The skip is massive, and is built entirely of angle bars and sheet steel. It weighs 4000 lb., and has a capacity of four tons. These skips are used for hoisting magnetite.



Type of Skip Used at Mineville, N. Y.

Reheater for Air Hoist

The six levels below the Sweeney tunnel, in the Last Chance mine at Wardner, Idaho, are reached by an inclined winze containing two skipways and a manway. A compressed-air hoist operated in balance serves these lower levels with skips of 30 cu.ft. capacity. Trouble was experienced from the hoisting engine freezing, so that reheating of the air had to be resorted to. Gasolene torches playing on a coil of air pipe were tried, but with poor success, until finally the scheme now used was hit upon.

A 3-in. perforated air line is run into the drum of a 40-h.p. fire-tube boiler, the air passing up through the heated water and being piped to the hoist from the steam chamber. A check valve is used on the air line before it enters the boiler, so that as the reheated air is drawn to the hoisting engine, more air is admitted to the boiler, but, at the same time, water is prevented from backing into the air pipes. The air pipe in the boiler is closed at its end and drilled with ¼-in. holes, through which the air escapes.

With the reheater, the air pressure is raised from 5 to 15 lb., depending upon the rate of consumption, and no trouble is experienced from the hoist freezing. Only a small wood fire is kept under the boiler, not more than ¾ cord of slabwood being burned per 24 hours.

Preparations for Blasting

By M. T. Hoster *

One can visit many of the different mines and mining districts of the country, and in each he will find some peculiarity in the detail manner in which the miner goes about to fire his round of holes. The necessary operations are discussed under the subheads following, and the best practice outlined.

Cutting the Fuse—Fuse should never be less than 5 ft. in length and often 6 or 7 ft., depending on the number of holes, whether in a shaft, raise, drift or stope. They should always be cut straight across (not slanting) with a sharp knife or cleaver, for if the fuse is not so cut, some of the powder may fall out and prevent the cap from becoming ignited. If cut slanting, the pointed end may bend over and seal the powder from the fulminate when the fuse is pushed into the cap.

Crimping—Crimping the cap on the fuse is usually done by means of the thin-jawed crimper, the broad-jawed crimper, by biting with the teeth or by using the candlestick. The last two are certainly crude and inefficient means, but are still practised by individuals even when a crimper is at hand. With the thin-jawed crimper, the cap is grooved on the fuse, the great disadvantage of this being that such a sharp groove may often squeeze the shell into the fuse so sharply that the powder train is choked or cut, causing a missed hole. Two or more such grooves may be lightly pressed on each cap, but water may leak in as the cap does not fit the fuse closely.

The broad-jawed, or California crimper is far better, as the metal is not grooved and still fits the fuse closely. With the California crimper, the cap may be pressed once, but a better way is to press several times, revolving the fuse and cap slowly each time the jaws open, squeezing lightly at first and stronger as the cap contracts about the fuse. This crimp gives a water-tight fit. Many missed holes are unquestionably due to imperfect crimping; hence this operation should be left to a reliable man and not to the miner, as is so often the case.

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*Ca Minera de Gatico, Gatico, Chile, S. A.

*Alvarado Gold Mining Company, Congress Junction, Ariz.

The Primer—At times, one will see a miner loading his holes by tamping in a stick or two of powder, then inserting the fuse and tamping in more powder, the fuse lying between the wall of the hole and the powder. This is inefficient and a primer should always be prepared beforehand. The two best methods of making a primer are: (1) Open up one end of the cartridge, extract a small amount of powder, press a hole into the center of the stick of powder and insert the fuse. Then twist the paper cartridge about the fuse and tie it tight with cord. For wet holes the space at the top of the cartridge is often filled with grease.

(2) Simply stick a hole into the cartridge and insert the fuse. This method does not require as much time and is surely not as good as the first, but will give satisfactory results. The second primer must be handled with more care to prevent the fuse from coming out and should always be inserted into the hole fuse-end first, which necessitates a bend in the fuse. This will, according to some, nick the fuse and cause a misfire. To prove the falsity of this idea, tie a few knots in a fuse, pull as tight as possible, submerge in water for a few hours and ignite. If the fuse is of standard make, as should always be the case, chances are twenty to one that the fire will travel through each knot.

Greasing—For wet holes the fuse is often greased with axle grease or crude oil. Some miners rub grease into the entire fuse, but this is not necessary, as any good fuse will withstand water for a few hours at least. If grease is used at all it should be rubbed on the fuse only where it enters the cap, as it may prevent water from soaking into the cap at this point.

Loading the Holes—For dry holes, all of the paper cartridges, excepting the primer cartridge, should be slit with a knife before placing in the hole. The object of this is to give the powder a chance to spread out when tamped and so fill the entire hole. For wet holes it is best to slit the first two cartridges only, as the water will fill up any space not taken up by the remaining powder. The most effective place to have the powder is at the bottom of the hole, as is well illustrated with goffer holes; hence the object of slitting at least the first two sticks in wet holes. In loading a hole with, for example, five sticks of powder, load in the first two sticks, tamping each solidly into place. Then load the primer, tamping but lightly, and finally the last two sticks of powder, which should be pressed in well. Some miners and pamphlets on this subject say to load the primer last, but this hardly seems advisable. Never load the primer first, and always use a wooden tamping stick; a metal bar or rod may come in contact with a rock, thereby causing enough of a spark to fire the powder.

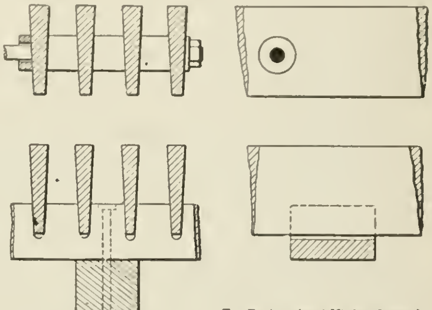
Tamping with Clay or Mud—In some districts soft clay or mud is tamped into the hole after the powder has been loaded. This is more the case with hand than with machine drilling, but whether there is any good resulting from this tamping is doubtful. It is often advantageous to force a little earthy matter into a hole in order to prevent the sparks of some nearby hole from igniting the powder or to prevent the powder in a dry hole from falling out, but otherwise the force of the explosion can hardly be affected by this tamping. If a hole is tamped at all it should never be filled to the collar, as this makes it difficult to discover a missed hole.

Splitting and Spitting the Fuse—Each fuse to be spit should be cut open at or near the end so as to expose sufficient fuse powder for igniting, or spitting, the fuse. The three general ways in which this may be done are: Slice the last inch of the fuse in half; cut a slit in the side of the fuse; fork open the end of the fuse. The first is a poor way, as the powder exposed may all fall out before it is time to spit. The second method is much used as there is the least chance of the powder falling out and it requires little time. The big disadvantage of this method is that when spitting, the fire may travel away from instead of toward the cap, and the miner, being in a hurry, may not notice this. The last method is undoubtedly the best by far, and as easy as any, for although some of the fuse powder may fall out, enough will always be left where the arms of the fork meet. For very wet places the second method has an advantage over the third in that the powder is not as liable to become wet.

The old and still much used method of spitting by use of candles or miners' lamps is slow, inefficient for a large number of holes, and also dangerous. Spitting one fuse by candle, the second fuse from the first, the third from the second, etc., is good but can be used only when the holes are close together. The advantage of this method is that, when through spitting, the miner is certain that all the fuse was spit properly. A more used, and by far the best method of spitting, is by means of an extra piece of notched fuse. This is a piece of fuse about 18 in. long, which is slit or notched along one side, the notches being about 1 in. apart. When ready, light one end of this fuse, and as the fire travels along the fuse it will spit out at each notch in succession. As the fire spits from the first notch, ingnite the first fuse, with the second notch the second fuse, etc., the advantages being that there is the same interval between the lighting of each fuse and the method is rapid, safe and easy.

Improved Method of Holding Grizzly Bars

There are two methods of securing the bars in a grizzly, of which the less desirable is the one in common use. In the accompanying sketch from a paper by C. O. Schmitt, read before the South African Association of Engineers, the upper figure shows the common method of holding the bars by rods and distance pieces, while the lower figure illustrates a scheme for holding them independently.


The Engineering & Mining Journal

METHODS OF HOLDING GRIZZLY BARS

The latter method has the advantage that each bar can be taken out and replaced when worn, with a minimum of labor; while in the former case the whole set has to be lifted by block and tackle.

Device to Prevent Scouring of Amalagamation Plates

Especially where coarse crushing is practised there is usually an excessive scouring of the amalgamation plates where the pulp flows from the distributer to the plates. In the Florence Goldfield mill this scouring action is prevented by placing iron plates, ¼ in. thick and 1½ in. wide, across the top of the plates. The pulp falls or flows on these iron strips from the distributer and then to the amalgamation plates. By this simple means a great saving in plates has been effected at practically no extra cost. In cleaning the plates the strips are simply lifted out and the plates scraped as usual.

Utilizing Water in Mines

Where it is necessary to drop water a hundred feet or more to a pumping level, it can be utilized to furnish power by conducting it through tight pipes instead of allowing it to find its own course through stopes, raises, etc. One Cœur d'Alene mine uses such power to drive a fan, and another drives a generator which supplies electric light to six stations of the mine.

Smelting in Bond

SPECIAL CORRESPONDENCE

The Treasury Department is now practically ready to issue the new regulations governing the process of smelting in bond under the terms of the Payne-Aldrich act. Several sets of regulations will be issued, one for each of the principal points at which smelting in bond is carried on. The preparation of the regulations has been exceptionally difficult and tedious, and the authorities are of the opinion that the provision of the Payne-Aldrich law relating to this subject is extremely defective and unsatisfactory. They have reached this conclusion as a result of the work of the special expert, Professor Hofmann, who has been engaged in visiting the various plants where the smelting is conducted for the purpose of studying the per cent. of waste due to the methods of smelting there in vogue. Another obstacle to the early determination of the terms of the new regulations is found in the constant exertion of personal and political influence for the purpose of directing the framing of the document. This has necessitated the redrafting of the regulations several times.

Congressional leaders in the Republican party now contemplate the passage, if possible, of a joint rule on the part of both Senate and House, under the terms of which it would be permissible to offer and, if desired, to adopt amendments to individual schedules or sections in the tariff act without throwing open to amendment the general body of the act. Should this result be attained it is believed that one of the earliest sections to be redrafted would be that relating to smelting.

Mine Explosion at Palos, Alabama

SPECIAL CORRESPONDENCE

As the result of a terrific explosion in the No. 3 mine of the Palos Coal and Coke Company, of Birmingham, Ala., on May 5, more than 100 miners were entombed. The flames from the explosion shot 200 ft. into the air and the shock was felt for miles. The fan machinery was damaged, but air was immediately pumped into the mine in the hope that some of the men were still alive. A special train, carrying State Mine Inspector Hillhouse, Government Expert Rutledge, and a number of doctors, was immediately despatched from Birmingham. The hospital relief car of the Tennessee Coal, Iron and Railroad Company was also hurried to the scene of the explosion and rescuers were equipped at once with oxygen helmets.

The cause of the explosion has not yet been determined. The condition of the bodies that have been recovered indicates that much force and flame accompanied the explosion. It was found difficult to distinguish between the bodies of the negroes and those of the white miners.

April Oil Dividends

The accompanying table gives the amount of dividends paid by a number of California oil companies during April, 1910, together with their total dividends to date, as reported by the California Stock and Oil Exchange, San Francisco.

Name of Company.	April, 1910, Dividend.	Total Paid to Date.
Alma	$11,400	171,000
American Petroleum	126,735	1,183,430
Caribou	20,176	720,707
Claremont	10,000	335,000
Columbia	9,993	284,789
Euclid	3,500	127,500
Globe	6,000	87,000
Home	2,000	476,000
Homestake	1,000	78,250
Illinois crude	2,000	90,000
Imperial	60,000	2,000,000
Kern River	2,000	102,000
Mascot	5,000	15,000
Mexican Petroleum	85,617	3,562,960
Monte Cristo	50,000	440,000
Palmer	18,020	268,380
Paraffine	3,000	18,000
Pinal	14,992	902,093
Premier	10,000	10,000
Record	7,500	62,500
Rice Ranch	3,000	102,000
Royalty	300	15,766
S. F. & McKittrick	15,000	355,000
Sauer Dough	4,987	522,291
Section 25	10,000	20,000
Sesnon	20,000	110,000
Sovereign	5,000	95,000
Thirty Three	20,000	690,000
Traders	14,960	194,146
Union	124,813	6,493,068
United Petroleum	40,375	2,219,335
Wabash	3,000	123,000
Total for April, 1910	$710,368	

The New York Metal Exchange

Mr. Paul Koning, of New York, the representative of Brandeis, Goldschmidt & Co., of London, who was lately elected president of the New York Metal Exchange, has made the following statement:

"At the present time there can be no doubt that the principal object of the exchange is to disseminate information. This is obtained in two different ways: partly by obtaining official printed statistics, and partly by personal intercourse among the members on the floor of the exchange. The statistical department of the exchange is of great value, as absolutely fair and reliable statistics are daily compiled and published by the secretary, giving all details as to import and export shipments, European deliveries into consumption, daily prices quoted on the London metal exchange, and, in the case of tin, the prices quoted in the Straits Settlements, etc.

"As to actual trading on the floor of the exchange, I must confess that this has steadily decreased during the last few years. Personally, I do not believe that the exchange will ever see any large trading in copper, as the American copper trade is concentrated in comparatively few hands, who sell directly to consumers, while speculative dealings, as they exist on the London metal exchange, are not feasible here, as long as the large and financially responsible interests do not participate. The matter was tried about a year ago, but, as expected, did not lead to results."

The Lead Convention

Julius Matton, of 25 Rood Lane, London, E. C., has issued a circular reviewing the first year of the lead convention, which says in part:

The secret of the inner arrangement of the combination has been well kept and we know only that it is selling all of its lead through one of its members, a Frankfurt house. Even about the object of the combination, we are left rather in the dark. From remarks by members of the combination I am inclined to think that the object was to raise the price for lead.

Taking all the facts into account, there surely can be only one conclusion, viz.: The combination has, thus far, been a failure, (1) financially for the producers, as they did not get even quite as much for their lead as in the preceding year, and, very likely, had to pay a stiff commission in the bargain; (2) morally for the selling agents, as they did not get control over the market and, consequently, could not raise the price.

The assertion that the price would have been lower, if it had not been for the combination, is too absurd to be taken seriously. As the price has not been made by the combination but has been made for them, I do not see how it could have been different unless the price would have been forced down purposely. The little buying now and then to stay a downward movement or to raise the price temporarily, has had no effect on the general course of the market.

On the other hand, John Darling, chairman of the Broken Hill Proprietary Company, made the following remarks at the meeting of that company on April 25, 1910:

When in Europe a few months ago I was invited to meet the members of the Lead Convention, which I did in Paris, and was favorably impressed and satisfied that their desire was not to speculate and boom the markets, but to endeavor by judicious production so to regulate supplies as to maintain a steady remunerative price in the markets of the world, and if practicable, to prevent serious fluctuations in prices, which are not permanently beneficial to either the producer or consumer. I think the Convention will result advantageously in the mutual interests of lead producers and manufacturers.

Report of North Butte Mining Company

In the fifth annual report of the North Butte Mining Company is given the report on the property made in March, 1910, by R. M. Atwater, Jr. Mr. Atwater is disposed to believe the unfavorable showing on the Edith May 2200 is due to local conditions in the shape of faulting, and that these conditions may correct themselves rapidly. The Jessie vein offers little hope at greater depth. Mr. Atwater states that, as it is usual in Butte for an orebody to commence in one vein simultaneously with the giving out of an orebody in a neighboring vein, the Gem vein may succeed to the productiveness of the Jessie, and the Adirondack to that of the Edith May. Mr. Atwater's report follows:

"Commencing in April, 1905, the North Butte Mining Company has produced up to Dec. 31, 1909, 150,360,938 lb. of copper, 4,943,669 oz. of silver, and 6818 oz. of gold, according to settlements of the smelters buying the ores. This product was contained in 1,673,648 tons of ore taken from the various veins of the property.

Producing Veins

"At the start there were three producing veins, the Speculator, the Edith May and the Jessie, of which the first named was nearly worked out down to the 1900-ft. level (after having produced $6,000,000 worth of metals) while the other two had been opened up just far enough to give promise of their future productiveness. Prior to the purchase of the property by the North Butte company, these two veins had been opened only on the 1200- and 1600-ft. levels for about half their productive length, and there had been taken out about 65,000 tons of ore, yielding 11,000,000 lb. of copper, 400,000 oz. silver, and $10,000 gold.

Development Work

"From the time of the purchase to date development work has been carried on energetically, many thousands of feet of crosscutting, drifting, etc., having been completed, the net result being a large increase in the expected dimensions of the Jessie and Edith May orebodies and two more producing veins, namely, Adirondack and Gem, while two other veins, the Crœsus and the Berlin, have yet to be explored more fully before a final verdict can be given. This even does not exhaust the possibilities of the large area owned by the company, but it must be admitted that the ground originally considered most promising has been pretty thoroughly explored.

Position of Present Ore Reserves

"At the end of 1909 the principal ore reserves were contained in the Edith May vein; the Jessie stopes having been nearly mined out above the 1800 level, but still showing a large reserve of lower grade ore between the 1800 and the 2200. The Speculator vein has been explored down to the 2200 level and all the known ore taken out except a block of about 4000 tons above the 2000-ft. level.

"The Adirondack and Gem veins, however, did not begin to make ore until the 1600-ft. level was reached, and are showing material improvement at the 1800-ft. level. These two veins hold out much promise for the future.

Ore in Depth in Edith May Vein.

"The Edith May vein was extraordinarily rich between the 1200 and the 1800. The 2000-ft. level showed a noticeable decrease in copper and silver, and on the 2200 (present deepest) the vein carried pay ore for only 300 ft., as against 1000 ft. on the 1800. The width and general character of the vein are unchanged; the grade of the ore decreased gradually with depth. On the 2200 a pair of cross faults developed which have a decided influence on the orebody. These faults form a wedge-shaped section of ground with the point upward; within the wedge, the ore is excellent and of a normal character; outside it dies away.

"A winze is being sunk now in this piece of ground to determine the downward extent of this good ore, and the result may be of the greatest importance to the future of the company, since the continuation of high-grade ore has been proved in Butte, several times, to a much greater depth than the Edith May 2200 level.

"It is not usual, in Butte, for an orebody to give way to barren vein filling and then be followed in depth by a second orebody, and the complete dying away of an orebody usually is the end of the productiveness of that portion of the vein; more generally the orebody in one vein gives out simultaneously with the commencement of an orebody in a neighboring vein. However, the conditions on the 2200 Edith May show the effect of a disturbance by local conditions which promise to correct themselves rapidly, and if ores hold in depth within this wedge-shaped section, the orebody so developed will be a large and important one.

Deep Conditions of Other Veins

"On the Jessie vein the best ore lay between the 1200 and 1800 levels, the grade becoming lower throughout on the 2000 and 2200. There is less indication of a possible revival of the orebody here since the ore has changed considerably in its composition, showing more iron and quite a little zinc in the western faces of the drifts.

"The Gem vein lies close to the Jessie vein, just to the north, and carries ore from the 1600 downward. On the 1800 it is opening up well, although not yet big. Crosscuts at 2000 and 2200 will soon reach this vein, and there is a fair hope that it will succeed to the former productiveness of the Jessie.

"The Adirondack vein lies just south of the Edith May, and offers a second string to the bow, for while its orebody is still short and narrow, the mineralization is excellent and the grade of ore high. Physical conditions which would cause this vein to succeed to the Edith May in depth are by no means remote.

Ore Reserves and Costs

"The ore blocks remaining in the proved areas are summarized in an accompanying table. The value of this ore is variable, but the necessary method of its extraction will average up the grade so that the general average yield in copper will be close to 65 lb. per ton. On this basis, the ore tonnage given will produce 56,670,000 lb. of salable copper.

NORTH BUTTE ORE RESERVES.

	Tons.
Edith May	627,671
Jessie	173,237
Adirondack	9,090
Gem	2,373
Speculator	4,000
January and February production	55,476
Total	871,847

"The present total cost of turning out copper at this property is 10.5c. per lb., everything realized over this amount being available for dividends. These costs are based on the average yields figured above and it is not likely that they will increase.

"It must be remembered that nearly all the development work necessary for the extraction of this ore has been completed, and consequently, its actual cost would show a decrease were it not that simultaneously with its extraction a large amount of new development work will be carried on.

"At the present rate of production, the tonnage as calculated will be worked out in 22 months. There is quite a strong probability, however, that the outside limits of the Edith May orebody will be found to extend further, especially on the east side, than has been calculated.

"The Adirondack and Gem ore below the 1800 has not been taken into account as the development is not far enough along to warrant any figures yet, although the continuation of the ore is almost certain.

Development Program

"It will be best to push the work on the 2200 winze with all speed to the 2400-level line, opening out an intermediate at 2300, but it will be unwise to start the crosscut to the main shaft from the winze bottom. A drift at the 2400-level line is all that should be run, but stoping could be commenced, if necessary. The main shaft should be sunk to the 2400 level, at least, and connection run to the winze bottom forthwith. This work will take fully five months to complete."

Results in 1909.

In 1909 North Butte produced 461,590 wet tons of ore and smelted 449,875 dry tons, of which 84,460 dry tons were first class, and 365,415 tons were second class. This ore yielded 33,102,153 lb. fine copper, 1,048,272 oz. of silver, and 1302 oz. of gold. The average of fine copper per dry ton of ore treated was 75.38 pounds.

The principal development during the year was on the 2000 and 2200 levels of the Edith May vein. The average of the ore on the 2000-ft. level was irregular, but as a whole the level has opened up a large body of ore mostly of second class. On the 2200-ft. level, John D. Pope, general manager, notes that the best grade of ore appeared between two faults and close to them. These faults separate rapidly in going down, increasing the length of territory in which higher grade ore may be expected on the levels below. A winze is being sunk to determine whether this improved condition will continue.

On the 1800 level of the Jessie vein the vein was found to be of high grade, but of smaller size than had previously been opened to the west. The grade is maintained on the 2000 level but decreases on the 2200 where cut. On the Adirondack vein, south of the Edith May, a body of ore 140 ft. long, 4 ft. wide and with an average grade of 8 per cent., was opened on the 1800-ft. level. On the 700-ft. level from the Gem shaft a crosscut was extended south into a portion of the vein heretofore considered of little value. It opened up a width of between 14 and 15 ft. of 5 per cent. copper ore, which also carried 7 oz. of silver to the ton. The management expects to secure a large tonnage from this block of ground.

Dividends in Excess of Earnings

During the year the company paid $1,600,000 in dividends, which was in excess of the earnings for the year. The president states that this excess was made as the company has no need of the funds for any purpose, and in times such as have existed during the last year it was thought best to distribute all the money possible. The net earnings for the year were about $1,080,000. The company acquired several additional pieces of ground during the year, among which was a one-half interest in the Granite Mountain claim, which was secured from the Lewishons in consideration of shaft sinking and development.

At the Raymond Dinner

We referred last week to the excellent and warmly applauded address of W. L. Saunders in presenting forty-seven American Beauty roses to Mrs. Rossiter W. Raymond, at the Plaza hotel, New York, on the occasion of Dr. Raymond's seventieth birthday dinner, April 30, 1910. Mr. Saunders' address was as follows:

All honor to our guest, but it falls to my lot to speak of one who is preferred before him; of one who at this feast is as welcome as the flowers in May.

Lord Burleigh in giving advice to his son said, "Use great prudence and circumspection in choosing thy wife, for from thence will spring all thy future good or evil."

Forty-seven years ago was a critical period in the life of our guest: Young, able, ambitious and yet strong in faith and love, he knew that the glory of young men should be their strength, and so towering in the confidence of twenty-three he plucked from highest boughs this "flower of wifely patience."

If the gospel be true, that "a prudent wife is from the Lord," then

"There's in you all that we believe of Heaven,
Amazing brightness, purity and truth,
Eternal joy and everlasting love."

Look back, sir, through the pleasures of memory on the events of nearly half a century of your active life; think of your greatest joys; recall the applause of the multitude, the honors bestowed, the pomp of power, the satisfaction gained by prosperity, happiness and through troops of friends, yes, even up to this night which should be a proud moment to any man, yet you will not deny that after all "there's nothing half so sweet in life as love's young dream."

There is a beautiful song called "Let me dream again," in which are the words: "O, do not wake me, let me dream again." To you love's dream has had no awakening since that bright morning when you sailed forth upon the sea of life, with this "gentle, trusting, loving wife."

The story is told of a man who led in everything. He was the captain of the ball team; the leader in his class; the county chairman and the deacon in the church. In due course he took to himself a wife, and a friend who knew him well was asked how he was getting along since he married. He always led everyone and it was said that no woman could ever get ahead of him. "Oh," said the mutual friend, "he is still leading, I suppose, but his wife is just behind holding the reins."

We drink to her who is *his* wife and long may she reign!

Here's health to her,
Here's wealth to her,

to her who is his guide, philosopher and friend; to her who is more than a star, for she is a constellation of virtues, she is the comet and he, why he is only the man in the moon! To her, to her!

On behalf of his friends and yours it is my privilege to lay these flowers at your feet.

Here is a rose for you for every year of wedded life: It lifts its face above the thorns as you have always done, as you do now.

"Here, mark you, where the bolt of Cupid fell:
It fell upon a fragrant little flower,
Before, milk-white, now crimson with love's wound."

Winners of Rand Stope Drill Competition

The winners of the stope-drill competition in the Transvaal are announced, unofficially, by the *South African Min. Journ:* to be the Holman 2⅛x5 in. and the Siskol 2⅜x6 in. These machines are stated to be practically tied for first place, the next in order being the Chersen. This competition was arranged by the Government and the Chamber of Mines and was commenced Feb. 15, 1909; thus the trials have been continuous for more than a year. There were 21 machines entered originally; of these, eight failed to pass the elimination tests and the actual competition was begun by 13 types of machine; Holman 2¾, Chersen, Holman 2⅛, Climax Imperial, Murphy, New Century OO, Siskol, Waugh, Westphalia and Konomax. The Climax Imperial, Murphy, Waugh and Westphalia were hammer drills, the remainder being of the reciprocating type. The essential difference between the two leading machines is stated to be that the Siskol is the faster running drill while the operating costs are considerably less in the case of the Holman 2⅛ inch.

Monthly statements of progress were made until August, when these were discontinued. At that time, the relative positions of the competitors were widely different from their final standing, illustrating the fact that tests of machines over short periods are not sufficient evidence on which to base a final judgment.

The Mountain Copper Company, Shasta county, Cal., produced 1254 tons of blister copper in 1909, and reports a profit from sales of fertilizer and sulphuric acid nearly double those of 1908. Smelting was confined to treatment of cinders from the low-grade ore of the Hornet with sufficient rich ore from the Iron Mountain to prevent loss on the operation.

A Contribution to the Question of Prices

Prices Are Governed by Supply and Demand. Index Numbers. Recent Increase Less Than Commonly Believed. No Depreciation of Gold

BY W. R. INGALLS

The commonly employed measures of the relation of commodity prices to gold, which has been discussed so much of late, are the so called index numbers. It is important first to consider what these represent. At the present time there are five commonly reported, viz., those of the London *Economist*, Mr. Sauerbeck, the U. S. Bureau of Labor, Bradstreets's and Dunn's. I shall leave out of account in this paper the Dunn and *Economist* numbers, although the latter is of long record and high authority, for the reason that in neither case are annual averages available for a long series of years, and consequently they have not been ready for the comparison that I have made.

The index numbers of Sauerbeck and the Bureau of Labor are the arithmetical averages of the wholesale prices of a large number of commodities expressed in percentage of, or proportion to, the average of the same commodities for a period assumed as the standard, or starting point. Bradstreet's number is the sum of the prices of a pound each of 96 commodities. Sauerbeck's number represents prices in Great Britain, especially the London market. The Bureau of Labor and Bradstreet's indexes represent American prices, especially in the New York market.

INDEX NUMBERS

At first sight the methods of computing these index numbers appear crude, and possibly misleading, inasmuch as the relative importance of the commodities does not enter into consideration. Sauerbeck has, however, computed quantitative indices and has found them to agree substantially with his arithmetical. I have lately computed a quantitative index number of the prices of metals in the American market and have found its line to exhibit a substantial parallelism with the arithmetical numbers of the Bureau of Labor for its class of commodities most nearly corresponding. I have found, moreover, that the Bureau of Labor and Bradstreet's numbers for the United States follow approximately parallel lines when plotted, and also correspond in a general way with the line of Sauerbeck's numbers for Great Britain.

It may be accepted, therefore, that the index numbers show fairly the trend of commodity prices; that the trend for the last 10 years has been upward; and that this has been the case, although not to the same degree, both in Europe and America.

THE HYPOTHESIS OF GOLD DEPRECIATION

The cause of this upward movement of prices has been a subject of active discussion. Until recently it was chiefly academic and the common explanation offered by the professors of political economy in American universities is that the principal, if not the only reason, has been the increasing production of gold. A goodly number of economists, however, have all along held a diametrically opposite view, expressing the opinion that the production of gold is far from being the chief governor of commodity prices. I attempted to uphold that opinion in a contribution in the ENGINEERING AND MINING JOURNAL of Nov. 28, 1908, wherein I showed that while in late years there has been the same direction of gold production and commodity prices, there had been previously, going back to 1851 (earlier than which there are no reliable statistics) no parallelism; and that a comparison of the world's gold production with the iron production aroused the suspicion that the former may actually have fallen short of the monetary requirements. The same idea has been expressed far more emphatically by Professor de Launay in his treatise on "The World's Gold," published in 1908, wherein he arrives at his conclusions after an elaborate study of the subject. In my own paper to which I have referred above, I suggested a variety of causes other than gold production that upon careful study might be found to account for the rise in prices.

THE SUBJECT OF PRICES NOW OF POPULAR INTEREST

Since then the whole question has passed from the realm of academic discussion into the field of popular interest, and now we have public men and journalists of all degrees debating the "cost of living." We hear now less of the effect of gold production and more of trusts and the tariff, which more readily excite the popular imagination. It is admitted by the thoughtful, if we except those economists who dogmatically dismiss the whole subject with the dictum of increasing gold production, that the rise in prices is due to many and complex causes, whereof the mean proportional can not easily be determined. The natural procedure, it seems to me, is to dissect the index numbers and with the assistance of experts in each industry establish the history and governing factors for each important commodity.

INDEX NUMBERS VS. "COST OF LIVING"

Before going further, however, it appears to be worth while to draw a distinction between the index numbers and the "cost of living." It is easy to remember how the index numbers declined in 1907 while there was general complaint that the cost of living remained as high as ever. If we had a quantitative index number for the total consumption of a country it would correspond more closely to the cost of living, but even so it would not be an absolute measure, because it would be based upon wholesale prices, while the chief concern of the consumer is in the retail prices, and it is easy to conceive of changes in conditions of distribution, etc., which would materially alter retail prices while the wholesale remained constant. The cost of cement, pig iron, copper, etc., affect through rent, taxes, and other ways the citizen who personally never bought a pound of those things, but the prices of eggs and green-groceries, which do not figure in the index numbers, are of more immediate importance in his budget.

CAUSES AFFECTING PRICES

Limiting ourselves, then, to the index numbers, we find among the causes that have been assigned to account for the recent rise the following: (1) Increasing gold production; (2) exhaustion of natural resources; (3) increase in standard of living; (4) extravagance in living; (5) monopolization of necessities; (6) protective tariffs; (7) demands of labor; (8) increasing congestion of population in cities.

It will appear upon consideration that several of these causes as stated above mean substantially the same thing.

On the other hand there are several causes that are constantly operating in favor of lower prices. Among these are: (*a*) Development of new resources; (*b*) progress in science and the arts; (*c*) improvements in transportation.

A QUANTITATIVE INDEX FOR THE METALS

The quantitative index numbers for the prices of metals in the United States that I have computed are based upon the approximate consumption of iron, copper, lead, zinc, tin and aluminum, and the annual average prices for those metals. For copper, lead and zinc, statistics of consumption are available for a long series of years. With respect to iron, tin and aluminum there have been no annual reports of stocks on hand to enable an estimate as to consumption and in the cases of iron and aluminum, the production is assumed to be the consumption; in the case of tin, the importation is regarded as the consumption. Such error as there may be in these assumptions is not likely to be of serious character.

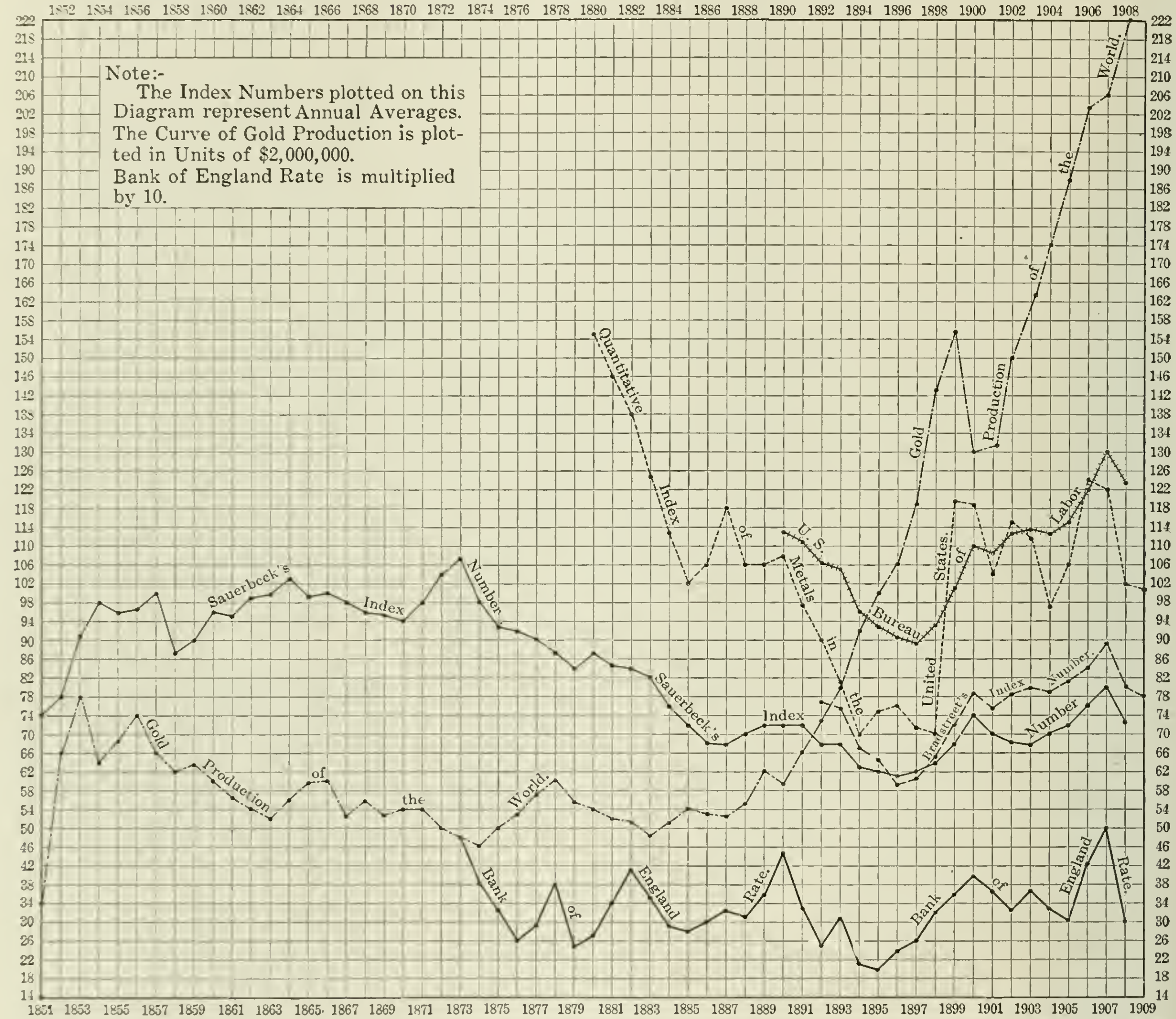
Using the sum of the value of the consumption of these metals as the dividend and the aggregate quantity as the divisor, the quotient is the average of all, or the index number, which for convenience, is expressed in terms of cents per 100 lb. The numbers thus computed are as follows:

Year.	Number.	Year.	Number.	Year.	Number.
1880	155	1890	109	1900	119
1881	145	1891	97	1901	104
1882	138	1892	90	1902	117
1883	124	1893	82	1903	113
1884	112	1894	70	1904	95
1885	102	1895	75	1905	107
1886	107	1896	76	1906	124
1887	118	1897	71	1907	121
1888	106	1898	70	1908	101
1889	106	1899	120	1909	101

The value of the consumption of these six metals in the United States rose from ± $150,000,000 in the '80s to a maximum of $726,000,000 in 1906. These immense figures represent the magnitude of one of the basic industries and may be accepted as a fair criterion of conditions in general business in so far as the United States is concerned.

Analysis of Charts

I have plotted these indices upon several diagrams. No. 1 shows the relation of three index numbers to the gold production of the world and the discount rate of the Bank of England. No. 2 shows the relation between the quantitative index of the metals in the United States and the quotational averages for the six metals that enter into the composition of the quantitative index. Upon this diagram the quantitative index is plotted in terms of dollars per 2000 lb. No. 3 shows the world's production of iron, copper, lead and zinc. No. 4 shows two well known index numbers, one British and one American, with a separate charting of certain of the components.



Note:-
The Index Numbers plotted on this Diagram represent Annual Averages.
The Curve of Gold Production is plotted in Units of $2,000,000.
Bank of England Rate is multiplied by 10.

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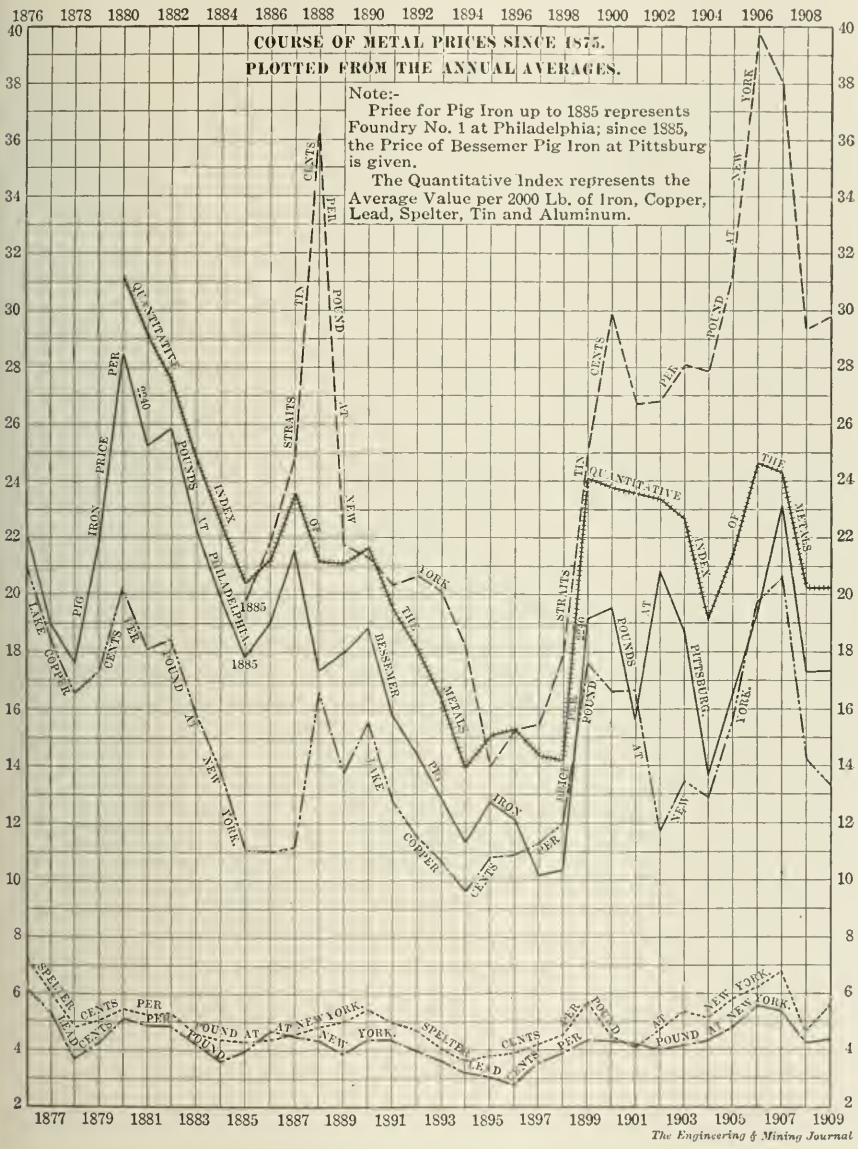
I. Production of Gold and Commodity Prices

Looking at the diagrams, several things immediately become apparent, among which are the following: The world's gold production started its ascent in 1883, while commodities which had been descending since 1873 continued on the downward course with only two or three interruptions until 1896. By that time the gold production had attained a high point. Since 1896 both gold-production and commodity prices have risen, the former in the greater ratio. But although commodities attained a high point in 1900 and have since continued at a high range, the latter has at no time exceeded what prevailed previous to 1882. I am now referring to Sauerbeck's figures. The others develop in different ways, but not materially different. Still referring to Sauerbeck's figures it appears that the rise in foodstuffs since 1896 has been less than the general average. On the other hand, the rise in minerals has been more than the average. The cost of foodstuffs has not risen to an extent that of itself would attract great attention, but the rise in minerals has been startling. An examination of the figures of the Bureau of Labor discloses a similar occurrence. The index of "metals and implements" since 1896 has in general ranged higher than the index of all commodities, though not all the time, and has risen to higher peaks. The Bureau of Labor and Sauerbeck's curves exhibit sufficient parallelism to lead to the conclusion that the causes for their upward trend have affected America and Europe to substantially the same degree.



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II. Course of Metal Prices

Even a Quantitative Index Is not Absolute

I shall now direct attention to my own quantitative index of the metals in the United States as showing most accurately the cost of the consumption of this class of commodities—a highly important class, accounting for approximately $700,000,000 per annum in recent years. The curve plotted from these figures shows a general decline from 1880 to 1898. In 1899 there was a remarkable ascent, the high level being maintained in 1900, followed by a sharp decline in 1901, a sharp ascent in 1902, a slow decline to 1905, again a sharp rise in 1906, a small decline in 1907 and a great decline in 1908.

I must pause here to point out inaccuracies which cannot be avoided even in a quantitative index number, owing to the following causes: (1) It is impossible to obtain precise statistics of consumption. The figures that are assumed to represent it are approximations of varying degrees of accuracy. In general they are probably fairly correct, but in certain years of industrial confusion they are likely to be less correct. (2) The aggregate values for each year are computed with the quotational averages for each metal. These agree closely, in general, with the quantitative averages in so far as I have tested them in the cases of copper, lead and spelter; but in 1907 they were materially higher, owing to the peculiar conditions of that year. Consequently the index number for that year should exhibit a sharper decline than it does. I have gone into this explanation in order to make it clear that the index numbers should not be used for too minute deductions, although in a broad consideration they are undoubtedly indicative.

The Rise in 1899

Returning to the analysis, it is evident that the remarkable rise in the prices for metals in 1899, as manifested by all the indexes, must have been due to some sharply operating factor. Indeed, we know that it was coincident with the outburst of industrial activity which occurred at that time in America and to a less extent in Europe, and with recessions and rallies has continued ever since. During this period the rate of interest has fluctuated substantially with the indices, as indeed it generally does, which is not to be reconciled easily with the theory of depreciation of money because of increase in the quantity of gold. Moreover, the quantitative index of metal prices in the United States does not show since 1899 a range that is greatly in excess of what prevailed previous to 1891 when the industrial depression of the '90s began. The course of metal markets since 1899 is capable of adequate explanation without recourse to the hypothesis of depreciation of gold.

Increasing Gold Production

If increasing gold production had led to depreciation in the value of gold we should expect to see a substantially uniform appreciation in the indices of all classes of commodities, but such has not been the case. An oversupply of money would also tend toward a declining tendency in the rate of discount, which has not happened. But I do not say that the increase in gold production has not been without effect. Serving as a basis for greatly extended credit it may have stimulated the industrial development of the world in the recent period, giving rise to the increased demand which primarily elevated prices, and similarly the greater financial facilities probably assisted in maintaining prices during the depression following the crisis of 1907. An examination of the statistics of the production of all the important metals shows that the ratio of increase in gold has been less than that of iron, copper, lead, tin and zinc.

Exhaustion of Natural Resources

Exhaustion of natural resources is no doubt to a large extent accountable for rising prices. Thus it has gradually become necessary to go further afield for many things. Lumber, rubber and the skins of animals are noteworthy examples. In some cases former supplies have been totally exhausted, e.g., buffalo hides, and substitutes must now be used.

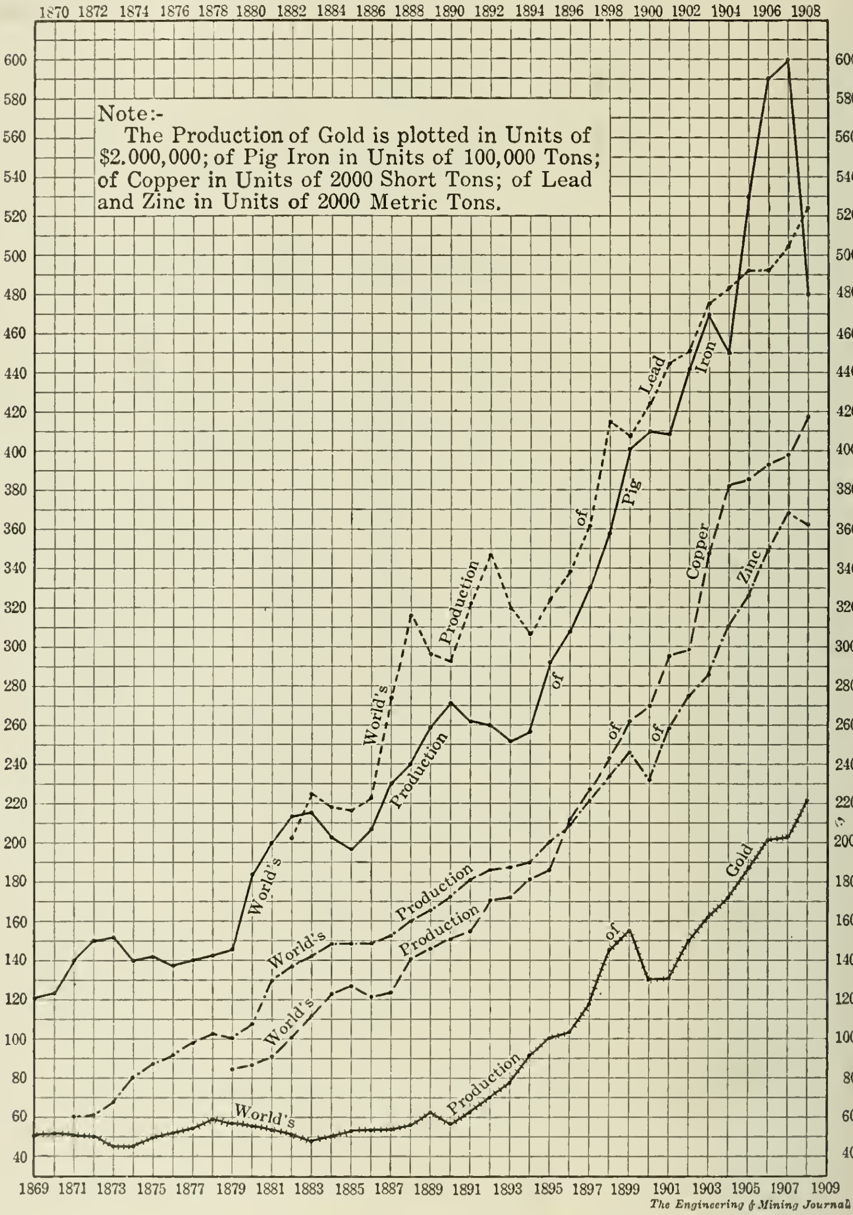
An equivalent to the necessity of bringing things from greater distance is the compulsory resource to poorer or more difficultly obtainable supplies. Thus the metals are nowadays obtained generally from lower grades of ore than formerly. In Europe the coal seams near the surface have been to a large extent exhausted and it is now necessary to mine at great depth. This is one reason why coal is more costly in Europe than in the United States. Leaving aside the increased mining costs attendant upon the exploitation of thin and otherwise unfavorable seams, a great outlay of capital is required to open a colliery and competition is thereby restricted by a perfectly natural cause. The destructive competition among the producers of bituminous coal in the United States results from the existence of extensive seams, near the surface, which can be attacked at many places and at comparatively small initial outlay. Consequently it is to be observed that the price for bituminous coal in the United States has risen but little. The early exhaustion of some of our existing resources is clearly foreseen. Thus the phosphate deposits of South Carolina, Florida and Tennessee, and the nitrate deposits of Chile. Rising prices for phosphate rock are so fully anticipated that investments in such resources are being made by some far-seeing persons for precisely this reason.

The tendency toward rising prices because of exhaustion of resources is checked by factors *A*, *B* and *C*. Thus we formerly obtained our lead supply from Wisconsin. We have since had to go as far away as Idaho, but the greatly increased distance and the recourse to poorer ores has been fully offset by these three factors. The iron industry offers the most noteworthy example. Also copper of which a large part of the supply is now obtained from ores that only 10 years ago were valueless. We can even now anticipate the development of new resources. Thus, long before the niter deposits of Chile are exhausted the world will undoubtedly be obtaining a large part of its nitrogen requirements from the atmosphere.

Exhaustion of resources is consequently a factor in creating higher prices, but very far from being of universal operation.

STANDARD OF LIVING—EXTRAVAGANCE

There can be no question about the improvement in comfort in which the world lives, not only the well-to-do classes, but also the mass of the population. The greater demand for commodities may in a given period outrun the supply and thereby lead to rising prices. It seems to be highly probable that this has happened during the last 10 years. The people have made more money and have wanted more things. Extravagance in living is a natural consequence of the increase in the standard, from which it differs only in degree. We cannot draw sharply the line between comfort and pleasure, but a few steps either way leaves no question as to the distinction. The world has undoubtedly been experiencing lately an era of extravagance, and equally without doubt this has been of very serious economic results. Consider for example the automobile mania, which for pleasure chiefly consumes hundreds of millions of dollars annually as truly as if it were dissipated in the smoke and ashes of a great conflagration. The labor of hundreds of thousands of men ministers to this pleasure which otherwise would be employed in the production of necessaries. Extravagance is not merely a personal matter. It is also municipal and national, and generally all of these interests are guilty of it at the same time, as at present.



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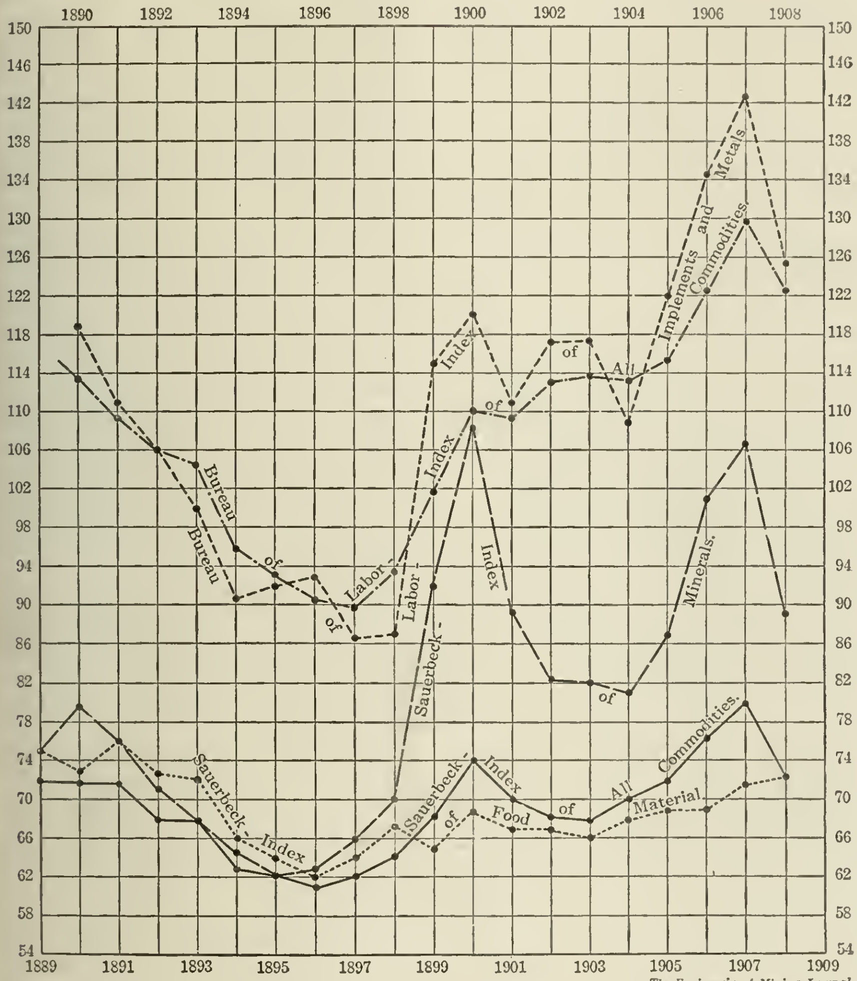
III. WORLD'S PRODUCTION OF METALS

TRUSTS AND MONOPOLIES

Monopolization of necessities, whole or partial, has also been a factor in raising prices. The ascent in the late '90s was coincident not only with the outburst of industry, but also with the promotion mania and the inauguration of schemes for the control of price. The last was not confined to the United States, but developed in Europe where we have had cartels, conventions and syndicates which have been more open in their purpose than have our trusts. Consequently, we have in this another factor of international effect.

Limiting our attention to America, it is necessary to note only a few of the corporations that have deliberately attempted to control prices and have succeeded to a more or less extent. The Amalgamated Copper Company undertook to raise the price of copper in 1900-

01. The American Smelting and Refining Company has steadily exercised dominion in the lead market, save when it temporarily lost its grip in 1907-8, and has doubtless commanded more for that product than otherwise would have ruled. The United States Steel Corporation has kept the price of steel rails pegged at $28 per ton for many years and its policy in other products up to the spring of 1909 is of recent memory. Although the Government has not been able to prove its existence, nearly everyone is convinced of the understanding among the anthracite producers and that they fix prices, which generally trend upward.



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IV. Dissection of Index Numbers

A complete monopoly of a necessity, such as exists in anthracite, can annul the operation of the natural law of supply and demand, because it can make the supply whatever it pleases. In the other cases the great corporations do not possess perfect monopolies and the natural law still governs, although it may be temporarily impeded, as many of the corporations have learned. Nevertheless, it is certain that their exactions have made the prices of many commodities higher than they would normally have been, but it is impossible to measure the amount.

Protective Tariffs

Protective tariffs are, of course, the breeder of monopolies, inasmuch as they protect the latter by warding off foreign competition. They also enable favored producers in a country to exploit lean or remote resources under the stimulus of artificial prices which the consumers are required to pay.

The fact that the tariff is exacted in order to make or keep prices high is sufficient evidence that it has that effect. However, there has been no material increase in the duties since 1897 and we may therefore dismiss the tariff as a factor in the recent rise in prices, except in a few cases wherein domestic demand may have outrun the supply and importations have been prevented, e.g., timber, dairy products, etc.

The general upward trend of prices, having been experienced both in Europe and America, cannot be ascribed to our tariff.

Demands of Labor

By the generally accepted tenets, labor is the residual claimant upon the product of industry, i.e., wages are what remains after rent, interest and profits have been deducted. The price of the product being established fundamentally by demand and supply, the cost of labor should not theoretically play any part. The rise in wages that has occurred during recent years is in the main a consequence rather than a cause of increasing commodity prices. Nevertheless, it is clear that the demands of labor may be to some extent contributory to the increased cost of living if not to commodity prices. Thus, in those cities where unionism prevails, the cost of building has been distinctly raised. In many industries the accession to demands for increased wages is followed immediately by an advance in price for the manufacture, especially when the latter be a necessity in decent living. In general production, however, the demands of labor for higher wages when commodity prices are high are its claim to the residual, which claim becomes effectual through the increased need for labor. Wages being thus regulated by demand and supply, a scarcity of labor may interfere with the supply of a commodity and therefore influence its price. The same thing may result from inefficiency of labor, which tends to increase with increased wages. It is probable that the exactions of labor unions have had some effect upon prices, but that is an effect which it is difficult to trace. Whatever be the effect, however, it is analogous to those of monopolies and extravagance, for a combination of labor is as truly a trust as is a combination of capital, and wastefulness in production is economically as bad as wastefulness in consumption.

The Supply of Food Stuff

Among the causes that had been assigned for the recent rise in the general index numbers is lagging agricultural development, based upon the idea that the supply of food stuffs has not increased in the same ratio as the population of the world. This idea is not confirmed by some important statistics. In 1898-1901 the world's production of corn, wheat, oats, barley and rye aggregated about 11,000,000,000 bu. in each of those years. In 1904-7, the aggregate was about 13,000,000,000 bu. per annum. Here is an increase of about 20 per cent. in the decade. Data as to the world's population and increase in demand are lacking, but the gentle rise in the index numbers for these fundamental foodstuffs does not manifest any alarming or extraordinary shortage.

On the other hand it is easy to account for the greatly enhanced value of cotton, rubber and lumber by deficiency in the supply arising from well understood causes. The prices for the chief metals have lately declined because the supply is so abundant. We do not need any theory of gold depreciation to account for these perfectly obvious occurrences, and such a theory cannot very well explain the opposite trends for various staple commodities that are observable. Analysis of the conditions of metal prices should make this clear.

Statements of Nevada Consolidated and Affiliated Companies

In connection with the recent application of Utah Copper for the listing of additional stock on the New York Stock Exchange, the accompanying statements of Nevada Consolidated and subsidiary companies were submitted.

NEVADA CONSOLIDATED COPPER COMPANY.

BALANCE SHEET, DEC. 31, 1909.

Assets.

Property	$4,250,421
Investments:	
10,000 shares Nevada Nor. stock	$1,000,000
First-mortgage bonds Nev. Nor., par	500,000
42,000 shares Steptoe Valley stock	4,200,000
1,255,898 shares Cumberland Ely stock, at cost	1,934,910
Total investments	$7,634,910
Metals on hand	$2,550,025
Less cost of refining and delivery in New York	405,967
Net metals on hand	$2,144,058
Material on hand	101,231
Accounts collectible	383,319
Cash	198,354
*Deferred charges to operation	840,799
Total	$15,553,092

*This item includes expenditures for removal of waste or capping overlying the ore, and will be gradually extinguished.

Liabilities.

Capital stock, 2,000,000 shares at $5	$10,000,000
Less held for conversion of bonds, 5,000 shares	$25,000
Held for acquiring Cumberland Ely stock, 13,018 shares	65,090
Balance issued, 1,981,982 shares, at $5	$9,909,910
First-mortgage convertible bonds	50,000
Accounts payable	493,897
Capital surplus	3,048,479
Profit and loss	2,050,806
Total	$15,553,092

CUMBERLAND ELY COPPER COMPANY.

PROFIT AND LOSS.

Earnings Dec. 1, 1908, to Nov. 30, 1909	$742,557
Less interest on loans	25,677
	$716,880
Earnings Dec. 1, 1909, to Dec. 31, 1909	28,216
Balance in account Dec. 1, 1908	312,421
Total	$1,057,520

BALANCE SHEET, DEC. 31, 1909.

Assets.

Property	$4,700,860
Investments:	
10,000 shares Nevada Nor capital stock	$1,000,000
Nevada Nor bonds, par	500,000
32,000 shares Steptoe Valley stock	3,200,000
Total investments	$4,700,000
Metals on hand	$337,702
Less cost of refining and delivery in New York	54,859
Net metals on hand	$282,852
Material on hand	81,586
Accounts collectible	481,789
Cash on hand	12,903
Total	$10,265,990

Liabilities.

Capital stock	$6,500,000
Capital surplus	2,641,122
Accounts payable	67,348
Profit and loss	1,057,520
Total	$10,265,990

STEPTOE VALLEY SMELTING AND MINING COMPANY.

PROFIT AND LOSS.

Earnings Oct. 1 to Dec. 31, 1909	$194,661
Deduct depreciation	36,987
	$157,674
Less dividends paid	157,674

BALANCE SHEET, DEC. 31, 1909.

Assets.

Property	$7,817,801
Investments	25,000
Material on hand	370,672
Accounts collectible	56,398
Cash	56,143
Total	$8,326,014

Liabilities.

Capital stock, 74,000 shares	$7,400,000
Depreciation reserve	137,554
Accounts payable	788,460
Total	$8,326,014

NEVADA NORTHERN RAILWAY COMPANY.

SURPLUS ACCOUNT.

Net operating earnings July 1 to Dec. 31, 1909	$446,850
Add interest collected	792
	$447,642
Appropriations:	
New construction and equipment	$79,375
Bond interest accrued	25,000
Sinking fund accrued	25,000
Deduct appropriations	$129,375
Surplus	$318,267
Add balance July 1, 1909	238,823
	$557,090
Deduct dividends, Dec. 15	400,000
Balance in account Dec. 31, 1909.	$157,090

BALANCE SHEET, DEC. 31, 1909.

Assets.

Property and equipment	$2,811,305
Working assets:	
Material and supplies	$39,449
Cash	110,213
Accounts collectible	169,470
Total working assets	$319,132
Cash and securities in sinking fund	103,606
*Discount on securities issued	1,000,000
Total	$4,234,043

Liabilities.

Capital stock	$2,000,000
First-mortgage bonds	1,000,000
Accounts payable	120,713
Accrued liabilities not due	41,328
Equipment depreciation reserve	58,952
Appropriated surplus:	
Mortgage-bond sinking fund	$103,606
Additions to property	752,353
Total appropriated surplus	$855,959
Free surplus account	157,091
Total	$4,234,043

*The item "discount on securities issued" will be ultimately extinguished by credits from earnings or further additions to property.

Mineral Production of Tasmania in 1909

The Mines Department of Tasmania reports the total value of the mineral production of the State in 1909 at $7,664,976. The production of metals was 44,777 oz. gold, including that contained in copper and silver, and 8638 tons blister copper. Metallic ores reported, the metal contents of which are not given, were 80,378 tons of silver-lead ore; 1588 tons copper ore; 4511 tons tin ore; 28 tons of tungsten ore; 3 tons of bismuth ore. The coal production was 66,162 tons.

United States Smelting, Refining and Mining Company

The United States Smelting, Refining and Mining Company earned $3,136,360 net in 1909, paid 7 per cent. on its preferred stock and 4 per cent on its common, and carried forward an undivided surplus of $1,715,230 on the balance sheet. The metals produced, including custom ores, were: Copper, 36,672,606 lb., sold at 13c. per lb.; lead, 41,627,995 lb. at 4.29c.; silver, 9,637,119 oz., at 51.969c. per oz.; gold, 128,393 oz. The report states that the corps of field engineers, now under the direction of Sidney J. Jennings, has been enlarged and is actively searching for new mining ventures for the company. During 1909 the company acquired a smeltery at Needles, Cal., and some mining property near Kingman, Ariz.

Frederick Lyon, in charge of operation, gives the following data regarding the properties of the company: There is sufficient tonnage in sight at the Bingham, Utah, mines to insure regular shipments on the present scale for a number of years, and on this account but little development was done. However, as much available ore was added to the reserves as was extracted. Shipments to the Midvale smeltery amounted to 79,676 tons. The installation at the concentrator of the Huff electrostatic process for recovering zinc proved successful.

The Centennial-Eureka shipped 109,430 tons, sank its shaft to 2200 ft., and drove a 2160-ft. tunnel connecting with the shaft at the 500-ft. level. A little development was done on the Bullion Beck & Champion.

The Midvale smeltery operated its lead furnaces at practically full capacity during most of the year. The baghouse for the treatment of the gases from the lead smeltery was such a success that the same device will be installed for the copper smeltery.

The Mammoth Copper Mining Company, Kennett, Cal., produced 401,244 tons of ore and the smeltery treated 575,600 tons of charge. Development is stated to have maintained the ore reserves unchanged. A baghouse similar to that in Utah is under construction and should be ready at an early date.

The small smeltery at Needles, Cal., and several small mines near Kingman, Ariz., bought during the year from the Arizona-Mexican Mining and Smelting Company, are being equipped and developed. It is expected to blow in the smeltery soon, and the company is also building a 200-ton concentrator at Needles. It is the intention to build up a custom smelting business at this point. The Real del Monte and Pachuca mines in Mexico extracted 213,630 tons of milling ore and 1579 tons of shipping ore, and maintained their ore reserves.

Recent Advances in the Electrometallurgy of Zinc

Metal Losses May be Reduced; Less Labor; Cheap Power a Necessity; Reduction of Blende with Iron Requires High Temperature. Use of Carbon

BY FRANZ PETERS*

As an argument in favor of the production of zinc in the electric induction furnace, Gin has pointed out that the heat is transmitted directly to the charge, without having to pass through intervening furnace walls. The scope of the distilling plant is limited only by the capacity of the electric furnace. The wear and tear of fireproof material is reduced. There is less manual labor than with muffle furnaces. The loss of metal, from incomplete reduction, cracking of retorts, reoxidation and incomplete condensation, is greatly diminished.

ELECTRIC SMELTING REQUIRES CHEAP POWER

W. McA. Johnson,[1] sees no advantage in the induction furnace. If water power is available at $12.50 to $21 per h.p.-year, the capital invested, per ton of ore produced, would be but small, especially as the productive capacity, per unit of space occupied, is high for electric furnaces. With continuous working the cost of labor would be low. The zinc would be obtained pure and more uniform than from small retorts. Ores which cannot be worked by the ordinary process, owing to their action on the vessels, can be utilized in the electric furnace. The recovery of the lead, copper and precious metals would be more complete than in the old process.

Another important factor is the high heat efficiency, which in the case of a 500-kw. furnace would certainly not fall below 85 per cent. Using gas engines to run the dynamos, 23 per cent. of the heat of the coal is rendered available, of which 85 per cent., or 19.5 per cent. in all, finally appears in the furnace. Compare this 19.5 with the figures of present-day practice: Four to 6 per cent. in America, and 8 to 10 per cent. in Belgium and Germany. Experiments conducted with a combination of the old retort process (in which the heat efficiency is fairly good in the initial stages) with the electric-furnace method (for the final stage), have given encouraging results.

Assuming a heat efficiency of 65 per cent. for the electric furnace, Gin has calculated the energy required for working up one ton of ore. His results are as follows: For an 80 per cent. zinc oxide, 1975 kw.-hours; for roasted calamine containing 50 per cent. Zn, 1780; for blende with 52 per cent. Zn, 1900, and for 26 per cent. Broken Hill ore, 1250.

The power consumption in kilowatt-hours per ton of ore is roughly 650 + five times the percentage of zinc. According to Richards[4], however, this is on condition that the gases issue at a temperature not above 500 deg. C.; that the zinc can be tapped liquid from the furnace; that there is not too much loss of heat through the cooling water, and finally that the latent heat of condensation of the zinc vapor is for the most part returned to the hearth by the settling charge. The furnace would then be working with 88 per cent. current efficiency. Of the energy supplied to the furnace about three-quarters is utilized for the chemical reactions. Of the remaining fourth, one-half passes out with the furnace products, and the other half is lost by radiation, conduction, and in the cooling water. Richards has also independently calculated the electric energy required for working up one ton of ore, and arrives at the figure of 1530 kw.-hours for an ore containing 40.5 per cent. zinc oxide, and 38 per cent. zinc silicate, provided that the vapors issue from the furnace at a temperature of 1033 to 1200 deg. C. A plant with ten 100-h.p. electric furnaces, assuming that water power is used, ought to handle 28,000 tons of calcined calamine with 50 per cent. zinc, or 24,000 tons of blende, with 52 per cent. zinc.

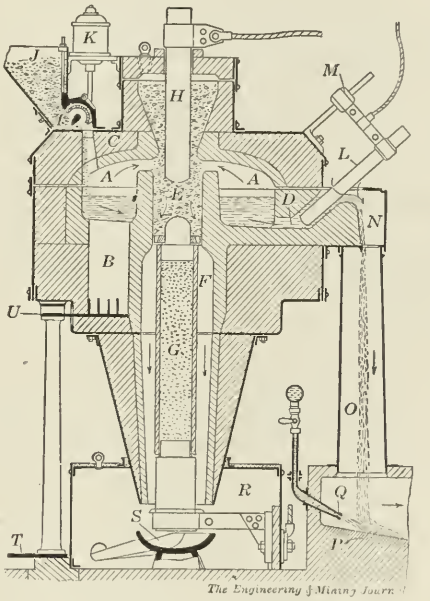

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FIG. 1. ELECTRIC FURNACE OF COTE AND PIERRON

Ingalls[5] states that as yet it has not been demonstrated that it is possible to produce spelter continuously on a commercial scale in electric furnaces, and further that assuming that purely metallurgical difficulties can be surmounted, electric smelting is economically unwarranted unless power be available at approximately $12 per horsepower-year.

REDUCTION OF BLENDE WITH IRON

The methods for reducing blende by means of iron have not hitherto found application in practice. This is partly because they necessitate the use of a much higher temperature. It is out of the question to carry out the process in retorts, owing to the low heat efficiency of external heating and the heavy wear and tear on the retort walls at such high temperatures. This difficulty may be overcome by the use of the electric furnace. According to Cote & Pierron[6] the cost of the electric heating is equal to that of the coal heating in the coal reduction process if the price of the kilowatt-year is not over $18, and that of the coal is $2 per ton.

Gin[7] proposes to prepare zinc in the induction furnace either by the chemical action of iron upon the blende or with the aid of the heat given out by the iron.[8] For this purpose he uses a furnace in which the circulation of the charge is brought about by unequal heating. The furnace is incased in sheet iron tamped with calcined dolomite and pitch. The roof is made of calcined-magnesia bricks. When the iron bath has reached the proper temperature, a charge of zinc and coal, or of blende, lime and coal, is introduced and the working door is quickly closed and luted. The temperature rises rapidly, and in a short time zinc vapor and carbon monoxide begin to pass out to the condensing chambers, in which the mean temperature is normally 500 degrees.

When using a mixture of sulphides to which lime and coal have been added, air is admitted into the furnace after tapping off the zinc, so that the calcium sulphide is superficially converted into sulphate and the liquid slag is drawn off. The sulphates and oxides of lead and zinc then react in the condensing chambers

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NOTE—Abridged translation from *Glückauf*, Sept. 25, 1909.

[1] *Trans.* Am. Electrochem. Soc., 1907 (12), p. 137.

[4] *Electrochem. Met. Ind.*, 1908 (6), p. 196.

[5] Report of Canadian Zinc Commission, 1906.

[6] British patent No. 22,283 of 1907.

[7] German patent. 208,085.

[8] *Trans.* Amer. Electrochem. Soc., 1907, p. 120.

with formation of a little lead, which takes up the silver, and of a mixture of sulphides and oxides with a small proportion of basic zinc sulphate. The oxide products are reduced after adding lime and coal.

REGULATING THE CONDENSER TEMPERATURE

The furnace of E. F. Cote and P. R. Pierron comprises as a special feature an electrical heating device, by means of which the temperature of the condenser can be regulated at will. This precaution is of particular importance in connection with an electric furnace, since on the one hand the temperature limits between which liquid metal can be condensed are comparatively narrow (430 to 560 deg. C.), while on the other hand the radiation from the furnace cannot be relied upon to the same extent as in the ordinary furnace for the regulation of the temperature of condensation; moreover, when oxidized material is used, the carbon monoxide does not give sufficient heat, and when blende and iron are used the heating effect of the zinc vapors does not extend far enough.

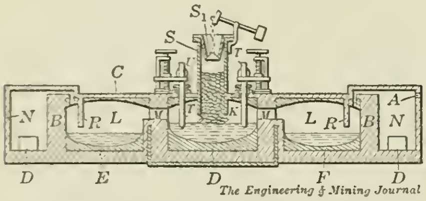

FIG. 2. ELECTRIC FURNACE OF STANFIELD AND REYNOLDS

If the furnace walls become incrusted in the course of the process, it is usually sufficient to cause an arc to play for a short time by lifting one or both of the electrodes. If this is not enough, the charging is stopped, the portion of the charge in the furnace is worked off, the furnace is cleared and quickly raked out. In normal working the charging is interrupted a few minutes before tapping off the slag.

If it is desired to manufacture zinc white the temperature in the condenser is raised to 600 deg. so that practically no precipitation takes place therein. If the raw material consists of imperfectly calcined calamine, or blende containing calcareous gangue and water, the zinc vapor is oxidized by the carbon dioxide and moisture. In order to prevent this or to cause the re-formation of zinc, the vapors issuing from the furnace are passed through a column of coke at bright-red heat.

RESISTANCE FURNACE

The furnace[9] represented in Fig. 1 is designed exclusively for blende, and is operated as a resistance furnace only, since the arc would cause the volatilization of iron, silica and sulphide along with the zinc. The annular crucible *A* is fed with three-phase current. The three carbon electrodes are symmetrically distributed around the circumference, one of them *B* being shown vertically under the charging aperture. Diametrically opposite is the tap hole *D*, the crucible bottom sloping slightly toward that side. The zinc vapors pass through the red-hot column of coke *E* and the condenser *F* in the direction of the arrows. Axially placed within the condenser is a column of coke or graphite powder *G* packed rather more firmly at the top than at the bottom, and receiving current through electrodes above and below. The current leaves the furnace by electrode *H* placed axially in the closed feed hopper. This latter contains sufficient coal for several days' run, the material settling down gradually in proportion with the very slow combustion. The resistances *E*, *G*, *H* form part of a transformer circuit so that the current *F* fed to them can be regulated as regards intensity and tension. The charging is continuous.

The columns are insulated from the floor and from the furnace casing. Three-phase current is used, inasmuch as the molten material between every two electrodes has approximately the same resistance, so that there is no displacement of phase. Of course direct current may also be used in conjunction with an even number of electrodes. In most cases the zinc condensed contains considerable impurities. It is then advisable to provide an electrically heated refiner next to the condenser.[10]

REMOVING THE IMPURITIES

If the heating is continued long enough the impurities of the zinc rise to the surface, mix with the coal ash falling down from the grate and flow over into a closed space surrounding the trough. From here they are withdrawn from time to time. The temperature of the bath may be regulated by varying its depth, independently of the regulation of the temperature in the condenser.

According to E. Fleuerville,[11] the Cote & Pierron process was first tried in the year 1906 at Lyon with a 100-h.p. furnace. As these experiments were crowned with success the large-scale exploitation of the process was undertaken by the Société des Fonderies Electriques. This company has been using the method since May, 1907, at a works in the Pyrenees in which 300 kw. are fed to the electrodes. At present they produce only zinc oxide of 98.6 to 99 per cent. quality, which is equal to the X X product prepared by the Belgian method.

Using ores containing iron, W. McA. Johnson[12] reduces first the iron and then the zinc, the latter being then distilled off, using the iron as resistance. The ore containing, for example, 40 per cent. zinc, 20 per cent. iron, 30 per cent. sulphur, and small quantities of copper sulphide, lead sulphide and precious metals, is roasted at 850 to 900 deg. C. The sulphur need be reduced to 3 per cent. only, so that a concentrated sulphur dioxide gas is obtained. The residue which contains the greater part of the zinc and iron in the form of oxides is heated with 35 per cent. of carbon to 850 to 950 deg. C. Spongy iron is formed while the zinc oxide remains unreduced. If the heating is then continued, using the iron sponge as resistance in the electric furnace, and driving the temperature to at least 1000 to 1150 deg. C., the zinc oxide is reduced and the iron acts upon any unconverted blende, so that zinc distils off while the matte remains behind.

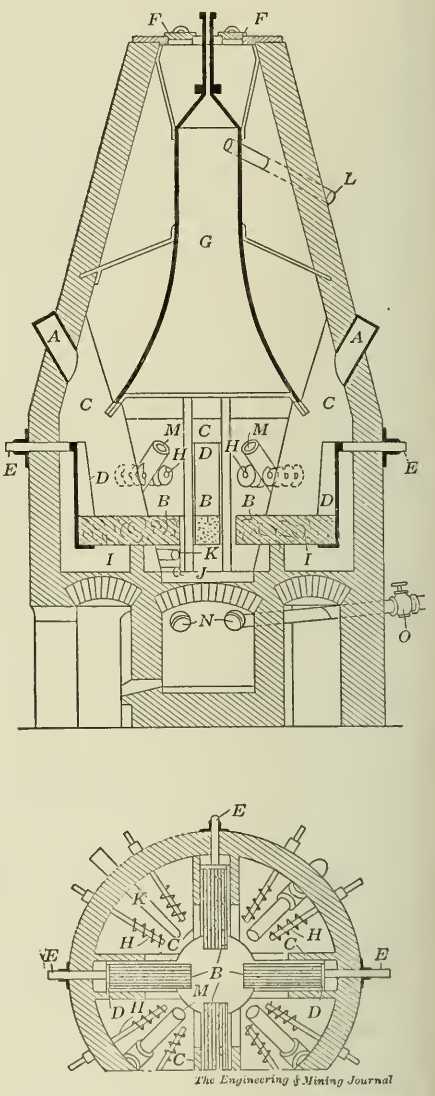

FIG. 3. TAYLOR'S ELECTRIC FURNACE

According to a process worked out by A. Stansfield and L. Bowldby Reynolds,[13] the lead is obtained liquid and the zinc in the form of vapor. The oxidized or roasted ore is introduced together with coal into a bath of slag or other suitable materials kept molten by electric resistance heating. The furnace, which is shown in Fig. 2, consists of a reaction chamber *K* upon the bottom of which the lead collects. From this chamber ports *M* lead it to lateral condensing chambers *L*. At the further end these condensing chambers communicate with dust chambers *N*.

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[9] English patent No. 22,283, Oct. 9, 1907; German patent No. 200,148.

[10] German patent No. 206,311, May 19, 1908.

[11] *Houille Blanche*, 1908, Vol. 7, p. 273.

[12] U. S. patent No. 868,345.

[13] German patent No. 183,470, 1905.

The electrodes *T* are inserted through stuffing boxes *V* on either side of the feed shafts. The lead and the slag are tapped off at opposite ends of the melting chamber, while the zinc is drawn off in the condensing chambers *L*, and zinc oxide is withdrawn through door *D*. The carbon monoxide escapes by *A*.

THE USE OF POWDERED CARBON

E. R. Taylor[11] recommends heating the zinc furnace with finely powdered retort carbon or coke. The materials are fed in through pipes *A*, Fig. 3, filling both the space between the extremities of the four electrodes *B* and also between these and the walls *C*, which nearly inclose the same. Conductors *D* and *E* serve to establish connection with the source of current. The charge is introduced at *F*, drops down along the walls of the bell *G*, and is conveyed to the reaction zone by the screws *H* and *I*. Slag and nonvolatile reduction products collecting beneath the electrodes are withdrawn through nozzles *J* and *K*. Gases and vapors collect under the bell *G* and thence escape from the furnace through two vents which may be partially closed by dampers. One of these vents serves essentially for the escape of the gases through pipe *L* to the exterior. The heavier constituents, such as the zinc vapors, pass by preference through the second and enter the condenser through pipes *M* and *N*. From the condenser a pipe *O* leads to the exterior.

CONDENSATION UNDER PRESSURE

It has been proposed[15] to collect volatile metals such as zinc under pressure. In the case of shaft furnaces with the ordinary methods of heating the metal vapor is so strongly diluted with indifferent gases that the metal is precipitated in the form of dust. A certain amount of overheating, such as takes place near the electrodes with electrical heating, is here unavoidable. But also when working with closed vessel a portion of the zinc volatilizes when molten iron is introduced into metallic sulphides. Moreover a highly heated vessel is ill adapted to resist pressure. These disadvantages are avoided by working with an induction furnace, according to L. Gruter[16]. The furnace is contained within a tightly closed envelop. The cover is first of all removed and a small amount of liquid zinc and preheated mixture of zinc ore and coal is introduced into the trough of the transformer furnace, and this trough is then covered with insulating material so as to retain radiant heat. The charging aperture is then closed and the interior of the furnace is filled with a compressed, indifferent gas such as carbon monoxide. The current is then switched on. The furnace container may be made of iron. This arrangement can also be used for melting down powdered metals. Working under pressure has also been proposed by A. R. Bruna[17], who heats the ore by coal firing. If the raw material is blende, carbon bisulphide is obtained as a by-product and can be utilized as fuel, with recovery of the sulphur.

In electric melting furnaces, crucibles and muffles heated by means of finely granular resistance material, the fireclay walls become conducting at high temperatures, and are consequently subject to excessive wear. To prevent this the Kryptolgesellschaft divides up the resistance material into segments by means of a number of auxiliary electrodes of more highly conducting material, and introduces the current at a large number of points.

Report of Tonopah Mining Company

The net earnings of the Tonopah Mining Company, Tonopah, Nev., including the Desert Power and Mill Company, in the fiscal year ended Feb. 28, 1910, were $1,639,602 out of which four regular and extra dividends of 25 and 10 per cent. each were paid. Tonopah Mining has an increased capitalization of $1,000,000 and the Desert Power and Mill Company $801,000, all of which is held by the Tonopah Mining Company. During the year the bonded indebtedness of the milling company to the mining company was entirely discharged. The total surplus is given as $4,967,919 at the end of the year.

THE MINE

During the year 231,986 wet tons of ore and waste were hoisted from the Mizpah, Silver Top and Red Plume shafts, of which 166,078 dry tons of ore of an average value of $20.93 per ton were shipped to the mill at Millers. The average mining cost was $4.172 per dry ton of ore shipped to the mill and $2.987 per dry ton of ore and waste hoisted. The total cost per dry ton of ore shipped, including all development work, was $4.55 per ton. The total costs, including extraordinary development were reduced 23.1c. in spite of the fact that there were 159 ft. more of shaft sinking and 1104 ft. more of core drilling done than during the previous year.

The total development during the year was as follows: Drifts, 10,589 ft.; crosscuts, 5905; winzes and raises, 3840; shaft sinking, 542; core drilling, 1996 ft. Deep development was carried on by sinking the Mizpah shaft to a depth of 1517 ft. and has been all in lower rhyolite below the 900-ft. level. A drill hole was driven vertically 653 ft. below the 1500-ft. level, near the Mizpah shaft in the lower rhyolite. Another drill hole was run horizontally from the same point to the south 544 ft. in the lower rhyolite. A third drill hole was put down vertically from near the Silver Top shaft on the 740-ft. level ending 1393 ft. below that level, also in the lower rhyolite. The results of deep development in the Mizpah shaft so far have been negative. This work will be continued during the coming year.

Later development in the earlier andesite and to a less extent in the upper rhyolite resulted in opening new ore in all parts of the mine, the most valuable being the Red Plume vein and a parallel vein to the north, the Mizpah fault vein and new veins in the Silver Top shaft workings. Lateral development will be pursued from the Sand Grass shaft as soon as the earlier andesite is encountered. The ore reserves are estimated at 414,583 tons of a gross value of $21.93 per ton, a total of $9,094,847 and an increase in value over last year's reserve of $1,131,000, and an increase in tonnage of 47,535 tons.

THE MILL

But few changes in equipment affecting the method of ore treatment at the Desert mill were found necessary during the year. Some minor changes were of course made without interrupting operation of the plant. Great improvements in operating results were made during the year and the management predicts further improvements during 1910.

There were milled and treated 166,174 dry tons of ore averaging 0.313 oz. gold and 28.05 oz. of silver per ton, with a total metal content of 52,023 oz. of gold and 4,658,296 oz. of silver, from which there were recovered by concentration

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[14] U. S. patents Nos. 843,776 and 843,777.

[15] *Glückauf*, 1905, p. 1569.

[16] German patent No. 192,575.

[17] French patent No. 343,114.

and shipped to the smeltery 1335 dry tons of concentrates, averaging 5.033 oz. of gold and 736.535 oz. of silver per ton, a total of 6722 oz. of gold and 983,643 oz. of silver. The sand and slime treated by the cyanide process yielded 3,463,816 oz. of bullion containing 40,553 fine oz. of gold and 3,282,422 fine oz. of silver. Slag and refinery by-products shipped to the smeltery aggregated 88.32 tons containing 64.13 oz. of gold and 4003.76 oz. of silver. The recoveries made by the mill for the year were by concentration 12.9 per cent. of the gold and 21.1 per cent. of the silver contents of the ore, and by cyanidation 78.1 per cent. of the gold and 70.6 per cent. of the silver contents of the ore, or a combined extraction of 91.7 per cent., as compared with 90.3 per cent. for the preceding year.

The direct milling cost per ton for the previous year was $3.446, indirect cost $0.719, total milling cost per ton $4.165. The direct cost per ton for the year under review was $2.928, indirect $0.249, total $3.177; a decrease in the direct per ton cost of $0.518, indirect $0.470, total $0.988 per ton. The average cost to mine and mill the ore and market the products for the year was as follows, excluding extraordinary development work: Mining cost, $4.17 per ton; milling cost, $3.18 per ton; metal losses in milling, $1.78; freight on ore milled $0.60; marketing mill product, $078; total cost per ton, $10.51; average gross value of ore milled, $20.93; profit, $10.42 per ton.

Occurrence and Prospects of Oil in Mexico

BY E. ORDONEZ [*]

The statement made some time since that the oil lands of Mexico and the oil industry of that country must be controlled by but few owners, seems to have been true for a number of years. In fact, the right to the subsoil of the oil lands of the gulf coast of Mexico belongs to but few companies, each one controlling large areas of land. The responsibility for this situation must be found in our present ignorance concerning the real geological conditions which regulate the existence of oil in certain well known sections of the gulf coast.

A great part of the land now held will never yield oil, while other tracts will prove productive in unlooked-for places; and thus the oil-bearing districts may be scattered on the gulf coast and separated by extensive barren lands. Again, it is a fact that the homogeneity of the geological constitution of the coast lands from Tamaulipas to the Isthmus of Tehuantepec makes easy the expectation of finding oil in any place on the coast

This homogeneous formation along the gulf coast is a thick, impervious bedding of shale of Upper Cretaceous age The upper beds are sandstone intercalated with shale, the former containing thin seams of coal and plant remains which have been more or less carbonized. This stratified material is about 4000 ft. thick and is almost horizontal, with slight undulations. Only small blocks are tilted out of place.

Volcanic Theory of Oil Accumulation

A short time since, the anticlinal theory was used to explain the existence of all the oilfields in Mexico. Since the first discovery of oil in commercial quantities, about six years ago, I have always contended that the heavy and asphaltic oil generally found in Mexico has been accumulated in some porous seams or pockets of great dimensions, which spaces were first opened during recent volcanic disturbances. These volcanic disturbances were mostly of the explosive type. The volcanic phenomena were relatively weak and may be said to have drilled the land upward, opening narrow pipes around which the most productive wells have been found.

The viscous oil is mixed with volcanic sand and small, sharp scales of shale, as though the oil impregnated the zone of friction between the lava core filling of the chimney and the surrounding shale, which is practically undisturbed. To my mind, this phenomenon of the oil coming near the surface along volcanic pipes seems to show that there is a deep-seated common source of oil along the coast, only mechanical facilities being needed to bring the oil to the surface.

Oil Indications at Many Places

The number of oil seepages found on the Mexican gulf coast far away from volcanic eminences or rocks, may prove that quite another kind of geological disturbance beside volcanic may have made the oil come up, and investigation along these lines of disturbance must be the principal object of oil prospectors and experts in Mexico. The existence of these seepages far from volcanic rocks, might be explained as coming in localities of aborted volcanic eruptions, or near young intrusive rocks, but I have recently seen small oil seepages at the axes of small anticlines and synclines, following the cracked spaces along these axes where the lack of elasticity of the shale made it break at the period of movement. I have also seen small seepages along fault planes. Only experience gained by drilling will decide whether or not these disturbances may give room somewhere in accessible depths for large accumulations of oil.

Although the shale which must always be drilled through when looking for oil, sometimes to the depth of 3000 ft., is impervious, the rocks below are more permeable to fluids. In some of the wells, before coming exhausted, the asphaltic oil contains variable amounts of salt water from the sea or from another source.

The manifestations of oil are widespread in the gulf-coast lands of Mexico, where, as before stated, the commercial oil districts must have an irregular distribution. In many places along the shore, bunches of dry asphalt are thrown up by the sea after having been floating for a long time on the ocean. Along the inside of the shale formation, against the foothills of the Sierra Madre, the limestones underlying the shale are impregnated in many places with light oil and show small, greasy spots with a strong odor. In the underlying rocks are found thin beds of bituminous shales. At the middle of the gulf peneplain where islands of underlying sedimentaries appear, it is common to find narrow pockets and veins of grahamite, which are common also in the mountains of the Sierra Madre, near the coast.

There are also found isolated hills of old intrusive rocks, like nepheline syenites and diorites on the gulf coast. Oil has never been found around these intrusive hills. Both the intrusives and the younger basaltic rocks are frequently nephelitic.

I insist in my belief that the oil industry of Mexico has an attractive future. The Mexican demand for cheap fuel is increasing every day and the development of the oil industry on any possible scale will never supply any purpose save that of home consumption. Every oil man recognizes the great difficulty of ample investigation along the gulf coast, as the shale formation is covered with abundant tropical vegetation, is overlain with thick mud and lagoons and estuaries or products of mountain decays. If it were possible to have an understanding among the oil experts in Mexico as to the line of investigations each one should pursue, and illustrating their views about the origin and condition of the oil in Mexico, my belief is that the oil industry could gain a much faster development.

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[*] Geologist, 2a General Prim 13, Mexico, D. F., Mex.

Recent Reverberatory Smelting Practice—I

Practice at Garfield Smeltery; Fuel Used for Calcining is 0.2 per Cent. of Charge. Heat Losses of Reverberatory Analyzed; Operating Details

BY REDICK R. MOORE*

The recent methods of operation of reverberatory furnaces, furnace dimensions and construction, have been described by Offerhaus[1] and others[2]; as the newer reverberatory furnaces are of the Anaconda type, these notes will be confined to the means for overcoming difficulties encountered in their operation, some suggestions for improvements derived from experience at Garfield, Utah, in operating five of these furnaces, a study of the theory of the processes, and some thermochemical calculations illustrating the theory.

PREPARATION OF ORE

Generally the ores and concentrates to be suitable for the reverberatory should be fine enough to pass a ¾-in. screen, and after sampling should be bedded in mixtures large enough to give a uniform charge over a considerable period so as to maintain a uniform grade of matte and slag. When ores are received regularly, there should be provided four bins or beds, each having a capacity of four days' supply, with one smaller bed to carry a high-grade copper concentrate and one for low-grade concentrates, or iron ore to correct charges. Of the four main bins in ordinary course of operations, one would be empty, one smelting, one building and one complete and ready for smelting.

The simplest, cheapest and most efficient method of building the ore mixtures in such bins is by the belt-conveyer system with traveling trippers. The belts, after three years of service, show practically no wear on this fine material and the costs of repairs and power are extremely low.

The bins should be built with the W-shaped bottom for the cheapest handling in cars or on belts below. The ores and concentrates, being generally quite damp, will not run except at a steep angle and must be pulled down with hoes or bent shovels, which is done readily; but with a square bottom, while giving greater bin capacity, a large amount must be shoveled into the openings, thus increasing the cost of handling. Of course, the W-shape could be obtained by leaving ore and concentrates to remain in the corners. This would entail unreliable cutoffs and a tieup of much ore.

DELIVERY TO MCDOUGAL ROASTERS

The delivery of the charge to the McDougal roasters, as done at Garfield, is a prolific source of danger and expense, to say nothing of the wear and tear on nerves of foremen and metallurgist. Eight 3-ft. tracks underneath the bins connect with scales where all loads are weighed. From the scales, with an upgrade and four curves. the McDougals are reached by a trestle about 70 ft. high. To supply the McDougals with 1200 to 1300 tons of ore requires two motormen and four cars each shift. While one car is being loaded, the motorman takes the other loaded car to the roasters, unloads and returns, so there are two cars loading and two in transit or unloading all the time. Each ½-mile round trip handles six tons of ore. The cars are hopper-bottomed and discharge readily except in cold weather.

Each car carries two electric motors and can be run in either direction. Returning, the motorman is behind the car and cannot see ahead except by craning his neck to one side. This has resulted in a number of wrecks and disablements. The use of heavier motors and running trains of four cars each should reduce cost of delivery one-half. The logical method for handling the mixture from the ore bins to the roasters would be by a system of belts.

OPERATION OF THE MCDOUGAL FURNACES

Loading and delivery of ore to McDougals is charged to roasting. The operation of McDougal roasters varies with the contents and properties of the ore and concentrates charged. If the ore and concentrates are low in copper and sulphur it may be necessary to use some fuel to maintain sufficient temperature. If the ore is high in sulphur and low in copper it will be necessary to roast to a low percentage of sulphur and probably add silicious ore, either in the roaster or in the reverberatory, to produce matte of good converting grade, and slags that will not rapidly destroy the lining of the reverberatory.

If the ores or concentrates are high in copper, and low in iron and sulphur, no roasting at all may be necessary. Simple fusion alone makes a too high-grade matte to allow production of clean slag. The Utah copper concentrates containing 25 per cent. Cu, 12 per cent. Fe and 20 per cent. S would produce a matte of 47 to 50 per cent Cu upon simple fusion. The shortage of FeO and CaO to produce liquid slags would have to be supplied from iron ore and limestone if fluxing ores were not obtainable. But even in this case it would be advisable to dry the ore either in McDougal or other furnaces before attempting to smelt, as wet ores will not spread properly in the reverberatory and therefore greatly delay the smelting. The McDougal roaster at Garfield is an efficient drier, drying silicious ores for the basic-lined converter at the rate of 60 tons per day with 300 lb. of Utah coal. This result was obtained by changing one of the doors on the bottom floor into a small firebox and causing all the air that entered the roaster to pass through the fire, otherwise working the roaster the same as when calcining.

At Garfield the ore and concentrate mixtures were generally such that little fluxing was necessary in the reverberatories and it was not necessary to roast below 10 or 11 per cent. sulphur. At the same time 30 per cent. of the total charge was added on the fifth floor of the McDougal, which gave an average of 55 tons per day at a cost of 22c. per ton. Other averages of over 50 tons per furnace day were maintained for six months at a cost of less than 25c. per ton. The concentrates added on the fifth floor of the McDougal were high in copper. They were added here on account of the fineness and tendency to produce excessive amounts of flue dust. In figuring upon reverberatory smelting with McDougal roasting the amount of flue dust produced by the McDougal and reverberatories should be taken into consideration. Doctor Ricketts has not taken this into account in his paper[2] on reverberatory practice at Cananea. At Garfield the McDougals produced about 6 per cent. flue dust. This flue dust carries more silica and sulphur and less copper than the charge, and is more difficult to smelt as has been noted by Offerhaus.[3]

Notwithstanding the elaborate system of flues constructed at the Garfield plant there was a stack loss of about 500 lb. of copper per day from the McDougals alone.

DIFFICULTIES ENCOUNTERED WITH MCDOUGALS

The ore charged in the McDougals at Garfield decrepitates strongly, especially on the third floor. The particles sticking to the brickwork and clogging up the openings required heavy labor to dislodge and remove the incrustations. This was remedied by enlarging the drop holes and setting cast-iron barring plates in the brick work of the floors from which any incrustation was readily barred off without damage. One fireman and one helper could then take care of the water, feeding and barring of five to eight furnaces.

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*Consulting mining and metallurgical engineer to the Mexican-American Holding and Improvement Company, 20 Broad street, New York.

[1] ENG. AND MIN. JOURN., June 13 and 20, 1908.

[2] *Trans.* A. I. M. E., Vol. XXXIV, p. 265; Vol. XXXVII, p. 431; L. D. Ricketts, ENG. AND MIN. JOURN., Feb. 5, 1910.

[3] *Op. cit.*

In the original 16 furnaces practically no difficulty was had with the driving mechanism, but with the second installation of eight furnaces the driving mechanism and feed were too light and badly designed. A great many changes had to be made before the furnaces could be made to do the work.

The water used for cooling the columns and arms was brackish and they quickly filled with sediment. But for the cooling effect of adding concentrates on the fifth floor, the campaigns would have been extremely short. It was necessary to have one furnace out of 16 down all of the time, cleaning out columns and changing arms. Furnaces were sometimes run for several months without any water in the arms. I suggested the purification of the water by the addition of milk of lime, as was successfully done at Aguascalientes, Mex., and Peabody, Kan., but the idea never got beyond a few laboratory demonstrations. This filling of the arms and columns with sediment and precipitates from the water took the greater part of the time of a mechanic and two helpers, and necessitated the rebuilding of two to four floors of a McDougal each month on the original installation of 16 McDougals.

BRICK VS. IRON UPTAKES

The sheet-iron uptakes from the McDougals corroded badly and after three years' service were rapidly giving out. I designed and equipped one furnace with brick uptakes which gave every promise of success. They will be easily and cheaply replaced if worn out. The sheet-iron dampers in the uptake were also badly corroded and useless after the furnaces were put in commission. Easily manipulated cast-iron dampers were later designed for regulating the draft. The brick uptakes rested upon channel bars fastened to the framework of the furnace and are connected with the top floor by a sheet-iron thimble to avoid the effects of expansion and contraction of the brickwork of the top of the furnace. Arrangements were made to brick up from the roof to and inside the channel bars if the sheet-iron thimble gave out.

The sloping parts of the sheet-iron ore-storage hoppers or bins over each furnace were also giving out and four of them had been replaced. In replacing them, flanges were put on above the point where wear was apparent, and the lower part bolted to the flanges, so that when worn out again, they could be replaced with little labor. A suggestion that cast-iron plates be bolted on the inside to take the wear was proposed, but was not installed.

As originally built, the calcine hoppers had a 9-in. opening closed with a simple slide working through a slot in front and closing against the casting at the back. If a ½-in. piece of ore caught between the slide and the back, the fines would keep on running and it would be necessary to open and close the slide sometimes three and four times before the flow was stopped. This caused overflowed cars and the overflow had to be shoveled into other cars at considerable expense. This was remedied by the simple expedient of boring out a slot on the back so the slide would pass through, forcing any small piece of calcines with it. Cleaning up under the McDougals was charged to roasting.

The hopper cars for taking the hot calcines to the reverberatories were covered, except for a narrow slot along the center; on account of the hot dust it was difficult to see when the car was filled, and it was frequently overfilled. By cutting this slot wider and turning the pieces back to form a sideboard, this difficulty was remedied. The overflow and cleanings, both under McDougals and under the bins were much reduced. In building a new plant a great deal of inconvenience and cost would be avoided by keeping in mind these troubles and their remedies. An ample head of pure water and facilities for flushing out the water columns and arms with as much frequency as the boilers of the power plant, should be provided. If the water is bad, recourse may be had to air cooling of columns and arms. This has been experimented with at Steptoe and some successful results secured. It is doubtful whether it would be successful with concentrates and ore that produce excessive heat.

It is also important that the McDougals should be operated at a uniform tonnage upon any given class of ore, as increasing or decreasing the feed has the effect of increasing or diminishing the sulphur content of the calcines within certain ill defined limits, which makes it difficult to maintain the desired composition of the slag and matte. As the reverberatory furnaces are likely to go out of commission without notice, arrangements should be made to hold a quantity of calcines in quickly available storage for such emergencies. There is no trouble in shutting down McDougals, but when starting up, coal must be used to secure the proper heat. The calcines are poor and full of coal ashes and fine coke for some time. The amount of coal used is small, amounting at Garfield to only about 0.2 per cent. of the total charge.

The stock of limestone and iron ore required for fluxing should be easily accessible, and if not quite dry should, in my opinion, be charged to the McDougals on the bottom floor so as to be thoroughly dried and incorporated with the charge. A thoroughly dry and mixed charge greatly facilitates smelting. Blast-furnace flue dust at Garfield appeared to offer no especial difficulty in smelting and a storage capacity of about 450 tons was available.

As a large amount of flue dust is produced it is essential to supply adequate settling chambers arranged so that the flue dust can be readily, continuously and cheaply removed and charged into the reverberatories. If allowed to accumulate it is evident that this material will give trouble when charged in large quantities, whereas, if it is smelted every day, mixed with calcines, its effect would not be so disastrous.

The calcines and flue dust are delivered to the reverberatory hoppers in hopper-bottomed electric trolley cars. Two motormen to the shift, with one extra motorman on flue dust and cleanup for one shift, supply five reverberatories.

THEORY OF REVERBERATORY SMELTING

The theory of reverberatory smelting is based upon the production of a high temperature by the combustion of gas, oil or coal and the absorption of a portion of the heat formed by a proper mixture of acids and bases, metals and metalloids in an inclosed area. As the amount of heat absorbed by one substance from another is the more rapid the greater the difference of temperature, it is necessary in smelting by the reverberatory method to produce as high a temperature in the products of combustion as is consistent with the chemical constitution of the fuel and the heat-resisting capability of the furnaces. The latter must always be above the smelting temperature of the ores charged.

With a good fuel any structure that could be erected would be quickly eroded and destroyed by the erosive slags and mattes produced were it not for the frequent additions of fresh calcines, ore and fluxes which by the absorption of heat reduce the temperature. It therefore follows that the fuel having the highest calorific power is the most suitable, as less will be required and faster working will result; and likewise the greater the quantity of fuel burned within a certain time the greater will be the tonnage smelted, and the increase in tonnage will be much greater than the increase in the amount of fuel.

Perhaps a better understanding of the theory of reverberatory smelting may be had by considering that in all cases we are burning gas with air. The coal-fired furnace firebox is a crude gas producer, and only the heat in the products of combustion above the temperature at which the useful work of slag and matte formation is done is available for smelting. The higher the temperature above this critical point the more rapid is the work of smelting and superheating the slag and matte formed. For this reason also (physical conditions of the charge being equal), the effect of charging with hot calcines is to give additional smelting capacity.

FURNACE BOTTOMS

A bottom once well smelted in and seasoned should give no further trouble, unless for some reason the matte is tapped down low and "boiled." On this account I think it good practice to put a thick layer of silicious sand or some equally good nonconductor of heat underneath the hearth in place of slag filling used at Anaconda; then a layer of porous bricks; then firebrick and finally silica brick underneath the silica that is to be fused in. The bottoms should in no case be put over vaults, tunnels nor on I-beams. If a bottom should be raised by "boiling" matte or improper burning in and setting, the amount of metal tied up would be increased instead of diminished, which is generally stated to be the object of the vault construction. The silica for the bottoms should contain over 90 per cent. SiO_2. Decomposed quartzite from near Salt Lake City was used at Garfield. It analyzed about as follows: 92 per cent. SiO_2; 2 per cent. Al_2O_3; 1.8 per cent. CaO and 1 per cent. iron.

The substitution of basic or neutral material for quartz in the linings of the reverberatory for the purpose of avoiding the necessity of frequent fettling has been tried at several plants unsuccessfully. With chrome iron ore, the binding material which seems to be a magnesium ferrite was quickly attacked and removed by the silicious slags at the high temperature prevailing. The remaining chromite, while not acted upon, crumbled and fell into the bottom of the furnace. With magnesia bricks, the temperature seems to be above their slag-formation temperature in the presence of silicious slags and they were rapidly eroded. The longer life of magnesia and chromite in the refining furnace, where a high heat is obtained must be due to the basic character of the slag formed.

"Boiling" matte is a peculiar phenomenon taking place at high temperatures. As reverberatory mattes carry higher sulphur than blast-furnace mattes, being nearly the theoretical composition of $Cu_2S + xFeS$, the boiling may be due to the distillation of sulphur.

HEAT LOSSES

The losses of heat, aside from the heat removed with the smelted products, matte and slag, are due to the conduction through and radiation from the furnace, the heat in the escaping gases, incomplete combustion in the furnace and incomplete gasification in the firebox. The temperature produced by the combustion of the fuel will be influenced by all of these losses (except that of escaping gases) and by the admission of cold air or excess of air either through imperfect joints or through the firebox. The loss of heat through the bottom is small as it is covered by a layer of matte which is a poor conductor of heat.

The loss of heat through the walls may be reduced by using a layer of porous red bricks for the outer walls, but this is a questionable practice as it may be necessary to lose some heat to protect the walls from excessive corrosion.

The loss of heat through the arch is more serious. Attempts have been made to reduce the loss at that point by covering the roof with poorly conducting substances such as a layer of 3 in. of clean silica sand. This was abandoned, I am informed, on account of the rapid destruction of the arch. The most recent attempts in this direction have been by lengthening the arch bricks until silica bricks 20 in. long are now being used. My own experience with 20-in. bricks was disastrous, as bricks of this length from two factories spalled badly and gave a short life for the arch. One set of brick was practically all gone, in the two sections in front of the bridge wall, in burning in the bottom before the furnace was charged. Silica bricks from the Anaconda brick plant 15 in. in length showed practically none of this spalling. They gave excellent results and were afterward used in the back end of the furnace exclusively. In the front, where the temperature was lower, 12-in. silica bricks were used. The heat in the escaping gases is partly recovered by passing the gas through water-tube boilers, either in tandem or parallel, and a further recovery, where the heat is not required for the production of draft, can be made by introducing "economizers" after the boilers or by heating air for combustion. The temperature of the gases after passing through the boilers is reported by Ricketts to be 750 deg. F. at Cananea; at Anaconda 626 deg. F. (Offerhaus) and 575 to 600 deg. F. at Garfield. From these temperatures it would appear that boilers in tandem are more effective than in parallel.

INCOMPLETE COMBUSTION OF FUEL

The loss of heat from incomplete combustion in the modern furnace is generally small when carefully operated, unless for some special reason it is desired to throw the heat into the front or flues. This can be done by closing the dampers down to a small outlet for the gases. Indeed, I smelted flue-dust accretions out of the flue between the furnace and the boiler so that the resulting slag ran into the boiler and furnace, effectually cleaning out the flue by this means. Whether this practice is economical or not is open to question. It certainly would not be economical if flue and bypass were arranged with dampers close to the furnace so that either of them could be readily cut out for cleaning when necessary. The remedy for incomplete combustion is the simple admission of air through the checker work in the arch, or preferably a similar one in the back wall of the furnace.

The loss of heat through the incomplete combustion or gasification of the fuel in the firebox is serious when using coal fuel. The difficulty of accomplishing this may make coals, otherwise suitable for the process, entirely useless for the purpose of smelting. The recovery of coke by jigging at Anaconda is stated to be about 10 per cent. of the original fuel and as the recovery is poor the actual loss of fuel through the grates is not less than 20 per cent. under the most favorable conditions. In addition there is a large loss of heat due to the high temperature of the ashes.

USING PULVERIZED COAL

As the complete combustion of gasification of even the most suitable coals in a firebox is impracticable the remedy of pulverizing the coal and burning the pulverized fuel would appear to be the solution of the problem. This has been tried at Cananea, Mexico, and at the Highland Boy smeltery at Murray, Utah. At Cananea it was not successful, apparently from insufficient flue area; lack of a bypass flue; inefficient firing; lack of sufficient air, and possibly from failure to dry the coal properly. At Murray the difficulties as explained to me by a former employee were altogether due to insufficient drying of the coal and inefficient pulverizing machinery.

I proposed that coal-dust firing be tried at Garfield, as it gave promise of reductions in costs. A slack coal could be obtained for $2.75 per ton, which gave nearly as good analyses and as low ash as the lump coal, costing about $4 per ton. The analyses were approximately as follows:

	Moisture, Per Cent.	Volatile, Per Cent.	F.C., Per Cent.	Ash, per Cent.
Lump coal.....	4.5	40.0	49.0	6.5
Screenings.....	5.5	39.5	48.5	6.5

The lump coal used in the reverberatories slacked badly upon storage, and if it contained even a small percentage of fines could scarcely be burned with the draft obtainable. There remained in the ashes over 40 per cent. of the fixed carbon and 8 per cent. of the volatile matter. This determination was made from analyses and tonnages over a long period.

The suggested experiment was never made and various means to utilize the ash and to produce cleaner ashes were tried. Among these, that of using it for producing steam gave the most promise, as a practical boiler test made by the engineering department showed an evaporating efficiency of about 67 per cent. of that of the coal screenings. Attempts to use the ashes upon the blast-furnace charge proved futile under the existing necessity of making high tonnages. If briquetted, or the furnace operated under low blast, it is possible that they might be utilized successfully.

All attempts to produce cleaner ashes were unsuccessful and such improvements in costs and tonnages as were obtained were due to keeping the screenings out of the firebox; using cleaner lump coal; cleaning of the firebox; more efficient labor; improved drafts; uniform composition of slags and mattes. Mattes above 42 per cent. seemed to cause slower running, and slags above 44 per cent. silica had a similar effect, and below 38 per cent. silica the linings of the furnaces were rapidly eroded.

Regenerative Furnaces

Producer gas has been suggested for fuel, both with regeneration and without. A regenerative gas plant was built and operated at Great Falls for a time but given up, it is said, on account of difficulties with the producers and the excessive cooling of the gases in the winter months.

A regenerative reverberatory using fuel oil has been operated by the Peyton Chemical Company at Oakland, Cal. Preheating the air used for combustion increased the smelting capacity of the small furnace about 50 per cent.[4]

Operating Details

The operations of quartzing, charging, skimming, matte handling, firing and grating were carried out at Garfield about the same as described by Offerhaus, Ricketts and Austin at Anaconda and Cananea. The following differences may be noted: In quartzing or fettling, the Anaconda practice was generally followed. The Cananea method was tried on one furnace, but taking into consideration the cooling effect of the openings and cold wet fettling material, the large amount of floaters formed requiring the addition of limestone flux, there did not seem to be any gain over the older practice. The charges must be dropped where there is heat to smelt them. This resulted in charging at times over half the length of the furnace. In skimming it was found that occasionally small amounts of matte were rabbled over, and an enlarged settling box about 3 ft. wide, 10 ft. long and 2 ft. deep was installed to settle and save it. All the slag and matte tapped and cleaned from this box were resmelted in the blast furnace.

Firing was done as at Anaconda and various depths of grate bars from 20 to 42 in. below the top of the bridge wall were tried, finally settling on 24 in. as probably the best for the coal in use. Forced draft was used and the firebox divided into two sections by a brick wall so that while one side was under forced draft, the other was being grated. Improvements in the construction of the doors resulted in better utilization of the forced draft and better tonnages than had previously obtained. Grate bars of cast iron, 3 in. square, cast over an iron rod, replaced the original 2-in. square iron bars and gave better service.

Draft

The draft in the flues back of the boilers should not be less than 1.7 in. of water with coal firing. Drafts at Anaconda are stated to be between 1.7 and 2 in. At Steptoe valley the same drafts were obtained. At Garfield great difficulty was had to secure good draft and it was only after the expenditure of large sums in taking the angles out of flues, enlarging them in places, stopping leaks, etc., that a draft as high as 1.83 in. of water was obtained and then only by sending the escaping gases from one or more of the furnaces direct into the flue.

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[4] Eng. and Min. Journ., LXXXVI, p. 898.

Mount Boppy, New South Wales

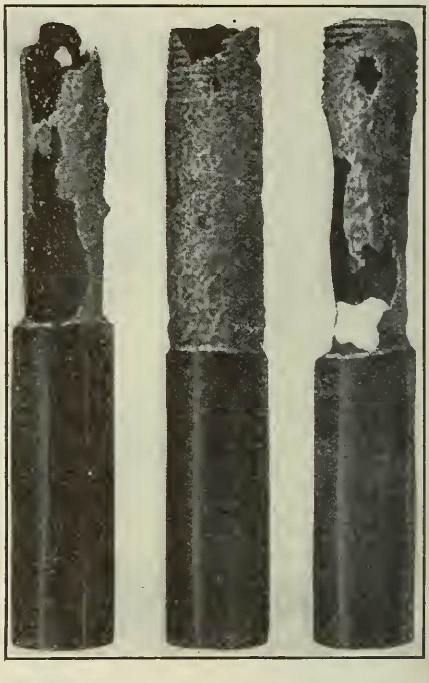
Although the returns from the Mount Boppy Gold Mining Company, N. S. W., during 1909 were below the level of the three preceding years, the prospects of the property have been much improved by the development work that has been carried on. The ore reserves have been increased 30,000 tons and now stand at a figure equal to three years' supply at the present rate of extraction. Not only is the reef looking well in the lowest levels, but fresh discoveries of good ore have been made in the upper levels. During 1909 there were 70,333 tons of quartz crushed from which gold to the value of £120,994 was recovered, or a yield of 34.4s. ($8.36) per ton. In 1908 the tonnage crushed was about the same, but the gold won had a value of £143,850. Throughout the past year a larger proportion than formerly of low-grade ore has been treated, the stopes having been worked in their proper rotation, and no special effort was made to keep up the grade of previous years by drawing ore from the richer stopes.

In summing up the position the manager states that the whole outlook of the property has largely improved during the year, with possibilities of further discoveries and improvements in the ensuing 12 months. The working costs, which averaged 21.6s. ($5.25) per ton, show a reduction of 4.1s. ($1) per ton compared with the preceding year. The reduction plant consists of a 60-stamp mill and a grinding plant consisting of two Ivanhoe and one Middleton-Cobbe pans. The sands and slimes are cyanided and a recovery of 4 dwt. 13 grains per ton milled is obtained from this source. There are also Wilfley concentrators, the concentrates from which are now treated on the spot by agitation and filter pressing and are not shipped to the smeltery as formerly.

Since 1902 the Mount Boppy company has won gold to the value of £854,805 and has paid £353,032 in dividends.

Highland Non-Corrosive Coating

A compound that is claimed to effectually resist the corroding influence of acid mine water is being marketed under the trade name of Highland noncorrosive coating. In the accompanying engraving are shown three nipples that were partly coated with this compound and then placed in a mine in the Connellsville region, where the water was particularly bad. The views show clearly how the destructive action of the water was resisted by the coating.



Pipe, the Lower Ends of which were Treated with "Highland" Coating

In about 15 minutes after application, the coating dries with a hard glossy, enamel-like finish, which it is stated will not be eroded even by gritty mine water under heavy pressure nor at the elbows where the scouring action is more pronounced. The application of the coating is a quick and inexpensive operation. An ordinary brush like that used in painting is employed, or if pipe is to be covered it may be dipped in a bath of the coating. No settling out of any of the ingredients occurs so that it is not necessary to stir the mixture each time any is used. Daubing the threads of both members when making connections will produce a joint that should not rust or leak. The coating is made by the Highland Chemical Products Company, Connellsville, Pennsylvania.

Russian Platinum and Foreign Companies in Russia

French Company Controls Platinum Situation through Nijni Tagil Works; Ural Miners Ask Government to Rescue the Small Operators

BY V. X. PRAVDINSKY

One of the great hindrances to the industrial progress of humanity is race hatred; this is rampant in all countries and perhaps reaches its acme in the Southern States, but is almost as strongly developed in the Russian empire. There the pure-blood Russian looks down with contempt on his Finnish, German, Jewish, Lettish and Polish fellow citizens. Patriotic sentiments intensify this feeling when the Russian regards foreigners, and just now an active campaign is being waged against foreign-owned enterprises by a large section of the Russian press under the leadership of the *Novoye Vremya* (the *New Times*, a leading St. Petersburg journal). The anti-foreign feeling is especially directed against foreign-owned mines, and more particularly against foreign miners of the "God-given" noble metals—gold and platinum.

Of late this feeling has been stimulated by the great profits made by the Lena Goldfields and by the fall in the price of platinum, and also by the recent abrogation of the contract between Johnson, Matthey & Co., London and the Demidoff San Donatos, whereby the French Company has acquired from the Demidoffs the control of the platinum output of their Nijni Tagil works. By this acquisition the French Company controls 86 per cent. of the platinum produced in Russia, and as Russia furnishes about 96 per cent. of the world's output, this company now controls the platinum situation.

It seems worth noting here that although Russia now produces nearly all of the world's platinum, there are large platinum deposits known in Colombia. There is a strong probability of a greater production from that country in the near future from the working of these deposits by Gen. J. C. Castillo, to whom has been granted a platinum monopoly for Colombia, and who is now starting to work on a large scale under the backing of a Pittsburg syndicate.

Neither the *Novoye Vremya* nor any other of the Russian journals takes notice of the fact that the Lena Goldfields and the French company are almost the only dividend-paying, foreign-owned mines in the Russian empire, and they also fail to state that foreigners are entitled to a little profit to counterbalance the vast losses— estimated by good authorities at over $300,000,000—which Belgian, English and French capitalists have met with during the last twenty years in unpayable mining and kindred enterprises in Russia and Siberia.

RACE FEELING INTENSIFIED BY DISREGARD OF CUSTOMS

Not all of the anti-foreign feeling is due to the above-mentioned causes and there are, of course, many cases in which the Russian dislike of the foreigner is intensified by the latter's tactlessness and stupidity. A marked instance of lack of foresight was the action of a large British-owned copper-mining company in southern Russia, which began to work a limestone deposit without authorization and finally had to pay a private owner $500,000 for a deposit that might have been had for a song in the beginning. This same company is now refusing to allow a Russian mining professor in a government college (and hence a quasi-official) to visit its mine; an action that will certainly be adversely criticized in influential circles. Ignorance of and indefference to local customs also frequently cause trouble, as in the case of a noted London mining engineer whose hat was knocked off by a bystander when he neglected to remove it on entering a railway office where the picture of the Tsar was in plain sight.

Some of the English managers of Siberian mines state that the anti-foreign feeling is shown not only by the newspapers, but also crops up in the regulations made by the State mining engineers, under whose control all Russian (by Russian I mean also Siberian) mines are worked, and it does seem that in some cases these regulations are made with the express purpose of worrying the foreigner. As a matter of fact, two of the most important foreign-owned companies operating in Russia are greatly hindered in their work by absurd regulations. For example; in a coal mine the State engineer requires that the timbers used for supporting the roof at the face of work and those used in the tunnels be set so that they touch, thus making solid walls of timber in ground that needs but little support. In a Siberian gold mine he refuses to allow the stopes to be filled with tailings, and requires rock to be quarried for filling purposes. Another method by which the State engineer can influence profits is in the fixing of the prices of the goods that mining companies are obliged to keep for sale to their employees, and sometimes he sets these prices so low that there is a heavy loss to the company. The prices are set once a year and there is practically no appeal from the inspector's dictum.

To these charges against the honesty of purpose of the Russian mining inspectors, Russian engineers answer that the inspectors are always honest, are all desirous of seeing a speedy development of the mines of Siberia, fully realize that such development needs the aid of the foreign capitalist, and hence are ready to assist him as far as possible. These Russian engineers also state that the chief cause of the friction between the inspectors and the foreign managers is the neglect of the latter to study the Russian mining law and to take the precautions that the law demands. The result of this noncompliance with the law is that there are more accidents in the foreign-managed than in Russian-managed mines. Every accident occurring in a mine has to be reported in detail by the inspector, and from his personal, as well as from a humanitarian standpoint, he is anxious to see the mining regulations complied with and to keep accidents at a minimum.

LOW PRICE OF PLATINUM NOT DUE SOLELY TO MANIPULATION

As stated above, it is probable that the principal cause for the recent agitation against foreign-owned mines is the sharp decline in the price of platinum, which fell from $38 per oz. in New York in the winter of 1906-7 to $18.75 per oz. in August, 1908, and remained around $23 during most of 1909. This decline in price is attributed by the Russians to the machinations of the French Company, which is supposed to have lowered the price so that it could acquire control of the Nijni Tagil and other deposits. No credit is given the company for the high prices of 1906-7, and no account is taken of the panic in the United States in October, 1907, and its far-reaching influence on the markets of the world.

As the French Company mines and refines 86 per cent. of the Russian platinum, it has a great deal to do with fixing the price, but it seems to me that the cause of the great fall in the price must be sought for elsewhere than in the direct manipulation of the market by the French Company, and was largely due to the panic of 1907.

It seems worth while to remark in passing—as has already been pointed out by Mr. Purington and other writers familiar with the subject—that although the French Company controls nearly all the platinum, yet there is no platinum monopoly in Russia. All persons having mining rights are free to work old or to develop new platinum deposits. However, such deposits are not easy to find, for though it is well known that a great area of the northern Urals and adjacent country is platinum-bearing, none of the many prospecting expeditions which have explored this region has found a payable deposit. Among these expeditions I mention only that of the French Company, which explored the upper Losswa river in 1907, spending over $20,000 and finding nothing valuable.

Some Remedies Suggested

The fall in the price of platinum, which has been referred to above, has led to many suggestions for the amelioration of the situation. Among these proposals three seem worthy of mention: The voluntary formation of a syndicate of platinum producers; the formation of a similar syndicate, but under governmental compulsion; and the making of platinum a Government monopoly by requiring the delivery of all the platinum mined in the empire to the treasury, where it will be refined and placed on the market at a price satisfactory to the producers (probably something like 24,000 rubles per pood, or about $23.50 per oz.). Just how the French Company is to be eliminated in these schemes has never been disclosed.

One advantage of the establishment of a Government refinery would be that the profit arising from the sale of the rare metals (iridium, osmium, palladium and ruthenium, which the Russian crude platinum contains, and which is at present absorbed by the foreign refiner) would go to the platinum producers. No statement is made as to the probable amount of this profit. This plan for the building of a Government refinery and the purchase of the platinum at an enhanced price meets with strong opposition, and a number of writers point out that the paying of an artificial price is only the picking of the Government pockets by the Ural miners.

The discussion of these various plans for improving the platinum situation has brought out a great flood of articles in the Russian press and many of these have been quoted in the technical biweekly journal *Gold and Platinum,* edited by the Permanent Consulting Office of Gold and Platinum Producers. One of the most interesting of these articles is entitled "The Poor Platinum Producers," and originally appeared in the *Novoye Vremya;* this article takes for a text and severely criticizes a plaintive letter of the president of the chief committee of the gold and platinum producers, in which he argues for the formation of a trust of all the producers and suggests that as Russia has a monopoly of world's platinum she should keep the industry entirely in her own hands.

The critic states that previous attempts to form such a trust have failed, owing to the indifference of the platinum producers, and says that there is not much likelihood of the Government taking up the matter and requiring all the producers to enter into a trust; in this view the only thing that is apt to be beneficial is the building of a Government refinery, and, more beneficial than all else, for the miners to do more work and less complaining.

Ural Miners Want Government Aid

The agitated state of mind and the dependent spirit of the Ural miners is well shown in a telegram sent to the Prime Minister and various other high officials by the committee of the Ekaterinburg Exchange, after considering the new contract made between the French Company and the Nijni Tagil works. This contract is that the French Company loans the Nijni Tagil works $1,000,000 for 20 years, at a rate of interest not stated, and for a charge of 2000 rubles on each pood of platinum and another charge of 500 rubles for selling the platinum—a total charge of about $2.50 per oz. The "works" are to continue to mine the platinum, but it is all to be delivered to the French Company. According to the views of the Ekaterinburg Committee this arrangement is most harmful and they expressed their feelings in the following telegram:

"The committee of the Mercantile and Mining Chamber of Ekaterinburg is greatly disturbed at the turning over by the Nijni Tagil works of its platinum to the French Company. Standing on guard over the Ural industrials, the committee calls on the Government for help. The transfer of this rich property will cause the ruin of the whole region. The small platinum operators, as yet only hampered by the operations of the foreign syndicate, will be entirely destroyed. The apparent temporary help of the French Company is only palliative, for without its platinum this 'pearl' of the Urals (i.e. the Nijni Tagil works) cannot pay its running expenses from its remaining products (copper, iron, etc.) and within two or three years will again be in financial difficulties.

"That unique earthly wealth of Russia —platinum—should be found only in the hands of the Russian Government, and hence the committee beseeches the Government not to allow the possession of the Nijni Tagil works to pass into foreign hands, and begs the Government to take over, if not the whole works, at least the platinum portion of the business, either allowing the platinum to be mined by the Nijni Tagil works, or by others as may seem best. This action will be the salvation of the district and of all the platinum producers of the Urals."

The response of the St. Petersburg authorities to this desperate appeal was to disregard the wishes of the platinum miners and to confirm the contract made by the French Company; it is said that influence from the highest court circles was used to bring about this confirmation. The latest news (March, 1910) is that the Ural miners are now trying to build a private platinum refinery at a cost of $50,000, and are looking to the Government to assist them in this work.

In conclusion it may be well to add that the individual Russian, like most civilized men, does not allow a feeling of patriotic pride to interfere with his personal profits, and always welcomes the foreigner who comes to buy his mines for more than they are worth. And it may be also noted that while there is a strong anti-foreign feeling among a large section of the Russian people, there are many potent influences working for the foreign financier, and that there is no danger of his being entirely deprived of a share in the industrial development of the vast and rich Russian empire, nor of the rewards that belong to his capital and enterprise.

Globe and Phoenix, Rhodesia

Special Correspondence

The report for 1909 states that 74,492 tons were crushed by the Globe & Phœnix mine, Rhodesia, from which £280,733 in gold was recovered. Working costs averaged 28s. 2d. ($6.80) per ton. The exposure of rich ore in the bottom levels has added considerably to the value of the mine. On Dec. 31, 1908, the estimated ore reserves were 144,348 tons containing 16 dwt. per ton, or a gross value of £485,020; on Dec. 31, 1909, the tonnage was 171,507 tons, averaging 31.2 dwt., and the gross value £1,124,878. The net profit on the year's operations amounted to £150,646, out of which dividends equal to 80 per cent. of the nominal capital were paid.

The main shaft has a depth of 2307 ft. on the incline and preparations are being made to sink to the 18th level. From the 13th level downward, the pay shoot has increased in length. At this level the stoping distance is roughly 1230 ft.; at the 14th level it is 1315 ft.; and at the 15th level, 1923 ft. On the 15th and 16th levels the reef showed a value 28.9 dwt. over 37.9 in., and 64.6 dwt. over 31.8 in. The 17th level has not yet been driven the length of the levels above and the persistence of the rich ore in depth is still a matter of uncertainty.

The consulting engineer, H. A. Piper, reports that substantial monthly returns will be maintained for fully two years without unduly exhausting the exceptionally high-grade ore. The plant is being increased and renewed, and it is expected that the new plant will be in running order by June, when an improved extraction may be looked for.

Tissot Breathing Apparatus for Rescue Work

Description of Machine and Instructions for Its Use in Rescue Work. Liquid Absorbents Are Used in Place of Solid Alkali

BY HENRY BRIGGS*

The Tissot type of breathing apparatus made by Messrs. Lapipe & Wittmann, rue Oberkampf, Paris, though in high favor in France, is practically unknown in English-speaking countries. Supplemented by Drægers, it forms the equipment of the important Liévin rescue-station, Pas-de-Calais, France, which was instituted after the Courrières disaster to be ready to cope with any similar occurrence, should need arise.

Three views of a person wearing the Tissot apparatus are given in the accompanying figures, from which it will be seen that, with the exception of the tubes directly in connection with the wearer's nose, the whole appliance is carried on the back. The weight is, therefore, not so well balanced as in the Fleuss or Dræger pneumataphores; but offsetting that drawback are the advantages accruing to the wearer through the absence of any protuberance in front which might prevent seeing where to put the feet, and in crawling or climbing.

The Tissot apparatus is of the generator type, the same volume of air which, during its circuit of the apparatus, is replenished with oxygen and cleansed of carbon-dioxide, being breathed repeatedly. The oxygen is contained in a single steel bottle and blows through a reducing valve and a flexible tube into the inhaling pipe, and thence into the nostrils. To act as the necessary reservoir a breathing bag of india-rubber cloth is provided in the air circuit. Pressure and delivery gages are in connection with the oxygen cylinder, and in the mode of operation of the latter, we have the first salient point of difference of the Tissot from other forms of regenerator. The reducing valve is provided with an adjustable screw which serves to regulate the oxygen supply, while the delivery gage registers the amount discharged. The delivery of oxygen is, therefore, not controlled automatically as in the Weg, nor set to a constant, ample volume, as in the Dræger, Fleuss or Shamrock appliances, but is adjusted by the wearer to suit his immediate requirements. Fig. 3 shows the wearer making this adjustment.

The Delivery Gage

The delivery gage has four marks on its dial, respectively indicating:

1. (A black mark) *Rest, or slow walking.*
2. (A blue mark) *Rapid marching.*
3. (A red mark) *Work.*
4. (A second black mark labeled "S") *Aid.*

The wearer turns the screw under the reducing valve until the needle of the delivery gage stands over that one of these four marks which accords with the nature of the work he is just about to perform. The first two marks call for no explanation; the needle is brought to the third mark when heavy manual labor is to be performed or when about to climb a road of heavy gradient; the extra delivery afforded when the needle is brought to the fourth mark "S," is only taken advantage of when the wearer gets out of breath or experiences a momentary shortage in oxygen supply. The pointer is also brought to "S" when the bottle is feeding two men, in which circumstance their apparatus are connected together by a length of tube attached to taps on the oxygen pipes. In this way one man whose oxygen reserve is yet plentiful · is able to help another whose bottle is exhausted, the delivery with the pointer at "S" being enough for two men walking slowly.

The pressure gage is seen in Fig. 3 underneath, but projecting forward of the delivery gage. It enables the wearer to ascertain at any time the quantity of oxygen remaining in the bottle, and he is taught to deduce from the gage reading the length of time yet available, on the basis that each kilogram of registered pressure corresponds with:

(a) One minute of work, the needle of the delivery gage being at the red mark;

(b) 1.3 min. of rapid marching, the needle being at the blue mark;

(c) 1.5 min. of slow walking, the needle being over the first black mark.

If the gage registers 50 kg., for example, the apparatus will work during 50 min. of active labor, 65 min. of quick marching, or 75 min. of slow walking.

Men Must Have Good Eyesight

The men selected for training with the Tissot apparatus must possess good eyesight among their other good qualifications in order that they may be able to read their own gages.

The carbon-dioxide of respiration is abstracted by passing the air through a sheet-iron absorbing vessel containing caustic potash solution. Though the use of liquid absorbents was general in the early forms of Continental regenerators, I believe the Tissot the only present-day type in which a solution is used in place of the more usual solid alkali. It cannot but be admitted that another danger is added in using liquid potash owing to the risk of it being carried up into the nose and mouth, when the wearer would probably die in great agony. The wearer of the Tissot apparatus is warned against descending steep places head foremost, the explanation given being that the absorber does not work well under such conditions.

Perhaps the most interesting peculiarity of the apparatus is that it is designed purely for nasal breathing. Although in the most recent form (1909) provision is made for mouth breathing, or combined nose and mouth breathing, should such be preferred, the nasal type is the one generally used at present.

To effect connection with the nose, nasal tubes, after having been wetted with saliva, are thrust well into the nostrils. These connect into the horizontal metal tube opposite the chin (see Fig. 1). In the latter tube, and respectively on the left- and right-hand sides of it, are inward and outward opening valves, the former serving to admit regenerated air to the nose on inspiration and the latter to allow it to pass thence, back to the breathing bag, on expiration. When wearing the apparatus, the mouth is closed by a plate-gag. The whole breathing apparatus is securely fixed to the head by the aid of a skull cap, a chin strap, and five other leather straps.

The nasal tubes are easily detached from the apparatus and are provided in different sizes. To test if a pair are of the correct diameter, after thrusting them into the nostrils and before attaching the metal tube to them, the wearer closes the nasal tubes with his thumbs and tries, not too forcibly, to blow air down his nose; if he succeeds, the tubes are too small and he selects a size larger. According to instructions issued by the central station, no man is selected for training whose nostrils are abnormal, as the circumstances would render his use of the Tissot apparatus dangerous.

It is impossible to pronounce with any degree of finality on the comparative value of this breathing apparatus, for up to the present it has not been used in actual salvage work after an explosion or fire underground. I was assured, however, by the director of the Liévin station that it had never been known to fail during the very severe tests it has been put to in the smoke chamber there.

Whether an apparatus needing such close and continual attention and regulation on the part of the wearer will not act adversely on his efficiency as a rescuer, time only can show.

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*Lecturer in mining, Heriot-Watt College, Edinburgh, Scotland.

Instructions to Leaders of Rescue Squads Equipped with Tissot Apparatus

The following instructions to leaders of rescue squads are a digest of those issued by the Liévin station. While they refer primarily to parties equipped with the Tissot apparatus, I believe they will have a considerable general interest at the present time, now that the question of training men in rescue work is receiving such wide attention:

The squad is composed normally of three or four trained rescuers and a leader; it may be accompanied in the mine by one or more guides. The leader of a squad ought to endeavor to conform with the instructions he has received, but only as far as those instructions are compatible with the safety of the squad, for which he is entirely responsible. If one of the chief officials accompanies the squad and takes charge of it, the leader ceases to be responsible for the work performed, but he must not on that account relax his vigilance over the welfare of the members and must continue to see that their breathing apparatus works efficiently. It is his duty to inform the official in charge immediately should any circumstance arise militating against the safe execution of any order given.

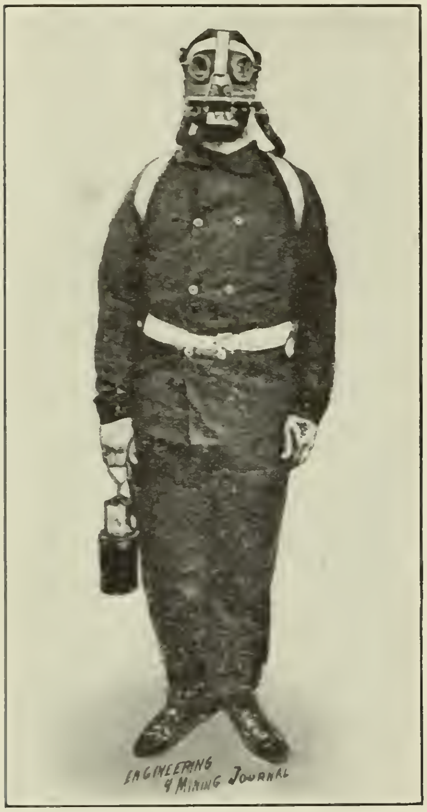

Fig. 1. Front View of Person Wearing the Tissot Apparatus

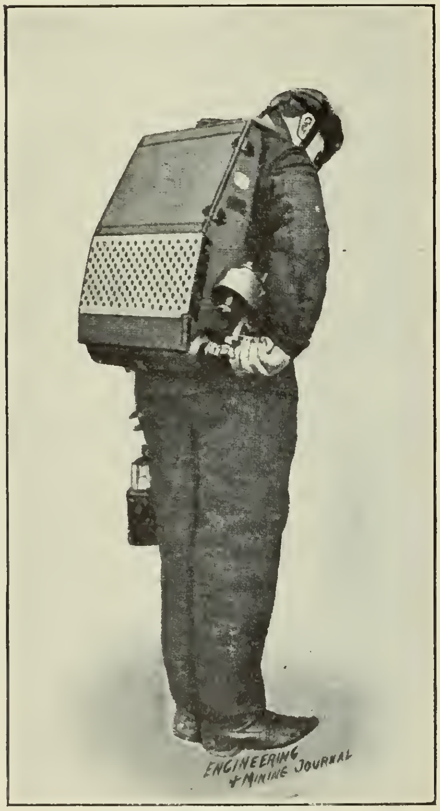

Fig. 2. Starting the Apparatus: The Wearer is Opening the Oxygen Cock and Reading the Pressure Gage

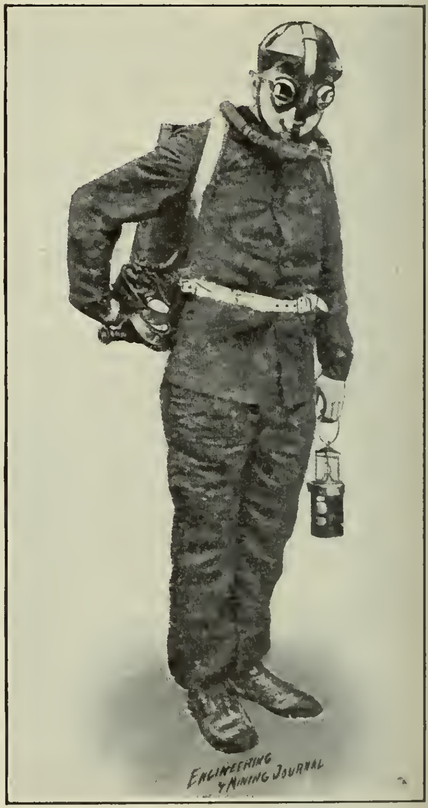

Fig. 3. Showing the Man Adjusting the Oxygen Delivery

Duties of the Leader

Before his men don their apparatus, the leader of a squad must make sure that no one is ill, intoxicated, or suffering from a cold in the head. As soon as the men are equipped ready, and have started breathing with the apparatus, the leader carefully verifies the different adjustments; he sees that the nasal tubes are thrust well into the nostrils, listens if the valves work freely, and makes sure that all connections to the nose are properly made; he notes that the rubber tubes, including that leading from the oxygen supply, are in good order and in their correct positions. He shakes each apparatus to find if the absorber holds its full charge of potash solution, reads the pressure gage to determine if there is a sufficient supply of oxygen, and makes certain that there is no leakage at the valve of the oxygen cylinder; he also ascertains that the wearer of each apparatus has adjusted the supply valve so that the delivery of oxygen, as registered by the delivery gage, is, for the time being, according to the need of the wearer. Before descending the shaft, he sees that each man is provided with smoke spectacles and an electric handlamp in good working order.

In the mine, the leader gives his orders either vocally, or, if he has put on a plate gag, by means of signals with a bicycle horn. The code of signals he must then employ is as follows:

One blast of the horn, to stop the party or to call its attention to other signals he wishes to make;

Two blasts, "advance."

Three blasts, "retreat."

Several blasts in rapid succession, "take care."

When underground, the leader must make a frequent examination of the delivery gages of his men to see that the needles stand at the first black mark when the men are resting; at the blue mark if they are traveling a level road or descending an incline; and at the red mark if they are performing manual labor or any fatiguing exercise, such as ascending a steep incline or climbing ladders.

Every half hour the leader must stop his men; see to the adjustments of the apparatus, examine the nasal tubes, and ascertain with care if any apparatus has received damage. Particularly should he make a careful examination of the rubber tubes, and get one of his men to examine his own. He must then find the lowest of the pressure-gage readings, and calculate from it how long a time the squad still has available, for the movements of the squad must always be regulated according to the capabilities of the man who possesses least oxygen. The estimate which a leader of a squad makes as to the time it will take to return to a safe place in fresh air must always be a very liberal one, so as to allow ample time to retire. Should he be under the orders of a superior official accompanying the party, he has the duty of calling that person's attention to the pressure gages when he considers it time to beat a retreat.

The leader of a squad must never work his men so hard that they lose their breath, and must endeavor to husband the resources of his party. He must bear in mind that to work too hard while wearing a breathing apparatus shows foolhardiness rather than zeal. A leader who does not husband the strength of his men exposes them to grave risk of disaster; moreover, by pushing the men too hard, he compromises the success of the salvage operations, for if only one man becomes incapable of further work, the whole party has to retire, it being never permissible to split the squad into parts. If a superior official is in charge of the party, it still rests with the leader to call that person's attention to the fact should he consider that the work the men are set is of too arduous a nature or that the pace at which they are walking is too trying.

The squad must never subdivide.

The leader must never allow any one of his men to go so far from him that he is out of sight.

Should one of the party fall ill or one of the apparatus get out of order through any cause whatever, the leader must sound an immediate retreat.

The retreat must be carried out in an orderly manner and must never be allowed to degenerate into a rush.

During rescue or exploratory work the leader of a party should carry with him a notebook with a pencil attached, and a penknife, so that he may be able to note down what he has been bidden to observe in the course of the operations, and also to allow him to write his orders to the men should he be unable to make them comprehensive by signs. He ought to carry with him a reliable watch, or one of the men may carry a watch that the leader may make use of. If he is leading an exploratory party after an explosion, he should enter in the notebook the time at which the squad enters the section of the mine containing afterdamp, so that, at any time during the work, he may know how long it would take him to return to a safe atmosphere.

If the leader of a squad is sufficiently skilled with a breathing apparatus to dispense with the plate gag, and if he has not put one on, he must take the utmost care to keep his mouth shut and to speak as little as possible, because the more he speaks the emptier his breathing bag becomes. Especially should he be careful not to inhale while speaking.

The instructions of which the above is a digest are bound up in pamphlet form together with others on the mode of controlling the apparatus itself. The latter are stated with the utmost simplicity and arranged very clearly in catechism form, it being intended that they be committed to memory by each trained rescuer. For example, the first question and answer runs:

"How do you begin when you are going to put the apparatus on?"

"When I am going to put the apparatus on, I first see about the nose attachment"—there are two dozen of such questions and answers. It would seem that this system of imparting instruction to the men most vitally concerned could be adopted with advantage elsewhere, and in connection with any form of breathing apparatus.

Coal Mine Accidents in Great Britain

Special Correspondence

When the Home Office officials render an account of the coal-mine accidents in the United Kingdom, it is not at all improbable that as regards the number of deaths, the year 1909 will be the blackest on record since 1873, when a systematic method of checking the accidents was instituted. In support of this statement reference is made to the figures published month by month in the *Board of Trade Labor Gazette;* a three-year comparison of the details is shown in an accompanying table.

MONTHLY LIST OF COAL-MINE FATALITIES.

Month.	Deaths in 1907.	Deaths in 1908.	Deaths in 1909.
January.......	102	114	109
February......	83	132	258
March.........	109	135	92
April..........	91	90	83
May...........	83	102	100
June..........	97	84	94
July...........	94	81	108
August........	85	164	91
September.....	119	94	107
October.......	115	99	148
November....	130	97	117
December......	109	105	...

The *Gazette* figures are approximate, but are on the safe side, being, as a matter of fact, an underestimate, seeing that therein 1217 deaths in 1907 and 1297 deaths in 1908 were recorded, while the revised totals in the Blue Books showed 1245 and 1308 respectively. For the purpose of this estimate, it is recalled that in Great Britain the years in which most deaths from accidents occurred were 1878 with 1413 deaths, 1880 with 1318 deaths, and 1908 with 1308 deaths. On the other hand, the most favorable years were 1898 with 908 deaths, 1899 with 916 deaths, and 1897 with 930 deaths.

Examining the table given below, it is seen that in the eleven completed months (January-November) for which 1909 statistics are available, there were 1307 deaths from accidents, comparing unfavorably with the revised Government total of 1308 deaths throughout the whole of 1908. During 1909, therefore, there has been an average of 128 deaths per month, whereas the average for the year 1878 was 118, the latter constituting the blackest record for the United Kingdom. In the matter of deaths, the closing month of the year will need to be very favorable indeed if all the unenviable records of the past may not be broken. The prospect is not inviting, even allowing that many more persons have been employed at the mines, for in the course of the last 30 years science and management have improved considerably. The figures but show the existing need for some support to science in the way of discipline, enabling the mines to be operated with greater security to life and limb.

Accidents Are Now More Numerous

It is not merely in deaths that a less enviable record is being established. Nonfatal accidents are more numerous than common sense indicates they should be, the Home Office divulging injuries to 141,851 persons in a total of 987,813 employed. In various centers in Great Britain, good work is being done by miners' relief funds, and the figures of the Lancashire and Cheshire Miners' Permanent Relief Society may be set forth as evidence of the greater risks the miner seems to run today as compared with a decade and a half ago.

YEARLY MINE FATALITIES TO MEMBERS OF RELIEF SOCIETY.

Year.	No. of Members.	No. of Accidents During Year.	Proportion of Accidents per 1000 Members per Annum.
1893...	51,451	6,477	127.0
1894...	55,294	9,028	164.1
1895...	54,601	9,270	168.5
1896..	53,412	9,882	186.4
1897...	53,924	9,972	184.6
1904...	47,354	10,357	220.3
1905...	47,393	10,501	223.4
1906...	49,622	11,407	228.1
1907...	53,108	13,237	219.7
1908..	51,448	13,202	210.0

All measures to secure safety should be supported by both operators and miners. So far as breathing appliances are concerned, it is to be desired that the present machines will be further developed in the hope of finding a solution to the problem of rescue work. Experience is proving that one station only, for a large mining county or district is inadequate. To be of superior value, the apparatus should be employed as quickly as possible after an explosion. The first couple of hours are the most important, and hope diminishes should 8½ hours on the scene as at Devi, recently, in South Wales. At the same time, recollecting the sensational rescue of a band of workers from the burning St. Paul mine in the State of Illinois, after a week's entombment, all hope is not necessarily extinguished, even in the event of delay, and therefore it is not possible to specify definitely in this matter of rescuing miners.

Admitting there is some risk attending the use of breathing appliances, due to inexperience and failure to observe necessary precautions, there are probably greater risks in rescue operations conducted without them. To the great honor of the mining community, these risks are willingly run should there be but one spark of hope. Of this there was evidence in the Devi explosion referred to, when a manager, an undermanager, an overman, a fireman and a contractor all gave up their lives in the endeavor, fruitless as it happened, to save the men below. Dressed in the breathing appliances these officials at any rate might have come out again alive. As it is, their names are added to the death roll of the year.

Rescue Work at Coal Mines of Pennsylvania

Special Correspondence

State Senator Edward P. Blewitt, of Pennsylvania, who is himself a mining engineer, has in contemplation a plan to organize a rescue brigade throughout the anthracite regions, practically similar in plan and organization to the first aid to the injured corps which has been established at a large number of mines, and which has proved such an unqualified success and blessing around the mines of the anthracite regions. So far as Senator Blewitt has revealed his plan, it appears that in the first instance he will select two or three men at each colliery who will be specifically instructed in rescue work. These will form the nuclei of larger aggregations which will be directly under the control of a central bureau, with its staff of officers, instruments and so on. When an accident occurs at a mine which demands more or less rescue work, these men will lead in the rescue operations. Should a catastrophe on a large scale occur, the rescuers at the different mines will be mobilized at some particular point or points and rushed as fast as possible to the scene of the disaster. This appears to be the plan in broad outline. Senator Blewitt declares that when an accident demanding rescue work occurs at the present time, there is great confusion and delay owing to the foremen and mine superintendents not having any systematic organization, or one that would adjust itself immediately on scientific principles.

Senator Blewitt says that he will shortly request the mining companies to select two or three of their most experienced and intelligent miners at each colliery to lead the local rescue corps. He declares that this can be done without entailing much expense. He says also that he has been in communication with a number of mining experts and mining engineers who have readily given their support to the plan as he has outlined it, and he declares that in their communications, they have assured him that his plan is perfectly feasible and reasonable in its conception, as far as it has gone.

Mine Inspector P. M. Boyle in his annual report calls attention to the large number of accidents, fatal and permanently disabling that have occurred in his district during the past year, and he declares that this increase of accidents shows "that there is laxity" somewhere. The greater part of the accidents that he has to report are, he asserts, due to falls of rock. This is something which no company, no mine superintendent, no mine inspector can help according to the inspector. It is the miner's duty to keep his roof in good repair, and Rule 349, of the Pennsylvania statutes, gives specific information and instruction as to his duties in that respect. The neglect of this obvious and necessary duty cannot always be attributable to the ignorant foreigner. Time and again, experienced miners who never obtained "a scratch" in the mines during the 30 or 40 years which they have worked in them, man or boy, ultimately become victims to a fall by neglecting some palpable precaution. Inspector Boyle is not the only one of the anthracite inspectors who has made a similar complaint in his annual report. The increase in mining fatalities coupled with a small, but decreased output at the aggregate of mines in any given district, is one of the most discouraging features in connection with the present admirable conditions of supervision that have been instituted at the mines both by the State and the companies.

Fire in a Coal Mine Imperiled 200 Miners

A serious fire occurred in the Manifold mine No. 1, of the Youghiogheny & Ohio Coal Company, near Washington, Penn., last month. The men who attempted to subdue the flames were compelled to work in 10-min. shifts. The damage to the mine was considerable. The accident was caused by the ignition of penned-up gas from exploding percussion caps. The exploding gas tore away a stopping which held the gas in check, and the flames seriously burned 10 men. Superintendent McKinney was present in the mine at the time and directed the uninjured to carry those who were burned through an unused entry to an old air shaft, where the entire force, with the injured, climbed slippery ladders to the surface.

COLLIERY·NOTES

Wet wood pulp is found to be an effective tamping material.

The annual meeting of the Diamond Coal and Coke Company was held last week at Salt Lake City. The following men were elected directors: John D. Ryan, B. B. Thayer, E. F. Ferry, H. I. Meehan, J. E. Judson, D. B. Hennessy and A. B. Grafius. This company is one of the Amalgamated subsidiaries and will be bought out by the Anaconda Copper Mining Company. No action concerning the sale was taken, however.

It is a curious fact that in many of our recent coal-dust explosions, the coal face has not been affected, the force of the explosions being almost entirely confined to the main intake airways. Some engineers have suggested that this condition is due to the natural moisture in the coal itself acting as a negative force; however, it seems more probable that the real cause is due to the comparatively low velocity of the air current at the face being unable to maintain the dust in suspension.

The pathway of those who attempt to introduce coal-cutting machinery into the English mines of Nottinghamshire is far from being a smooth one. For the last two years the miners at those properties where cutting machines have been introduced have been on one prolonged strike. At the present time no settlement has been made and no prospect thereof is in sight. In all cases the miners have claimed that to accept the terms proposed by the operators would mean to vote themselves a reduction in wages. The general argument in behalf of the miners in all these disputes is that the owners gain advantages from the use of machines and that the workers are entitled to a fair share therein—or, at the least, that their wages should not be reduced.

Since the introduction in European mines of what may be termed high explosives, it is stated that the disuse of tamping in firing shots has been greatly increased. This has been caused by the advertisement of the original manufacturers, wherein they alleged that their special explosives were just as effective untamped as tamped; the result of this has been to encourage miners to place their shot in the bore hole with a small bit of clay at the mouth of the hole to keep the air out, as they say; the result of this action has been to increase the number of blown-out shots. It is to be hoped that the miners in this country will be educated in a different way and be taught that the use of sufficient tamping is an absolute requirement. It would be better if our mine laws should specify a certain fixed proportion between the amount of explosives used and the length of tamping.

PERSONAL

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

S. F. Shaw is making mine examinations in Arizona.

W. E. Pomeroy has returned to Toledo, Sonora, Mexico, from a visit to the United States.

J. B. F. Herreshoff, of New York, has been visiting the Granby mines in British Columbia.

W. H. Hayden has resigned his position as chief engineer of the Exploration Syndicate, of Ontario.

J. B. Tyrrell, of Toronto, has gone to Fort Matachewan in northern Ontario, to investigate alleged gold discoveries.

M. J. Heller, consulting engineer of the Consolidated Arizona Smelting Company, left Arizona for New York last week.

S. S. Fowler left British Columbia late in April for London and Paris, on a business trip of several months' duration.

J. S. Lawrence took charge, in April, of the Animas mine of the Wyman Mining Company, at San Javier, Sonora, Mexico.

Herbert C. Enos, of Mexico City, has been making examinations of mines in the Santa Eulalia mining district for the past two months.

W. E. Corey, president of the United States Steel Corporation, sailed from New York, May 5, and expects to be in Europe until July.

Herbert Haas, of San Francisco, is in the hospital at Globe, Ariz., with a fractured leg, as a result of an accident at the Inspiration mine.

W. A. Bowden, designing engineer of the Canadian Department of Railways and Canals, has been appointed chief engineer of the department.

Thomas Bennets, engineer for the Atlantic Mining Company, has resigned and taken the position of superintendent for the Lake Copper Company.

H. L. Whittemore, instructor at the University of Illinois, has been appointed engineer of tests at the Watertown Arsenal of the United States Army.

Professor Stauffer, recently with the Geological Survey of Ohio, has been appointed assistant professor of geology in the School of Mining at Kingston, Ontario.

It is announced from Mexico that Enrique C. Creel, well known from his connection with large banking and mining enterprises, has been appointed Minister of Foreign Affairs of the Republic.

E. L. Marston has been appointed superintendent of the mines of the Yaqui Smelting and Refining Company at Toledo, Sonora, Mexico, and is putting the smelting works in order to start.

W. R. Wilson, mining engineer of Toronto, Ont., has gone West to survey coal lands along the line of the Grand Trunk Pacific in the Yellowhead Pass country, owned by a new company known as the Jasper Park Collieries.

Kumataia Nakai and Kazuye Kibe, mining engineers representing the Furukawa Mining Company, of Japan, have recently made a thorough inspection of the mines of Butte and the smelteries at Anaconda and Great Falls.

I. L. Merrill, of Los Angeles, Cal., president of the Hedley Gold Mining Company, of New York, has been making a thorough examination of the company's gold mine and 40-stamp mill in Hedley camp, Similkameen, B. C.

W. J. Elmendorf, of Spokane, Wash., has gone to Portland Canal, B. C., as manager for the Portland Canal Mining and Development Company, Ltd., which is opening a silver-lead mine and putting in a small concentrating plant there.

Roscoe H. Channing, Jr., is making an examination of the Comstock mines as a basis for a reorganization or readjustment plan along the lines suggested in the circular letter of May 8, 1910, of the committee that has this matter in charge.

C. H. McMillan, formerly engaged as a steel expert with the Dominion Iron and Steel Company, but latterly connected with the Bethlehem Steel Company in the same capacity, has been engaged by the Dominion Steel Company as assistant general manager.

Prof. Francis A. Thomson, head of the mining engineering department of Washington State College, Pullman, Wash., has been appointed consulting engineer to the owners of a mining property in Slocan district, B. C., who are putting in a plant for cyaniding a dry silver ore.

T. Lane Carter. who has had long experience in the Transvaal and has recently been in Central America, has decided to remain in the United States, and has joined the firm of S. W. Osgood & Co., which will hereafter be known as Osgood, Carter & Co., with offices in the First National Bank building, Chicago.

OBITUARY

George W. Corey died at Denver, Colo., April 19. He graduated from the Michigan College of Mines in 1903, and afterward continued the study of mineralogy and petrography at the University of Wisconsin. He engaged in practical mining work for several years, and for the two years past had been connected with the Missouri School of Mines, as instructor in mineralogy and petrography. He had many friends in the mining world.

Rudolph Liden died recently at Ronquillo, Sonora, Mex., aged about 55 years. He was born in Sweden and educated at a technical school in that country. After some years in a laboratory at Stockholm, he came to Colorado and engaged in mining and construction work. In 1897 he was assistant to Paul Johnson at La Gran Fundicion Central Mexicana, Aguascalientes. Later he was at the California Copper Company's works at Madera; with the British Columbia Copper Company at Greenwood; with the Alaska Smelting Company at Hadley; with the Arizona Copper Company at Clifton. For a time, also, he was with the Allis-Chalmers company, and then spent two years at the Cerro de Pasco mines in Peru, whence he went to Mexico. He was a draftsman and constructor of much ability and made many friends by his genial and cheerful disposition.

SOCIETIES and TECHNICAL SCHOOLS

Canadian Mining Institute—The eighth general meeting of the Western Branch is to be held at Grand Forks, Boundary district, B. C., May 26. Among the papers to be read will be two by members of the Geological Survey of Canada, one by O. E. LeRoy, on the "Geology of Phœnix camp," Boundary district, and the other by L. Reinecke, on the "West Fork of Kettle river," in the same district. W. Fleet Robertson, provincial mineralogist for British Columbia, is chairman of the branch. There are about 200 members of the institute resident in the territory.

American Electrochemical Society—The meeting in Pittsburg, which began May 5, was largely attended and a number of valuable papers were presented. Visits were paid to a number of industrial establishments. The following officers were elected: President, W. H. Walker, of Massachusetts Institute of Technology; vice-presidents, E. F. Roeber, New York; L. Kahlenberg, University of Wisconsin; managers, C. F. Burgess, Madison, Wis.; C. P. Townsend, Washington; W. R. Whitney, Schenectady, N. Y.; treasurer, Pedro G. Salom, Philadelphia; secretary, Joseph Richards, Lehigh University.

Engineers' Society of Pennsylvania—The second annual convention is to be held June 1-4, at Harrisburg. The convention is organized and directed by the society, but all members of the profession in Pennsylvania are invited to attend and partake in the discussion and business meetings. The hope is ultimately to bring every engineer in the State into affiliation with the society. The list of speakers is to include some of the leading engineers of the country, and at the business meetings will be discussed the question of an "Engineer's Code of Ethics," a joint committee of the four large engineering clubs and societies of Pennsylvania having had this matter under consideration during the year. E. P. Dasher, Gilbert building, Harrisburg, Penn., is secretary.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

May 9—The coal consumers of the Pacific coast will note with satisfaction that the Chezum group of coal claims in the Bering river or Katalla field, Alaska, will soon pass to patent, the final payment having been made of $18,000 to the land office in Juneau, April 22. Chezum is said also to have been concerned in the location of the Cunningham claims about which there is now so much controversy. According to Salin Joslin, of Fairbanks, coal is brought into Alaska at the present time from points as far away as Cardiff, Wales, while the extensive Alaskan fields lie undeveloped.

The strike of the coal miners in Australia being over, several cargoes of coal from there have arrived in San Francisco causing, together with the approach of summer, a sharp decline in the price to dealers of Australian, British Columbian and Japanese coal from $12 to $9 per ton and Coos Bay coal from $10 to $7.

Trinity county, like Siskiyou, is blessed with a drainage system that is not regarded as navigable, and hence not under the restrictions of the U. S. Debris Commission. Consequently, hydraulic mining flourishes there, and the largest operations of this sort in the west at this time are now carried on at the Lagrange mine near Weaverville. After a good season's run, the Larson brothers, operating two giants on China creek, have closed down the mine until the next rains begin. The Quinby ranch is now a placer mine comprising 237 acres on Willow creek, 10 miles from the Trinity river. It is owned by Gus Perigot and George Teal, who report a good season's run. One giant with 4-in. nozzle was operated during the winter. The Trinity River Dredging Company, of Chico, capital $300,000, has an option on 900 acres at the mouth of Eastman gulch, above Lewiston, and has purchased the water right of the Fairview company, to 1000 in. of water on Papoose creek, together with the ditch and pipe line for the development of electric power to operate the sawmill and the dredge when that is installed.

The smeltery-smoke problem is being settled as reported in Shasta county on the basis of the Utah decree of Judge Marshall. The baghouse process will be installed at the Mammoth plant at Kennett and it is understood that the Balaklala plant at Coram will adopt the Cotrell process now in use at the Selby Smelting and Lead works. The time for installing the devices has been extended from July 1 to October 1. Manager White, of the Shasta County Farmers Protective Association, has been in the East consulting with the directors of the copper companies and Attorney Shanahan has been instructed by the executive committee of the farmers' association to prepare the necessary papers for the foundation of a suit in the Circuit court, whereby the legality of all the proceedings will be settled.

The Yuba Consolidated Gold Fields Company, of Hammonton, Yuba county, has 12 dredges in operation with George J. Gray, formerly of Oroville, as superintendent. The Yuba Construction Company is now building a large dredge capable of digging to 60 ft. The buckets have 13 cu.ft. capacity and weigh each 3750 pounds.

The Plein Mining and Dredging Company, of Oroville, Cal., is now having a Risdon dredge built in San Francisco for operation at Nome, Alaska. It is planned to recruit the entire working force from the Oroville field.

The San Diego & Arizona railroad to connect San Diego with Yuma is now being graded near Potrero which is about 35 miles east of San Diego. This railroad, while of especial value to the farmers, will open up a region of some interesting mineral possibilities.

Denver

May 10—The final hearing in the suit of the Creede heirs vs. D. H. Moffat, S. T. Smith, L. E. Campbell and the W. S. Cheesman heirs, has commenced in the federal court here, Judge Phillips, of Kansas City, on the bench. This suit involves the ownership of a large block of shares in the Amethyst mine of Creede, which it is alleged was obtained by the defendants from N. C. Creede, deceased, through fraud and misrepresentation. The evidence in the case has already been introduced, and at the present hearing arguments of counsel as to points of law and fact only will be submitted.

The test case of the Hart Consolidated Mining Company, vs. the officials of Teller county, involving the right to tax nonproducing mining property under certain conditions, is on trial in the district court at Colorado Springs.

The Cripple Creek deep drainage tunnel was advanced 376 ft. during April, making a total of 13,218 ft. driven. Following the publication of these figures, it was reported that the El Paso company had entered into an agreement with the contractor of the tunnel work, whereby the former is permitted to sink a churn-drill hole 350 ft. from the bottom of its shaft to make connection with the tunnel, thus hastening the draining of the El Paso mine when the tunnel shall have reached that point. It is stated that the contract has already been let for this drill work, and that operations will be commenced soon.

President Milliken, of the Golden Cycle company, is credited with the statement that his company will build an aërial tramway from the mine at Independence to the Colorado City mill at an estimated cost of $200,000. The reason for the construction of this tramway lies in the fact that the Colorado Springs & Cripple Creek railway will increase ore rates to the company after the expiration of the present contract, April, 1911.

In the Anaconda, Cripple Creek, owned by the Mary McKinney company, O. Keener, leasing on the property, is reported to have opened a surface deposit of oxidized ore carrying free gold. The lessees say they will contract to deliver 50 tons daily to the Anaconda cyanide mill if they can arrange for treatment of the output. In 1892, about $28,000 was taken from an open cut on the surface of the vein, most of it being free gold, the result of oxidation of the calaverite, and it is stated that it carried as high as 16 oz. per ton in car lots. The country rock is andesitic breccia, traversed by dikes of phonolite and basalt.

Salt Lake City

May 9—The employees at the Murray plant of the American Smelting & Refining Company recently presented a petition to the management asking that their wages be increased May 1. The matter was discussed with the men, and was refused on the ground that the company could not meet the demands at the present time. It was stated by one of the officials that when business had improved the company would be in a better position to entertain any just demands that might be presented. There have been no further developments.

The senior class of the Colorado School of Mines arrived in Salt Lake May 2 on its annual tour.

The Utah Consolidated is carrying on development, and making preparations for shipments to the International smeltery. The vertical shaft has been driven from the No. 8 to No. 9 level and will be used hereafter for hoisting ore. The inclined shaft which is the main ore-hoisting shaft will be used entirely for development. It is now being sunk from the No. 9 to the No. 10 level. Ore will be raised to the No. 7 level, and sent to the orebins at the mouth of the No. 7 tunnel.

The bullion receipts of the Salt Lake Assay Office for April were: Gold, 4897 oz., silver, 1466 ounces.

A contract has been let for the driving of the 14,000-ft. tunnel to be run by the Snake Creek Mining and Tunnel Company. This tunnel will develop the southern part of the Park City district, and afford drainage and transportation for that section of the camp. The tunnel will start from Mill flat in the bed of Snake creek, about seven miles from Heber, and will be driven in the direction of Silver Island lake in Bonanza flat. The portal of the tunnel is above the intake of the Snake Creek Power Company, so that the water developed can be utilized for power. The Snake Creek company's plant is now developing about 1200 h.p. and this will probably be increased. The proposed tunnel will be 6½x9 ft. in the clear, with a water-way 3½ ft. deep by 4 ft. wide. It will be double tracked and electrically equipped for heavy haulage. The contract was let to Free & Taylor, of Salt Lake City, who expect to begin active work in a short time. The compressor has been ordered, and men are employed at the tunnel site. The machinery will be driven by electricity furnished by the Snake Creek Power Company's plant, a mile distant. The officers of the company are Jesse Knight, president, H. Otto Hanke, vice-president, George W. Lambourne, secretary and treasurer. The tunnel will cut across the formation of the camp, and will prospect and eventually develop a large territory.

Butte

May 6—George F. Bartlett, of Boston who represents the minority stockholders of the North Butte company is in Butte for the purpose of making an examination of the property. Robert H. Gross, president of the East Butte company, is also here to make his periodical inspection of that company's plant. In the recent report of the North Butte company it was stated that a compromise agreement had been reached with the Tuolumne company concerning the strip of ground which each company claims. President Edward Hickey, of the Tuolumne company, states that the only agreement between the companies is that the engineers of each shall have free access to the workings of the other but that no agreement of any kind has been made respecting the mining of ore and that the Tuolumne company takes the position that it is within its absolute rights and therefore has no compromise to offer.

By a vote of 167,382 shares out of a total issued of 180,000 the stockholders of the Parrot Silver and Copper Mining Company at the special meeting in Butte April 30, decided to accept the offer of the Anaconda Copper Company and transfer all its property in exchange for 90,000 shares of Anaconda stock. The dissenting voters numbered only 3575 shares, while the threatened injunction proceedings failed to materialize. Under the law of Montana the stockholders who dissented may, within 20 days after the meeting, appeal to the local district court for the appointment of three appraisers who shall proceed to appraise their stock, and when this is done the dissenting stockholders have a lien on all the real property of the mining company, superior to that of the purchaser, and the amount determined by the appraisement must be paid them by the corporation or the purchaser. It is probable that this will be done in the present instance.

In the Judith Mountain district, Fergus county, indications point to increased activity. J. A. Humbird, of St. Paul, and one of the large owners in the New Year mine, recently visited the property for the purpose of making plans for resumption. At the Gold Reef mine, Gilt Edge, 60 men are employed by the lessees and the same lessees are also working the Maginnis mine at Maiden. The mill on the Cumberland mine at Maiden gave satisfactory results at a recent test by A. S. Wright and James Breen, who also control the old Spotted Horse property, upon which they intend to do considerable development work. Stuart and Burr have been at work on the War Eagle property and will soon make a shipment.

In the Roundup coal district, Yellowstone County, the recent demand of the Chicago, Milwaukee & Puget Sound railway for 2500 tons of coal daily will result in increased activity. It is probable that the Davis mine at which development work only is being done, will now start to produce. The Roundup Coal Company's No. 2 mine, which mines exclusively for the railway, will continue its operations at full capacity and No. 3 mine will greatly increase its output.

The annual stockholders meeting of the Boston & Montana Mining Company was held in Butte, May 28 and 149,471 out of the total of 150,000 shares were represented. The following were elected directors: Sidney Chase, of Boston, Frederick P. Addicks and Benjamin B. Thayer, of New York, David B. Hennessy, of Bellport, N. Y., and John D. Ryan, of Butte.

Goldfield

May 8—Checks for dividend No. 7, including the regular quarterly dividend of 30c. and the extra disbursement of 20c. per share, were mailed to the Goldfield Consolidated stockholders April 30. Speaking of the recent fire the monthly report says: "The damage to the mill will have been completely repaired and the entire mill operating within 90 days. Pending the restoration of full efficiency, sufficient ore will be shipped to offset the loss of 30 per cent. of the mill capacity, and the company's normal production and net earnings of approximately $700,000 per month will be maintained." This statement, conservative as it is, is practically a guarantee that for the current quarter, not only the regular dividend of 30c. per share will be declared, but that an extra dividend of 20c. per share will be forthcoming.

Juneau, Alaska

April 25—The Copper River & Northwestern will reach the junction of the Copper and Chitina rivers this summer and will lay out a town there for a distributing point to the Kennicott-Bonanza copper mine and other mining interests of that section.

The spring season in the Yukon has been favorable and early work will start. The Yukon Gold Company, which had six dredges last year, will have seven in operation this season and will also use three elevators. The completion of the Bonanza extension of the main ditch since the 1909 season will permit of more extensive hydraulic operations this summer. The ditch is now over 70 miles long.

Cobalt

May 10—The Hargraves company has received official notification from the Government, that the petition to have the royalty reduced has been granted and in the future they will pay 25 per cent. of the net profits of the ore, instead of 25 per cent. of the gross proceeds. The royalty question in this camp is a serious one to the miners that have to pay it, as in no case is it less than 10 per cent., and in the majority of cases is 25 per cent. It is particularly annoying considering the methods employed by the Government, in several cases, to force the companies to pay it. It is significant to note that none of the companies that were able to pay dividends in the face of the royalty, received the reduction. It is, of course, natural that a small royalty should be exacted, and this is met by the 3 per cent. tax that all the companies have to pay.

An interesting point in the report of the Nipissing, related to the limitations of surface trenching. Many of the veins are small and as they are irregular, a trench might often cross one at a point where there is nothing showing. Last year trenching on the Nipissing cost $806 a mile. The manager advocates the removal of all the overburden. The trouble under existing conditions would be in the disposal of the spoil.

The official figures for the Cobalt production for 1909 just issued by the Government, show a total output of 25,885,-

983 oz. of silver. This is nearly 2,000,000 oz. in excess of the estimated production. The district of South Lorraine is credited with 144,953 oz., most of which came from the Wettlaufer.

Toronto

May 10—The Ontario Department of Lands, Forests and Mines has placed on view at the Legislative buildings what is claimed to be the largest block of silver ore known. It was found on the Cobalt Gem location, Cobalt, where it is supposed to have been deposited by glacial action, and was purchased by the department for $5100. It weighs 1640 lb. and its dimensions are 5 ft. 5 in. x 2 ft. 5 in. x 1 ft. 6 in. In many places the ore is exceedingly rich.

The Canadian Parliament was prorogued May 4. The bill fixing the time for the expiration of the iron and steel bounties was passed. Finance Minister Fielding made a statement bearing upon the policy of the government in regard to the encouragement of this industry. As previously announced the iron and steel bounties in general would terminate on Dec. 31, 1910, but in the case of wire rods, six months longer would be given and these bounties would expire on June 30, 1911. He said that in view of the cessation of the bounties he had no doubt that the iron and steel interests would ask for additional tariff protection, but it was as yet too early to speak as to what the government would do in the matter.

D. D. Mann, of Toronto, vice president of the Canadian Northern Railway, has announced that the line will be extended from Edmonton, or some point in that neighborhood, to the Brazeau coalfields in the foothills of the Rocky mountains in Alberta, the company having taken over a charter covering the route from the Alberta Midland Railway. The line will be subsidized by the government. The purchase of the coal areas which contain soft coal of high grade entails an expenditure of about $10,000,000 and the Canadian Northern interests are associated in the transaction with British and German capitalists. It is expected that the working of this field will place the railway in an independent position so far as the coal supply for their western lines is concerned and they also anticipate a heavy industrial demand for the output.

Mexico

May 7—By June 1 oil will be flowing through the 168 miles of pipe of the Huasteca Petroleum Company from the wells in the State of Veracruz to Tampico, on the Gulf of Mexico. In addition to the pipe line and pumping stations, the company has installed twelve 55,000-bbl. steel tanks and six 10,000-bbl. steel tanks, which go to make up the storage capacity at the stations and the Tampico terminals. The pipe-line capacity will be about 28,000 bbl. per day. The company proposes next to build a pipe line to the Mesa Central and to Mexico City, where the same interests have installed a gas plant using oil. E. L. Doheny, of Los Angeles, is at the head of this and other oil companies operating in the Ebano fields of the Mexican gulf region.

The extension of the pipe line from the Furbero oilfields under the waters of Tuxpan harbor to buoys outside the bar has been completed, and the first tank steamer has been loaded with oil for the Pearson-Aguila refinery at Minatitlan. The Pearson-Aguila interests will build a pipe line from wells recently brought in at Tanguijo and Potrero del Llano to the Tamiahua lagoon, using barges to deliver the oil at Tampico. Later a pipe line to Tampico will be built.

The Neuva Luz shaft at Guanajuato is now down 550 m., having attained the first 50 m. of the work beyond the limit at which the government subvention of 150 pesos per meter becomes effective. A crosscut will be started at 2000 ft. to cut the Veta Madre. This crosscut will be between 800 and 900 ft., to the hanging wall of the vein and will cut the vein 600 ft. vertically below the lowest point in the Valenciana workings, the deepest of any of the old operations on the Veta Madre.

London

May 7—For the last week or two, company promoters have been exceedingly busy and a large number of new mining companies have been offered to the public. Oil companies have been most prominent, especially those formed to exploit the new Maikop oilfield, on the northern flanks of the western Caucasus mountains. Dr. Paul Dvorkovitz has communicated a favorable report in which the following passage occurs: "My own impression, based on actual experience in the vast majority of the oilfields of the world—an impression which I have reason for believing will be amply justified in the near future—is that oil in commercial quantities will be found in practically every part of the Maikop field, with but comparatively few exceptions, providing, of course, that great care is exercised in entrusting drilling operations to thoroughly competent people."

Dr. Dvorkovitz cautions British investors at the present stage to confine their investments to companies whose properties are spread over a wide area of the oilfield. Maikop possesses an advantage over Baku in that it is a less distance from the sea and also because the crude oil contains a larger percentage of motor spirit, for which there is so large a demand.

Another mining district asking for capital is Arizona, where the Arizona-Morenci Copper Company owns 2000 acres in what is described in the prospectus as recognized and proved copper-bearing zone of the Clifton-Morenci district. This company, incorporated under the laws of Arizona, has a capital of $10,000,000. The present issue is 500,000 fully paid, 7 per cent. participating preference shares of treasury stock at the price of 21s. per share.

Another company offering capital in London is the Kern River Oilfields, of California, which has been formed to acquire as a going concern the property and assets of the Imperial Oil Company and of the Thirty-three Oil Company, as well as oil land belonging to the Keith & Mack Oil Company. The Imperial and Thirty-three companies commenced operations in 1900 and have produced to 1910, 17,981,730 bbl., of which 921,446 were consumed as fuel. The properties are valued by Arthur C. Macdonald at £900,000. The share capital in £1,350,000, of which 1,050,000 shares of £1 each are now offered for subscription at par.

The Frontenac Consolidated Mines invite subscriptions for acquiring and amalgamating the mining properties of the Frontenac Mining Company, and the Aduddell Mines Company, of Colorado. The properties consist of claims near Central City and Idaho Springs, which have been developed to some extent. The Frontenac mine reached the producing stage in 1909, and during the last three months the output has averaged £1200 in value on a daily tonnage of from 50 to 60 tons. The Aduddell property is situated over the Newhouse tunnel, which cuts the vein at a depth of 1800 ft. The ore reserves are estimated at 437,117 tons of a value of $9.44, containing an estimated net profit of $1,423,606, but three-quarters of this is only in the form of prospective ore. The present issue will provide £50,000 working capital, which is to be applied in developing the upper levels by continuing the Aduddell shaft to connect with an upraise from the Newhouse tunnel, a vertical depth of 1150 ft., and for other development work. It is also intended to erect a new 300-ton mill at Blackhawk. The properties have been reported on by S. W. Tyler and Forbes Rickard, of Denver, and by Messrs. Alexander Hill and Stewart, of London, all of whom, it is stated, have confirmed the recommendation of Henry P. Lowe, who has been managing the properties and will continue to give his services as managing director.

The Newfoundland Oil Development Company is being formed to acquire 374 petroliferous claims of 320 acres each, in the north or northwest part of Newfoundland. With the working capital provided it is intended to sink wells and develop the property. The existence of oil under the area to be acquired is considered probable by Annabel & Young, of Westminster, and W. H. Taylor, of St. Johns, Newfoundland. Professor Howley is also quoted as having reported favorably on the district.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Arizona

Gila County

Arizona Commercial—Only a force sufficient to carry on development work on the lower levels of the mine has been retained. The flow of water on the seventh level has increased.

National Mining Exploration—On the 660-ft. level, a crosscut driven southeast recently encountered a stringer of high-grade carbonate ore. Assays show high copper content. Since striking the ore, a crosscut has been driven 13 ft. through faulted ground containing much iron. The main vein has not been struck.

Superior & Globe—The only underground development under way is the sinking of a winze on the vein from the 550-ft. level. This winze is 75 ft. deep and is bottomed in vein matter containing iron, but no copper.

Old Dominion—About 400 tons of concentrating ore, 300 tons of ore available for smelting and 300 tons of waste are hoisted daily. The bulk of this ore is being stoped on the west side of the 12th level, the east side of the 14th level and the intermediate level betwen the 14th and 15th. On the 13th level much high-grade ore is also being extracted from the body recently encountered. For the most part, the high-grade ore is malachite and chrysocolla. The management is considering the installation of electrical haulage system on the 12th and 14th levels on the east side of A shaft. About 1000 ft. of raising and 500 ft. of drifting are done under contract monthly for development purposes.

Mohave County

Dixie-Queen—This mine in the Weaver district is developing by shafts and a 500-ft. tunnel. A 40-h.p. Olds-Close hoist has been added to the equipment. M. A. Moore is superintendent.

Los Angeles Gem Company—This company is developing a turquoise deposit near Mineral Park.

Horseshoe—This mine at Cerbat is down 400 ft. and crosscutting. J. W. Thorne is superintendent.

Expansion—This mine in the River range has done 2500 ft. of development. The ore is cyanideable. C. J. Hutchinson is in charge.

Congress—S. R. Porter has secured control of this mine. It was worked 30 years ago but abandoned on account of the zinc.

George Washington—This group, Mineral Park, has two tunnels 143 and 395 ft. The ore carries copper, silver and gold.

Boundary Cone—This mine, two miles from the Tom Reed, is developing on a wide vein. J. M. Vassar is superintendent.

Arizona Gold Mines—This company will add 40 stamps to the 10 now installed.

Champion—This mine at Cerbat, recently acquired by the U. S. company, is being sunk deeper in charge of N. J. Churchill.

Redemption—The mine two miles from Chloride has a 25-ton concentrator and has 1500 ft. of development. R. J. Ferguson is manager.

Hardy—This old mine near Miller has two shafts 230 and 270 ft. and a 800-ft. tunnel. George Miller is manager.

Ventura—This company struck shipping silver ore at 76 ft. on the east slope of Stockton hill. J. P. Hamilton is manager.

Gold Crown—High-gold ore is found in the breast of the tunnel at Union pass. An 100-ton plant is under way. A. Barton is manager.

Keystone—S. R. Porter is developing and operating this old mine. Compressor and electric plant have been installed. The ore runs high in zinc.

Yavapai County

Cleopatra—This property at Jerome has a 4600-ft. tunnel, a 70-deg. incline shaft, 1880 ft., and 470-ft. vertical shaft. A 50-ton smelting plant will start soon. G. W. Hull is president.

Hull—This company at Jerome is drifting 250 ft. from the main tunnel at 3400 ft The ore is copper sulphide with quartz.

California

Calaveras County

Kenross—At this hydraulic mine, two giants are being operated and everything is working satisfactorily.

Campo Seco—This company has been incorporated and has taken over the Gallagher claims near those of the Penn Chemical Company and is developing.

Eldorado County

On patented land, four miles northeast of Camino, a find of a rich 3-ft. quartz vein is reported by Judd Young. The location is such that the vein if extensive can be opened by a tunnel from Big cañon.

Fresno County

Brushy Ridge—Free-milling gold ore in sufficient quantity to justify the erection of a mill is reported on the claims of this local company. W. E. Steuben is secretary.

Kern County

Two strikes of gold in the Stringer district, Johannesburg, are reported; one at the Gold Coin mine belonging to the Stanford company, of Los Angeles; and one at the Pearl Wedge mine on the 100 level, C. G. Illingsworth, owner.

The Weatherbee group of tungsten claims near Attiola are reported sold to C. G. Illingsworth for $12,000.

Blue Mountain—The unwatering of the shaft of this mine in Grizzly gulch, in the northeastern part of the county, has been completed and the 4-ft. vein is reported to show well. A stamp mill is being erected. J. Waugaman is superintendent.

Mariposa County

Number 1—The Gold Treasure Mining Company has taken over this property 4 miles from Hornitos and plans the erection of a mill as there is a large amount of ore on the dumps.

Monarch Mining and Development Company—This company has been organized at Palo Alto to develop mines in Mariposa county. An electric power plant is planned.

Hill & Gunn—Extensive development, including the sinking of a three-compartment shaft will be done by J. A. Ogden.

Trujillo—This mine, formerly called the Mexican, in which high-grade ore was found last year, is said to be looking well. J. P. Nichols is opening two new prospects near by and will install hoisting machinery.

Placer County

A party has gone from Oroville to Forest City in Placer county to build a dredge of the Risdon type for the Eldorado Placer Gold Dredge Company which owns five miles of ground on the Middle Fork of the American river. The dredge will be equipped with a swinging stacker to deposit the tailings on the banks of the stream. W. H. Brule is the superintendent.

Enterprise—This quartz mine is reported sold to George H. Chadeayne. A mill and cyanide plant is planned.

Pioneer Quartz—Work on this low-grade mine, Humbug district on the American river, has been started again under H. W. Morris.

Rio Antigua—Development work is being prosecuted vigorously on the South Fork mines of this company near Forest City. The raise in the adit has reached the channel bedrock. In the Maple Grove claim, the drifts are exposing good gravel.

Golden State—A new company, J. T. Hennessy secretary, has purchased the quartz claims of the old company of the same name at Chicago Park.

PLUMAS COUNTY

Plumas-Eureka—Work was resumed last November with D. J. Lawton in charge and a 5-ft. vein of good ore has been encountered in new territory on one of the lower levels.

North California—This corporation has sent a keystone drill to Halstead flat to prospect gravel claims. Work will be in charge of Thomas Mooney.

Bluff City—After a period of idleness, this mine on Squirrel creek about 10 miles east of Quincy, is now being operated by A. E. Shinn and others and 200 tons of ore are ready for the 10-stamp mill.

Chilkoot—A. E. Murdock reports that his copper claims, eight miles north of Chilkoot, are showing bornite. There is a 400-ft. tunnel and a shaft 104 ft. deep.

White Lily—The mill, Seneca district, is running steadily and there is much ore developed. S. P. Dunn is superintendent.

Del Monte—This claim, recently bought by J. J. Reilly, is high on the slope above the White Lily. Twelve men are running a tunnel.

SAN BERNARDINO COUNTY

Wake-up-Johnnie—Three strikes of high-grade ore are reported on the Mitchell, Hart and Barber claims.

Kelton and Horn—Lewis A. Dunham has purchased the Kelton and Horn groups in the Turtle mountains for $84,000.

SIERRA COUNTY

Standard—This property, Sailor ravine, has been sold by the bonders, Frye & Blevins, to F. A. Gowing. The price was $75,000. This property has developed within the last year into one of the richest quartz mines of the Downieville district.

Sovereign—A tunnel to cut the Nevada vein in this property is being run. A compressor has just been installed.

Oakland—Voyle Brothers, owners of this mine in the Gold Lake district, will soon start their mill on the rich ore discovered last autumn.

YUBA COUNTY

Blue Point—Superintendent Tarr is completing the large ditch started two years ago to operate the Blue Point mine, Smartsville. The claims formerly belonged to Patrick Campbell.

Black Swan—This mine at Smartsville is preparing for an active season.

Dobbins Ranch—Near this locality a quartz vein has been found of which much is expected. The Bonanza mine here formerly produced rich ore.

Colorado

GUNNISON COUNTY

Spar Copper—This property at Whitepine, has been sold to the United Mining and Holding Company, of Boston, by Dan. C. Tobin, of Leadville, who had the option from the Charles L. Tutt estate, of Colorado Springs. T. H. Jenks, of Albuquerque, will have charge of the development and operation.

LAKE COUNTY—LEADVILLE

Penn—This mine, on Breece hill, is maintaining a steady production under three sets of lessees. Lanphier brothers are shipping two carloads per day, and doing considerable development; E. A. Hanifer is operating through No. 1 shaft, making a good output; while No. 2 shaft, under John Dwyer, is keeping up a steady production.

Gallagher—Though not shipping at present, active work on this Yankee Hill property is being carried on under lease.

Robert Emmet—This Rock Hill mine, formerly a heavy producer, but idle for two years, has been leased by local parties, who will carry on their operations in the old workings, while prospecting the undeveloped portions of the property.

Famous—This mine, in South Evans gulch, has been taken under lease by George S. Schroeder, of Denver, with Sam Doran in charge. A small force is at work and an electric hoist and compressor will be installed. The workings have been drained, supposedly by the Yak tunnel.

Resurrection—The Yak tunnel is also rapidly draining this mine. Prospecting is the chief activity, though production is being maintained.

TELLER COUNTY—CRIPPLE CREEK

Acacia—Morris Brothers, leasing the Morning Star, shipped in a recent week two carloads of coarse ore and one of screenings, estimated at $28 per ton from above the 350-ft. level. Shipments were also made from the South Burns and Burns lease.

Old Gold—Lessees operating this property on Beacon hill have received returns from a 25-ton shipment mined from a stope from the 350-ft. level showing $42 per ton. The 550-ft. shaft has two levels under water.

Fluorine—A company, organized to operate the Fluorine mine and Copper Mountain mill, has commenced work. The mill will treat 75 tons per day of the low-grade ore from the Flourine.

Stratton Estate—Frank Seely, operating the Favorite claim under lease through the Logan shaft, is reported to have made a strike of from 7 to 9 ft. of 2-oz. gold ore in an upraise from the 500-ft. level.

Stratton's Independence—Results for March: Production, 2169 tons of ore averaging 24 dwt. 17 gr. per ton; dump ore milled, 6600 tons; net working profit to the company, $12,660; expenditure development account, $1400.

SAN JUAN REGION

Calliope—This tunnel, near Ouray, will be finished by the middle of this month, and will intersect and drain the workings.

Black Bear—The Pandora terminal of the Black Bear tramway is finished, and the buckets are being attached to the cable.

Mammoth—Operation of this property is to be resumed at once with three shifts, and it is hoped to start the mill by June 1.

Tomboy—Return for April: Mill ran 28 days; crushed 10,500 tons, yielding bullion, $31,500; concentrates shipped, $40,500; total, $72,000; expenses, $46,500; profit, $25,500.

Idaho

CŒUR D'ALENE DISTRICT

The producing mines of the Cœur d'Alene district made a total net profit of $2,079,822 in 1909, according to the annual reports just filed with the assessor of Shoshone county. The total tonnage of these properties approximated 1,720,600 tons of a gross value of $10,996,000. This tonnage was the lightest in years. With increased operations evident already this year and with several new shippers in the market it seems assured that the amount of the net profits and the amount of the ore extracted for 1910 will be much greater than the preceding year. The various producers and the net profits of each are as follows: Mace mine of Federal (lead), $469,155; Wardner mine of Federal (lead), $350,678; Bunker Hill & Sullivan (lead), $575,547; Hercules (lead), $325,305; Hecla (lead), $189,169; Snowstorm (copper), $169,966.

Alice—The Federal company is reported to have made an offer to Richard Wilson, of Portland, owner of the majority of the Alice stock, for the purchase of the control of the Alice at $1.50 per share. The offer has not been accepted, but still stands. The Alice has been producing since January.

Caledonia—The mine is shipping 25 tons daily. Charles McKinnis, manager, reports under date of May 2: "We have been crosscutting the lode on the 500 level about 100 ft. east of the shart, and have now exposed about 37 to 40 ft. of ore on the main lower level; 65 per cent. of it is shipping ore. In the wide Taylor stope on the 300 level, 90 per cent. is shipping ore."

Galena—The Anchor and West Hecla companies, which own properties adjoining the Galena, are seeking to effect a consolidation with that company in order to gain a more efficient and economical operation of all three properties.

Indiana

St. Joseph County

Drilling the first of several wells to be sunk by the Rolling Prairie & Newcastle Oil Company, southeast of South Bend, has caused some excitement. The company has leased 15,000 acres.

Vanderburg County

William O. Ferguson, of Evansville, has been appointed receiver for the Chandler Coal Company, which has a large mine at Chandler, and offices at Evansville. The receiver has been instructed to pay all the company's debts and keep the mine running. Joseph Bryan will be retained as superintendent.

Vermillion County

All the mines in the Clinton field are idle because the foreign miners object to the American miners working. They cannot be made to understand the resumption order comes from union officials. A national organizer who can explain to them in their own tongue the conditions under which the mines have resumed has been sent for.

Kentucky

The Asher Coal Mining Company, lately organized, has leased 14,000 acres of coal land on Crane creek, Toms creek and Cumberland river. Work has begun on two mines, and on a power station which is to supply electricity to both. T. J. Asher, Wasito, Ky., is president.

Michigan

Copper

Twin Lakes—This development company has reached bedrock with the sand pipe through which the diamond drill will operate in sinking the first hole of a series.

Hancock—No. 2 vertical shaft has reached 2260 ft. The crosscut from the 18th level to intercept the winze or subshaft sinking on the No. 3 lode, tributary to No. 1 shaft, will soon be holed through. This will be the second main working crosscut; the first was established at the 13th level to handle the rock from the levels above. The rock coming from the 13th to 18th levels will be handled through this crosscut and dumped into bins for loading.

Phœnix—Drilling has been started near one of the old shafts on the Ashbed lode. It is planned to make a complete drill cross section of these lands.

Osceola—The work of repairing Nos. 5 and 6 shafts of the main mine is going forward without delay as is also the alterations to the shaft houses.

Lake—The returns for April averaged 35.1 lb. to the ton against 28 lb. for March. About 100 tons were treated daily, the rock coming from development openings, no attempt being made to maintain an established production.

Missouri

Joplin Zinc-Lead District

The Dupont Powder Company has completed the purchase of 900 acres near Duenweg for $70,000 and will build another powder factory to cost about $500,000.

Tom Coyne, of Webb City, has bought for $16,000 the 40-acre lease of Wells Brothers at Toms Station where important strikes have recently been made.

W. H. Hackett, of Joplin, and James Epstein, of New York, have purchased the 40-acre fee of James Luke West, of Joplin, in the sheet-ground district and will erect a 350-ton mill on the tract. J. G. Marcum, of Joplin, has the contract for the mill. The price paid for the tract was $35,000.

Minor Heir—James F. Gallagher has purchased the mine and mill in the North Webb City sheet-ground district.

Bird Dog—The mill has been completed on the Bradford-Kansas City land at Webb City and will begin operations soon.

Mary E—C. C. Playter is erecting a mill on the mine at Spring City on his 20-acre lease.

Vantage Extraction Company—This company, composed of the bondholders of the old company, has bought the Vantage lease on the Baker land north of Webb City for $7000.

Montana

Butte District

La France—Preparations are being made for resumption of operations at the Lexington mine. A dry concentrator was in use at the mine for a while but was closed down by an injunction issued at the request of surrounding property owners who claimed that the dust scattered by the mill was injurious to their health. The concentrator at Basin, half of which is now being used for treatment of Butte & Superior ores, is owned by the La France company, and can be used for the Lexington zinc ores also.

Butte & Ballaklava—The new electric hoist is in operation and is giving satisfaction.

Broadwater County

Keating—The new electric plant is being installed at the Blacker shaft which is down 500 ft. Drifting is in progress at that level and the shaft will be continued 100 ft. The mining and treatment costs are reported to be $9 per ton. The old Keating shaft will still be used to hoist ore from some of the upper levels.

Madison County

Nellie Bly—The management states that 12,000 tons of gold ore, running $10 per ton has been blocked. A 10-stamp mill will be erected.

Missoula County

Iron Mountain—Under the direction of R. C. Davis, superintendent, the mine has been unwatered and a new station put in at the 1600-ft. level. While timbering the raise from the 1600-ft. to the 1500-ft. level a body of high-grade zinc ore was found which had apparently overlooked. On the 1850-ft. level the old crosscut, now in about half way to the silver lode, is being driven forward and should cut it with another 150 feet.

Nevada

Esmeralda County—Goldfield

Goldfield Consolidated—A power-distributing plant with a capacity of 2000 h.p. is to be built to replace the present transformer station. Besides being much larger the new plant is to be equipped with enormous storage batteries, for "equalizing" purposes, and of capacity sufficient to carry the mill for several hours in case of accident at the generating plant in Bishop Creek.

Florence—Work on the Little Florence vein system has developed 2000 ft. of ore in a continuous body on the seventh level. The mill is showing excellent returns.

Grizzly Bear—Ore has been encountered at 1200 ft. presumably an extension of the Mohawk vein. A station and lateral workings are under way.

Humboldt County

The oil well at Sulphur is down 350 ft. Many locations have been made.

Keystone—This mine has been sold to M. G. Moore & Co., of Boston, and will be operated.

Radiator Hill—Dwyer and Cummings, of Seattle, have begun work at National under direction of Mr. Dwyer.

Harnan—This lead mine in the western part of Humboldt county will be worked by John Harnan, of Cripple Creek.

Nye County

Tonopah—The new shaft on Sand Grass ground is down 253 ft. but is still in the later andesite capping.

Tonopah-Belmont—In anticipation of the reöpening of the 60-stamp mill at Millers changes are being made to do away with the ore washers at the mine. The washers and picking belt were necessary while the ore was being shipped to the smeltery. Work underground continues to develop the big Belmont vein.

West End Consolidated—A transformer plant of 150-kw. capacity, together with a 100-h.p. motor and a two-stage Ingersoll-Sargent compressor has been added.

Montana-Tonopah—The week's run shows 1057 tons of ore crushed and cyanided with an extraction of 91 per cent.

Bonnie Clare—Work has commenced on the 9-mile railroad to be built from the Gold Mountain mines to the Bonnie Clare mill. The enlarging of the mill to 100 tons is being pushed.

Shoshone Quicksilver Mining Company—This company at present is operating a small reduction plant, which comprises retort furnaces. The company is now planning to erect a modern furnace of 50 tons daily capacity. The mine is said to be highly promising.

STOREY COUNTY

The time for the deposit of stock in the plan for the Comstock mines merger has been extended to June 1. Roscoe H. Channing, Jr., is making an examination for a basis for comparative valuation.

New Mexico

SOCORRO COUNTY

Ernestine—This company is shipping regularly from the Mogollon camp, milling about 650 tons weekly.

Enterprise—Work has been resumed.

Socorro—The mill is treating 100 tons daily. Recent mill changes will increase the product. New orebodies have been found above the 600 level. G. W. Tower is in charge.

Deadwood—The mill site has been surveyed and work on the mill will begin soon. The mine is extensively developed.

Helen—The pipe line is being installed and 25 men are employed on development and plant.

Oregon

BAKER COUNTY

Irondike—The sale of this mine at Homestead, to the Lewisohn Brothers, of New York, has been declared off, owing to failure to agree on terms.

Pennsylvania

Philadelphia & Reading Coal and Iron Company—The statement for the nine months of the fiscal year from July 1 to March 31 shows gross receipts of $23,822,803; expenses, $23,007,680; net earnings, $815,123. As compared with 1908-9, there were decreases of $1,836,164 in gross receipts and of $609,691 in net earnings.

South Dakota

Gilt Edge—This property in the Black Hills district has been transferred to J. S. Ford, of Chicago, who will remodel the mill and operate the mine as an "open cut" proposition.

Castle Rock—This hydraulic operation is preparing to resume.

Utah

BEAVER COUNTY

Cedar-Talisman—The strike of silver-lead ore recently on the 500-ft. level, has been drifted on for 28 ft., and averages 8 ft. in width. Zinc ore has recently been opened on the 140-ft. level in the Talisman and also on the 225-ft. level of the Cedar workings.

King David—The directors have decided to close down.

Hub—This property in the Star district is being developed on two levels under the direction of A. D. Moffat.

Erie—This company's property in the Washington district is being developed by a tunnel, which is following a 3-ft. vein. Streaks of ore have been encountered, carrying copper, lead and zinc.

JUAB COUNTY

Tintic-ore shipments in carload lots for the week ended April 29, were: Centennial-Eureka, 5; Uncle Sam, 4; Eagle & Blue Bell, 3; Gemini, 4; Bullion Beck, 2; Scranton, 4; Lower Mammoth, 3; Mammoth, 2; Opohongo, 1; Black Jack, 2; Colorado, 10; Sioux Consolidated, 14; Iron Blossom, 19; Dragon Iron, 25; Governor (lease), 1; Beck Tunnel, 2; Brooklyn, 2; Grand Central, 8; Chief Consolidated, 3; May Day, 1; total, 115.

Lower Mammoth—The drift on the 2000-ft. level which has been driven through mineralized country rock for some distance is reported to have broken into ore. Some drifting has been done on this ore, but the main body has not yet been encountered.

Gemini—Work is being done from the 1300- to the 1600-ft. level. The company ceased working on the 1900-ft. level some time ago on account of a broken pump. About four carloads of ore are being shipped weekly. The Ridge & Valley mine which adjoins the Gemini is being operated through the latter workings.

Opex—A raise from the 2147-ft. level has encountered mineralized rock. The Opex is looking for a continuation of the Centennial-Eureka orebodies. Work is being pushed.

Tintic Central—The shaft has been in a shattered zone from the 450- to the 690-ft. levels, where solid limestone has, been entered. The company intends to sink 150 ft. deeper and will drift to the east in search of ore.

East Tintic—Four carloads of ore were shipped during April. It is said this will net $2500.

Tintic Humboldt—New officers and directors were elected at the annual meeting in Provo, May 3. Drifting will be done on the 100-ft. level.

Iron Blossom—The No. 1 shaft is at 1500 ft. A station has been cut here and sinking will be continued to 200 ft. A better grade of ore than heretofore is being mined from raises on the 500-ft. level.

TOOELE COUNTY

Bullion Coalition—The five feet of ore recently opened in the Honerine drain tunnel has been drifted on for 40 ft., and is reported to be strong in the face.

Kearsarge—This property in Dry cañon, six miles from Stockton, was a producer in former years. The mine was developed by an incline of 1000 ft., and is reported to have produced rich silver-lead ore. The Dry Cañon Mines Company recently secured control, and has begun development. The old incline is being cleaned out, and a gasolene hoist and new tracks installed.

UINTAH COUNTY

Gilsonite Asphaltum Company—This company has opened a new mine near Dragon. The ore has to be hauled 10 miles to the railroad.

Washington

CLALLAM COUNTY

A syndicate under the management of D. J. O'Brien will begin the development of coal prospects at Dry creek, three miles from Port Angeles.

WALLA WALLA COUNTY

Prosser—This company is looking for a site on which to erect a smelting plant. C. E. Bunting is consulting engineer.

Wisconsin

The sale of the Ashland Iron and Steel Company plant including six blast furnaces at Ashland, four chemical plants and the Yale iron mine at Bessemer and the Tylers Fork mine at Plummer is nearly closed. The new company known as the Lake Superior Iron and Chemical Company is organized at Detroit, Mich., and has British capital invested in it. The capital is $8,000,000.

ZINC-LEAD DISTRICT

Lucky Twelve—This company is constructing a 100-ton mill at New Diggings.

Little Minnie—The Blue Mounds mill, at Dodgeville, has been purchased and will be moved to this property.

Hoosier—This company has started its new mill with electric power. James Billingsly is manager.

Kohinoor-Blende—The new mill made its first car of concentrates recently. William Tiffany is manager.

Vinegar Hill—The Unity mill, south of Hazel Green, is completed and will be operated by electric power. This company is drilling the Rowley and Coon Branch, at Benton, and the Linden Queen, at Linden, under option contracts. William Smith, Platteville, is manager.

Frontier—This company at Benton is planning to construct a power plant and to install concentrating machinery.

Canada

Alberta

Eureka Coal Company—Practical coal miners at Lethbridge have formed this company with a capital of $75,000, to lease and operate the R. G. Duggan mine near Taber.

British Columbia

Nugget—The report of the directors of this mine, Nelson district, shows that in 1909 approximately 5000 tons of ore was put through the 4-stamp mill, yielding bullion $72,861 and concentrate $5246. Besides this, 246 tons of higher grade ore to the smeltery yielded $29,108. The average recovered content of the ore milled was $15.30 per ton, and of that sent to the smeltery $118. Underground development done during the year totalled 1300 ft. The vein is opened by tunnels on four levels, the lowest 455 ft. below the vein outcrop. Net profits for the year were $49,698.

Standard—Much ore has been found on this Slocan Lake property on tunnel levels Nos. 4, 5 and 6, and in an intermediate working opened from a winze between Nos. 4 and 5. The sorted ore runs up to 75 per cent. lead and from 65 to 85 oz. silver per ton.

British Columbia Copper Company—The March report shows the output of 891,419 lb. of copper, 2623.745 oz. of gold and 9191 oz. of silver, which is an increase in copper of more than 200,000 lb. over January or February. The company expects to start development at once on the Rawhide property of the New Dominion, and shipments will be begun soon. At the Wellington, the new spur should be completed soon, when hauling will be commenced. At the Lone Star an aerial tramway three miles long is being built to the Canadian Pacific near Boundary Falls.

Ontario

The shipments from Cobalt for the week ended April 29 were: La Rose, 253,050 lb.; Nipissing, 375,070; Kerr Lake, 309,500; McKinley-Darragh, 94,830; O'Brien, 64,900; Buffalo, 63,500; Chambers-Ferland, 62,550; Right-of-Way, 60,040; Temiskaming, 58,200; Cobalt Central, 41,600; King Edward, 40,460; Crown Reserve, 77,900; total, 1,501,600 pounds.

Beaver—A 30-ton car of ore, expected to yield 6000 oz. silver to the ton, has been shipped. It was in about equal amounts from the 200- and 250-ft. levels.

Nova Scotia—When the mill goes into operation it has been decided to treat the ore by amalgamation and cyaniding. Concentration tables will not be put in.

La Rose—A new oreshoot has been opened in No. 3 vein on the west side of the Hill shaft, at the 75-ft. level, averaging 3 in. in width and carrying 4000 oz. silver per ton. Stoping is being done on the east side of the Hill shaft for 145 ft., the vein containing good ore from the open cut down to the 135-ft. level. At the Lawson, a drift run from the 88-ft. level toward the shaft on vein No. 2 has struck the oreshoot developed in the upper workings, with a good showing of silver both in the vein and wall rock.

Cobalt Central—The company has decided to issue $400,000 worth of bonds to secure accounts due and to provide funds for development. The issue will take care of pending suits in Canada.

Foley—This property, Mine Center, western Ontario, includes 1100 acres and has been idle some years owing to difficulties as regards the title. Work will be resumed by the Foley Gold Mines Company, of which A. Lincoln Hoffman, of Duluth, is secretary-treasurer. It has a good equipment, including a 20-stamp mill.

Yukon Territory

Canadian Klondike Company—Dredge No. 1 commenced operations April 27, the earliest date in Yukon dredging.

Mexico

Chihuahua

Rio Plata—On March 5, the stamp mill was closed in order to utilize the whole of the cyanide plant in reducing the accumulation of tailings to a point where all danger of loss during the rainy season will be eliminated. The stamps will again be put in operation about July 1. The capacity of the cyanide plant has been increased, 1665 tons being treated during March. By the rainy season at least 2400 tons per month will be treated by cyanide. The manager estimates that the minimum net average monthly profit for the fiscal year 1910 will be $20,000. Henry W. Miller is president.

San Toy—The net earnings for the first quarter of 1910 were $65,025 from 5445 tons of ore.

Jalisco

Amparo—The annual report shows profits in 1909 of 668,538 pesos out of a total revenue of 1,500,000 pesos. The 50-stamp mill operated 344.69 days, crushing 63,398 dry metric tons of ore, producing concentrates and bullion to the value of 1,400.017 pesos. Rich ore shipped netted 44,049 pesos. The total cost per ton of ore mined, milled and marketed was 11.24 pesos. The ore in sight Jan. 1 above the 700-ft. level was estimated at 360,000 tons, and the probable ore below that level at 350,000 tons. Equipment that will increase the reduction capacity 1000 tons monthly has been ordered.

Mexico

El Oro—Return for April: Crushed 28,546 tons, yielding bullion, $210.980; working expenses, $98,800; expenditure on developments, $17,400; profit, $91,780; profit on railway, $5000; total profit, $99,780.

Mexico Mines—Return for April: Crushed 11,534 tons, yielding bullion, $125,000; working expenses, $44,440; expenditure on developments, $13,100; profit, $67,460.

Sonora

Wyman Mining Company—This company at San Javier has the Animas lead-silver mine. The mill has been remodeled and more machinery and a 30-ton smeltery will be installed. J. S. Lawrence is in charge. The mine receives coal from the Los Bronces mine by burro transport.

San Juan—This silver-lead mine at San Javier is under option to C. N. Nelson who is operating it.

La Barranca—This British company operating the Los Goteras is completing a 60-ton cyanide plant. Two years ore supply is said to be developed. F. C. Fanshaw is manager.

La Dura—This property at La Dura is under examination for purchasers.

Transvaal—Good smelting ore has been developed in the Verde and Ultima Chanza mines of this company, though the smeltery will not be started up again until suitable transportation facilities are afforded.

Santa Fe—A crosscut on the 100-ft. level of the Montoya mine has run into a vein of silver ore.

Washington—For unexplained reasons Dr. L. D. Ricketts and James Douglas have surrendered their option on this mine to its original owners, Bostwick & Dixon.

El Tigre—Men have been put to work on the installation of a large cyanide plant.

Africa

Rhodesia

The production of metals and minerals other than gold for the two months ended Feb. 28 included 40,640 oz. silver; 14 tons copper; 142 tons lead; 17 tons chrome ore; 27,824 tons coal. The persons employed at Rhodesian mines in February included 1730 white men and 31,931 negroes; a decrease during the month of 24 whites and an increase of 821 negroes.

Asia

Korea

Oriental Consolidated—The April cleanup was $117,100.

New Caledonia

Exports from the colony for the two months ended Feb. 28 are reported by the *Bulletin du Commerce*, of Noumea, at 16,028 metric tons nickel ore and 6438 tons chrome ore.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, May 14—Coal trade in the East is in fair condition only. The Central district in Pennsylvania is not fully at work yet, notwithstanding the recent wage agreement. In the seaboard bituminous trade, West Virginia competition is a disturbing factor, which may make trouble later.

In the West, matters are still in a disturbed condition. The settlement in the Pittsburg district is gradually being made and mines are getting to work. In Ohio and Indiana also, the mines are gradually resuming and coal is going to consumers, many of whom were beginning to feel the need of supplies. In Illinois, however, everything is unsettled yet and no general resumption of work is in sight. The Southwest, also, is unsettled, though negotiations are going on slowly.

The question of coal prices under the general advance in mining rates has not fairly come up yet, but will undoubtedly cause a lot of discussion later.

The Lake trade is slow in starting, and the outlook for the season business so far is not very good.

COAL TRAFFIC NOTES

Coal receipts and shipments at Cincinnati for the year, reported by Chamber of Commerce, in short tons:

	1908.	1909.	Changes	
River receipts......	1,430,600	1,842,240	I.	411,640
Rail receipts.......	3,394,880	3,582,840	I.	187,960
Total receipts.....	4,825,480	5,425,080	I.	599,600
River shipments....	2,434,160	2,528,400	I.	94,240
Rail shipments.....	135,200	269,080	I.	133,880
Total shipments..	2,569,360	2,797,480	I.	228,120
Consumption	2,256,120	2,627,600	I.	371,480

Only 18,840 tons of anthracite were received in 1909. Other receipts were: Pittsburg coal, 830.600; West Virginia, 2,970,280; Kentucky and miscellaneous, 1,605,160 tons.

Anthracite shipments in April were large, reaching a total of 6,224,396 tons, which is 1,050,230 tons more than in March, and 333,220 tons more than April, 1909. For the four months ended April 30 the shipments were, in long tons:

	1909.	1910.	Changes.	
Reading..........	4,555,959	4,362,204	D.	193,755
Lehigh Valley....	3,551,618	3,781,812	I.	230,194
N. J. Central......	2,734,096	2,746,862	I.	12,766
Lackawanna......	3,179,787	3,189,103	I.	9,316
Del. & Hudson....	2,239,202	2,071,093	D.	168,109
Pennsylvania	2,070,596	2,156,567	I.	85,961
Erie...	2,694,373	2,515,088	D.	179,285
N. Y., Ont. & West.	957,368	914,235	D.	43,133
Total...	21,982,999	21,736,964	D.	246,035

The total decrease was 1.1 per cent. The Lehigh Valley, the Pennsylvania, the Central Railroad of New Jersey and the Delaware, Lackawanna & Western had increases; the other four lines had decreases.

Shipments of anthracite by Lake from Buffalo for the season up to April 30 were 454,615 tons.

New York

ANTHRACITE

May 14—No special change is to be noted in the market, which remains steady, with a good business forward. The April shipments from the mines were large.

Schedule prices of domestic sizes are $4.35 for broken, and $4.60 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, $3@3.25; buckwheat, $2.20@2.50; No. 2 buckwheat or rice, $1.65@2; barley, $1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

BITUMINOUS

Current business is fair, but with a strong preference for the lower-priced coals. Contract making still drags; it is unusual for so many contracts to remain still open so late as this. The New River and Kanawha people have been busy in New England territory this spring, offering coal at very low prices, and this has been a disturbing element. Notwithstanding the Central district settlement in Pennsylvania, several mines are still idle, the men holding out for some local cause.

New York harbor trade is moderate, and prices do not improve. West Virginia coal can be had at $2.40, f.o.b. shipping point; while $2.50@2.55 is paid for Somerset and $2.65@2.70 for good Miller vein steam coal.

Car supply is once more good and is practically up to all needs. Transportation is good and coal comes through promptly.

In the coastwise-vessel market boats are in good supply. Going rates from Philadelphia are 70@75c. to Boston, Salem and Portland; 75@80c. to Portsmouth; 80@85c. to Lynn, Bath and Bangor; 80@90c. to Newburyport; 65c. to Providence and the Sound.

Birmingham

May 9—Coal production in Alabama is quite healthy. There is a fair demand for the product and the railroads are giving good transportation facilities. Coal prices show no material strength, in fact, there is an inclination to weakness. The steady shipments of coal from this district to Mobile and other southern ports will mean much to this district, as the trade is being worked. There is a fair demand for coke and the production is strong.

Chicago

May 9—Buying of steam coals has become more general with the increase of receipts from mines that have resumed operations east of Illinois. The amount now coming in from these sources seems capable of holding the market free from panic because of the lack of Illinois coal, indefinitely. But normally a high proportion—perhaps 70 per cent.—of all the coal consumed in the Chicago district is from Illinois mines. This proportion can hardly be supplied long from the East.

Smokeless coals at $3.55 for lump and $3.15 for run-of-mine have a large sale and will increase in popularity if a speedy settlement of the Illinois labor situation is not brought about. There is little trouble about too much smokeless on track these days. Hocking at $3.15 is in good demand and supply.

Of Indiana coals lump and egg bring $2.25@2.50 and run-of-mine and screenings $2.15@2.40.

Owing to the cool weather, domestic coal has been steadily though not largely in demand, with anthracite selling extraordinarily well for the first week in May.

Cleveland

May 9—Ohio mines are operating rather irregularly, but a fair supply is coming to market. All sizes are to be had freely except slack, which is rather scarce. This condition will be changed when the Lake trades gets fairly under way, when slack will be plentiful, as the Lake shipments are mainly lump.

Quotations are, for Cleveland delivery: Middle district $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.65 for slack; No. 8 district, $2.20 for 1¼-in., $2 for ¾-in., $1.90 for run-of-mine and slack. Youghiogheny brings $2.45@2.50 for 1¼-in., $2.30 for ¾-in., $2.15 for run-of-mine and $1.90 for slack; Pocahontas, $2.85 for lump and $2.45 for run-of-mine.

Indianapolis

The Indiana bituminous coal miners of district No. 11 having accepted the offer of the operators, resumed work on May 7. About 11,000 miners went to work, leaving 3000 still unemployed, pending the settlement of working conditions. The mines were found to be in excellent condition, because of extensive repairs made during the 33 days suspension.

The terms of the agreement were a compromise. The docking clause is modified as follows: Any miner loading impurities with his coal in such quantities as to show intent of gross negligence shall, for the first offense, be fined 50c., for the second 75c., and for the third offense, he shall pay $1; the division of the price for machine mining will be adjusted by the joint scale committee. Sections 1, 2 and 3 of article 9 will be eliminated. The 5.55 per cent. advance, as set forth in the Cincinnati circular, will be made.

There is a good demand for coal. Most of the large consumers had exhausted their stocks, and in some instances had closed down their plants.

Pittsburg

May 10—The coal mines are all at work again and producing full tonnage. The car supply is satisfactory. Lake shipments were started last week, and the movement promises to be heavy. There is ample vessel room, as ore shipments down the Lakes opened up with a rush, April showing an ore movement of 1,520,305 tons, which is the record ore movement for the month.

Prices are reported as well maintained, at the higher level established during the suspension, fully 10c. a ton above the level just before. Mine-run and nut are $1.25; ¾-in., $1.35; 1½-in. domestic, $1.50; slack, 85c. per ton.

Connellsville Coke—The market has been unsteady and it is believed in some quarters that contracts for second half have been made at concessions, the sellers binding the buyers to secrecy. The open quotation on second-half furnace contracts is about $2, but it is not improbable that contracts have been made at about $1.80. Prompt furnace is available without any difficulty at $1.70@1.75, and it is possible $1.65 could be done. Foundry is quotable at $2.25@2.35 for prompt, and $2.35@2.50 for contract. With lower prices for both coke and pig iron, ideas on ratio contracts have been revised, the ratios being increased as is usual when prices are lower, and the idea of operators is about 8 to 1 on basic pig iron and 8½ to 1 on bessemer, coke being taken at ovens and pig iron at Valley furnaces.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended April 30 at 372,803 tons, or 50,000 tons decrease from the preceding week and 100,000 tons decrease from the maximum rate, attained about Feb. 1 last. Shipments were 4138 cars to Pittsburg, 7202 cars to points west of Pittsburg, and 986 cars to points east of Connellsville, a total of 12,326 cars.

St. Louis

May 9—It seems as if the weather man has been the coal man's friend all this year. The winter was extremely severe and the spring has been raw and cold. May has been unusually cold up to the present date; it is generally a summer month here. This has brought about a peculiar condition in the retail coal trade. Dealers all stocked enough coal to run them for six or eight weeks under ordinary conditions. The unusual weather conditions cleaned out these stocks during the first two weeks of the strike. Prices on outside coal, especially lump which was of a very doubtful grade, have been so high that dealers did not care to stock up any, as they thought that it was better to wait until the weather broke than to be left with a lot of extremely high-priced coal on hand. For this reason the majority of dealers are absolutely out of soft coal and the general public has been somewhat up against it to get coal. Of course, the large buildings and places which had to have it have had no difficulty in getting coal, as it has only been a matter of paying the price.

The wholesale trade has been brisk during the past week and prices on outside coal are advancing. If the strike lasts another week a very sharp rise is anticipated. A number of large industries which have used storage coal up to the present time have now their last shovelfull in sight and will have to come on the open market for additional supplies of coal in a very few days. The railroads which stocked coal heavily are beginning to take some interest in the situation and are putting out feelers for additional supplies of coal.

Current prices are quoted as follows:

	F.o.b. Mine.	St. Louis.
Illinois:		
Lump	$2.50	$3.02
Mine-run	2.25	2.77
Kentucky:		
Mine-run	2.35	.....
Lump	2.50	.....
Pocahontas and New River:		
Lump or egg	1.50	4.00
Mine-run	1.10	3.65
Pennsylvania anthracite:		
Chestnut, stove or egg	.....	6.55
Grate	.....	6.30
Arkansas anthracite	3.35	5.35
Coke:		
Connellsville foundry	.....	5.10
Gas house	.....	4.50
Smithing coal	.....	4.15

The anthracite situation is satisfactory and a good volume of coal is coming forward. Business for May has picked up and there is no doubt that the usual tonnage will move this month. The demand for the large sizes is exceptionally good. Chestnut is a hard seller at present.

FOREIGN·COAL·TRADE

German Coal Trade—Exports and imports of fuel in the German Empire, two months ended Feb. 28, metric tons:

	Exports.	Imports.	Excess.	
Coal	3,411,413	1,173,784	Exp.	2,237,629
Brown coal	11,280	1,083,284	Imp.	1,072,004
Coke	628,874	113,522	Exp.	515,352
Briquets	256,113	34,636	Exp.	221,477
Total	4,307,680	2,405,226	Exp.	1,902,454
Total, 1909	4,250,974	2,368,583	Exp.	1,882,391

Increase in exports, 56,706 tons, or 1.3 per cent.; increase in imports, 36,643 tons, or 1.5 per cent. Exports of coke this year included 3940 tons to the United States.

Spanish Fuel Imports—Imports of coal into Spain, two months ended Feb. 28, were 334,457 metric tons, an increase of 22,480 tons; imports of coke, 31,210 tons, a decrease of 8989 tons.

Austro-Hungarian Coal—Production of coal in Austro-Hungary, two months ended Feb. 28, metric tons:

	1909.	1910.	Changes.	
Coal	2,265,332	2,321,341	I.	56,009
Brown coal	3,976,041	4,149,866	I.	173,825
Total mined	6,241,373	6,471,207	I.	229,834
Coke made	298,476	325,127	I.	26,651
Briquets made	60,166	58,273	D.	1,893

Of the briquets reported this year 29,353 tons were made from brown coal, or lignite.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on April 30: Best Welsh steam, $3.90; seconds, $3.78; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.42; best steam smalls, $2.16; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, May 14—The iron and steel markets still hold a waiting position; though the actual consumption is large, no one seems disposed to make commitments far ahead.

The most prominent topic just now is the curtailment of pig-iron production. A number of the steel-works furnaces have gone out, but it is not easy to ascertain just how much their output has been cut, or how much iron is on hand. The merchant furnaces in the East are coming slowly to the stopping point. In the West, curtailment is going on faster; nearly half the merchant furnaces in western Pennsylvania and eastern Ohio have either gone out of blast or have definitely decided to blow out when certain contracts are filled or certain raw materials used up. In several cases the raw material which governs is ore, the furnaces having had a stock calculated to carry them into the present navigation season while they have not bought ore for the season. The claim of furnaces is that prices recently quoted represented absolute cost, making reasonable allowance for contingencies, and the present conduct of blast-furnace owners supports this contention, for there do not seem to be any furnace men going around with cut prices, while furnaces actually are being blown out. Stocks of steel-making iron in the hands of merchant furnaces are estimated at 200,000 tons; there is fully as large a tonnage in foundry iron in the South, and probably twice as much in foundry iron in the North. This would make a total of about 800,000 tons, or four weeks' production of the merchant furnaces at the recent rate. It is possible only to guess at stocks held by the steel companies, but good authorities put it at 500,000 tons more. This would give total stocks of 1,300,000 tons, or about half a month's production at the recent rate. This is not as excessive as some recent talk would indicate.

In finished material some business has been done in small structural contracts which foot up a fair total. Much of it is being taken at low rates. Bars and sheets are in fair demand, but other lines are quiet.

Bessemer Steel Production—The American Iron and Steel Association reports the make of bessemer steel in the United States for the years given as follows, in long tons:

	1908.	1909.		Changes.
Pennsylvania..	2,106,382	2,845,602	I.	739,220
Ohio........	1,955,446	3,466,077	I.	1,510,631
Illinois.......	1,237,747	1,632,444	I.	394,697
Other States..	817,180	1,386,660	I.	569,480
Total ...	6,116,755	9,330,783	I.	3,214,028

The increase in 1909, as compared with 1908, was 52.5 per cent. As compared with 1907, however, there was a decrease last year of 2,336,766 tons, or 20 per cent.; and there was a decrease of 2,945,047 tons, or 24 per cent., from 1906, the year of maximum production.

Pig-iron Production—The reports of the furnaces on May 1, as collected and reported by the *Iron Age*, show 290 coke and anthracite stacks in blast, having a total daily capacity of 78,700 tons; a decrease of 5900 tons as compared with April 1. Making allowance for the charcoal furnaces, the total production of pig iron in the United States in April is estimated at 2,518,500 long tons; for the four months ended April 30 it was 10,245,000 tons. Of this 6,803,000 tons were made by furnaces owned and operated by steel companies.

Baltimore

May 10—Exports for the week included 4287 tons steel rails, 1013 tons rail rail fastenings, 50 tons structural steel and 529,865 lb. wire to Mexico. Imports included 50 tons silicospiegel, 50 tons spiegeleisen, and 1625 tons ferromanganese from Great Britain; 20,750 tons iron ore from Cuba.

Birmingham

May 9—There is a little buying of pig iron noted in the Southern territory, but it is evident that the waiting game is still on, and consumers are still hopeful of getting the product at a low price. No. 2 foundry is now being quoted at $12@12.50 per ton, the first named price prevailing for immediate delivery iron and $12.50 price for third- and fourth-quarter delivery. Some of the larger consumers in Southern territory have been buying small lots of iron right along, but there is evidence that there will be need for a large quantity of the product. The make in this section of the country has been curtailed; as a consequence, there is not much iron being sent to the furnace yards in this State. The furnace companies do not appear to be willing to make further concessions to secure business. There is no change in conditions in steel in this section. The new plant of the Southern Iron and Steel Company will be started up in the next few days.

Chicago

May 9—The pig-iron market is seemingly coming to a crisis, for melters are watching conditions sharply, in view of reductions of output, and to all appearances are ready to make contracts for large last-half requirements the moment they see the bottom of the market. Inquiries are reported much more numerous and for larger tonnage. Actual sales are still light, the average melter being satisfied to provide for temporary needs. Southern No. 2 foundry brings $12 Birmingham or $16.35 Chicago, and Northern brings $17; reported reductions below these prices not being verified, though it may be as rumored that some No. 2 foundry iron has sold at a little less than $12 Birmingham. Southern iron is more ragged or more nearly ragged than Northern and at the $12 price catches the business largely. Iron and steel products have had a quiet but fairly active week, with indications of a continuance of these conditions. The consuming power of the country is still heavy and locally, at least, there are no indications of a serious falling off. That some of the largest consumers of pig iron have been letting their purchases wait until their needs force them into the market, is said in some business circles, apparently with good foundation.

Cleveland

May 9—Nearly 1,000,000 tons of ore are reported shipped in April. There have been no additional sales recently.

Pig Iron—Little business has been closed. The blowing out of a number of furnaces has almost stopped the talk of lower prices. Bessemer pig can be had at $17.90; No. 2 foundry, $16.50@16.75; No. 2 Southern, $16.10@16.35; forge, $16@16.25; all Cleveland delivery.

Finished Material—Structural steel and bars have been dull locally; cutting on sheets is still going on. Several good orders for trolley rails have been placed.

Philadelphia

May 10—The influence of the sharp pending curtailment of the pig-iron production in western centers is reflected in this market by a more cautious policy in covering summer and autumn requirements. For various reasons many consumers who look to this territory for supplies have been pursuing a hand-to-mouth policy since the opening of spring. The present disposition is to continue that policy and await further developments. The undertone in the industries which consume pig iron continues strong because of the steady demand for products. Furnace interests are satisfied with the present course of the market and find no difficulty in disposing of their output at practically unchanged quotations. The most encouraging feature this week is the receipt of inquiries from quite a number of large consumers who usually place contracts through June. No. 2X averages $17.50; forge, $16.50; basic, $17; southern forge is offered at $15.25 per ton.

Steel Billets—Billets have declined a little further and the placing of a few orders at the lowest quoted prices indicates that the buyers look for no further drop.

Bars—The undertone of the market is perceptibly stronger, but sales are not increasing. Local distribution continues to absorb the customary mill output. Store distribution is maintained under healthy building activities.

Sheets—The only observable change is due to the fact that some large buyers are figuring on placing orders that will see them through most of the coming busy season. The mills are not soliciting business by any further concessions. Material for building purposes is more active, but light sheets are rather dull.

Pipes and Tubes—Business has been actively sought for, which indicates further weakness. Tubes are weak.

Plates—Large orders for plates for shipbuilding purposes have been placed and cover only a part of what will be wanted. The shipyards are quite busy and are figuring upon considerable new work. The smaller buyers who use tank, have sent a few small orders for material wanted immediately.

Scrap—The market has relapsed into dullness and only the usual small business is reported by the yardmen. Some of them are acting, however, on tips given by large users of scrap, with reference to heavy scrap at certain prices named.

Pittsburg

May 10—Generally speaking, the market shows no material change, new business being light, but in some quarters an improvement is reported in buying of finished-steel products so far this month as compared with April, which was a very poor month. There is a wide difference between the different products both as to new buying and as to specifying on old contracts. Thus, there is quite good buying of hoops and bands, and fair buying of merchant bars, while that in plates, shapes, pipe and wire is light. Again, specifications are good on bars, plates, shapes, sheets and tinplates. The only lines which have had to make any large curtailment in production have been wire and pipe, which have suffered a reduction of fully 40 per cent. The Pittsburg Steel Company, however, will next Monday start its steel plant and wire mill at Monessen, idle for five weeks.

Prices of finished-steel products are very well maintained considering the dullness. Plates and shapes remain quotable at 1.50c. against 1.55c. at the opening of the year, but lower prices might be made were important business offered. Steel bars are firm at 1.45c., practically as high as the market went on the recent movement, while hoops are firm at 1.55c.@1.60c., substantially the highest level touched. Wire and nails are being regularly shaded $1 a ton, and occasionally $2, while sheets are being shaded $1 to $2 a ton. These concessions are not general. Merchant pipe is well held, the only easiness noted being that the leading interest is selling to jobbers on a sort of jug-handled contract, for delivery over three months, these contracts really amounting to options.

Pig Iron—The market has been completely stagnant. Prices are not quotably changed from last week, except that on account of offerings of basic by speculative merchants it can be quoted at $15.50, Valley, 25c. below last week's quotation. A sale of 1000 tons of bessemer has just been made between friends at $16.50 and is not regarded as affecting the market quotation, which we repeat at $17, Valley. Foundry is quotable at $15.50, Valley, malleable at $15.75 and forge at $15. In view of the large curtailment in production and the fact that consumers have been holding off so long, it is not impossible that prices, after declining since last November, will experience a slight upturn in the next month or two.

Steel—Bessemer steel is a trifle easier, and can be quoted 50c. lower than last week. Billet transactions are light, but there is fair buying of sheet bars. The market can be quoted at $25.50@26 for bessemer billets, $26.50@27 for bessemer sheet bars, $28.50@29 for openhearth billets, and $29@29.50 for openhearth sheet bars, with rods at $32, all f.o.b. maker's mill, Pittsburg or Youngstown districts.

Ferromanganese—The market continues quiet and soft, with prices at about $40@40.50, Baltimore, for prompt and $40.50@41 for third quarter, freight to Pittsburg being $1.95 per ton.

Sheets—There is a fairly good demand for sheets, but not as good as a month ago. There is usually a seasonable lull in June, and this year it is coming somewhat early. A number of the larger mills are well filled and will make no concessions; others were more optimistic when the heavy business was placed, holding off, so that now they must invite business. Such mills are conceding $1 and occasionally $2 a ton, particularly on galvanized, from regular quotations, which are 2.40c. on black sheets, 3.50c. on galvanized sheets, $1.70 per square on painted corrugated roofing and $3 on galvanized corrugated roofing. Blue annealed sheets are scarcer than ever. The only mill which was able to make prompt deliveries has lengthened its promise from three to six weeks. Its price has been 1.85c. on No. 10 gage, against 1.75c., the nominal market, which prevails only on deliveries far ahead. On really prompt delivery it is possible 1.90c. could be obtained.

St. Louis

May 9—The amount of business closed this week shows a considerable increase over last week, though this is not saying much, as the market is really slow. Inquiries seem to be coming in better, especially for third- and fourth-quarter delivery. Local producers are in very good shape and are running steadily, though several Southern interests seem to need orders badly. The price of $12.50 Birmingham or $16.25 per ton St. Louis for immediate delivery seems to be the prevailing one; 50c. per ton advance over these figures is being asked for third- and fourth-quarter delivery.

FOREIGN IRON TRADE

United States Iron Ore Movement—Imports and exports of iron ore in the United States, three months ended March 31, long tons:

	1909.	1910.	Changes.
Imports...........	275,658	618,883	I. 343,225
Exports	20,023	21,889	I. 1,866

Of the imports this year 361,580 tons came from Cuba and 216,129 tons from Europe.

Imports of manganese ore for the three months 37,118 tons in 1909, and 51,849 in 1910; increase, 14,731 tons.

United States Foreign Trade—Exports and imports of iron and steel in the United States for the three months ended March 31 are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1909.	1910.	Changes.
Exports........	$35,050,293	$42,252,359	I.$ 7,202,066
Imports	5,832,848	10,359,069	I. 4,526,221
Excess, exp.	$29,216,415	$31,892,290	I.$ 2,675,845

The leading items were as follows, in long tons:

	Exports		Imports	
	1909.	1910.	1909.	1910.
Pig iron............	8,754	13,584	31,416	60,597
Scrap...............	3,941	2,448	1,313	47,608
Billets, blooms, etc.	21,427	4,912	3,349	12,699
Bars	18,026	27,370	5,072	8,432
Rails...............	50,741	109,192	289	3,985
Sheets and plates..	33,678	72,265	901	1,461
Structural steel....	24,628	28,067	2,143	2,192
Wire-rods..........	3,797	4,705	3,243	4,900
Wire.........	33,190	36,797	.....	......
Nails and spikes..	12,472	13,110	.....	.....
Tinplates.	2,504	3,139	11,781	18,058
Pipe and fittings..	31,566	37,167	.....	......

Imports of wire not given in quantities; values, $246,921 in 1909, and $378,475 this year.

METAL · MARKETS

New York, May 11—The metal markets generally continue rather heavy and the downward tendency recently reported has changed only in a few lines

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin lead zinc and aluminum, was 127 for the month of January; 124 for February; 118 for March; 118 for April.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1910..	$ 1,815,329	$ 4,492,229	Imp. $ 2,676,900
" 1909..	21,252,462	5,161,648	Exp. 16,090,814
Year 1910..	10,915,595	9,686,702	" 1,228,893
" 1909..	37,978,632	12,158,275	" 25,820,357
Silver:			
Mar. 1910.	4 553,110	3,872,912	Exp. 680,198
" 1909 .	5,079,287	3,279,531	" 1,799,756
Year 1910 .	13,640,333	11,276,595	" 2,363,438
" 1909..	14,473,929	10,453,218	" 4,020,712

Exports from the port of New York, week ended May 7: Gold, $1,094,000; silver, $614.243, both chiefly to London. Imports: Gold, $138,691; silver, $36,172, from the West Indies, South America and Japan.

Gold—The price of gold on the open market in London continued at 77s. 9d. per oz. for bars, and 76s. 5d. per oz. for American coin. Business was interrupted by the stops owing to the death of the King. In New York no gold was taken for export.

Platinum—The market remains quiet but steady, and prices are unchanged. Dealers ask $29@29.50 per oz. for refined platinum and $34.50@35 per oz. for hard metal.

Our Russian correspondent writes under date of April 28 that the market has been inactive, on account of the Easter holidays. At Ekaterinburg prices fell a little on account of the desire of small holders to realize; 6.30 rubles per zolotnik—$23.69 per oz.—being accepted for crude metal, 83 per cent. platinum. In St. Petersburg the quotation for the same grade is 25,000 rubles per pood—$24.50 per oz.—but this is subject to negotiation for large orders.

Silver—The market fell to 24 11/16d. this week on selling by China banks; but on renewed buying by India bazaars and speculative buying, silver has again recovered and closes firm at 24 15/16d. in London.

SILVER AND STERLING EXCHANGE

May.	5	6	7	9	10	11
New York....	54	53⅞	53⅝	53⅝	53⅞	54⅛
London.....	24⅞	24 13/16	24 11/16	24 11/16	24 13/16	24 15/16
Sterling Ex..	4.8675	4.8680	4.8700	4.8700	4.8685	4.8665

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to April 28, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£1,471,800	£2,177,600	I. £ 705,800
China........	1,038,200	1,113,500	I. 75,300
Straits........	82,800	......	D. 82,800
Total......	£2,592,800	£3,291,100	I. £ 698,300

India Council bills in London brought an average of 16.06d. per rupee.

Copper, Tin, Lead and Zinc

	Copper.			Tin.	Lead.		Zinc.
May.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
5	12⅝ @12⅞	12¼ @12⅜	59 9/16	32¾	4.32½ @4.35	4.17½ @4.20	4.85 @4.90
6	12⅝ @12⅞	12¼ @12⅜	55⅝	33	4.32½ @4.35	4.17½ @4.20	4.85 @4.90
7	12⅝ @12⅞	12¼ @12⅜	....	33	4.30 @4.35	4.15 @4.20	4.85 @4.90
9	12¾ @13	12⅜ @12½	55¾	33	4.30 @4.32½	4.15 @4.17½	4.87½ @4.92½
10	12¾ @13	12½ @12⅝	56¼	33⅛	4.30 @4.32½	4.15 @4.17½	4 90 @4.95
11	12¾ @13	12⅝ @12¾	57	33¼	4.30 @4.32½	4.12½ @4.15	4.97½ @5.02½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Up to May 7 certain interests were free sellers at 12⅝c. and under, but with the change in sentiment that became manifest on Monday, when European buyers came into the market, a stiffening of terms resulted, and fairly large sales were made at an advance. These were chiefly for foreign delivery. European consumers are still in the market for large quantities. Although the supplies of American manufacturers are believed to be low, they have not yet entered the market to any important extent. The reports of some large sales to them were erroneous. However, it is anticipated that buying will shortly have to be undertaken from this quarter. Sales of Lake during the last week have been insignificant. The market closes at 12¾ @ 13c. for Lake copper, and 12⅝ @ 12¾c. for electrolytic in cakes, wirebars and ingots. The average for casting copper during the week has been nominally 12⅜ @ 12½ cents.

Copper sheets are 18 @ 19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been reduced ¼c. to 14c. base, carload lots at mill.

The London market for standard copper has been active and strong and prices have advanced about £1 10s., closing at £57 for spot and £57 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £59 10s.; best selected, £60 5s. @ £60 15s.; strong sheets, £68 10s. @ £69 10s. per ton.

Henry R. Merton & Co., London, report under date of April 23 that during the previous week a good business for consumptive purposes was done, the low prices ruling for refined copper proving attractive. Manufacturers in Great Britain are well supplied with orders for tubes, sheets and wire, and consequently were disposed to cover their requirements. Continental consumers were less in evidence, having purchased largely during the previous week.

The Utah Copper Company reports production and sale of 18,511,819 lb. of copper during the first quarter of 1910, at average price of 13.33c. The quotational average for the same period was 13.40c.

Operations at the Perth Amboy refinery of the American Smelting and Refining Company are impeded by labor difficulties, a lockout having been inaugurated at the end of April.

Exports of copper from New York and Philadelphia for the week were 2422 long tons. Our special correspondent gives the exports from Baltimore at 1181 tons.

Brass Prices—The Ansonia Brass Company on May 2 made a further reduction of ¼c. in brass prices. The new schedule is as follows, per lb: High sheet brass, high brass wire and high brass rods, 14½c. base; brazed brass tubes, 19⅝c. base; 5 per cent. discount from extras.

Tin—At the lower quotations of last week, good purchasing from this side took place in the London market. Prices advanced generally and at the close the market is firm at £150 15s. for spot, and £152 2s. 6d. for three months.

Consumers bought more freely at the lower prices which were made in the domestic market during last week. Prices here advanced in sympathy with the London market and close at about 33¼ cents.

Lead—The market is quiet and somewhat lower at 4.30 @ 4.32½c., New York, and 4.12½ @ 4.15c. St. Louis.

The American Smelting and Refining Company, on May 10, reduced its price for desilverized to 4.40c., New York, but the independent producers immediately cut under, and at the close of the week Missouri brands were easily obtainable at 4.12½ cents.

The London market has been strong, and Spanish lead has advanced to £12 12s. 6d. and English lead to £12 15s. per ton.

Spelter—At the lower level of prices which has been reached, buyers are disposed to take hold, particularly as their supplies are small. A fair business has been done this week at higher prices, and the market closes at 4.97½ @ 5.02½c. St. Louis, and 5.12½ @ 5.17½c. New York.

New York spelter quotations May 5-7, inclusive, were 5 @ 5.05c.; May 9, 5.02½ @ 5.07½c.; May 10, 5.05 @ 5.10c.; May 11, 5.12½ @ 5.17½ cents.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Base price of zinc sheets on April 28 was reduced 25c. to $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Spelter Market—Paul Speier reports from Breslau, April 23, that the current price for good ordinary spelter is 46.25 marks per 100 kg.—equal to 4.99c. per lb.—f.o.b. works in Silesia; special brands, 47.25 marks. Zinc sheets are steady at 57 @ 62 marks per 100 kg.—average 6.42c. per lb. Zinc dust is quoted at 44 marks per 100 kg.—4.75c. per lb.—delivered at Stettin.

Imports and exports of zinc, etc., in Germany, three months ended March 31, metric tons:

	Imports		Exports	
	1909.	1910.	1909.	1910.
Spelter....................	6,658	8,349	16,875	18,278
Scrap zinc..............	606	347	1,247	1,268
Zinc sheets............	11	36	4,744	4,632
Zinc dust...............	219	269	769	709
Zinc pigments	1,773	1,739	5,860	7,195

Other Metals

Aluminum—Business remains very good, and there are inquiries coming in for considerable quantities. Prices are higher, at 23¾ @ 24c. per lb. for No. 1 ingots in large lots, New York. The market abroad continues strong with an upward tendency.

Antimony—The market is almost dead, and prices are nominally unchanged. Quotations are 8¾ @ 8½c. for Cookson's; 7⅞ @ 8c. for U. S.; 7⅜ @ 7½c. for outside brands.

Quicksilver—The market remains steady. New York quotations are $48 per flask of 75 lb.; jobbers ask 67 @ 69c. per lb. for small lots. San Francisco, $47.50 @ 48 for domestic orders, and $2 less for export. The London price is £9 per flask; with £8 17s. 6d. quoted by jobbers.

Cadmium—Current quotations are 65

@70c. per lb. in 100-lb. lots at Cleveland, Ohio.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Joplin, Mo., May 7—The highest price reported paid for zinc sulphide ore was $42 per ton, the base $35@39.50 per ton of 60 per cent. zinc. The high price for zinc silicate was $28, the base $18@22 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $36.62 per ton.

Lead declined $1 per ton, selling uniformly all week at $49 for ores of 80 per cent. or better, with deductions under this grade. The average price, all grades of lead ore, was $48.76 per ton.

A total of 20 mining companies have closed down but only temporarily, it is hoped. At least they are closed until such time as the price of zinc ore shall resume a level high enough to warrant a return to operations. It is estimated by producers that the output will be curtailed next week from 1200 to 1500 tons. This week the output was lowered about 500 tons by mills closed down at the end of last week. The shipment was 1400 tons less than last week.

SHIPMENTS, WEEK ENDED MAY 7.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	2,843,950	1,603,250	$ 93,314
Joplin	1,525,060	226,690	35,998
Duenweg	765,000	157,070	17,955
Alba-Neck	448,170	......	9,187
Granby	606,670	16,340	8,810
Miami	84,620	315,860	8,585
Carthage	412,450	......	8,249
Spurgeon	385,930	......	5,070
Sarcoxie	230,760	......	4,385
Galena	194,600	25,290	4,217
Badger	127,680	22,320	3,097
Aurora	211,370	......	2,799
Cave Springs	84,950	......	1,533
Carl Junction	64,070	......	1,345
Quapaw	56,450	......	1,016
Wentworth	66,100	......	661
Totals	8,107,830	2,366,820	$206,221
19 weeks	209,252,550	31,261,370	$5,493,669

Zinc value, the week, $148,502; 19 weeks, $4,262,601
Lead value, the week, 57,719; 19 weeks, 830,468

MONTHLY AVERAGE PRICES

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51 26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, May 11—There is little change in the general market, which is inclined to be quiet.

Copper Sulphate—Business has been steady on the decline, and prices are unchanged at $4 per 100 lb. for carload lots and $4.25 for smaller orders.

Arsenic—Prices are unchanged, at $2.40@2.50 per 100 lb. for white arsenic. Sales have been light and considerable quantities are being stored for higher prices.

Nitrate of Soda—Sales are fewer, as the heavy buying season is over. This article is still quoted at 2.15c. per lb. for spot lots, while 2.05c. per lb. is named for futures.

Mortimer & Wisner, New York, report the position of nitrate of soda in the United States on May 1 as follows, in long tons:

	1909.	1910.	Changes.
Stocks, Jan. 1	9,140	14,000	I. 4,860
Imports, 4 mos	124,700	160,680	I. 35,980
Total supplies	133,840	174,680	I. 40,840
Deliveries, 4 mos	122,440	168,155	I. 45,715
Stocks, May 1	11,400	6,525	D. 4,875
Afloat for U. S. ports	58,000	80,000	I. 22,000

Quantities afloat include all cargoes reported which are due to arrive at United States ports by Aug. 15 next.

Potash Salts—Exports of potash salts from Germany, three months ended March 31, metric tons:

	1909.	1910.	Changes.
Kainit, kieserit, etc.	173,988	299,068	I. 125,080
Potassium chloride	41,841	82,824	I. 40,983
Potassium sulphate	13,895	19,633	I. 5,738
Pot.-magnesium sul.	30,580	67,676	I. 37,096
Total	260,304	469,201	I. 208,897

Of the total exports this year 269,570 tons were to the United States; an increase of 84,986 tons over last year.

MINING·STOCKS $

New York, May 11—A fair recovery in the general stock market is to be noted. In some cases quotations advanced several points, though the rise was interrupted by profit taking in a highly professional market. The general tone is not strong, however, and reactions seem to be expected at any time. The close is above last week in a marked but irregular fashion.

On the Curb the copper stocks were more in demand and generally improved in price over last week. Cobalt stocks were fairly active and sold well. Other mining stocks were not much in evidence. On the whole the business on the Curb was better than for several weeks past.

Sales at public auction in New York, May 4, included 1000 shares Deer Creek Mining and Milling Company, $10 each; 100 shares Piedmont Reduction Company, $10 each; 500 shares Sinaloa & Sonora Mining and Smelting Company.

May 11—The copper-share market has a better tone than has been discernable for many months. They had been sold to a standstill and consequently have shown a hardening tendency for the last week. Today, however, they became buoyant. Aside from Amalgamated, the newer Lake stocks showed the most marked strength.

There is said to be a rather formidable short interest in Amalgamated and notwithstanding the large capital the stock

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	February.	March.	April.
Arizona, Ltd	2,658,000	2,886,000	2,340,000
Boleo (Mexico)	2,331,832	2,148,383	2,777,800
Copper Queen	8,927,203	10,809,488	9,920,000
Calumet & Ariz	2,024,000	2,820,000	... .
Cananea (Mexico)	3,586,000	3,700,000	4,262,000
Detroit	1,486,400	1,698,975	1,930,000
Imperial	750,000	825,000	800,000
Nevada Con. (Est.)	5,115,723	5,339,466	5,500 000
Old Dominion	2,035,000	2,674,000	2,325,000
Shannon	1,526,000	1,468,000	1,288,000
Superior & Pitts	1,864,000	2,370,000	....
Utah Copper Co	5,798,819	8,190,000	....
Butte District	13,758,620	24,000,000	25,000,000
Lake Superior	18,250,000	19,250,000	....
Total production	69,995,874	88,439,846	....
Imports, bars, etc.	14,093,381	20,178,202	....
Imp. in ore & matte	6,063,764	6,181,476	....
Total	90,153,019	114,799,524	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report for March includes for the first time the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
V, 1909	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31 332,403

	VISIBLE STOCKS.		
	United States.	Europe.	Total.
V, 1909	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338 392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

advanced rapidly. In fact, the price is up almost $7 for the week to well above $70. Brokerage houses report small holdings of this stock, which is a complaint that has been quite general for some time. Lake stock has risen almost $6 to better than $56.

Indiana had a smart spurt, which put the price up $7.50 during the week to $23.50. North Lake had a sympathetic movement, which caused a rally of $3.50 to $13.50. Isle Royale has been favored with a $4.50 rise to $18.25. Arizona Commercial has probably seen its worst and the price is up $4.50 for the week to $18.25. Copper Range made a low at $64.75, but is back to $67.25. North Butte has shown up well, marketwise.

Curb stocks, after severe depression, have shown considerable rallying power. Chino shows the greatest recovery.

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev	May 31	June 21	$0.10
Blue Bell, Idaho	Mar. 14	June 1	0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Bullion, Nev	May 8	June 6	0.05
Columbus Con., Utah	....	May 11	0.25
Con. Imperial, Nev	Apr. 19	May 12	0.01
Con. Virginia, Nev	May 9	June 3	0.20
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal	May 10	....	1.25
Hector, Idaho	Mar. 28	May 26	0.00¼
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	....	2.50
Mexican, Nev	May 17	June 9	0.15
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich	Mar. 10	....	1.00
Ophir, Nev	Apr. 22	May 16	0.25
Overman, Nev	Apr. 6	Apr. 27	0.10
Savage, Nev	May 2	May 27	0.10
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21	....	0.03
Utah, Nev	Apr. 22	May 3	0.05
Utah Con. of Tintic, Utah	May 15	....	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	......	24.343	......
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56	12.733	12.93	13.091	57.363	57.238
May	12.893	......	13.238	......	59.338	......
June	13.214	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.351	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32.403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	......	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS May 10

Name of Comp.	Bid.
Listed:	
Acacia	.06
Cripple Cr'k Con.	.02¾
C. K. & N.	.17½
Doctor Jack Pot.	.08
Elkton Con	.70¾
El Paso	.83¾
Fannie Rawlins	‡.01¼
Findlay	.07
Gold Dollar	‡.12¼
Gold Sovereign	.03¼
Isabella	.16½
Mary McKinney	‡.48
Pharmacist	.02¾
Portland	1.04
Vindicator	.79½
Work	.03½
Unlisted:	
Golden Cycle	1.50
United Gold Mines	‡.07¼

SALT LAKE May 10

Name of Comp.	Clg.
Carisa	.48
Colorado Mining.	.61
Columbus Con.	.47
Daly Judge	‡4.03
Grand Central	1.15
Iron Blossom	.98
Little Bell	1.25
Little Chief	.45
Lower Mammoth.	‡.57
Mason Valley	6.25
Maj. Mines	2.32½
May Day	‡.08¾
Nevada Hills	‡.65
New York	‡.13
Prince Con	.70
Red Warrior	6.00
Silver King Coal'n	2.35
Sioux Con	.31
Uncle Sam	.35
Victoria	1.07½

SAN FRANCISCO. May 10.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.13	Belmont	3.50
Belcher	.89	Daisy	.06
Best & Belcher	‡.25	Jim Butler	.19
Caledonia	.51	MacNamara	.29
Challenge Con	.28	Midway	.29
Chollar	.16	North Star	.03
Confidence	1.10	West End Con	.42
Con. Cal. & Va.	1.22	Atlanta	.13
Crown Point	.90	Booth	.13
Exchequer	.20	C.O.D. Con	.06
Gould & Curry	.28	Columbia Mt.	‡.05
Hale & Norcross	.37	Comb. Frac.	.47
Mexican	1.27	Great Bend	.02
Ophir	1.35	Jumbo Extension	.22
Overman	1.10	Oro	.05
Potosi	.35	Red Hill	.03
Savage	.36	Sandstorm	.04
Sierra Nevada	.28	Silver Pick	.08
Union	.29	St. Ives	.14
Yellow Jacket	.90	Tramps Con	‡.04

N. Y. EXCH. May 10

Name of Comp.	Clg.
Amalgamated	70⅛
Am. Agri. Chem.	46
Am.Sm.&Ref.,com	79¾
Am. Sm. & Ref., pf.	87⅛
Anaconda	43½
Bethlehem Steel	30
Col. & Hock. C. & I.	‡8⅞
Colo. Fuel & Iron.	38⅜
Du Pont P'd'r, pf.	‡87½
Federal M. & S.	41
Great Nor., ore ctf.	64¼
Nat'nalLead,com.	78⅜
National Lead, pf.	‡107
Pittsburg Coal	19¼
RepublicI&S,com.	34⅜
Republic I & S, pf.	97½
SlossSheffi'd,com.	73½
Sloss Sheffield, pf.	117½
Tennessee Copper	27½
Utah Copper	46
U. S. Steel, com.	83⅛
U. S. Steel, pf.	118¼
Va. Car. Chem.	58¾

N. Y. CURB May 10

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	16½
Braden Copper	4⅜
B. C. Copper	5¾
Buffalo Mines	3½
Butte Coalition	20½
Chino Copper	13¼
Cobalt Central	.09½
Combination Fra.	.42
Con. Ariz. Sm.	2⅜
Cumberland Ely	‡9
Davis-Daly	1⅞
Dominion Cop.	7
Ely Con	.50
El Rayo	3
Florence	3⅛
Gila Copper	6½
Giroux	8
Gold Hill	1⅜
Goldfield Con.	8 3/16
Greene Cananea	8⅞
Guanajuato	1⅝
Guggen. Exp.	180
Kerr Lake	.08¾
La Rose	4 1/16
McKinley-Dar-Sa.	.91
Miami Copper	22¾
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	⅞
Newhouse M. & S.	‡3½
Nipissing Mines	10
Ohio Copper	2½
Pacific Sm. & M.	¾
Silver Queen	.12
Standard Oil	625
Stewart	1⅛
Tonopah	8⅝
Tonopah Ex.	.84
Tri-Bullion	⅞
Utah Apex	3½
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4½

LONDON May 11

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	10	0
Esperanza	2	12	0
Tomboy	0	18	0
El Oro	1	7	3
Oroville	0	8	9

BOSTON EXCH. May 10

Name of Comp.	Clg.
Adventure	7
Allouez	44
Am. Zinc	25½
Arcadian	5⅞
Arizona Com	17
Atlantic	7⅜
Boston Con.	‡14⅞
Butte & Balak	11¼
Calumet & Ariz.	61½
Calumet & Hecla.	585
Centennial	18
Con. Mercur	.10
Copper Range	67½
Daly-West	8
East Butte	8
Franklin	13
Granby	45
Greene—Can.	8⅞
Hancock	20¾
Helvetia	2¾
Indiana	23
Isle Royale	18¼
Keweenaw	3¾
Lake	56
La Salle	12⅞
Mass	7
Michigan	5
Mohawk	51
Nevada	19½
North Butte	33⅞
North Lake	13½
Ojibway	7¼
Old Dominion	36
Osceola	136
Parrot	14¾
Quincy	78
Shannon	11½
Superior	44
Superior & Bost.	11
Superior & Pitts.	12¼
Tamarack	50
Trinity	6
U. S. Smg. & Ref.	42¾
U.S.Sm. & Re., pd.	49½
Utah Apex	3
Utah Con	22
Victoria	3
Winona	9
Wolverine	114½
Wyandotte	2

BOSTON CURB May 10

Name of Comp.	Clg.
Ahmeek	‡.11
Bingham Mines	3
Boston Ely	2⅝
Calaveras	5⅞
Champion	.09
Chemung	‡9⅝
Chief Cons	1⅜
Chino	12¾
Cons. Ariz.	2⅜
Corbin	.06¾
Cactus	3¼
Crown Reserve	‡3
First Nat. Cop.	2⅜
Gila Copper	6⅝
Indiana	34¾
Inspiration	7⅛
Majestic	.70
Nevada-Douglas	2⅞
New Baltic	7¼
Oneco	2⅛
Ray Central	2⅜
Ray Con	19
Rawhide Coal	.29
Rhode Island Coal	7
San Antonio	7½
Shattuck-Ariz	29
South Lake	5½
Superior & Globe	.38
Trethewey	1.34
Tuolumne Copper	‡3¾
Vulture	9½
Yuma	.90

‡Last quotation.

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The Advance in Silver

The recent advance in the price of silver, which has carried the quotations up to a point not previously reached since the first quarter of 1908, seems to be well held. The sharp break which followed the increase in the Indian duty on the metal was, as predicted at the time, only temporary, and the price quickly recovered and even advanced. The current quotation of 54c. in New York and 24⅞d. in London is 2½c. above the average of last year, and the general tendency seems to be upward. As usual the advance comes chiefly from increased demand from the Far East, which is now, as it has been for a long time, the ruling factor in the silver market.

Perhaps the more important cause for this larger demand is found in the improved conditions in India, resulting from two years of good harvests. The people are generally prosperous; their buying power has been increased and according to their immemorial custom the surplus is being invested in silver in various forms. This cause is a familiar one and needs no special comment; it works now as it has in former years. China has also contributed to the larger demand. In January and February the shipments to that country were large, but since then they have fallen off, and the Chinese banks have transferred some of their silver to India in payment of rice bills and in actual sales. The causes of the Chinese demand are more complex. The long continued depression of silver and the consequent low rates of exchange have tended to an increase in the exports of merchandise and a decrease of imports, leaving a larger balance to be paid for in money—that is, in silver. Moreover there has been a steady increase in manufacturing in that country, so that the home industries now supply many of the articles of daily use formerly imported, and this again tends to improve the export balance, which must be paid in silver. The results of the causes above outlined are shown in the following table.

The principal exports from London to the East for the four months ended April 28 were:

	1909.	1910.	Changes.	
India	£1,471,800	£2,177,600	I.	£ 705,800
China	1,038,200	1,113,500	I.	75,300
Straits	82,800	....	D.	82,800
Total	£2,592,800	£3,291 100	I.	£ 698,300
App. oz.	26,340,200	32,869,600	I.	6,529 400

The increase here in the approximate quantities was 24.8 per cent.; a little smaller in proportion than that in values. The Straits are no longer takers of silver, since the gold standard was established there.

Outside of the shipments to the Far East there have been some minor causes for increased demand. Germany has bought this year a considerable quantity for coinage, and Russia has also taken large quantities, either for coinage or for use in the East. There is also reported an improvement in the demand for silver for use in the arts, which usually accompanies a period of increased prosperity. This sale fell off heavily in 1908, but now shows a considerable recovery.

The improvement in the silver market has not been accompanied by any increase in our own sales of silver. The exports from and imports into the

United States for the four months ended April 30, were as follows in value:

	1909.	1910.	Changes.
Exports........	$19 426,181	$18,336,081	D. $1,090,100
Imports........	14,675,365	15,238,634	I. 563,269
Net exports..	$ 4,750,816	$ 3,097,447	D. $1,653,369
App. oz........	9,264,600	5,939,950	D. 3,324,650

This shows a decrease of 35.9 per cent. in the approximate quantity of the net exports. The imports are mainly in bullion and other crude forms to be refined here. The United States Mint has not been a buyer of silver this year.

As to the near future, it is to be expected that the demand from the East will continue large for some time to come, as the causes for it are still operative. Moreover, the reserve of coined silver in India is reported to be rapidly decreasing, and it is not unlikely that the Indian Government will soon be in the market as a buyer for coinage purposes, for the first time in three years. This will add to the demand and again improve the price.

Pig Iron Curtailment

The somewhat belated curtailment of pig-iron production is making considerable progress. The steel-works furnaces, which began the movement, have about reached what may be considered a permanent basis. Merchant furnaces are still going out of blast, though some companies are banking their stacks, in the hope of an early revival of business. The latter course is taken usually by those which have no large stocks of iron in their yards. We have said above that the movement was rather belated, and it would probably have been better timed if it had been begun three months ago, before the evident accumulation of stocks helped to force the decline in prices, which has carried them down nearly $2 per ton since the heavy buying of last October and November.

When that passed and there were no signs of a renewal, most people began to see what a few observers had already realized, that the extraordinary production of the second half of last year had run ahead of demand, and that continued output at that rate could not be absorbed. The country is not yet able to use pig iron at the rate of 30,000,000 or 31,000,000 tons a year. The fall buying movement was not renewed, and stocks began to accumulate to a degree which could not be hidden. Some producers were obliged to cut prices to clear out their stocks, and others had to follow to hold their business.

The steel-making companies are not directly affected by quotations, but they have to consider the cost of carrying iron, which increases rapidly with stocks. The merchant furnaces, with advanced prices of ore and coke, saw that their selling prices were coming uncomfortably near the cost of production. There was no alternative but to stop, and they are doing it right and left.

All this sounds rather sensational; but that appearance is given to the movement chiefly because of its long postponement. The suddenness of the movement has given it rather the appearance of a panic; but after all the cutting down the blast furnaces will still be turning out iron at a rate equal to the highest yearly output ever recorded and there is every prospect that this can be absorbed. It is simply that they did not realize that the capacity of production had been increased faster than consumption. We are now able to make somewhere between 33,000,000 and 34,000,000 tons a year, and an attempt to utilize the full capacity must certainly call a halt, because that is beyond any consumptive ability, except for a short period.

The Porphyry Copper Mines

We have repeatedly deprecated the circulation of "market letters" about mining enterprises by irresponsible brokerage houses, and we have assailed misrepresentation by anyone, high or low. Our attention has fallen this week upon a circular entitled, "The Low-Grade Porphyry Copper Mines," issued by Hayden, Stone & Co., that contains considerable misinformation, which we hope is ascribable only to carelessness. A mining house of the position of this one certainly should know better than some of the things that it says in this circular.

The most glaring fault is the printing of the prospective cost of copper by the Miami Copper Company at 7½c. per lb. Inasmuch as Mr. Channing has consistently said that the Miami cost will be 9c., it does not seem that prospective investors should be led to anticipate anything lower. It is true that some other engineers who have examined this property have expressed the opinion that Mr. Channing's estimate of 9c. is conservative, and likely to be beaten, but we do not believe that any competent engineer has indicated a figure anywhere near as low as 7½ cents.

The present cost of copper to the Utah Copper Company is put down at 8c. per lb., and the prospective cost at 7½c. In fact, the cost to this company in 1909, according to its own figures, was 8.787c.; for the first quarter of 1910 the cost was 8.43 cents.

For five porphyry copper mines this circular states figures of tonnage of ore in sight. No discrimination is made as to whether these figures represent proved ore, probable ore, or possible ore. In certain of the cases we know that the figures purporting to represent ore in sight include what the companies themselves rate only as probable ore. If the ore development of these companies were reckoned upon the same basis, we are sure that the figures would be decidedly different from those stated.

Finally, to make a short job of riddling this misleading circular, the net value of a mine is not properly reckoned by multiplying the tonnage of ore in sight by the present net value of one ton. Every tyro in mining finance ought to know that a ton of ore that is not going to be extracted for 20 years is not worth as much as a ton mined and milled today.

The porphyry copper mines are good investments upon the proper mining basis, but investors should understand thoroughly what that basis is, and should not believe everything they are told, even by reputable houses.

The action of the Department of Justice in attempting to dissolve the alleged cotton pool throws a new light upon the Sherman law for some persons who have heretofore been most rabid against the trusts. Everybody, in their estimation, has been bad except those kind gentlemen who have elevated the prices for cotton and wheat. It always matters whose ox is gored.

In addition to the higher cost of mining under the new wage scales, the Western coal operators will have to carry a general advance in railroad rates, which will take effect June 1. This advance, however, being general will not affect competitive trade; though it must increase the price to consumers.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

The Vortex Copper Converter

Referring to my article on the "Vortex Copper Converter" in the JOURNAL May 7, 1910, I wish to state that since the cost of furnishing air for bessemerizing is but 20 to 25 per cent. of the total expense of converting copper, and amounts to 0.1c. to 0.15c. per pound of copper, whatever increased efficiency in the air supply may be attainable, the ultimate saving would be but small. Other economies would directly result from the more efficient use of the air, such as more rapid oxidation of the charge and reduced time of blowing. The stirring effect of the air is increased also, an important function of the air aside from being the carrier of oxygen to burn the sulphur and oxidize the iron.

BASIC NONCORROSIVE LINING

The tuyere arrangement is of special value where the converter is lined with a noncorrosive lining. I have given this subject considerable thought and study, and as far back as 1906 submitted a report to the Compañia Metallurgica de Torreon, S. A., Torreon, Mexico, on the advantages of the vortex converter lined with basic material, and the feeding of silicious ores through the converter nose. I may say that the lining I intend to use is basic; it is, however, not magnesite, which aside from conducting and radiating heat readily, has other chemical and physical properties which make its use expensive and problematical for copper converter linings. One trouble experienced with basic-lined (magnesite) barrel converters, was the formation of noses at the end of the tuyeres. In punching these, portions of the lining were knocked into the converter, necessitating a cessation of operations to repair the tuyere lining.

With the arrangement of the tuyeres in a ring, the tuyere block can be built in one piece, and in the form of a truncated cone. This is forced into place by hydraulic pressure, and when damaged, is removed by the same force. This has been the practice in steel converting for many years, and has the advantage that a tuyere block can be replaced quickly.

REDUCTION IN CONVERTING COSTS

There is no doubt in my mind that the basic-lined copper converter will replace the one generally in use now. It has been reported that a margin of $2.50 has been attained in the basic-lined (magnesite) converters at Garfield, Utah, over the cost in the common barrel converter, and that three more basic-lined converters will be installed. This would be a reduction of 25 per cent. in cost of converting, with $10 (0.5c. per lb. Cu) the cost of converting one ton of copper. In a plant of the size of the Copper Queen reduction works at Douglas, producing 5000 tons of copper monthly, this would mean a monthly saving of $12,500.

When the silicious ores are fed through the nose of the converter, a thorough mixing of the converter contents is even more desirable than when the lining itself furnishes the silica for slagging the iron. It is for the reasons above set forth, that I anticipate a large field of usefulness for the vortex converter with noncorrosive, basic lining.

HERBERT HAAS.

Globe, Ariz., May 10, 1910.

Spurious Potassium Cyanide

The correspondence which appeared in the JOURNAL (F. A. Ross, Oct. 23, 1909; J. E. Clennell, Jan. 15, 1910; E. M. Hamilton, Feb. 12, 1910) on the subject of spurious potassium cyanide, left matters in a most unsatisfactory condition. Mr. Ross' samples having been submitted to analysis for the express purpose of determining the relative amounts of sodium and potassium they contained, it was surely most misleading and improper to return the sodium present "in terms of potassium."

DISSOCIATION DOES NOT AFFECT CHEMICAL ACTION

Mr. Clennell advances a theorem which calls for some discussion. He says, in short, "The soluble metallic cyanides are completely dissociated in dilute solution, therefore it would seem that the primary reaction on the gold or silver must depend solely on the presence of the cyanogen. The nature of the alkali metal exerts absolutely no influence on the extraction."

All soluble salts are probably more or less dissociated on going into solution in water, but although this increases the osmotic pressure and the electrical conductivity of the solution, it does not alter their chemical affinities or affect their behavior toward other reacting substances. If we suppose that the subdividing effect of water, in large preponderance of mass, is enough to divide the KCN molecule, holding the K apart from the CN, we must also suppose that it is enough to divide the AuCN molecule and keep the Au apart from the CN. Therefore, the dissociating effect of water is a force which acts on both sides of the equation and may be disregarded.

In explaining a chemical reaction it is not necessary to go into ionic theories. In describing the solution of iron by copper-chloride solution, it is not necessary to assume that the copper chloride is dissociated and that the chloride atom is therefore free to act on the iron; it is enough to say that the more electropositive and chemically active element displaces the less active. The affinity between K and CN continues to exist just the same when the molecule is dissociated by solution, for we do not get free potassium and cyanogen, but ionic K and CN, coëxisting although separated; nor can the K and CN be separated by their different diffusion rates. Thus, the affinity of K for CN has to be overcome by some stronger affinity before either of them can enter into another chemical combination.

ACTION OF OXYGEN IN CYANIDE SOLUTIONS

What is this stronger affinity in the case of the solution of gold? It is evidently not the affinity of cyanogen for gold, for this is such a small quantity that free cyanogen has not the slightest action on free gold, and it is impossible to think of a highly inert substance like gold as displacing the exceedingly active potassium from any of its combinations. We find the stronger affinity which we are seeking when we examine what takes place on the solution of gold in cyanide.

It is now held to be quite conclusively proved that cyanide solution has no action on gold unless free oxygen is present, and that the reaction which takes place is expressed by the equation

$$2Au + 4KCN + O + H_2O = 2KAuCN_2 + 2KOH$$

from which it is evident that what takes place is that an atom of oxygen removes two atoms of potassium from its combination with cyanogen, forming K_2O (which then forms KOH with the water) while the nascent cyanogen, in the absence of anything else with which it can combine, takes up gold to replace the potassium which has been removed.

If this reaction were determined by the affinity of cyanogen for gold, there is nothing to prevent it from going on in the absence of oxygen; the gold is there, the cyanogen is there, and the potassium, if it were displaced by gold from its combination with cyanogen, has plenty of water to combine with. But no such action takes place, whereby it is evident that the motive force of the reaction is the attraction of the alkali metal for oxygen.

Why Potassium Should be Preferable to Sodium

There are three forces tending to promote the combination of gold with cyanide: (1) The affinity of potassium for oxygen, one of the strongest chemical forces; (2) the affinity of gold for cyanogen, not a very strong force; and (3) the affinity of potassic cyanide for aurous cyanide, also not particularly strong. On the other side of the account there is nothing but the affinity between potassium and cyanogen, and although this is weak as compared with the oxygen affinity of potassium, as the oxygen is in the free or molecular state and has to liberate cyanogen in the nascent or atomic state, the reaction proceeds only slowly and with difficulty, whereas, if atomic or nascent oxygen is brought into contact with cyanide, the latter is broken up instantly.

If it is the case as is here represented, that the determining factor in this reaction is the attraction of the alkali metal for oxygen, it follows that the greater this attraction the more the reaction will be promoted. Potassium has a much stronger affinity for oxygen than has sodium, as everybody knows, and it is therefore reasonable to suppose that potassic cyanide will better promote the solution of the gold than will sodium cyanide. It is an old saying that "Whatever soda will do, potash will do better."

Theory of Selective Affinity

In the early days of the cyanide process, when the chemistry of the subject was not well understood, the inventors, to account to a somewhat incredulous world for the remarkable results obtained, gave out that they had discovered a "selective affinity" between the precious metals and cyanogen so wonderful in its operation that cyanogen would "select" the few pennyweight of gold or silver in an ore in preference to any or all of the rest of it, and this theory of an extraordinary affinity between cyanogen and gold was an article of faith with the chemists of the original cyanide-process company, and was spread abroad by them and became a tradition. The idea that "cyanogen" is the active principle is a survival of that tradition, but it is now quite evident that "cyanogen" on its liberation takes up gold and silver only when and because these are the only substances present in the free or uncombined state with which it can possibly enter into combination.

The South African cyanide chemists seem to be satisfied with sodium cyanide, but I believe that a different feeling prevails in America. Mr. Ross admits a preference for potassium, and Mr. Hamilton refers to "the fact that many workers are discarding the NaCN in favor of potassium cyanide." About seven years ago I used a lot of sodium cyanide testing about "120 per cent. KCN" but found it unsatisfactory on account of the solutions coming off turbid from the leaching vats, especially toward the end of the washing. Knowing the bad effect of caustic soda in causing turbid filtration, I attributed this to the sodium salt and went back to "KCN" when the turbidity ceased.

Reporting Strength of Solutions

Mr. Clennell's suggestion that the strength of solutions should be reported in per cent. of CN is open to the objection that it would be inconvenient in practice. When the solution man titrates his solution in terms of pounds of cyanide per ton he knows at once how many pounds per ton he must add to bring it up to the required strength, but if it were titrated in terms of cyanogen he would always have to make quite a calculation to find out how much cyanide was called for.

If one is using sodium cyanide, why not call it sodium cyanide and make up the solutions in terms of sodium cyanide, and make up the silver-nitrate solution with 17.3 grams per liter, when 1 cc. = 1 lb. NaCN per ton on a 20 cc. test, or 0.1 per cent. NaCN on a 10 cc. test? By this method any KCN would be returned "in terms of NaCN," but no one who believes that a molecular weight of NaCN is just as good as a molecular weight of KCN could consider that an objection.

It would also have the advantage of showing up any shortage in the cyanogen content of the cyanide, for if it did not test up to somewhere near 100 per cent. NaCN the question would be asked, "what else is there in it"? whereas at present the manufacturer can send out a material containing 75 per cent. sodium cyanide and 25 per cent. common salt and other worthless material, and still point with pride to the fact that his product "tests 100 per cent." At present, apparently, when a sufficient quantity of neutral byproduct is not obtained to bring the "nominal KCN" down to below 100 per cent, the requisite diluent is added in the form of common salt, quite harmless no doubt but not worth 20c. per pound.

Every Man Should Make His Own Tests

In any case, there can be no difference of opinion on the point that if a person wants potassium and orders potassium and pays for potassium he is entitled to get potassium and not sodium, just as if a person wants butter, and orders and pays for butter he ought to get butter and not oleo, and it is beside the question for the dealer to assert that oleo looks just as well and is quite as nutritious.

The only way in which the operator can look after his own interests is to make sodium-potassium determinations on the stuff he gets. Fortunately this is not such a formidable undertaking as Mr. Ross and Mr. Hamilton seem to think, as it can be done in an hour by anyone who can make a weighing and a titration, and with sufficient accuracy to meet the wants of the cyanide operator, who would be just as well satisfied with the proportion of sodium and potassium to 1 per cent. as to the second place of decimals.

Ralston Bell.

Edinburgh, March 10, 1910.

[Particulars of the method for rapid sodium-potassium determination will be published in the Journal at an early date.—Editor]

A Mythical Stock of Copper

The vagaries of the daily newspapers sometimes pass all understanding, but when a New York daily in its serious financial department fathers views like the following, who can wonder respecting the erroneous beliefs of Tom, Dick and Harry?

"A report came from London late yesterday that copper producers in all parts of the world are much worried over the big surplus of metal that has been accumulated by the Tanganyika Concessions in the Congo. This is one of the mysterious enterprises of the late King Leopold. Lady Warwick got the concession from the king and turned it over to the late Cecil Rhodes, taking a stock interest in the Concessions Company, which is building a railroad to be open by September. The report of yesterday was that by the time this railroad is ready to handle copper metal, the Tanganyika mines will have 200,000,000 lb. ready for delivery. This copper has not been counted in the surplus stock of the world. Its threatened appearance on the market is likely to create some excitement."

In fact, there has never been anything mysterious about Tanganyika Concessions, the promoters of the company having been very explicit in their statements. The company will not have 200,000,000 lb., or anything like it, for delivery in September next. It is recognized that the region in which this company is interested possesses large copper resources, but it will probably be several years before their copper begins to figure prominently in the market.

The Congo is being opened up as fast as capital can be obtained, and several development companies are now advertising for experienced prospectors, offering $150 and all expenses, together with bonuses for discoveries of importance.

The Passing of Bodie, California

The future of the Standard Consolidated at Bodie, Cal., is summed up by Superintendent Landers in the annual report of the company for the year ended Feb. 28, 1910, as follows: "We now find ourselves with little likely territory left to explore. Such as is left, containing many veins of very small size and only moderate value, cannot be counted on to furnish sufficient ore to keep the plant in full operation after the remaining ore in the Clay vein and its branches has been extracted, which may not be later than the coming summer." The total tonnage in reserve is given at 5600 tons worth $78,300.

Some of the territory has been thrown open to leasers, and the only other hope of the company seems to be to open the mine to greater depth. Upon this subject Mr. Landers does not become enthusiastic. He says: "The question of pumping out the lower levels or of either sinking one of the shafts or driving a long tunnel is being seriously considered. While it is possible that there is but little ore of pay grade on the lower levels, it *might* be well for the company to take the mining chance and endeavor to open up new orebodies at greater depth."

During the year the 20-stamp mill operated only 168.4 days and crushed 11,732 wet tons of ore. The slimes plant handled, from May 1 to Sept. 30, over 100 tons of slime from the ponds per day in addition to about 43 tons per day from the mill. The pond slimes averaged about $5.40 per ton, and those from the mill $8.07. An extraction of about 94 per cent. was made in the slimes plant at a cost of $2.73 per ton treated.

The Iron and Steel Institute

Special Correspondence

The 41st. annual meeting of the Iron and Steel Institute was held in London during the week ended May 6, under the presidency of the Duke of Devonshire, who has a large interest in the industry and who now occupies the chair that was held by his grandfather, the first president of the Institute, in 1869. Although not claiming any expert knowledge of the metallurgy of iron and steel, the Duke contributed an interesting presidential address, containing some useful statistics as regards production. In it attention was specially called to the enormous increases in late years of the American and German production of both pig iron and steel, as well as to the violent fluctuations in the American outputs. As regards the condition of the working classes in Great Britain at the present time compared with 1869, when the Iron and Steel Institute was founded, the Duke said that he thought they were now 100 per cent. better off.

The following papers were presented at the meeting: "The Girod Furnace and the Electric Smelting Works of the Paul Girod System," by Dr. W. Borchers; "The Economy and Design of Modern Reversing Rolling-Mill Steam Engines," by E. G. Sehmer and Dr. Rudolf Drawe; "Developments in the Production of Electric Power: its Application and Bearing upon the Iron and Steel Industries," by D. Selby-Bigge.

James J. Hill on Extravagance

James J. Hill writes in *World's Work* for May in part as follows:

We are living in an age of worldwide financial delirium. Most nations have thrown away moderation in the spending of money. The immense increase of wealth has greatly augmented the supply of capital. Its mobility strengthens the impression that it is inexhaustible. The wealth of France increases about a billion a year. This increment, collected by great banking concerns, may be drawn on by enterprise anywhere. While France is the best saver, it is not the richest nation.

The addition of uncounted billions to aggregate wealth has stimulated the spirit of financial adventure and the love of squandering. Its availability has lulled to sleep national prudence. The increase of apparent resources by easy resort to borrowing, the mortgaging of a patrimony not our own, the diversion of wealth to unproductive uses, have gone further than most realize.

Something is due to enormous currency inflation. The tariff is another contributing cause. Combinations in restraint of trade are partly responsible. Still more is due to decline of agricultural products compared to population. The large unexplained balance must be credited to lavish expenditure, which has grown to be a national trait, consuming our resources, encouraging indolence and luxury, and compelling constantly ascending wages. This is the meaning of the statement by me that it is not so much high cost of living as cost of high living that afflicts the country.

Perhaps the greatest factor in the price problem is the wage rate. As the labor supply diminishes, wages rise still more. High wages and prices work in a circle. But these wages do not come out of the air. In the end labor suffers when the business no longer pays profits and payrolls cease. High prices and wages and taxes may work for impoverishment of a nation by the same process of waste that impoverishes the soil. Material resources are conserved by steps to stop destruction. So the wealth of the country, its capital, its credit, must be saved from predatory poor as well as predatory rich, but above all from the predatory politician.

Trouble for California Wildcats

The U. S. postal authorities have joined hands with the California State Mining Bureau and State Mineralogist Lewis E. Aubury in the investigations as to fake companies in the California oilfields. Arrests and presecutions will be made under the Federal postal law, and under the California statute in cases where circumstances warrant such action instead of using the postal laws. There is a State statute which makes it a felony to misrepresent anything in connection with a mining company with the intention of deceiving and defrauding the public.

It is reported that already several companies are under suspicion, and that special agents of the postal authorities and the State Mining Bureau are in the field inquiring into the operation of these and other companies. Mr. Aubury has stated that evidence is about complete against one concern near Coalinga, and that the suspected companies now number probably a dozen.

Successful Year at Laurium, Greece

In the manufacture of pig lead at the Laurium mines, Greece, results were much better in 1909 than the previous year, i.e., the yield was greater, percentage of silver higher, and cost per ton less, says the *Mining Journal*. Mining was carried on more economically and improvement made in processes for washing ore and manufacture of briquets. Cheaper smelting is ascribed to better yields, reduced railway tariffs and more careful maintenance of the plant. Receipts in 1909 were 244,000 drachmas more than in 1908, the losses of the latter year being thus transformed into profits of 70,000. Hitherto, such low prices, combined with unfavorable rates of exchange, were unknown; but this demonstrates that the company can meet the most disadvantageous conditions. The washing plant was idle during two months in 1909, and only in half work for two others, owing to the state of the market. Lead mining was also reduced. On the other hand, to take advantage of the rise in zinc, 1816 tons of calamine were mined.

A large force of men are engaged in development work on the extensive iron-ore deposits controlled by the U. S. Steel Corporation, near Kashabowie, about 60 miles west of Fort William, Ont. Preliminary steps are being taken to organize a subsidiary Canadian company to operate the mines.

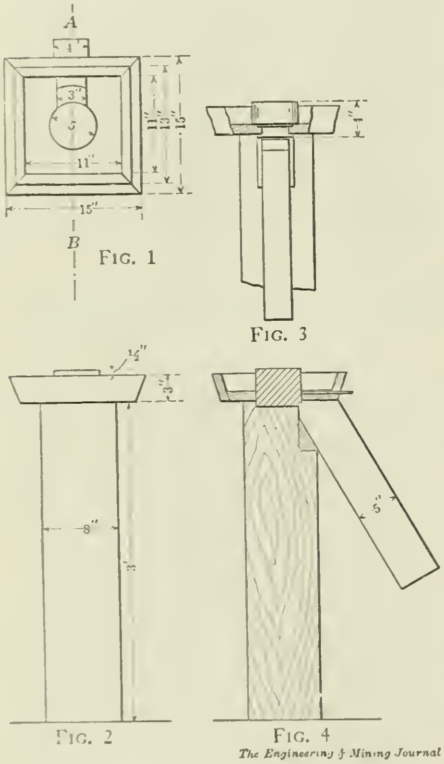
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

A Convenient Slag Anvil

By R. P. Wheelock*

The accompanying cuts show the details of a convenient and easily constructed, assay-office slag anvil for use in cleaning the lead buttons obtained in the fire assay. It is merely a beveled, square, wooden tray, about 2 in. in depth and lined with tin (pieces from a five-gallon oil can), set upon an 8x8-in. wooden post. In the center of the tray is a block of steel (a section of shafting answers the purpose) which is sunk into the post about ½ in. to insure stability.



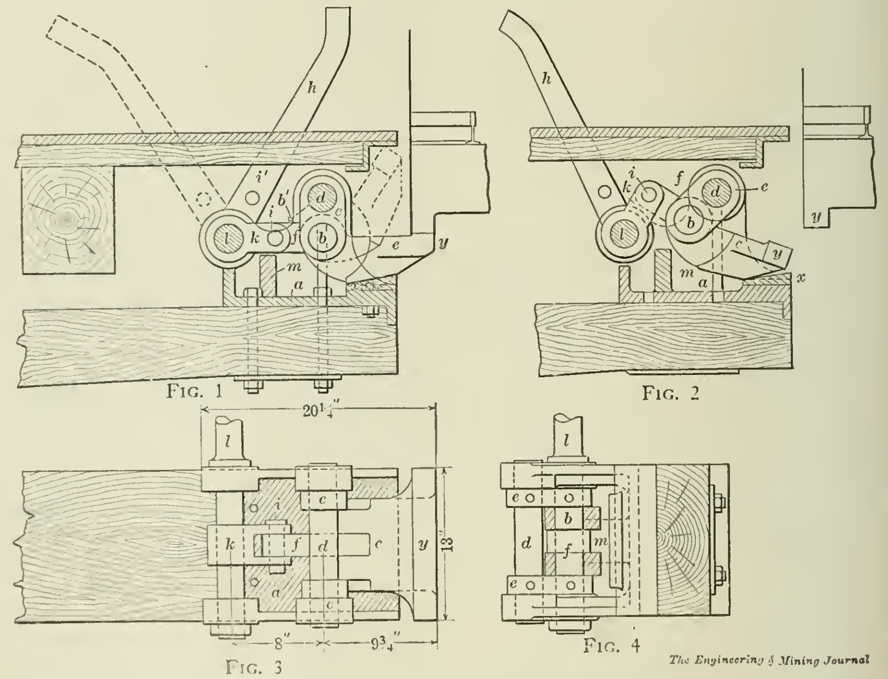
Detailed Construction of Slag Anvil

Back of the steel block, a sheet-iron slide is fitted in the bottom of the tray for the purpose of providing a discharge for the discarded slag which drops into the tin trough, shown in Figs. 3 and 4, when the slide is opened. The trough conducts the slag through the side of the building or into any receptacle provided.

Fig. 1 is a top view showing the tray steel block and partly opened slide; Fig. 2, a front elevation; Fig. 3, a rear elevation with the side of the tray broken in order to show the slide mounted in the bottom of the tray and the trough; and Fig. 4, a vertical section on the line *A B* of Fig. 1. The dimensions may be varied to suit conditions but those given are well adapted to general use.

Improved Landing Chair

An admirable type of landing chair, patterned after one in use for some years at various German mines, is installed at the Doe Run mines, Flat River, Mo. The prime feature of the chair is that it obviates the inconvenience and delay attending the lifting of the cage from its supports by the hoisting engine, a procedure which seems to be necessary in connection with the usual types of chairs. In addition to the bother and loss of time, the usual practice also involves waste of steam, excessive and concentrated wear on the hoisting rope, and other disadvantages.



Landing Chair used at Flat River, Missouri

The details of construction are shown in the accompanying figures. The upward projecting sides of the sole plate *A*, are bored to receive the two axles, *L* and *D*. To the former are rigidly attached the hand lever *H*, and the short lever *K*. On the shorter axle *D*, are fastened the two short links *E E*, through the ends of which passes the pin *B*. The pin *B* also passes loosely through the inner end of the chair piece *C*, and through the link *F*, the other end of which is loosely attached to the lever *K*, by the bolt *I*. The under side of *C* slides freely on the pillow block *X*. The axles *L*, of the two mechanisms on the opposite sides of the shaft collar are connected by keyed levers and link rods, so that they work in unison. The principal dimensions are as follows: *L*, 2 7/16 in. in diameter; *D*, 2 7/16 in.; *B*, 2⅛ in.; *I*, 1½ in.; center to center, *L-I*, 3½ in.; *I-B*, 4½ in.; *B-D*, 4¼ in.; length of *D*, 9 inches.

The essential feature of the design is that when the weight of the cage is resting on the outward end of the block *C*, the latter is held firmly in position by this weight; it cannot tip because the links *E E* lie in a vertical line from *B* to *D*, and it cannot slide backward because the link *F*, and the lever *K*, also lie in a straight line from *B* to *L*. In order to prevent a downward motion of the joint *I*, due to the weight of the hand lever *H*, a block *M*, is placed below the lever, *K*, to stop it at the horizontal position.

When the hand lever is thrown backward, through an angle of 60 deg., the piece *C*, is obviously withdrawn, and takes the position shown in Fig. 2. After the cage has passed down the shaft, the lever is returned to its first position, putting the piece *C*, in place, ready for the next landing. Owing to the hinged construction at *B*, the catching of the cage by *C* is automatic, as the piece simply lifts when the cage comes into contact with it, and falls into place when the cage rises above it. The total friction of the apparatus, most of which occurs at the rubbing surface *Y*, is so small that with a load of 5 tons resting on the chair, a force of less than 45 lb. at the handle will suffice to operate the mechanism. One of these chairs is placed on each side of the shaft, and by means a connecting rod both are operated by the same lever. As used at Flat River, the beam upon which the chair is mounted, is cushioned by a spiral spring placed beneath.

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*Quartette Mining Company, Searchlight, Nevada.

Stoping with the Slicing System

The slicing system of stoping is being carried on at a number of the Utah mines where the ground is too heavy to be held by square sets. At the Daly West, Park City, and the United States mines, Bingham cañon, this method is being successfully employed.

The practice is simply to raise to the upper limits of the ore and mine over the whole orebody for a thickness of one timber set, using such timbering as is necessary to hold the back. The floor is then covered with cheap planking, lagging or any available lumber which will serve as a floor. Auger holes are then bored in the timbers holding the roof, loaded and the timbers shot down. The back then caves upon the flooring which has been laid. Another "slice" is then worked out in the same manner from the raise, one set below the portion previously extracted.

To insure greater safety for the men the ore of the successive slices is best mined retreating, i. e., a crosscut is driven from the raise to the other wall of the orebody, drifts run to the stope limits and the working face advanced toward the raise. A safe retreat through the crosscut, which is in solid ground and should be well timbered, is thus always available for the miners.

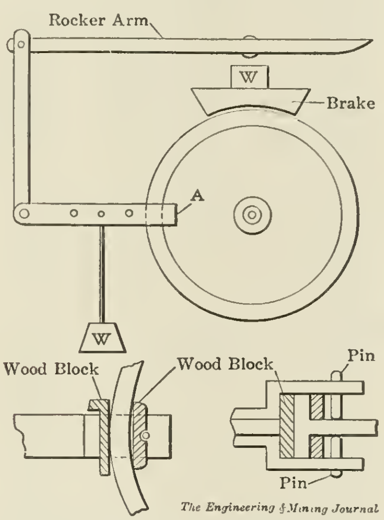
By this method of stoping all the timbers used to hold the roof as well as the different floors are, of course, lost. However, as the stopes need not be held open for any length of time, cheap lumber may be used for this purpose. Lumber in Bingham cañon costs about $18 per M. for local Uintah pine, and up to $22 per M. for Oregon pine. In one of the large mines at Bingham, where ore is mined at about $1.90 per ton, using square sets in overhand stopes, the timber cost approximates 17@34c. per ton of ore stoped. Under the slicing system the timber cost is probably not more than 5c. per ton higher, and by it ground is worked which could hardly be held by ordinary square setting.

Feeder Mechanism

By Charles A. Chase*

In the Journal, Feb. 5, 1910, are sketches of a feeder mechanism said to be used at Bodie, Cal. I have some interest in this matter because this type of feeder mechanism was devised and patented in 1899 by Charles D. Hooper, foreman of the Liberty Bell mill at Telluride, Colo. A bad feeder mechanism caused extraordinary losses of time and he found in this design complete relief. It has continued in use to the present time with the utmost satisfaction, and I doubt if its equal is available at present.

Mr. Hooper sold the rights to use this design to the Edward P. Allis Company which, I believe, made little use of it, perhaps not appreciating its full value. The original construction was slightly different from that shown on page 305. The additions consisted of two shoes of wood or iron which fitted against the inner surface of the ring and a flat piece of wood which fitted outside the ring. A brake, consisting of a weight or a shoe, rested on the top of the wheel. I am not sure whether this has been found a necessity or not. Instead of the spring we have commonly used a weight on the arm. I mention this simply as an interesting fact in connection with the device.



The Engineering & Mining Journal

Automatic Feeder at Liberty Bell Mill

Sampling Roaster Feed

At the Kalgurli gold mine, Western Australia, the sulpho-telluride ores are fed to the roaster by a short screw conveyer. Through a half-inch hole in the bottom of the casing surrounding the screw a stream of ore is delivered on the point of a cone, placed close up to the casing. A chute attached to the bottom of the cone diverts a portion for assay, the remainder being collected and returned to the fine-ore bin. F. G. Brinsden says that various methods of sampling have been tried, and comparisons of gold contents and grading analyses show that this is a reliable method of arriving at the head value of the ore. There is rarely any exceptional discrepancy between the actual and theoretical gold returns.

Ventilating with Compressed Air

The practice of turning compressed air into a ventilating pipe to induce an air current is quite general in the Cœur d'Alene mines. This is undoubtedly the simplest method of ventilating drifts when compressed air is at hand and power to operate a fan blower is not available. On the 1200-ft. level of the Hecla mine at Burke, air is drawn in this manner 500 ft. from the face of a drift to the shaft. Twelve-inch pipe is used and a piece of ¾-in. pipe turned up at the end serves as the air nozzle. The air current is in this instance sucked 500 ft through the fan pipe, the air jet being introduced into the fan pipe about 15 ft. above the bend at the shaft.

A different scheme is used on the 1600-ft. level of the Mace mine. Here the air jet is applied within a few feet of the suction end of the fan pipe. In this manner a current of air is forced 400 ft. to the shaft through 8-in. fan pipe. The nozzle is, however, different in this case, being made of ½-in. pipe bent in circular shape so as to just fit around the interior of the fan pipe. The coil is drilled with a number of ¼-in. holes on the side opposite the suction end of the fan pipe. It is claimed that this acts as a more efficient nozzle and requires much less air than does turning in the air in a single jet. These nozzles may be used at a number of places in the fan pipe if one will not draw a current of air sufficient for proper ventilation.

Machine Drilling in Alaska

The following data on machine drilling are furnished by Superintendent R. A. Kinzie, of the Ready Bullion mine, Douglas Island, Alaska, in his annual report to the Alaska United Gold Mining Company: Stoping, 33.06 ft. drilled and 46.36 tons broken per machine-drill shift; development, 40.42 ft. and 12.07 tons; sinking, 45.08 ft. and 15.24 tons. The cost of explosives in stoping averaged about $1.95 per drill per shift; in sinking, $2.70; and in drifting, from $1.90 to $2.88. The average cost of supplies, power, repairs, etc., was $5.65 per drill per shift. On the 700-Foot Claim mine of the same company the average number of feet drilled per machine per shift in stoping was 24.99, breaking 36.94 tons of rock; and in development, 31.88 ft.

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*Mining engineer, Equitable building, Denver, Colo.

breaking 7.89 tons. The cost for explosives per drill per shift varied from $1.82 to $2.28 in stoping, and from $1.85 to $3 in development. On this mine, the cost of supplies, power, repairs, etc., was $4.68 per drill per shift.

Combined Office and Laboratory Building

By Evans W. Buskett *

In connection with a plant recently designed by me, it was found feasible to place the office, drafting room and laboratory in one building as shown in the accompanying plan, thereby economizing on first cost and space, and making, for some purposes, a more convenient arrangement than with separate buildings.

The building is a frame structure 35x40 ft. It is built of yellow pine on concrete foundations. The floors are laid on 2x12-in. joists which are 16 in. between centers. There is first a rough pine floor 1 in. thick, which is laid diagonally. This is covered with 1x3-in. flooring. The ceilings are 11 ft. high and all rooms are lighted by an ample number of windows. The rooms are plastered with Acme cement plaster. The two front rooms and hall are painted an olive green, which is restful to the eyes. The other rooms are the cement color.

Arrangement of Building

There is a large basement under the north half of the building, equipped with bucking board, crushers, etc. The basement also contains a toilet room in which are a closet, lavatory and shower bath, with hot and cold water. There is also ample space for the hot-water heating plant, the hot-water boiler for the shower bath, and coal bins. The basement is floored with 6 in. of concrete.

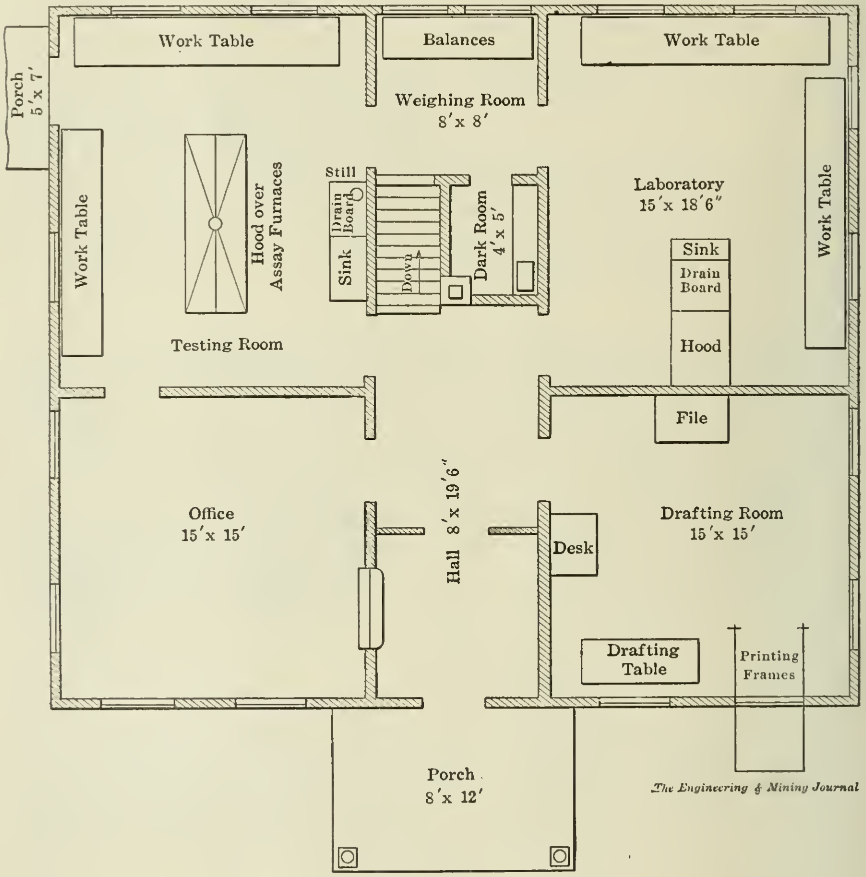
The main-floor entrance is from a porch 8x12 ft. into a hallway 8x19 ft. Directly in front is a gate, while to the left is a ticket window opening into the office. The office is 15 ft. square. To the right is the drafting room, which is also 15 ft. square, and is equipped with a drafting table, filing case and a printing frame mounted on a track, which projects from the south window. At the end of the hallway a stairway leads to the basement. At the right is the chemical laboratory. To the left is the testing room, while between the testing room and chemical laboratory is the weighing room, which is entered from both sides through swinging doors.

Laboratory Equipment

The chemical laboratory is equipped with a hood, filtering table, titrating table and sink. The hood is placed against the south wall and is built almost entirely of glass. Where it was necessary to use wood, all nailing was done from the outside, and when it was necessary to nail from the inside, the nails were countersunk and puttied. There is no finish on the inside of the hood, while the outside is made to match the building, which is finished with a liquid granite in the natural wood color. The bench floor under the hood is covered with firebrick. It is equipped with an electric hotplate on one side and a gasolene stove on the other. This stove is connected with a Hoskins pressure tank in the basement.

The burner of the still and the gasolene assay and test furnaces are also connected with this pressure tank. The hood has no sliding windows, both sides being open.

At the end of the table not occupied by the hood are the drain board and sink. The sink has cold-water connection only and is equipped with a large Richards air pump for filtering. Along the east side of the room is a work table which is used for filtering. On this table is a funnel rack which holds 24 funnels, while on the wall between the windows is a set of shelves giving ample space for reagent bottles. On the north side of the room is the titrating table. Above the window, on a shelf, are the bottles containing standard solutions, from which the solutions are siphoned into the burettes.



Plan of Building for Combined Office and Laboratory

The Weighing Room

The weighing room is 8 ft. square. It is lighted by two north windows, which give ample light and at the same time no direct sunlight reaches the balances. The top of the balance table is a piece of poplar 2x7½ ft. and 2 in. thick. It is fastened to two transverse blocks, which are bolted on top of concrete pillars resting on the foundation. Back of the weighing room is a small closet used as a photographic dark room.

The third room in the chemical laboratory is called, for the want of a better name, the testing room. It contains two work tables, a sink and drainboard and a furnace table. The furnace table is 4x8 ft., covered with firebrick, and is 3 ft. high. On this table are a gasolene muffle furnace and a pot furnace. Above the table and furnaces is a sheet-iron hood connected with a sheet-iron flue, with a revolving top, so that there is always a good draft. On the wall by the sink is a Sargent still which is heated by a gasolene burner. A door from this room enters a 5x7-ft. porch, where supplies are unloaded.

At the Alaska-Mexican mine in 1909, the machine drills working on stoping averaged 39.95 tons per drill per shift, drilling 27.16 ft. of hole; on development, they averaged 12.41 tons, drilling 34.72 ft.; and on cutting out, 15.13 tons, with 30.69 feet.

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*Sedalia, Mo.

Round Mountain Mining Company

The report of the Round Mountain Mining Company, of Nevada, for the year ended March 31, 1910, states that development work has been confined largely to the 600, 700, 800 and 900 levels. The most important development on Los Gazabo vein has been in the lower levels. A new oreshoot about 200 ft. long was encountered on the 700- and 800-ft. levels. Favorable developments resulted from work on the 600 level, where a total of 653 ft. of crosscuts and drifts extended into the footwall, exposing a body of ore 150 ft. in length by 100 ft. in width. On the 800-ft. level crosscuts have been extended into the footwall 958 ft. This work has opened two ore zones, one of which has been followed 140 ft. and has produced a fair tonnage of average grade ore, while the other zone has not yet been prospected to determine its size and value. During the year a total of 8098 ft. of drifts, crosscuts, raises, winzes and shafts were completed.

On the Mariposa, Saddleback and Valley View claims, development work was done by lessees. The Morrin lease workings which are on a vertical vein on the Mariposa claim have $12,000 worth of ore blocked out ready for stoping. This is a promising vein and has been worked to a vertical depth of only 80 feet.

Ore Reserves

The ore now blocked out in the various claims amounts to 45,360 tons, which is an increase of 5458 tons over the ore reserves of last year. The value of this ore based upon the average recovery for the year, $11.63 per ton, would be $527,537. Much of the ore now exposed is of a lower grade than that milled during the last year, which makes the average value between $9 and $10 per ton. In order that the company may mill this grade of ore at as great a profit as that obtained from the higher-grade ores, it has been decided to increase the capacity of milling plant from 100 tons to 150 tons per day. By mining and milling larger quantities of ore it is hoped to decrease the tonnage costs.

Tonnage Milled

During the year the amount of ore mined and milled was 33,860 tons of a gross value of $393,865 and a net value of $192,805. The total net profit for the year was $194,049. The cost per ton of ore was $5.919 as compared with $6.07 the year before. The mining costs are distributed as follows: Mine development per ton, $1.738; ore extraction, $2.318; mill operation, $1.51; general expenses, $0.353; total cost of $5.919 per ton.

Four quarterly dividends of 4c. per share amounting to $131,181, were paid. The company has 222 acres of patented ground, and 121 acres unpatented. During the year additions were made to the mine and mill equipment at a cost of $34,188. The company now has in its treasury $52,109. As to the future of the mine, the report states that only a small part of the territory has as yet been prospected. The discoveries made during the last five months in the footwall section, back of the main or Los Gazabo vein have opened large bodies of profitable ore, which have been only partially explored.

Copper Range Consolidated

The Copper Range Consolidated Company, Houghton, Mich., produced and sold 41,105,311 lb. of copper in 1909 from its three mines. Baltic produced 17,817,836 lb. at a cost of 7.98c. per lb.; Trimountain, 5,282,404 lb. at 13.89c. per lb.; and Champion, 9,002,535 lb. at 8.45c. per lb. (one-half of the Champion output belongs to St. Mary's Mineral Land Company). The Consolidated Company paid $1,536,930 dividends during the year.

The Baltic Mining Company produced 21.88 lb. of copper per ton from 814,260 tons of rock stamped. President W. A. Paine reports that "Baltic is as strong as ever and can be depended upon to keep up its good work." In regard to the Champion, he says: "The Champion is looking better than it has for two years, and is opening splendid new copper ground in the lowest levels." The Champion yield was 23.88 lb. copper per ton of rock stamped.

Trimountain yielded only 16.33 lb. copper per ton and operated at a deficit of $47,841. The Copper Range railroad paid its first dividend during the year, amounting to $600,000. The business of the road is steadily increasing, and the road is in excellent shape.

Steel Production in France

The production of steel in France in the year 1909, according to the report issued by the Comité des Forges, showed an increase of 206,954 tons, or 7.6 per cent., over that of 1908. The total make of ingots for two years past is given as follows, in metric tons:

	1908		1909	
	Tons.	Per Cent.	Tons.	Per Cent.
Acid converter	77,581	2.8	76,981	2.5
Basic converter	1,632,296	59.9	1,853,327	61.1
Open-hearth. .	1,002,789	36.8	1,080,912	35.6
Crucible......	12,662	0.4	16,895	0.6
Electric furnace	2,289	0.1	6,456	0.2
Total......	2,727,617	100.0	3,031,571	100.0

All classes of steel showed an increase last year except acid converter. The raw material used in making this steel in 1909 included 2,485,425 tons pig iron, of which 142,903 tons were classed as bessemer pig, 2,111,095 as basic pig and 231,427 as other iron; 127,196 tons ferromanganese and other alloys; 810,778 tons scrap and 17,887 tons ore.

The production of half-finished steel reported was: Blooms, 1,057,952; billets, 538,441; total, 1,596,393 tons, an increase of 280,394 tons over 1908. What proportion of these were sold by the various works in the half-finished form is not stated. The output of finished steel was, in metric tons:

	1908.	1909.	Changes.
Bars.	390,037	531,299	I. 111,262
Rails..........	322,211	351,631	I. 32,390
Plates and sheets	311,772	364,630	I. 19,858
Wire-rods & wire	155,446	169,558	I. 13 112
Shapes, etc......	551,565	505,339	D. 46 226
Tires	19,373	33,721	D. 15,652
Forgings	49,313	18,219	I. 7,906
Castings........	29,215	32,595	I. 3,350
Total. .	1,881,022	2,043,022	I. 159,000

About 36 per cent. of the finished steel was made in the department of Meurthe et Mosells; 26.5 in the Nord; and 10.5 per cent. in the Center district.

Alaska-Mexican Gold Mining Company

The Alaska-Mexican Gold Mining Company, Douglas Island, Alaska, in 1909 crushed ore of the highest grade so far treated, the average being estimated at $4.04 per ton during the year as compared with $3.22 in 1906, the year of highest grade heretofore. The mine produced and sent to the mill 220,976 tons of ore, of which 188,151 tons were milled in the Mexican mill and 32,425 were treated by the Alaska United company. The Mexican mill also crushed 38,100 tons of the United company's ore, making a total of 226,651 tons treated by this mill in 351 days, 17 hours. This tonnage yielded $2.077 per ton in free gold and base bullion and $1.66 per ton in concentrates, a total of $3.74 per ton.

In its report the company figures its operations on the basis of the ton of ore milled in its own mill (226,651) as follows: Total mining costs, $1.225 ($1.25 per ton of ore hoisted); milling, 0.2431; total operating, $1.6788; total operating profit from Mexican mill, $468,424 or $2.0667 per ton. After adjusting accounts with the Alaska United the profit for the year was $499,488, out of which $360,000 in dividends was paid (40 per cent. on issued stock) and $73,458 was carried forward to the balance sheet.

The Alaska-Mexican is working to a depth of 1320 ft., the shaft being 1470 ft. deep, and did 3848 ft. of development during the year. The ore reserves are given at 596,404 tons of an average assay of $3.58 per ton, all this ore being between the 660- and 1210-ft. levels. Only three accidents are reported, one of which was fatal.

One of the most unusual discoveries in a Cœur d'Alene mine was asbestos in connection with the high-grade galena exposed in a drift in the Parrot. A layer of asbestos of fine quality and fiber, and an ich thick, was found next to the shipping ore on the footwall.

Zinc Sulphide Pigment

n recent years, numerous attempts e been made to devise a white pig- nt to replace white lead, which is sub- t to discoloration in sulphurous at- spheres, and has also been interdicted many European governments for san- y reasons arising out of its poisonous ure. Among other pigments, zinc sul- de has long been recognized as a suit- e substitute, but the processes for king it an anhydrous, pure white form e been expensive and exceedingly ob- tionable on account of the necessity employing hydrogen sulphide gas, ich is even more poisonous than lead. early as 1878 it was pointed out that covering power of zinc sulphide was en superior to that of white lead, and the same time nonpoisonous and un- sceptible to sulphurous emanations.

AKING ZINC SULPHIDE WITHOUT HYDROGEN SULPHIDE

After long investigation, MM. Piperaut d Vila have succeeded, according to a port submitted to the Société d'Encour- ement pour l'Industrie Nationale and blished in its *Bulletin* of November, 09, in perfecting a process for the anufacture of zinc sulphide without the e of hydrogen sulphide. Metallic ox- es, derived by roasting suitable ores, e dissolved in a solution of caustic kali. The solution is then boiled vig- ously while powdered sulphur is ad- ed. This gradually produces an alka- ne sulphide, in a nascent state, which acts with the metals. Only enough lphur is added the first time to pre- pitate the metals having dark-colored lphides, lead, iron, etc.; after filtration, e amount of zinc contained in the fil- ate is determined by titration, and just nough more sulphur is added to com- lete the precipitation of the zinc. The eaction is not immediate, but progres- ive, and is complete only after a pro- nged boiling. The precipitate consists f dense, microscopic grains, which can e washed rapidly, dried easily and finally ehydrated at a red heat in closed muf- e furnaces. The dehydrated sulphide is fine, unctuous, white powder, having specific gravity of 4 to 4.2, and mixing reely with oil.

TESTS APPLIED TO ZINC SULPHIDE

The first objection raised to the use of inc sulphide as a pigment was that when xposed to the atmosphere, especially f damp, it might combine with oxygen, orming a sulphate which, being solu- le, would destroy the paint. Samples of oth hydrous and dehydrated zinc sul- phide were placed in flasks containing both fresh and salt water, were shaken every morning and exposed to the sun- light for six months; it was then found that the amount of decomposition of the anhydrous sulphide was almost negligible, while the hydrous sulphide had lost only 1.3 per cent. of its weight.

Other tests on the covering power, the mixing qualities, the ease of application, the durability under severe conditions when placed on wood, glass, mortar, etc., were carried out, both in the laboratory and on a commercial scale, and in comparison with white lead and zinc oxides; the tests are reported in full in the report above referred to, the conclusions being that zinc sulphide made by this process is in every respect equal, if not indeed superior, to either white lead or zinc oxide.

Franklin Mining Company

The Franklin Mining Company, Houghton, Mich., did a large amount of development in the Pewabic lode in 1909, aggregating over 7000 ft. of sinking and drifting. It is stated that the lode steadily improved from the 20th to the 28th level, where it runs into section 6. This section was purchased during the year, and, together with the present Franklin ownership of practically the entire capitalization of the Rhode Island Copper Company, gives Franklin 2800 acres in one plot.

The old Franklin mine was sold to the Quincy company about the first of 1909, and all development work ceased on the conglomerate about that time, and production from the conglomerate ceased entirely in November, 1909. The report states that the Pewabic lode is opened to the extent of over 15,000,000 cu.ft., blocking out 1,250,000 tons of stoping ground which appears to be above the average of the lode as mined at present in the district.

Some interesting cost data were embodied in the report and are summarized in the accompanying table. These costs include $109,950 spent in development on the Pewabic lode. The rock stamped included 47,190 tons from the Pewabic lode and 123,356 tons from the conglomerate, and in addition the mill handled 181,826 tons of custom ore from the Ahmeek. Contract prices were as follows: Sinking, 1107 ft., $8.332 per ft.; winze, 267 ft., $8.613; drifting, 5606 ft., $5.468; crosscutting, 172½ ft., $6.004; stoping, 8022 fathoms, $5.759 per fathom.

FRANKLIN PRODUCTION IN 1909.

Rock hoisted	176,417 tons
Rock stamped	170,546 tons
Mineral produced	3,306,820 lb.
Refined copper produced	1,615,556 lb.
Mineral in ton of rock stamped	19.38 lb.
Refined copper in ton of rock stamped	9.47 lb.

COSTS PER TON OF ROCK STAMPED.

Mining	$1.0616
Compressor and drills	0.0789
Hoisting	0.1367
Rock house	0.0662
Surface	0.0653
Transportation	0.1009
Stamping	0.3099
General	0.0969
Office	0.0249
Total operating and development	$1.9113
Construction	0.1160
Total	$2 0573

Pig Iron in Great Britain

The production of pig iron in the United Kingdom for two years past is reported by the British Iron Trade Association as below, in long tons:

	1908.	1909.	Changes.
First half	4,635,851	4,715,679	I. 79,828
Second half	4,653,989	4,948,608	I. 294,619
Year	9,289,840	9,664,287	I. 374,447

In 1908 the production of the two halves of the year was very nearly equal, while in 1909 the second half showed a gain of 232,929 tons over the first, while the first half had had a smaller advance, 61,690 tons, over the second half of 1908. The greater part of the increase in 1909 was in basic and bessemer pig, foundry and forge iron being about stationary; the exact figures not having been received. The production of pig iron in Great Britain has been as follows, in long tons, for 15 years past:

1895	7,895,965	1903	8,811,204
1896	8,563,209	1904	8,562,658
1897	8,789,455	1905	9,592,737
1898	8,631,151	1906	10,149,388
1899	9,305,319	1907	9,923,856
1900	8,908,570	1908	9,289,840
1901	7,761,830	1909	9,664,287
1902	8,586,693		

In this period of 15 years, the lowest point was reached in 1901 and the highest in 1906; the difference between those two years being 2,387,558 tons. The make of pig iron last year, though greater than that of 1908, fell below both 1907 and 1906; the decrease, as compared with the maximum year, being 485,101 tons. The production during the past 10 years has shown some considerable fluctuations, but no great advance.

The number of blast furnaces in Great Britain at the close of 1909 was 508. The average number in blast during the year was 320; the average make per furnace was 30,224 tons for the year. By districts the highest average output per furnace was 60,111 tons in South Wales; the lowest, 16,162 tons, in Scotland.

Pittsburg-Silver Peak

The Pittsburg-Silver Peak Gold Mining Company, at Blair, Nev., reports that an average of 95 stamps of the total number of 100 were in continuous operation during 1909. Bullion from 150,359 tons of ore was extracted, giving an average gross return of $6.09 per ton. The net earnings from operating were $337,004.

The president, William Flinn, says: "We have added 20 stamps to the mill, so that since April 1, 1910, 120 stamps have been dropping. The mine development has progressed so that additional stamps could easily be furnished with ore, but we deem it unwise to increase the capacity of the mill until after we have demonstrated the most economical process of extracting the bullion; to that end we are erecting a small experimental plant."

During the year the company purchased the property of the Silver Peak-Valcalda, about 175 acres.

Geological Survey Appropriations

Special Correspondence

The appropriations for the Geological Survey made in the new sundry civil bill and expected to receive the approval of Congress are as follows:

Office of the Director, $34,860; ten scientific assistants, $29,900; general expenses for pay of skilled laborers and various temporary employees, $20,000; topographic surveys in various portions of the United States, $350,000, to be immediately available; geologic surveys in the various portions of the United States, $225,000, to be immediately available; chemical and physical researches relating to the geology of the United States, $20,000; preparation of the illustrations of the Geological Survey, $18,280; preparation of the report of the mineral resources of the United States, $75,000; gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and the preparation of reports upon the best methods of utilizing the water resources, $100,000; the purchase of necessary books for the library, $2000; engraving and printing geologic maps, $100,000.

For the continuation of the analyzing and testing of the coals, lignites, and other mineral-fuel substances, $100,000; continuation of the topographic surveys of the public lands that have been or may hereafter be designated as national forests, $75,000, to be immediately available; subdivisional surveys of public lands in Alaska and the preparation of the necessary maps and field notes thereof, $40,000, to be immediately available; salaries of two Territorial mine inspectors, $4000; for *per diem,* in lieu of subsistence at a rate not exceeding $3 per day each while absent from their homes on duty, and for actual necessary traveling expenses of mine inspectors, including necessary sleeping-car fares, $3350; continuing the investigations as to the causes of mine explosions with a view to increasing safety in mining, to be immediately available, $150,000; total, $1,347,390.

These are substantially parallel with the appropriations of last year except a small addition for surveys of coal lands in Alaska and for the transfer of the appropriation for testing structural materials to the Bureau of Standards.

The Bureau of Mines

Special Correspondence

The bill providing for a bureau of mines, which passed both houses of Congress early in May was officially sent to the President for his approval on Saturday, May 14, and with it a memorandum from Secretary of Interior Ballinger, as well as one from Director George Otis Smith, of the Geological Survey, with reference to the content of the bureau bill. President Taft signed the bill on Monday, May 16. Even before the bill was signed, efforts were begun in behalf of candidates for the appointment of chief of the bureau. Advocates of J. A. Holmes, now head of the Technologic Branch of the Geological Survey, visited the President on May 14, there being in the delegation members of Congress and some representative coal operators. Other candidates whose names are being pressed are David Ross, now State superintendent of mines, of Illinois, and Benjamin B. Lawrence, a distinguished mining engineer of New York. The new bureau does not come into official existence until July 1, so that it is expected there will be a fair amount of deliberation in the selection of a chief.

The Mondell Coal Land Bill

Special Correspondence

The House of Representatives passed on May 12 the so called Mondell bill, providing for agricultural entries on coal lands. Several important changes were made This is by many regarded as the most important bill on any question affecting mining on public lands that has passed the House for a long time. The bill is expected to meet no serious opposition in the Senate; at any rate, none has thus far materialized. As passed by the House, the measure makes provision in detail in sections 1 and 2 for agricultural entries on public lands classified as coal lands. In section 3, the bill continues with a statement that patents issued by virtue of its terms shall contain "a reservation to the United States of all the coal in the lands so patented, together with the right to prospect for, mine and remove the same. The coal deposits in such lands shall be subject to disposal by the United States in accordance with the provisions of the coal-land laws in force at the time of such disposal.

"Any person qualified to acquire coal deposits or the right to mine and remove the coal under the laws of the United States shall have the right, at all times, to enter upon the lands selected, entered or patented, as provided by this act, for the purpose of prospecting for coal thereon upon the approval by the Secretary of the Interior of a bond or undertaking to be filed with him as security for the payment of all damages to the crops and improvements on such lands by reason of such prospecting.

"Any person who has acquired from the United States the coal deposits in any such land, or the right to mine or remove the same, may reënter and occupy so much of the surface thereof as may be required for all purposes reasonably incident to the mining and removal of the coal therefrom, and mine and remove the coal, upon payment of the damages caused thereby to the owner thereof, or upon giving a good and sufficient bond, or undertaking in an action instituted in any competent court to ascertain and fix said damages."

Iron Industry in Northern Bulgaria

By Robert Grimshaw*

The iron industry, which was introduced into Bulgaria 12 years ago, has developed rapidly in the last four or five years. This is especially so in Rustchuk, where there are two machine shops which are occupied more particularly with the manufacture of modern mill machinery. In 1908 they were compelled to enlarge their works considerably by reason of the numerous orders received. One of these two shops, which was started 12 years ago, has 400 workmen. Last year the firm was converted into a stock company with a working capital of $200,000. The other plant was started in 1907, is managed by a German engineer, and has 150 workmen. Worthy of mention, also, are the two shops in Plevna and Wratza, which besides agricultural implements and other products of iron also make safes, and are helped along by a government subsidy. The three foundries of the district about Rustchuk also receive a subsidy.

The manufacturing industries are weak, and it will be a long time before they can supply the native demand. For all that, by reason of the heavy tariff which went into operation in January of 1906, they are making good progress.

The Maikop Oilfield, Russia

British investors are taking a great interest in the Maikop oilfield in southern Russia. This field embraces an area of about 25 miles long by about 20 miles at the point of greatest breadth. It came into prominence toward the end of 1909 when the Black Sea Oil Fields, Ltd., brought in a gusher at a depth of less than 300 ft. Since that time operations have been actively carried on, but few wells have been completed.

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*Dresden, A., Germany.

orthwest Smelting and Refining Company

he Northwest Smelting and Refining
npany has succeeded to the control of
smelting plant at Sumpter, Ore. F.
Scofield, the general manager of the
company, has had extensive experi-
e in Montana, Colorado, Missouri and
h. He has furnished the following
a about the plant and the district:

THE SMELTING PLANT

he plant was erected in 1902-03 by
Oregon Smelting and Refining Com-
y, and was operated by that company,
il it closed in December, 1907. At the
e of closing, there was a large floating
ebtedness, and a mortgage covering
, was given. The company having de-
lted, the mortgage was foreclosed, and
property sold under execution Decem-
, 1909, to the present company.

he equipment includes: A modern,
omatic sampling mill, capacity of 250
s per day; a Chisholm, Boyd & White
quetting machine, capacity 100 tons of
quets per day; one 4x140-in. water-
keted copper furnace, 10 ft. from top
tuyeres to level of feed floor and
rged from barrows. It has a normal
acity of 200 tons of charge per 24
rs.

he power plant consists of a 16x36-
Corliss engine which supplies power to the entire plant, the blower and sample mill being belt driven, and a two-unit generator plant supplies power for electrically driven pumps, and for lighting.

The company owns several mining claims, a limestone quarry and timber land.

CHARACTER OF THE ORES

The ores of the district, immediately tributary to the smeltery, are silicious gold ores; and when the plant was formerly in operation, great difficulty was experienced in obtaining a supply of iron sufficient to meet the requirements of this silica, as well as copper enough to properly serve as the collecting agent, but the completion of the Northwestern railway from its connection at Huntington with the Oregon Railroad and Navigation Company, down the Snake river to Homestead, 55 miles, gives an outlet for the iron and copper ore from the Snake River and Seven Devils districts and insures a sufficient supply of iron and copper ore, to take care of the silicious ores of the district, up to the full capacity of the furnace.

RAILROAD EXTENSIONS

The Sumpter Valley railway, a narrow-gage line belonging to the Oregon Lumber Company, will complete an extension to Prairie City early in the summer; and during the coming season construct a branch line down the middle fork of the John Day river toward Susanville, both of which extensions will give transportation facilities to a large number of properties, which cannot now ship ore, on account of the high cost of wagon freighting. This entire district will supply base ores, carrying in many instances a considerable excess of iron, and will further insure the supply of iron necessary to handle the highly silicious gold ores. These ores also carry a small amount of copper.

The average ores of the district which will be served by the Sumpter smeltery are too low in value to stand shipment to either Tacoma or Salt Lake. When the smeltery closed in 1907 many mines were shut down which might have continued in operation had they had an available market for the ores. The resumption of smelting will permit these properties to reöpen. Some of them have already done so, and others are making preparations to reöpen. There are many mines, which can be made most valuable properties, if their management is placed in competent and honest hands, the money provided for their operation will be properly used instead of being squandered.

Report of Esperanza, Ltd.

he report of the directors of the Es-
anza, Ltd., which holds practically all
stock of the Esperanza Mining Com-
y, of Mexico, records a profit of
2,385 in 1909 and gives detailed data
to the operation of the property during
year.

CONCENTRATING ORES

he mine produced 30,065 dry metric
s (33,150 short tons) of sulphide ore
h an average content of 48.57 grams
56 oz.) gold and 343.06 grams (11 oz.)
silver per ton, a value of 76.32 pesos,
which 35.39 per cent. of the gold and
59 per cent. of the silver by weight
re recovered in concentrates, an extrac-
n of 31.23 per cent. by value. There
re produced 363 dry tons (400 short
s) of concentrates containing 1423
ms (45.7 oz.) of gold and 4431 grams
12.5 oz.) of silver, or 1973 pesos per
; and 29,702 tons of tailings contain-
31.77 grams (1.02 oz.) of gold and
3 grams (9.4 oz.) of silver (52.20
o) per ton.

he tailings were cyanided for a re-
r of 84.68 per cent. of the gold and 66.72 per cent. of the silver contents by weight, a combined extraction of 81.31 per cent. by value. The tailings from this cyanide treatment carried 4.67 grams (0.15 oz.) of gold and 97.55 grams (3.13 oz.) of silver. The total extraction thus effected from the concentrating ores was 90.1 per cent. of the gold and 71.91 per cent. of the silver by weight, or 86.17 per cent. of the total value of the ore.

TAILINGS AND OXIDIZED ORES

From the sand dump there were cyanided 28,173 dry metric tons (31,000 short tons) carrying 5.06 grams (0.16 oz.) gold and 58.39 grams (1.87 oz.) of silver per ton. The tailing from this treatment contained 1.53 grams (0.049 oz.) of gold and 28.08 grams (0.9 oz.) of silver (2.98 pesos) per ton, an extraction of 69.77 per cent. of the gold and 51.91 per cent. of the silver. The total extraction was 5.71 pesos per ton, or 65.71 per cent. of the total value of the sands.

The mine produced 122,078 dry metric tons (134,750 short tons) of oxidized ores, which were cyanided direct. These ores averaged 13.24 grams (0.425 oz.) of gold and 72.22 grams (2.32 oz.) of silver per ton, and yielded tailings carrying 1.639 grams (0.0525 oz.) of gold and 27.2 grams (0.875 oz.) of silver (3.08 pesos). A total recovery of 84.57 per cent. was made, this comprising 87.67 per cent. of the gold and 62.34 per cent. of the silver. The net return from mint and smeltery on this ore was 16.77 pesos per ton. A low extraction was made in June on account of starting the new mill, and in August on account of an accident to the sludge tank.

COSTS AND PROFITS

A grand total of 177,702 short tons (wet) of mine ore was treated, and 34,768 tons of old tailings, a total of 212,470 tons. The gross return was $2,094,446 and the total operating costs $1,315,201. The costs are given as follows: Development, $0.97; ore breaking, $2; mine to mill bins, $0.71; total mining, $3.68 per short ton (wet) of ore mined. The milling cost was $2.19; shipping and selling, $0.22; general, $0.55; renewals reserve, $0.14 per ton (wet) of ore and tailings treated. The net profits of the mine amounted to $787,219, out of which $278,585 was spent in new construction.

Ore Reserves

The ore reserves are estimated to yield a net return of $2,005,215, in addition to which the consulting engineer, Pope Yeatman, counts on considerable additional tonnage in both sulphide and oxide ores either indicated or partly developed. The tailings dump is estimated to yield a large profit from retreatment.

The new regrinding and treatment plant, composed of 10 tube mills and the necessary Pachuca tanks and Merrill filter presses, was completed last June. Zinc-dust precipitation has been substituted for the zinc-shavings method with a resulting economy. The remodeled plant is now one of the most uptodate and efficient in the Republic.

Quarterly Report of Utah Copper Company

In its report covering the first quarter of 1910, the Utah Copper Company gives the results from the properties of the company proper for January, and from both Utah and Boston Consolidated ground in February and March. Transportation difficulties did not permit of working at full capacity until March, in which month all plants were fully supplied, approximately 12,500 tons of ore per day.

Copper Output

The total output of copper was 18,511,819 lb. in the quarter, distributed as follows: January, 4,745,066 lb.; February, 5,913,465; March, 7,853,288 lb. The operating profit was $858,782, and the total net profit was $871,957, based on 13.33c. per lb. for copper. Income from Nevada Consolidated stock owned is not included in these figures.

Old Utah Milling Method Approved

In the future the Utah company's mill at Garfield will be known as the Magna, and that of Boston Consolidated will be called the Arthur. The cost of copper from the Magna plant was about 8c. per lb., but the higher costs at the Arthur plant made the total average cost 8.43c. per lb. for the quarter. About 17 per cent. of the ore treated was mined by underground methods from the Boston properties, but this method of mining will be discontinued as rapidly as overburden can be removed to permit the use of steam shovels. These stripping operations have already been commenced.

Plans are being prepared for increasing the capacity of the Arthur plant. The report states that a corps of independent engineers confirmed the earlier determinations of the company's own engineers that the machinery and method in use at the Magna are superior, both as to extraction and costs, to the system at the Arthur. Work has been commenced upon the remodeling of the Arthur plant to make it conform as nearly as possible to the Magna.

Ore Reserves

The combined, fully and partially developed ore reserves of the consolidated companies are stated to amount to 170,000,000 tons, "all of which is of a grade equal to that upon which we are now operating, and a large percentage of it is of a much better grade." Without considering the undeveloped areas of the property, this tonnage insures a life of 40 years at present capacity, or about 30 years at the capacity which will follow the improvements now under way and which will be completed within a year.

The Mining Industry in Corea*

The mining industry has developed considerably since the law of July 28, 1907, was adopted. Until that date only six gold and copper mines had been granted to foreigners; one belonged to a Japanese syndicate, the others being owned by American, French, English and Italian companies.

About Fifty Companies are Operating

At the end of 1908 there were 361 properties granted by the Corean government, including 109 placers; among these mines, six were granted to an American-Japanese company, eight to English companies, and five to a German company. All others belonged to Coreans or to Japanese. However, they did not work all these mines, their aim being speculation rather than effective mining. In fact, 24 mines and 27 placers only, out of the 361 concessions granted, are worked on a regular scale, and give satisfactory results. These are worked for gold, copper, coal, graphite and iron.

Production

The principal mining district is between the town of Hpyeng-Yang and the northern boundary of Corea. It includes the whole province of Hpyeng-An and a part of Hoang-Hai-To, and almost every metal may be found. The gold mines produced in 1908, 4040kg. of gold. The Hoang-Hai iron mines exported 100,000 tons of ore to Japan. This ore yields 50 to 55 per cent. iron and costs about 6 yen ($3) per metric ton. The coal mines yield about 55,000 metric tons yearly, 30,000 tons of which are shipped to Japan for briquetting for the fleet. Although of a good quality, its very friable character prevents its shipment to great distance.

Graphite Industry

About one-half of the graphite mines are in the hands of English capital. Corean graphite is not so good as that of India. The latter has a market value in London of 300 yen per ton, while the former is quoted only 50 yen. Deducting 12 to 18 yen for freight, etc., the net value is 32 to 38 yen, which leaves the company about 25 per cent profit. The Corean output of graphite is 10,000 tons yearly, while the world's consumption is over 130,000 tons. The production could be largely increased without any fear of exhaustion, as the graphite mines cover an area of about 4000 hectares.

Copper

Copper mines are also being developed in Corea. The Siou-An mine reports that from Oct. 1, 1907 to March 7, 1909, its output was 101,000 metric tons, worth 2,829,943 yen, which left a net profit of 1,862,724 yen ($931,000). Mr. Paillard concludes that the mining industry in Corea has a good future, but that nothing should be undertaken in that country without obtaining the advice of a specialist, as too many properties of little value are offered for sale by speculators who have obtained concessions. He points out that according to the law of Aug. 13, 1908 the machinery and explosives for gold, silver and copper mines enter free of custom duties, and that gold, silver and copper ores do not pay any export tax.

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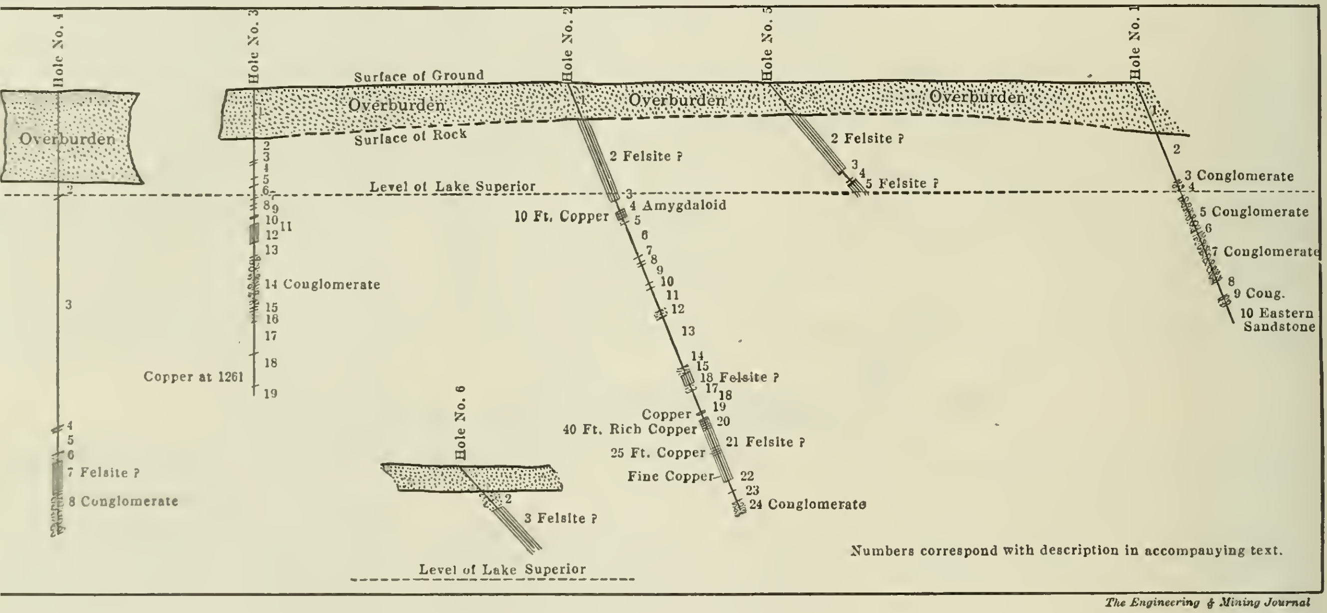
*Abstract of a report by M. Paillard of the French Consulate at Séoul.

)evelopment Work of Indiana Mining Company

Six Drill Holes Started; Two Finished; Deepest Hole 1843 ft. Metallic Copper and Chrysocolla Encountered. Indiana Lode Cut at 1441 Feet

REPORT OF SUPERINTENDENT

The report of R. M. Edwards, superin- ndent of the Indiana Mining Company, loughton, Mich., states that the work one so far consists entirely of diamond rilling with the object of thoroughly exloring the property. Six drill holes have een started, two of which have been ompleted and four are still sinking to greater depth. The accompanying tables ive the formation and approximate thick- ess through which the drill has passed.)etailed study of the cores was made y Alfred H. Meuche, formerly connected ith the Michigan Geological Survey. The ccompanying map shows the situation f the various drill holes, and Fig. 2 hows cross-sections. No positive cor- elation has yet been made to determine ne depth or strike of the beds.



Numbers correspond with description in accompanying text.

The Engineering & Mining Journal

Section Showing Drill Holes on Indiana Property

The important facts so far brought out re: (1) The position of the eastern andstone determined by Hole No. 1; 2) the existence of a mineralized mygdaloid lode, 30 ft. in thickness at a epth of 550 ft., in Hole No. 2; (3) he existence of copper-bearing rock, 0 ft. in thickness, at a depth of 1440 ft. n Hole No. 2. This bed showed a total hickness of 265 ft. It contains copper or 25 ft. near the center and also copper n the footwall. Holes No. 5 and No. 6, hould cut the same lode as that cut by No. 2, but they have encountered some ard rock, making progress slow, and ave not obtained sufficient depth to each the probable position of the lode.

Drill Hole No. 1

This hole is 520 ft. west and 270 ft. south of the north ¼ post of Section 27. The elevation is 447 ft. above the level of Lake Superior. The angle of dip at the surface is 65 deg. and at 975 ft. it is 72 deg. The direction of the hole is south 60 deg. east (magnetic). As neither dip nor strike have been determined the actual thickness of the bed cannot be computed. Referring to the tabulated record of Hole No. 1, formation No. 2, classified as ophite, consists largely of amygdaloid and trap. This bed is badly broken. No. 3 consists of a conglomerate and is considered the same as the one exposed in the rock cut on the railroad track in section 22. No. 4 is more or less porphyritic, consisting of trap and amygdaloid which seems to have been highly altered. No. 6 consists mostly of trap, the grain of which is coarse. In No. 8 the upper portion is amygdaloid, while the lower is a porphyritic trap.

RECORD OF DRILL HOLE NO. 1.

	Formation.	Depth, Ft.	Thickness, Ft.
1	Overburden..........	0–222	222
2	Ophite............	222–430	208
3	Conglomerate........	430–457	27
4	Melaphyre (trap)....	457–479	22
5	Conglomerate........	479–642	162
6	Porphyrite (trap)....	642–657	9
7	Conglomerate	651–862	211
8	Feldspathic Melaphyre ..	862–931	69
9	Conglomerate.	931–966	35
10	Eastern sandstone..	966–1060	bottom

Drill Hole No. 2

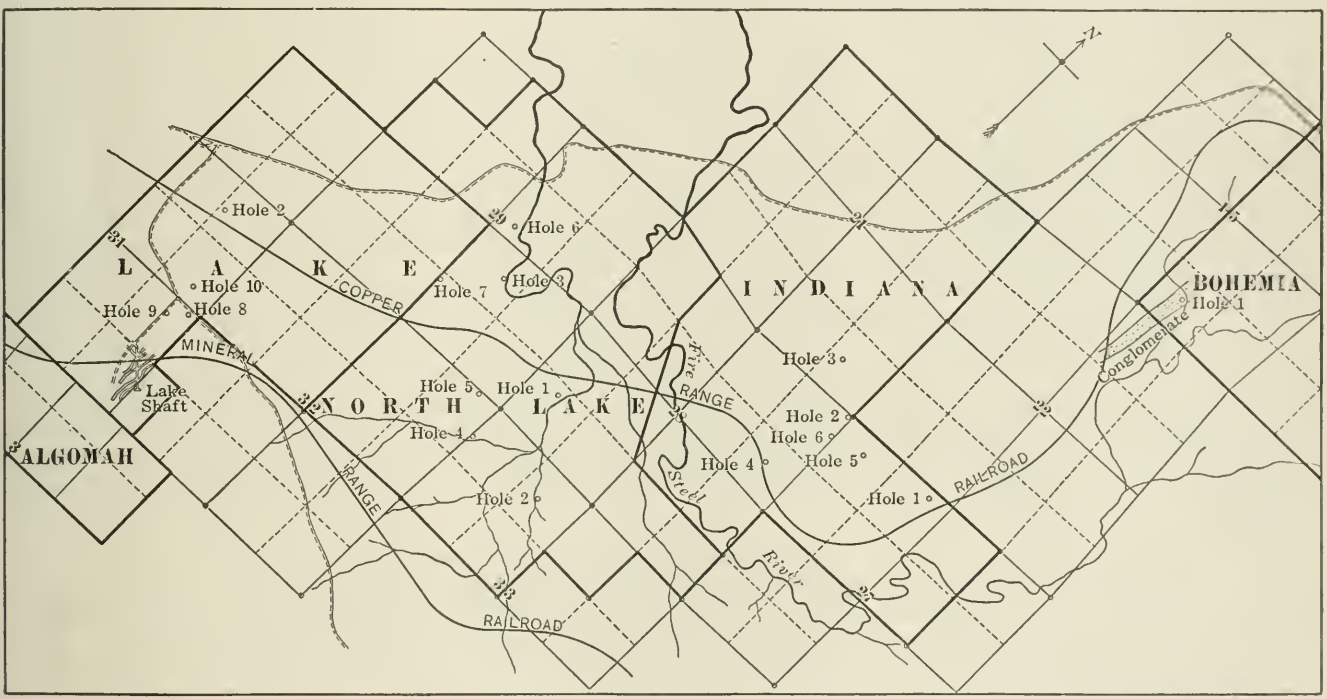
Drill Hole No. 2 is 13 ft. west and 41 ft. south of the northeast corner of Section 28. The elevation is 425 ft. above Lake Superior. The angle of dip at the surface is 67 deg., and at 1612 ft. is 70 deg. The direction of the hole is south 63 deg. and 28 min. east.

Referring to record of Hole No. 2, Mr. Meuche says that the felsite bed next below the overburden might have been a conglomerate and explains the absence of pebbles by assuming the pebbles were large and the cementing material to be poor so as to be ground up in drilling. This bed has undergone considerable alteration. At first, only a little core was obtained and a large amount of caving ground was encountered. From 240 to 290 ft. it looks much like a sandstone. A large amount of epidote is present. From 290 to 407 ft. is a brecciated area and the small pieces, except for angularity may be mistaken for pebbles. From 407 to 505 ft. the formation is bleached to a pure white. A thin section shows a cryptocrystalline ground mass altered by what appears as calcite.

Formation No. 3 consists largely of trap from which only a 6-in. core was obtained. A heavy clay seam was encountered at 530 to 533 ft. No. 4 is an amygdaloid and carries a fair percentage of copper from 570 to 558 ft. where it had much calcite, epidote and quartz.

RECORD OF DRILL HOLE NO. 2.

	Formation.	Depth, Ft.	Thickness, Ft.
1	Overburden	0–154	154
2	Felsite ?	154–510	356
3	Trap	510–550	40
4	Amygdaloid	550–580	30
5	Melaphyre sandstone	580–597	17
6	Ophite	597–741	144
7	Ophite	711–772	31
8	Ophite	772–781	9
9	Ophite	781–860	79
10	Amygdaloidal conglomerate	860–878	18
11	Ophite	878–959	81
12	Melaphyre sandstone	959–1016	57
13	Ophite	1016–1231	215
14	Amygdaloid	1231–1233	2
15	Sandstone	1233–1249	16
16	Felsite	1249–1306	57
17	Sandstone	1306–1325	19
18	Ophite	1325–1419	94
19	Felsite	1419–1428	9
20	Feldspathic ophite	1428–1441	13
21	Felsite	1441–1716	265
22	Melaphyre (trap)	1716–1766	50
23	Melaphyre	1766–1806	40
24	Conglomerate	1806–1843 +	37+



Indiana, North Lake and Adjoining Properties —Lake Superior Copper District

This quartz looks like a breccia. The rest of the bed is an epidotic amygdaloid. With reference to Formation No. 6, beds 4 and 5 probably represent the amygdaloidal part. Formation Nos. 7, 8 and 9, are ophyte, the upper portion of each being amygdaloid and the lower portion a trap. No. 10 is more or less brecciated, and is a part of the underlying trap. No. 12 is a sandstone, and the banding indicates a dip of approximately 35 deg., but this seems to be far lower than one would expect. Formation No. 13 consists of about 23 ft. of amygdaloid at the top and the remainder of trap. The amygdaloid contains more or less sandstone and the last 40 ft. of the trap are badly broken and crushed. No. 15 is a fine-grained dark sediment somewhat epidotized. This looks much like the sandstone in the top of Hole No. 6. Mr. Corning suggests that it might be a mud floor.

No. 16 is a felsite and carries a small amount of metallic copper and some chrysocolla from 1270 to 1293 ft. No. 17 is a dark gray sandstone similar to the bed from 1233 to 1249 ft. The bandings are 15 deg. from right angle to the hole. This is noteworthy as it would give credence to the flat dip. If the felsite is inclusive it may be a part of the overlying bed. No. 19 is classed as felsite and in this copper was found between 1424 and 1428 ft. No. 21 is also felsite and contains the Indiana lode, carrying copper from 1441 to 1492 ft. and from 1584 to 1611 ft. The last two or three ft. of this formation also shows copper. The top and bottom of this bed are much brecciated. No. 22 consists of an amygdaloidal trap, badly brecciated and shattered. A heavy dolomite seam occurs between 1718 and 1721 ft. No. 23 is a sandstone at the top while the remainder is of a soft clayey nature and badly brecciated. No. 24 is a typical pebble conglomerate.

Drill Hole No. 3

This hole is in Section 21, 832 ft. north and 1068 west of the southeast corner. The elevation is 423 ft. above Lake Superior. Formation No. 2 is classed as melaphyre and is brecciated and somewhat ophitic. No. 3 is a sandstone, the banding of which would indicate a flat dip corroborating observations in Hole No. 2. The other formations from No. 4 to 13 are alternately trap and amygdaloid. No. 14 is a typical pebble conglomerate. No. 16 is a reddish-brown sandstone. No. 17 consists of an amygdaloid at the top which merges into a sort of conglomerate at the base. Below this is trap. No. 18 consists of amygdaloid and trap with a percentage of copper occurring at 1161 feet.

RECORD OF DRILL HOLE NO. 3.

	Formation.	Depth, Ft.	Thickness, Ft.
1	Overburden	0–197	197
2	Melaphyre (ophitic)	197–288	91
3	Melaphyre sandstone	288–300	12
4	Melaphyre (Am. Tr.)	300–366	66
5	Melaphyre (Am. Tr.)	366–393	27
6	Melaphyre (Am. Tr.)	393–435	42
7	Melaphyre (Am. Tr.)	435–458	23
8	Melaphyre (Am. Tr.)	458–472	14
9	Melaphyre (Am. Tr.)	472–508	36
10	Felsite	508–513	5
11	Melaphyre (trap)	513–536	23
12	Felsite	536–615	79
13	Melaphyre (trap)	615–670	55
14	Conglomerate	670–878	208
15	Amygdaloid	878–885	7
16	Sandstone	885–931	49
17	Ophite (Am. Tr.)	934–1061	127
18	Ophite (Am. Tr.)	1061–1194	133
19	Ophite (Am. Tr.)	1194–1205+	11+
	Copper at 1161 ft.		

Drill Hole No. 4

Drill Hole No. 4 is vertical and is 697 ft. north and 611 ft. west of the east ¼ post of Section 28. The elevation here is 398 ft. above Lake Superior. Formation No. 2 consists almost entirely of trap which is badly brecciated. No. 3 is a trap which is coarse grained and feldspathic. Free quartz is visible. The dark mineral is either augite or hornblende. On the whole the rock resembles the Mt. Boehmia gabbro and for that reason it is here designated gabbro. A sandstone seam appears from 500 to 503 ft. No. 6 is a sandstone in which banding would give a dip of about 30 deg., corroborating the evidence in holes Nos. 2 and 3. No. 7 consists of felsite, the top of which is white and contains some copper. No. 8 is a typical pebble conglomerate. The bottom of the hole is still in this formation at a depth of 1786 feet.

RECORD OF DRILL HOLE NO. 4.

	Formation.	Depth, Ft.	Thickness, Ft.
1	Overburden	0–358	358
2	Melaphyre (trap)	358–405	47
3	Gabbro (trap)	405–1346	941
4	Amygdaloid sandstone	1346–1358	12
5	Ophite (trap)	1358–1454	96
6	Melaphyre sandstone	1454–1484	30
7	Felsite	1484–1615	131
8	Conglomerate	1615–1786+	171+

DRILL HOLE NO. 5

Drill Hole No. 5 is in Section 28 and is 800 ft. south 63 deg. 28 min. east of Hole No. 2. The angle of dip is 50 deg. The direction is south 63 deg. 28 min. east. This hole should tap Hole No. 2 but as yet no correlation can be made between the two. The elevation here is the same as at Hole No. 2. Formation No. 2 is classed as felsite while No. 3 is designated ophite, the top of which is amygdaloid and the bottom is a coarse-grained trap which looks as though part of the trap has been cut out by underlying felsite. No. 4 is a breccia which is probably the friction zone between the trap and felsite.

RECORD OF DRILL HOLE NO. 5.

	Formation.	Depth, Ft.	Thickness, Ft.
1	Overburden	0–160	160
2	Felsite	160–456	296
3	Ophite (Am. Tr.)	456–511	55
4	Breccia	511–515	4
5	Felsite	515–581	66
6	Ophite	581—	?

DRILL HOLE NO. 6

Drill Hole No. 6 is 500 ft. south of Hole No. 2. The angle of dip is 55 deg. The direction is south 63 deg., 28 min. east. The elevation is the same as at Hole No. 2. Formation No. 2 is a dark gray basic sandstone. The core shows banding which indicates a dip of 25 deg. This is the bed which Mr. Corning suggests might be a mud floor. Compare Hole No. 2 at 1233 to 1249 ft. No. 3 is classed as felsite. It is considerably altered and looks somewhat like a sandstone. It contains a small amount of copper at 242 feet.

Mineral Wool Production

The production of mineral wool in the United States in 1909 was greater than in any previous year, according to statistics collected for THE MINERAL INDUSTRY, amounting to 11,626 tons, valued at $101,621, an average price of $8.74 per ton. In 1908 the production was 9197 tons valued at $77,228, an average price of $8.40 per ton. There were six companies engaged in the manufacture of mineral wool in 1909 and approximately two-thirds of the output was rock wool made from sandstone and other silicious rock, and one-third was slag wool.

Bessemer Steel Production in 1909

The production of bessemer steel in the United States, as collected and reported by the American Iron and Steel Association, showed in 1909 an increase of 52.5 per cent. over that of 1908. Large as this gain was, it was less than that in pig iron, which was 61.8 per cent. for the same period; and this indicates that the make of open-hearth steel, not yet reported, will show a larger proportional increase. The total make of bessemer steel for the year was, in long tons, including ingots and direct castings:

	Ingots.	Castings.	Total.
Pennyslvania	2,838,530	7,072	2,845,602
Ohio	3,460,017	6,060	3,466,077
Illinois	1,628,200	4,244	1,632,444
Other States	1,370,222	16,438	1,386,660
Total, 1909	9,296,969	33,814	9,330,783
Total, 1908	6,096,196	20,559	6,116,755

The increase in ingots was 3,200,773; in castings, 13,255; total, 3,214,058 tons, or 52.5 per cent., as above. Ohio was the largest producer last year, Pennsylvania taking second rank for the first time. The steel was produced by 60 works in 1909, in 22 States. Louisiana, Texas and Iowa joined the list of steel-producing States in 1909. Of the active works, 22 made ingots but not castings, 34 made castings but not ingots, and 4 made both ingots and castings.

PROCESSES USED

All the bessemer steel in 1909 was made by the acid process; no basic converters have been in use in the United States since 1897. There were no Clapp-Griffiths works in operation in 1909, and only two Robert-bessemer plants were active, the same number as in 1908. Twenty-five standard bessemer plants were at work in 1909, as compared with 21 in 1908, and 18 Tropenas plants were running in 1909, against 16 in 1908. In addition one plant made steel by the Bookwalter process in 1909 and 1908, and 14 plants made steel by other minor bessemer processes in 1909, as compared with 12 in 1908. All the Tropenas and other modified bessemer plants make a specialty of direct castings and they furnished 32,993 tons of the castings reported last year; only 821 tons being made by the standard bessemer converters. Of the total production, 9,297,781 tons were made by the standard bessemer process; 15,006 tons by the Tropenas process; and 17,996 tons by other modifications of the bessemer process. In the total production for 1909, about 41,959 tons of alloyed-steel ingots and castings are included, of which 40,483 tons were titanium steel, 1467 tons were manganese steel and the remainder was nickel and vanadium steel. Of the total alloyed steel made, 1646 tons were direct castings.

COMPARATIVE PRODUCTION

The following table gives the total make of bessemer steel in the United States for 15 years past, in long tons:

1895	4,909,128	1903	8,592,829
1896	3,919,906	1904	7,859,140
1897	5,475,315	1905	10,941,375
1898	6,609,017	1906	12,275,830
1899	7,586,354	1907	11,667,549
1900	6,684,770	1908	6,116,755
1901	8,713,302	1909	9,330,783
1902	9,138,363		

The production in 1909 was less than in any year since 1904, with the sole exception of 1908. It was less than that of 1906, the year of greatest output, by 2,945,043 tons, or 24 per cent.

NEW WORKS

On Dec. 31, 1909, there were 9 plants with 12 standard, Tropenas, or other modified converters being built, as follows, by States: Pennsylvania, 3 plants with 4 converters, of which 2 were standard bessemer converters, 1 a Tropenas, and 1 a modified Tropenas; Delaware, 1 plant, with 2 Paxson-Deemer converters; Louisiana, 1 plant with 1 Tropenas converter; Michigan, 1 plant with 1 Tropenas converter; Wisconsin, 1 plant with 1 side-blown converter; Minnesota, 1 plant with 1 side-blown converter; and California, 1 plant with 2 surface-blown converters. With the exception of the two standard bessemer converters, which are to be used for desiliconizing and decarburizing molten metal for open-hearth steel furnaces, all the above converters will make a specialty of steel castings.

The Brennan Monorail for Alaska

According to a despatch to the New York *Sun*, Louis Brennan's gyroscope monorail system is to undergo a practical test. A contract, signed on April 29, grants the exclusive rights for the use of the device in Alaska to an American syndicate headed by John Ballaine, of Seattle. New York bankers are backing the syndicate, which undertakes to build 100 miles of line within a year.

Mr. Brennan will complete two cars, orders for which were given by Mr. Ballaine, who has seen the gyroscope car undergoing practical tests, in which it carried over 100 passengers at the rate of 26 miles an hour. Mr. Ballaine is very enthusiastic over the system. He said to the correspondent of the *Sun*:

"I estimate the cost of the 1000 miles of line we are going to build from the Matanuska coalfields toward Fairbanks will not exceed $3000 a mile, compared with at least $20,000 for even the lightest double-rail track. The ability of the gyroscope car to take curves will obviate most of the engineering difficulties."

Recent Reverberatory Smelting Practice—II

Preheated Air Advantageous. High Metal Losses in Flue Dust. Efficient Labor Required. Cananea Costs $2.53; Garfield $2.65 per Ton

BY REDICK R. MOORE*

The quantity and quality of fuel used in reverberatory furnaces deserve close attention. After making allowance for the power recovered from the escaping gases, the percentages of fuel charged to the smelting operation for several plants is about as follows: Anaconda, 20 to 25 per cent.; Garfield, 23 to 30; Steptoe Valley, 18 to 25; Cananea, (oil) 8.85 per cent.

The coal used at Anaconda is said to contain 11 per cent. ash and 33 per cent. volatile matter. If it contains 2 per cent. moisture there would be 54 per cent. fixed carbon and the heat value would be approximately 7000 cal. Similarly the coal used at Garfield would have a heat value of 6550 cal. The ultimate analyses of these coals are necessary to calculate the theoretical temperatures that would be produced in the products of their complete combustion by air without any excess or loss of heat at standard conditions. The ultimate analyses of the coals used for reverberatory smelting might help to throw some light upon the results obtained. Calculations based upon the ultimate analysis of a Wyoming lignite, having about the same heat value (6578 cal.) as the coal used at Garfield indicated that the theoretical temperature of the complete combustion would be 1862 deg. C. Similarly, taking for the ultimate analysis of the oil residuum used at Cananea, the analyses of a residuum oil giving about the same heat value of 10,100 cal. (carbon 85 per cent.; hydrogen 14 and oxygen 1) the temperature of the products of combustion using 0.44 parts of steam at 178 deg. C. for spraying would be 1800 deg. C. Using air for spraying it would be 1880 deg. C. This would indicate that with steam spray there would be absorbed, in the steam between 178 deg. C. and a smelting temperature of 1500 deg. C., 428 cal. for the 0.44 kg. of steam. By the use of compressed air, at an additional cost of about 25 per cent. of the steam spraying, these calories should all be available for smelting additional ore and be reflected in an increase of 14 to 21 per cent. in tonnage.

Preheating Air

Using a preheat of 200 deg. C. and using all preheated air for spraying and combustion the temperature should be, theoretically, 1975 deg. C. in the products of combustion, and there would be 687 cal. additional to increase the smelting capacity, since the waste gases from the boilers at 397 deg. C. should heat the air supply that amount. This should be a profitable field for experiment.

From Dr. Ricketts' statement of the reverberatory operations burning oil at Cananea[1] it is calculated that for every kilogram of material charged 0.1500 kg. of oil is used and the product is 0.2485 kg. of matte, 0.6302 kg. of slag and 0.1212 kg. of material volatilized. The volatilized matter consisted of 0.0444 kg. of CO_2 from the calcium and magnesium carbonates; 0.0572 kg. of SO_2 from the sulphates and sulphides, and 0.0786 kg. of oxygen from the higher oxides of iron which are reduced to FeO to form slag. From these data, by making reasonable assumptions, the amount of useful work done by the combustion of the oil is calculated as between 20 and 30 per cent. of the heat value of the oil. It can be seen that any heat introduced by preheated air should be entirely available, and if so the moderate preheat of 200 deg. C. would result in an increase of smelting capacity of 23 to 34 per cent. The lack of complete data makes it impossible to calculate the amount of heat actually used for smelting so the figures given were derived by maximum and minimum assumptions.

Richards[1] gives the heat utilized for smelting operations as 13.5 per cent. of the total heat value of the coal, of which 12.9 per cent. goes into the slag and 0.6 per cent. into the matte. His figures are also based on several assumptions.

Flame in Reverberatory Furnaces

The flame of a reverberatory is generally stated in most works on metallurgy as neutral. In the recently built furnaces this is not the case when working normally and making good tonnages. The flame for the back half of the furnace is dense and full of incandescent carbon or hydrocarbons, and is necessarily highly reducing. In the front third it begins to clear up from the admission of oxygen from leaks in doors and roof and at the "verb" it should be quite clear and have possibly a slight excess of oxygen, although in special cases combustion may not be complete until the gases have passed into the flue. I have seen deposits of soot on the bridgewalls of furnaces and probably the reduction of the Fe_2O_3 and Fe_3O_4 is partly accomplished by reduction by carbon deposited on the charge.

Long vs. Short Furnaces

The longer furnaces give trouble with most fuels from insufficient heat at the front which allows the slag to chill. This requires heavy firing to get the slag hot enough to skim. At Garfield, skimming bays were put in the sides about 30 ft. from the front, which were utilized for skimming when the slag was chilled on the bay in the front of the furnace. This same trouble seems to have been encountered at Cananea, with oil fuel. I can see no advantage in a furnace longer than 83 ft., and there are unquestionably several disadvantages. The only advantage claimed for the longer furnace is better settling. I am of the opinion that it is doubtful whether it is even as good. A slag that has passed the skimming stage foams badly from the formation of sulphurous acid. Foamy slags always carry over more matte than a slag that is not quite ready to skim.

It was generally noticed that a furnace which was badly eroded and needed fettling gave better tonnages than when the fettling was in good condition. When a furnace is newly fettled, the thickness of the fettling reduces the width so that a 19-ft. furnace will be only 15 or 16 ft. wide at the slag line. As the side walls are sooner or later partially eroded, greater area is obtained. This suggests the widening of the furnace in the smelting area. Slightly heavier I-beams and rods would hold the roof of a 25-ft. furnace. The fettling could be done by the Cananea plan, or by an arrangement which worked successfully on one furnace at Garfield. This consisted of a 4-in. pipe with a "T" on one end. One branch of the "T" connected with a hopper to feed the silica and in the other a steam jet was inserted to give velocity. This arrangement would throw quartz sand 25 to 30 ft. as fast as a man could shovel it into the hopper.

Flue Dust

Reverberatories as now operated make flue dust and arrangements should be made for the collection and cheap handling of it. If this is not done, the time is bound to arrive when all the flue dust will go out of the stack, or the draft will be affected and the furnaces will have to be closed down to clean it out.

The physical character of the ores or

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*Consulting engineer, Mexican-American Holding and Improvement Company, 20 Broad street, New York.

[2] *Met. Calculations*, Vol. III.

[1] Eng. and Min. Journ., Feb. 5, 1910.

concentrates calcined may greatly affect urnace tonnages. In concentrating some of the Bingham monzonites it was necessary to leave about 40 per cent. of the nonzonite with the concentrates in order to avoid heavy copper losses in the nill tailings. It was noticed in the smeltery that when using a large percentage of these concentrates the tonnage lropped, apparently from blanketing the urnace with highly silicious material. Jpon following this up it was found that sample of calcines taken from the top of the charge car showed up to 10 per ent. more silica and 7 per cent. less iron han a sample from the bed or mixture vould indicate, or correct samples from he roasters showed. This was found to e due to the segregation of the silicious natter from the heavier portion of the ed-hot calcines, while in a mobile condiion. This action was probably stronger r more intense in the furnace itself. It s probable that some similar physical eason caused the undoubted greater difiiculty of smelting McDougal flue dust, s compared to blast-furnace flue dust. At the same time the coke fines, always resent in all blast-furnace flue dusts, nay exert a favorable influence both from he reduction of Fe_2O_3 to FeO and from educing the actual weight to be smelted. Jndoubtedly the density and volume of he charge[2] as well as its specific heat nd conductivity affect the smelting caacity.

TONNAGE SMELTED

The tonnage smelted varies with conditions such as I have tried to point out. At the same plant, for example, the tonages are invariably lower when burnng coal in hot and moist weather, due argely to poorer draft. The capacity of our plants is given in the accompanying able.

	Furnaces.	Months.	Tons.	Tons per Furnace Day.
naconda	8	1	56,038	270
ananea	1	5	10,715	245
arfield	5	1	35,490	244
teptoe	.	. . .	. . . . .	300–400

At Steptoe Valley the converter slag vas all poured hot into the reverberatory, nd it is claimed that the slags were leaned of copper contents by the matte all from calcine charges, but the reerberatory slags showed an average of ully 0.1 per cent. more copper than lags from other plants where that pracce is not followed. This converter slag educed the amount of fluxing necessary ut even with its fluxing value utilized, it vas still necessary to add enough limetone to produce 8 to 10 per cent. CaO n the slags. The converter slag, as well s converter cleanings, matte chips, etc., vas considered part of the furnace tonage.

STACK LOSSES

Stack losses were estimated at Garfield by the use of a Pitot tube to obtain the velocities in the flues. A measured volume of the gas is aspirated through a cotton filter, taking care to have the velocity of aspiration greater than the velocity of the gases in the flue. The amount of copper filtered out and stopped in the tube is dissolved with the filter and determined. Knowing the flue area, a simple calculation gave the copper loss per minute or per day. One series of determinations showed the copper loss from the reverberatory flue to be 900 lb. per day.

The effective and cheap working of the reverberatory depends more upon effective and intelligent labor than does blast-furnace smelting. Firemen, graters, skimmers or chargers can, from lack of knowledge and care, or by shiftlessness, put the plant to great loss and expense. It therefore devolves especially upon the construction and operating engineers and metallurgists to see that working conditions are the best. Noxious gases from the furnaces themselves should be eliminated. Converter gases should be kept out of the reverberatory buildings and ample hot water for bathing and good clean change rooms supplied.

SMELTING COSTS AND CAPITAL ACCOUNT

Dr. Ricketts has given the direct cost of smelting both with poor coal and fuel oil at Cananea, but it should be especially noted that the plant is not a custom smeltery and the costs are not by any means the actual total cost of smelting. For example, the roasting cost is an essential part of reverberatory smelting and to get the matte into marketable copper and bullion requires converting and refining the blister copper. In addition we have to add sampling, insurance, taxes, salaries, and general expenses, and to be complete, amortization and interest upon the value of the metals locked up in the process and upon the working capital required for its operation. In custom smelting the interest on the working capital is generally carried in the capital account and does not appear in smelting costs; and the interest on the cost of the ore in course of treatment is taken up in the margins for smelting.

As outlined above, the working capital would comprise the stocks of coal, coke, fuels and supplies, and the salaries and wages expended in treatment. The value of ores would be their gross value less amounts deducted for treatment and losses, all of which should ordinarily be returned in 60 or 90 days, together with the profits of the operation, when ores are purchased outright. When treated by the toll system, the miner carries the capital corresponding to the value of the ore, or rather as much of it as corresponds to his actual cost in mining and delivering it to the smelter and refiner. Most refining contracts and some ore contracts are based upon the delivery of the metals or their value to the shipper, 60 days from receipt. This puts the interest on the value of the ore against the miner's account just as it does in the other case, the only difference being that he knows it.

AMORTIZATION

Amortization for deterioration should be carried as a fund for replacing the plant when worn out or obsolete and such a fund should be held at compound interest. This is properly taken care of in the difference between the actual cost of smelting and the actual metal returns. Quite the contrary is the case with a mining company owning its own mines, mills and reduction or smelting works. In the case of the custom-smelting industry, the life of the business may be presumed to be indefinite, while in the other, the life of the mine is more or less definite, and the life of the business is dependent on the life of one mine or one group of mines. Interest and amortization on the investments, and the working capital of the plant should be provided, although in the final analysis all these charges fall upon the profits of the mines.

UNIFORM SYSTEM OF COST RECORDS

There should be a uniform system of calculating smelting costs as the many different methods in vogue, each plant having its own system, render comparisons of costs of little value. In general, such a system should be based on the dry ore and flux smelted and each department should take care of or pay for the cost of smelting its byproducts, such as flue dust, cleanings, fuel slag, etc. The reverberatories should have credit for smelting blast-furnace flue dust, but not McDougal flue dust, and the blast furnace should have credit for smelting McDougal flue dust but not for its own flue dust, as it has already been credited with smelting it once, and the credit to one department of course becomes a charge to the department from which the material came.

A division of the charges to any department is useful also in locating the points at which improvements can be made. The division, if uniform at different plants, would also result in easy comparisons.

The following divisions and points of separation would be logical for reverberatories:

Sampling—To include weighing, moistures, unloading, sampling and delivery of ore and fluxes to the furnace bins, including its power, repairs and light.

Fuel—Cost of fuel delivered at works and losses and deterioration of same.

Power—Cost of motive power, including fuel for steam, oil, waste, labor, repairs to power machinery and lights, slag handling and charge hauling.

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[2] Sticht in "Principles of Copper Smelting," E. D. Peters, p. 319.

Labor—Including all loading, weighing, charging, feeding, firing, barring, furnacing, tapping, slag handling, cleanup, etc.

Tools and Supplies—Such tools and supplies as are in regular use, and shop work on same.

Repairs—Supplies and labor for repairs, including shop work.

Salaries—The proper proportion of all salaries directly connected with smelting operations.

General Expenses—Office expense, administration, legal expense, insurance and taxes.

Laboratory—Assaying and analyses, cost of supplies, light, heat, etc.

Roasting—Expense of handling ores to roasters, including power, repairs, labor, fuel and delivery of ore to calcine hoppers, lights, etc.

Converting—Handling matte to converters, power, labor, repairs, relining, casting and loading blister copper and handling converter slag, lights, etc.

Costs at Cananea and Garfield Compared

Calculating the Garfield and Cananea costs upon the same basis, we have the following comparisons between coal-fired reverberatories (with coal at about $4 per ton) and an oil-fired furnace on nearly the same tonnages.

	Cananea.	Garfield.
Fuel	$0.91	$0.91
Power	0.02	0.02
Labor	0.23	0.37
Supplies and repairs	0.36	0.13
Salaries	0.08	0.04
Laboratory	....	0.02
General expenses	....	0.19
Sampling	....	0.22
Roasting	0.17	0.22
Converting	0.68	0.50
Flux and fettling	0.08	0.03
Total	$2.53	$2.65

Amortization, interest, refining, freight and selling costs will bring the totals well above $3 per ton. The converting costs were calculated for Cananea on the basis of sending 6.8 per cent. of the tonnage to the converters where converting cost $10 per ton of blister copper. The roasting costs are based on the January percentages of calcines smelted and the 11 months' cost of 51c. per ton of dry concentrates roasted.

The costs per ton at the Highland Boy plant were: In 1906, $2.58; 1907, $3.21; and 1908, $3.98. These are calculated from the published statement by adding to the "smelting costs" the percentage of the "miscellaneous" that smelting bore to the entire costs, amounting to 9.6c., 11.4c. and 34.6c. for the respective years. The Highland Boy 1908 costs were, while shipping the ores to the Garfield plant and appear to include freight to the smeltery. The excessive miscellaneous cost in this year may have been due to smoke settlements.

Conditions Suitable for Reverberatory Operations

The advantages of the large reverberatories and their peculiar fitness for handling fine or crushed ores, flue dust and concentrates are now well understood. A comparison of their cost of operation and metal losses with blast-furnace costs and metal losses can readily be made and the determining factor of the advisability of construction of either system of smelting will probably be the cost and availability of the fuels used in the two methods. Where coke is costly and fuels suitable for reverberatory smelting are cheap, it will be advantageous to do reverberatory smelting even at the expense of crushing coarse ore to the necessary fineness. Where coke prices are reasonably low and fuel suitable for the reverberatory is costly, it may be best to install blast furnaces even at the expense of agglomerating the fines and flue dust by mechanical means or by pot-roasting or sintering. Where the fuel costs are nearly equal it will, of course, be better to install both classes of furnaces. Each problem must be worked out for its own locality and conditions.

Goldfield Consolidated

The preliminary report of the Goldfield Consolidated Mines Company for April shows that the production during the month exceeded that of March in spite of the decreased tonnage treated on account of the mill fire. The total average value of the ore was $75.11 per ton, the profit was $56.06 per ton (73.94 per cent.), and the total profit for the month was $839,040.

APRIL PRODUCTION.

	Dry Tons.	Mine Assay, Oz.	Per Ton.	Total.
Combination	3,080	1.75	$40.72	$125,400
Mohawk	4,700	1.82	42.37	199,000
Red Top	3,200	2.34	54.36	174,000
Clermont:				
Mill ore	3,530	3.88	90.32	....
Smelting ore	408	38.00	760.00	636,400
Total	14,918	.....	$75.11	$1,134,800

The excess of value assigned to the ore over the mine assays is explained by Manager Finlay as due to the fact that about 8000 oz. of gold were cleaned up at the mill following the fire of April 8. This gold belonged really to ore of former months, but principally to March.

Milling

The mill treated 15,818 tons of ore containing 38,409 oz. gold, from which 36,708 oz. were recovered, making an extraction of 95.57 per cent. The tonnage is approximate, the weighing apparatus having been destroyed in the fire. About 14,500 tons came direct from the mines and 1300 tons from ore contained in partially destroyed bins at the mill.

The actual value of the ore sent to the mill from the mine during the month was about $590,000, or $40.72 per ton. On this the tailings loss would be about $30,000, leaving an extraction of $560,000. To this should be added $314,000 in ore sent to the smelters, so that the total gross value actually produced was $904,000, contained in 14,918 tons, making $60.60 per ton. In this statement for April the mines are credited with $14.50 per ton on account of ore produced in former months. The amount per ton thus credited is large because the tonnage was so much below the normal.

APRIL EXPENSES.

	Amount.	Per Ton.
Bullion tax and marketing bullion	$24,000	
Administration, etc	17,000	
Total general	$41,000	$2.59
Mining	67,000	4.19
Transportation	2,600	0.17
Milling and cyaniding	$45,000	
Marketing concentrate residues	14,000	
Total milling	$59,000	$3.73
Construction—fire loss	65,000	4.11
Cost of marketing high-grade ore	26,000	1.74
	$260,600	$16.83
Loss in tailings	35,160	2.22
Total costs and losses	$295,760	$19.05

Note.—These high costs are due to fire loss, reduced tonnage and shipment of high-grade ore,

Development

The total advance was 2582 ft., being more than one foot for every six tons stoped. In addition, a large amount of work was done in clearing up and retimbering old drifts. The discovery of ore continues satisfactorily. Sill floor areas on main levels were increased by 1720 sq. ft.

Tonnage from new openings on main levels was as follows: Combination 180-ft. level, 226 tons @ 0.86 oz.; Mohawk, 350-ft. level, 105 tons @ 1.52 oz.; 600-ft. level, 804 tons @ 0.7 oz.; Red Top, 165-ft. level, 82 tons @ 0.43 oz.; 330-ft. level, 213 tons @ 0.78 oz.; Clermont, 600-ft. level, 40 tons @ 1.5 oz.; 650-ft. level, 183 tons @ 6.10 oz.; 750-ft. level, 277 tons @ 0.59 oz.; 900-ft. level, 164 tons @ 1.69 oz.; 1000-ft. level, 78 tons, @ 0.5 oz.; total, 2172 tons @ 1.25 ounces. These developments put in sight about twice as much ore as was mined.

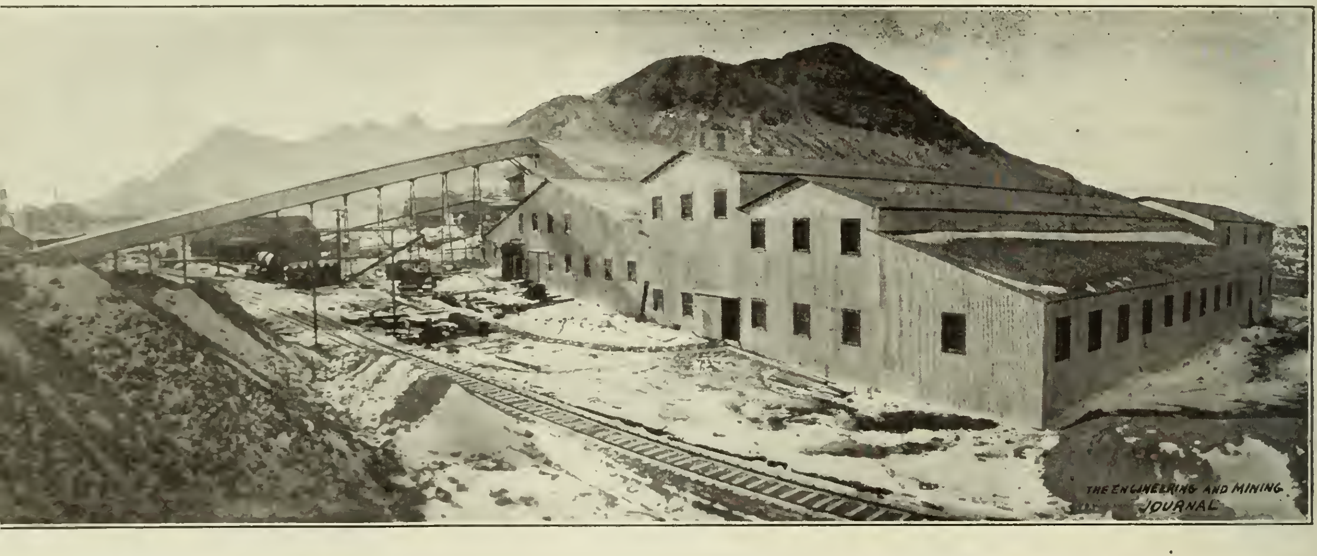
At the end of the month one of the important oreshoots of the Red Top was found in the 600-ft. level of the Clermont. The ore appears to be 12 ft. wide on the level and averages $30 per ton. Another important discovery is an orebody on the 900-ft. level of the Clermont. It has averaged to date $35 per ton, but contains some much higher-grade ore. It also points to further important discoveries on the 1000-ft. level.

New Mill of the Tonopah Extension Mining Co.

The Latest Milling Plant Erected in the Tonopah District; All-slime Process Employed; Trent Agitators Are Used for Aërating the Slime

MILL OPERATED BY 15 MEN

The Tonopah Extension Mining Com- any is the latest of the operating com- anies in Tonopah, Nev., to erect a mill nd cyanide plant. This new mill was arted up shortly before Feb. 1, 1910. It nploys an all-slime process and is dif- rent in some particulars from other ills in the vicinity. The rock is first ushed to about 1½-in. size, and is then arried to the battery bins by a belt con- eyer. The crushing department is en- rely separate from the mill, the convey- being 235 ft. in length and rising 40 . in that distance.



GENERAL VIEW OF TONOPAH EXTENSION MILL AND CYANIDE PLANT

The stamps, of which there are 30, e driven in sets of 10 by separate mo- rs situated under the ore bins. The ortars are set on blocks of concrete, inforced with 6-in. flat steel hoisting ables. Two Deister concentrators re- ove the coarse concentrates from the ulp from each battery of 10 stamps. he tailings from these tables flow to o Dorr classifiers, with sheet-steel nks, 4 ft. 6 in. wide by 16 ft. long, ith a bottom slope of 2 in. per ft. wo 5x18-ft. trunnion-type tube mills ke the coarse pulp from the Dorr class- ers. These tube mills are lined with l Oro lining cast in 21x16-in. blocks nd bolted to the shell. The ribs of the ning are about 1¼ in. thick and project in., leaving spaces of about 3 in. be- een the ribs.

The discharge from the tube mills goes rough hydraulic-classifying cones, hich remove the coarse particles and er the slimes to three Frenier sand pumps. The tube mills are set on a concrete floor, which slopes to a central pit, thus allowing the collection of all leakage. This leakage and the coarse product of the classifying cones is returned to the Dorr classifiers for retreatment. The slimes are pumped to six 8-ft. Callow cones, the overflow from which goes to the mill-solution tank and the thickened pulp to 12 Deister slime concentrators.

The slime tailings are run to a central pump and pumped to the slime-collecting tank, of which there are four, 24 ft. in diameter and 16 ft. high, having false conical bottoms with a slope of 25 deg. toward the center. The clear solution from these tanks can be discharged either to the mill tank or the gold tank, depending on its richness. A pump sends the thickened pulp from the slime-collecting tank to one of the three agitating tanks, where the solution is built up to its proper strength.

THE TRENT AGITATOR

These agitator tanks are called the L. C. Trent Shoshone agitator and aërator. The device is operated by drawing off the liquid and thin slime from the top of the tank containing the agitators, and forcing the liquor by means of a centrifugal pump through a central pipe to near the bottom of the tank. The central pipe has four arms or pipes radiating from it. These arms are fitted with short jet pipes, or nozzles, inclined downward toward the bottom of the tank; all the solution and pulp drawn from the top must pass through these nozzles. The pressure of the solution and slimes discharging through these restricted nozzles causes the arms to revolve at a speed sufficient to thoroughly stir and agitate. Air is admitted to the suction through a small valve, and is introduced in fine particles into the pump and forced into the solution. This results in a complete admixture of air, solution and slime. The solution becomes charged with microscopic particles of air and the top of the tank presents a seething, effervescent surface. A patent, gritproof step bearing excludes all sand and foreign material from the bearings of the pipe. An advantage of this form of agitator is that the arms revolve within a few minutes after starting the agitator, even after the slimes have been allowed to settle for several hours. A great difficulty in the operation of agitators in general is the difficulty in starting after the pulp has settled. Each agitator is driven by a separate motor.

The pulp from the agitator is pumped to a large storage tank, where it is kept agitated and the solutions drawn from the bottom to Blaisdell filters. The filter tank is constructed of steel and has five hopper bottoms. There are 100 5x10-ft. leaves made of canvas-covered, grooved, wooden strips. No cocoa matting is used. Each set of 20 leaves discharges through a separate hopper. The solution from the filters goes to the gold tank and thence to a long wooden box, 4 ft. square, which is filled with excelsior and removes any fine slimes from the solution. The overflow from this box goes direct to eight hopper-bottom zinc boxes, each having six compartments. The precipitates from the zinc boxes are sluiced to two tanks which are provided with false bottoms of cloth over slats and act as filters. The filtered liquor is then returned to the zinc boxes. The precipitate is dried in a steam drier and melted in an oil-fired furnace.

INDIVIDUAL DRIVING UNITS

The mill is run on three shifts of eight hours each. One man is employed on each shift on the batteries and also attends the electric-driven air compressor which supplies air to the mine; one man looks after the tube mills, Callow cones and Deister slimers; one solution man takes care of the agitators and solution tanks; the filters are attended by one man on each shift. On the day shift a roustabout, and a man to attend to the zinc boxes and cleanup are employed. These, with the mill superintedent, make a total force of 15 men. The capacity of the mill is 120 tons per 24 hours. The ore treated is a complex silver-gold ore, carrying approximately 90 oz. silver to 1 oz. of gold. The mill was designed by John G. Kirchen, general manager of the Tonopah Extension company, assisted by Fred M. Field, engineer.

Each unit of machinery, as far as possible, is driven by an individual Westinghouse motor. The distribution of these power units is as follows: Rock breaker, 30 h.p., 900 r.p.m.; conveyer, 7½ h.p., 1120 r.p.m.; distributer to battery bins, 5 h.p., 1120 r.p.m.; each battery of 10 stamps, 30 h.p., 690 r.p.m.; six Deister concentrators, 5 h.p., 1120 r.p.m.; two Dorr classifiers, 5 h.p., 1120 r.p.m.; two tube mills, 100 h.p., 690 r.p.m.; 12 Deister slime concentrators, 10 h.p., 1120 r.p.m.; sand and slime pumps, one 15 h.p. and one 10 h.p., 1120 r.p.m.; each Trent agitator, 10 h.p., 1120 r.p.m.; filter vacuum pump and excess-slime pump, 30 h.p., 680 r.p.m.; mill-solution pump, one 10 h.p. and one 7½ h.p., 1120 revolutions per minute.

Power Installation at Douglas Island, Alaska

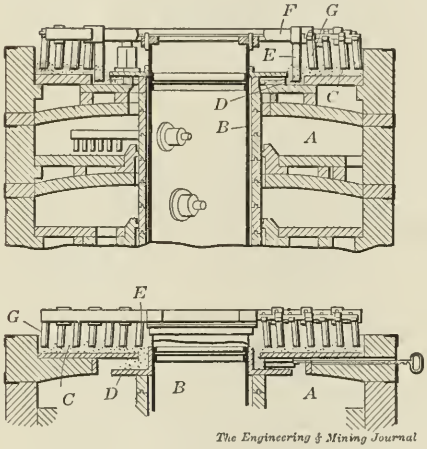
It has been decided to substitute electric power for steam wherever its application is deemed more economical at the Douglas Island, Alaska, mines. The installation decided upon at present consists of two units, one at Treadwell and the other at the mouth of Sheep creek on the north side of Gastineau channel, opposite the Ready Bullion mine and about one mile distant from it.

The Treadwell plant will use steam, and its purpose is to furnish power during the winter period when there is a scarcity of water. The plant consists of two Westinghouse-Parsons steam turbines direct connected to two 1000-k.v.a. Westinghouse generator units. At the Sheep Creek plant water will be used for power, and there is sufficient to supply the needs of the Douglas Island mines for about two-thirds of the year. This plant will have a slightly larger capacity than that at Treadwell.

Method of Charging Furnaces

Utley Wedge, of Ardmore, Penn., describes in Brit. Pat. 12,766, Nov. 25, 1909, a device for feeding ore or concentrates to roasting and other furnaces.

Two constructions embodying Mr. Wedge's invention are shown in the accompanying illustration, the upper one having a heating chamber provided immediately under the storage bed *C*. Above the upper working chamber *A* is an ore-storage bed *C* and a delivery bed *D*, the inner edge of which is arranged to deliver the ore falling over it to the chamber below. The storage and delivery beds communicate with each other through a passage *E*, which is filled with the ore to be charged, thus forming an air-tight closure, and prevents the escape of gas from the furnace. Mounted on the shaft *B* is a beam *F* with bearings at the ends for a rock shaft, to which a bar is fastened having the stirring blades *G*. By means of the rock shaft the blades are free to rise and fall as they travel over the ore. From the passage *E* the ore may flow by gravity to the delivery bed or may be fed by suitably inclined blades.



DEVICE FOR CHARGING FURNACES

An extensive opal deposit is reported in Oaxaca, Mexico, on the road from Tehuantepec to San Carlos, in the district of San Carlos, Yautepec. The deposit has not been commercially utilized, but it is said to be valuable both on account of the good grade of some of the opals and because of the extent of the formation.

Las Animas District of New Mexico

By Brigham Leatherbee *

A revival of the mining interests of Las Animas district, Sierra county, N. M., is now taking place. This district, which is characterized by a number of fissure veins converging at Animas peak, contains much mineral wealth. Lead, copper and vanadium have been discovered and prospecting work points to a renaissance in the mining operations of the district.

RENEWED ACTIVITY

The Statehood Mines Company is beginning active operations. The Snake mine has been unwatered and is being retimbered where necessary and a new raise will connect the 500-ft. level with the 425 level. New openings along the vein south of the main shaft are showing bodies of good ore. Work will shortly begin on the unwatering of the Opportunity mine. Preparations are being made to put the 30-stamp mill in operation within 60 days.

The Sigma Construction and Development Company, controlling the Wicks vein, is confining itself to development work, and is sinking a new shaft on the south slope, 750 ft. from the old one. The new shaft is a standard two-compartment shaft and is being sunk on the footwall at an incline of about 30 deg. It is now down 365 ft. and will be continued to a depth of 500 ft., which will place it on the 650 level of the old shaft. The two shafts have been connected by a drift and crosscut on the 300-ft. level, while a level has been made at 250 ft. in the new shaft. At 355 ft. a vein of gold-copper ore, 18 in. in width, was encountered.

The Ameranza Gold Mining Company has leased the Bonanza vein and is operating the old stamp mill on 400 tons of ore which were extracted during the winter. No new ore is being mined.

Hiltscher Brothers, who are operating on the southwest slope of Animas peak, have sunk a development shaft 150 ft., drifted 250 ft. on the 80-ft. level, and are now in a deposit of native copper in amygdaloid similar to that of the Michigan copper region. A new engine and air compressor have been ordered and the erection of a mill contemplated.

VANADIUM DEPOSITS

The vanadium properties of the Vanadium Queen Mining Company are not yet in active operation, but prospecting work is being done and deposits of high-grade ore are being uncovered. The property contains many caves which, so far as explored, are filled with vanadium ore.

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*Hillsboro, N. M.

Recent Developments in the Metallurgy of Iron

A Résumé of the Improvements and Experiments Made; Notes and References Covering Furnace Practice and Construction in Late Years

BY B. NEUMANN

Taking a glance backward over the history of cast-iron production, we may observe first of all that, of course, the extraordinary development of this industry could never have been accomplished had we been forced to use wood-charcoal for fuel, as in the early practice. In only a few localities, where forests abound, is it possible at the present day to procure wood in the quantities required for the modern furnace.

CHARCOAL COMPARED WITH COKE

Some interesting facts relating to the development of crude-iron production with the aid of coke in Germany have been noted by Lurmann.[1] This method naturally had its origin in one of the three great coalfields, not, however, as is commonly supposed, in Silesia, but in the Saar district. The first batch of crude cast iron smelted with coke was run in 1765 at Sulzbach, 24 years previous to the first introduction of coke smelting in Silesia. The first trial run in that province took place in 1789 at Malapane, but coke smelting did not become regular practice until its introduction at Gleiwitz in 1796. In the Ruhr district coke has been used regularly only since 1850, although experiments had been carried out in this direction as early as 1790 at Sterkrade.

The output of the furnaces was at first very small. The furnace at Gleiwitz produced only 2.66 tons per day. At Königshütte the daily output was 4.6 tons. At the present day a furnace in the Minette district produces 200 to 240 tons per day. The furnace of the Gewerkschaft Deutscher Kaiser, in Bruchhausen, has an average daily output of 500 tons. Its record for one day is 580 tons. American furnaces exceed this.[2] At Duquesne four furnaces produced (in March, 1906) an average of 660 tons daily, the maximum for one day being 845 tons. A furnace of the Illinois Steel Company reached the figure of 972 tons, a truly remarkable performance.

Charcoal furnaces lag far behind coke furnaces. Sweetser reports that a charcoal furnace, 69 ft. high, of the Algoma Steel Company at Sault Ste. Marie, has made a record run of 176 tons in a day. Canada has also the smallest charcoal furnaces, at Drummondville, with a daily output of only 3.44 tons.

Sweetser had occasion to run two modern furnaces of the same size, side by side, the one with coke, the other with charcoal.[3] As the result of his experience he concludes that a good coke furnace can be directly used for charcoal also. With charcoal only one-third the amount of lime and 65 per cent. of the ordinary blast are needed, as compared with the conditions of working with coke. The consumption per ton of crude iron was 930 kg. charcoal and 985 kg. coke. The customary average in the district is 997 kg. coke and 803.6 kg. charcoal.

The charcoal furnace, therefore, does not seem to have been at its best during the run reported by Sweetser. The sulphur content in the coke iron was 0.029 per cent. as against 0.011 per cent. in the charcoal iron.

FURNACE CONSTRUCTION

The various types of furnace construction, both old and new, have been discussed by Ehrenwerth.[4] He thinks that for some places some of the older systems still possess certain advantages. The same author also gives a formula for calculating the furnace profile.[5] This subject has also been dealt with by Howe in the JOURNAL.[6] Howe discusses the good points and failings of the several structures, and shows that it does not pay to increase the hight of the furnace beyond 75 to 100 feet.

At the Newport works in Cleveland an elliptical blast furnace which produces 210 tons daily has been installed. Its dimensions are 75x10x18 ft. Such an oval furnace was tried at Muhlheim in Germany in the '60s, at the time when Rochette furnaces of that form were coming into use. But this experiment did not meet with success.[7]

BLAST FURNACE DIAGRAMS

The reactions within the blast furnace can hardly be studied by direct observation, and accordingly there is still considerable divergence of opinions regarding the same. The conditions of equilibrium of the several substances taking part in the reactions within the blast furnace, have been investigated from the standpoint of theory by Boudouard, Baur and Glassner. From their results a "blast-furnace diagram" can be constructed which shows the state of affairs prevailing at different temperatures. Below 500 deg. the carbon monoxide has a reducing action only upon the ferric oxide Above 650 deg. the direct reducing action of solid carbon upon the Fe_3O_4 also sets in. The reduction of ferrous oxide begins at a temperature above 650 deg. Up to 1000 deg. it is affected by the carbon monoxide. Above this point solid carbon itself is the reducing agent. More recently Brisker[8] has demonstrated the correctness of the curves given by Baur and Glassner, on the basis of a number of blast-furnace balance sheets, so that we may now be fairly confident that this diagram does represent correctly the state of affairs in the blast furnace.

FUEL CONSUMPTION

Brisker has also published a number of calculations on the fuel consumption in blast-furnace practice.[9] Interesting figures on the distribution of the heat consumption are given by the Nurnberger Maschinen Aktiengesellschaft.[10] A blast furnace with a daily output of 250 tons consumes an equal quantity of coke. Of the corresponding amount of heat, the following fractions are used up for different phases of the process: For evaporation, 5 per cent.; for radiation, 5; for reduction, 24. In the molten slag 14 per cent. is carried off and lost, and in the iron 4 per cent. Thus the smelting process consumes 52 per cent. of the heat, the remaining 48 per cent. passing off in the furnace gases. For heating the blast 14 per cent. of this heat is recovered from the gases, and 9 per cent. more is used in the blowing engines. There is, therefore, finally left over in the furnace gases an excess of 25 per cent. of the total heat, which, if utilized, would be capable of furnishing 7500 horsepower.

EXPLOSIONS

Violent explosions often accompany the falling of the charge within the furnace. The cause of these explosions is still an open question. The explanation first offered was that they were due to the sudden bursting of gases into flame, as in the case of explosions in the gas and blast conduits. But this view is not tenable, although it has been revived quite recently by Teichgräber.[11] Neither can Osann's explanation[12] be accepted,

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Note.—Excerpts from an article in *Zeit. f. angew. Chem.*, Sept. 3, 1909, translated by I. Lathe, Washington, D. C.

[1] *Stahl u. Eisen*, 1909, p. 86.

[2] *Iron Trade Rev.*, 1908, pp. 33 and 106.

[3] *Trans. A. I. M. E.*, 1908, p. 303.

[4] *Oest. Zeit. f. B. u. H.*, 1908, p. 301.

[5] *Loc. cit.*, 1908, p. 229.

[6] ENG. AND MIN. JOURN., Sept. 12, 1908.

[7] *Stahl u. Eisen*, 1908, p. 1791.

[8] *Stahl. u. Eisen*, 1908, p. 391.

[9] *Stahl. u. Eisen*, 1908, p. 1305.

[10] *Stahl. u. Eisen*, 1908, p. 11.

[11] *Stahl. u. Eisen*, 1908, p. 1782.

[12] *Stahl u. Eisen*, 1908, p. 1783.

which ascribes the effect to purely physical conditions, namely, to great compression of the gases. Van Vloten[13] accounts for the observed effects by the supposition that there is a sudden evolution of large quantities of gas (carbon monoxide) as the red-hot dust of iron ore becomes intimately mingled with red-hot coke dust, and that this sudden increase in volume causes the disruptive effects. The conditions are particularly favorable for this occurrence when an overhanging portion of the charge collapses, so that all the different constituents come down together. Van Vloten was able to reproduce this effect on an experimental scale.

It has been proposed by Osann to use a thinner, but water-cooled furnace bed, to avoid bursting through of the molten metal. This suggestion has not found favor with technical men.[14] Latterly turbine blast has been coming more and more into vogue in furnace practice.[15] Bolling has shown[16] that the sulphur content of the coke is not quite such a serious matter as commonly supposed; coke containing as much as 2 per cent. sulphur causing no inconvenience whatever if a sufficiently basic slag is made.

Recovery of Gases

In America the recovery of the blast-furnace gases has long been neglected, but the matter is now being taken up in truly American style. The new works of the Indiana Steel Company, at Gary, Ind., are being equipped with a plant for utilizing the waste gases from sixteen 500-ton furnaces. When all the furnaces are working there will be 200,000 h.p. available. For the utilization of blast-furnace gases in gas engines a thorough purification from suspended dust is necessary. In Germany this is carried out mostly by means of Theisen's mechanical washer. Flaccus[17] gives an account of some new American gas washers of Nisbet and Bachmann.

It has been repeatedly proposed to regenerate the whole of the blast-furnace gases, i.e., to convert the carbon dioxide into carbon monoxide by treatment with coke. Schmiedhammer[18] points out that the quantity of coal required for the reduction and to supply the requisite heat would be comparatively small, and draws attention to the great advantages which would thus be gained, a rich, uniform gas being obtained. Bourcoud[19] proposes to use carbureted gas to reduce iron ore, the iron sponge being subsequently melted in the electric furnace.

Gayley Dry Air Blast

The Gayley dry-blast process, introduced some time ago at the Isabella works, has now been installed also at the Warwick works, in Pottstown, and at the south works of the Illinois Steel Company. The Cleveland Cliffs Iron Company, in Marquette, and the Northwestern Iron Company, in Maryville, are also planning to equip their furnaces with dry blast. Outside of America only one Gayley plant has hitherto been installed, namely, one at Cardiff, England. Cook has given a detailed account of the Warwick works,[20] and Simmersbach has described the dry-blast plant of the Illinois Steel Company,[21] and has also published some of the results obtained at Pottstown and Cardiff. At this last-mentioned works the advantage gained by the use of dry blast is 26.4 per cent. increase in the production, and 13.4 per cent. saving of fuel, when working for high production; or 14.1 per cent. increase in production and 18.4 per cent. fuel economy, when working for low fuel consumption. The running expenses and cost of maintenance is quoted at 10c. per ton of iron.

Slag Diagrams

Some interesting publications on slags appeared in 1908. Riecke prepared a large number of lime-alumina-silica compositions and has determined their melting points.[22] When the results are represented graphically they show a number of maxima and minima, indicating the existence of double silicates of in part unknown character. Matthesius has put these results of Riecke's and those of Boudouard into extremely handy and lucid form by plotting the composition of the slags in a system of triangular coordinates, the corresponding melting points being represented by the hight of a perpendicular erected upon each point of the triangular base-field. In this way a surface is generated, which shows a variety of properties hitherto unobserved.

Matthesius further plotted a number of other slags upon the same diagram, allowing for bases other than lime. The results show first of all a distinct difference between slags from gray and those from white crude iron, and again a marked divergence between slag from coke furnaces, charcoal furnaces, and from manganese steel and spiegeleisen. The diagram throws light on a number of observations of blast-furnace practice. Matthesius further shows how to apply the diagram for calculating the proper composition of the charge. This method possesses the advantage of greater clearness and certainty over the old method. Theussner[23] has made experiments with a view to obtaining an insight into the constitution of slags by examining the action of various solvents upon the same.

Among the uses for blast-furnace slag the chief are its application for slag stone and for slag cement. At first the slag, to which sand was sometimes added, was cast in iron molds in a bed of sand, and was there allowed to cool slowly. This method was practised by Payne as early as 1728. But only slags rich in silica and poor in lime could satisfactorily be dealt with in that way. A great progress was made when Lurmann discovered the hydraulic properties of granulated basic slag. Lurmann's method of making slag stone, and some other allied processes, have been described by Schwarz.[24]

Open-hearth Process

From America we have some suggestions for improvements in the open-hearth process; Blair, Jr.,[25] builds the furnace flue, which suffers most, of magnesia, and cools it. In this way the frequent interruptions in working are avoided. He further proposes to increase the productive capacity of the combined bessemer and open-hearth process; the construction of the furnace is modified, a feature being the introduction of a divided hearth.

An exhaustive discussion of the heat developed and consumed in the open-hearth furnace has been given by Meyer.[26] Starting from the generator the heat relations in the regenerators are first considered, then the gas losses on reversing, the arrangement of the burners, and the velocity of the entering gas and air. From these considerations a scientific foundation for the construction and designing of open-hearth furnaces is derived. The heat contained in the flue gases at 600 deg. C. cannot be further utilized. Hydrogen takes part in the combustion in the same measure as carbon monoxide, having due regard to the proportions in which these two are present in the gases. Nevertheless, for the sake of the steel and of the furnace vault, the hydrogen content of the generator gases should be kept as low as possible. The gas losses on reversing are slight. In order to secure a satisfactory flame the gas and air streams should be led to the hearth side by side through long flues and at a high velocity. Harrison and Wheeler[27] bring out the importance of a proper chemical control in running the open-hearth process.

Duplex Process

An article by Howe[28] is devoted to the study of the combined bessemer and open-hearth process, the so-called duplex process. This process furnishes the possibility of starting from a crude iron of a composition varying between wider limits than would be permissible with either the acid or basic process. The acid process requires a crude iron low in sulphur and with constant proportion of silicon; in the basic process the silicon and sulphur contents must both be small. If the furnace is run for a product low in sulphur, then the silicon content is increased. With the duplex process, however, an iron which would not be adapted for the ordinary bessemer process can well be worked up, for the acid converter eliminates the silicon and a part of the carbon and the open-hearth furnace subsequently receives a material thoroughly adapted for it.

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[13] *Stahl u. Eisen*, 1909, p. 1015.

[14] *Stahl. u. Eisen*, 1908, pp. 200 and 369.

[15] *Stahl. u. Eisen*, 1908, p. 73.

[16] *Metallurgie*, 1908, p. 493.

[17] *Berg. u. Hüttenmannische Rundschau*, 1908, p. 269.

[18] *Stahl. u. Eisen*, 1908, p. 126.

[19] *Oest. Zeit. f. B. u. H.*, 1908, p. 41.

[20] Eng. and Min. Journ., Oct. 24, 1908.

[21] *Stahl. u. Eisen*, 1909, p. 283.

[22] *Sprechsaal*, 1907, Nos. 44-46; *Stahl. u. Eisen*, 1908, p. 16.

[23] *Stahl. u. Eisen* 1908, p. 1121.

[24] *Stahl u Eisen*, 1908, p. 382.

[25] *Stahl u. Eisen*, 1908, pp. 170, 277.

[26] *Stahl u. Eisen*, 1908, pp. 717, 756, 802.

[27] *Metallurgie*, 1908, p. 633.

[28] *Electrochem. und Met. Ind.*, 1908, p .7.

For grades of iron low in silicon the partial elimination of the latter may be carried out in the mixer, where at the same time a portion of the manganese and sulphur can be removed. In fact a fairly complete purification in this way can be insured in the mixer according to Pratt[29] if care is taken to produce a basic-slag cover rich in oxygen, and if lime and oxide are repeatedly fed to the same. Pratt proposes to carry out, by the aid of the mixer, an entirely new process in which the scope of the hearth furnace is extended.

Pratt's Proposal to Use Three Fining Furnaces

In the ordinary fining process Pratt distinguishes three phases: (1) The melting stage, in which the iron is melted; (2) the period of exothermic reaction, or the period of low temperature during which the foreign substances, except carbon, undergo combustion; (3) the period of endothermic reaction, or the period of high temperature during which the carbon and other constituents are oxidized. Now in the ordinary open-hearth process, these periods are not sharply divided. Pratt proposes to separate them and carry them out in distinct furnaces. For this purpose are required: (1) A gas-heated mixer, as "finer," in which silicon, manganese, sulphur and phosphorus are to be eliminated as far as possible at low temperature without appreciably diminishing the carbon content; (2) a "scrapper" which must be kept at a high temperature in order to keep the scrap iron liquid; (3) a series of "finishers" which are fed with molten scrap. After adding hot lime and oxides purified crude iron is poured upon the charge. The carbon and the other constituents present in small quantities burn off quickly and the process proceeds rapidly. There is little loss and a good yield is obtained; low-grade raw material may be used. Much time and fuel are economized through the fact that the temperatures remain constant in all the furnaces.

Thomas Basic Process

An experimental investigation of the Thomas basic-bessemer process has been undertaken by Wust and Laval.[30] The changes undergone by the several constituents on blowing the charge are shown by means of a number of diagrams, and the changes in the metal are illustrated by a number of metallographic plates. A large number of temperature measurements, analyses of converter gases, etc., furnish an insight into many interesting features in the process. On the basis of their investigations, they prepared a balance sheet of the materials entering into the process and a plan of the heat supplied and consumed in the Thomas process. For 9730 kg. of steel the heat received is shown in an accompanying table.

HEAT PER 9730 KG. STEEL IN THOMAS PROCESS.

Heat Received.	Heat Units.	Per Cent.
Introduced with the crude iron	2,902,960	43
By oxidation of impurities.	3,917,080	57
Total heat received.....	6,820,040	100
Heat Expended.		
Carried away in the gases, decomposition of steam and heating the lime....	1,641,007	24
Heat lost in the slag......	1,361,410	20
Heat in the molten steel...	3,269,280	48
Lost by radiation.........	548,343	8
Total heat expended....	6,820,040	100

The crude iron is fed at an average temperature of 1252 deg. C.; the temperature of the slag is about 25 deg. higher. The steel coming from the converter, after adding the carburizing and deoxidizing agents, has a temperature of 1552 deg. C. The temperature of the flame in the Thomas process rises from 1000 to 1500 deg. in 15 min., and subsequently falls somewhat. There is further calculated what economy might be secured if the blast were used either dry, rich in oxygen, or heated. The use of dry blast would not lead to any particular advantage from the point of view of heat consumption, but the quality of the steel would be improved and the steel rendered denser owing to the fact that there would be no opportunity for the absorption of hydrogen. This supposition has been confirmed by experiments in America where a dry-blast plant originally installed for use with blast furnaces was temporarily, by the way of experiment, connected to a bessemer-converter system. If a blast richer in oxygen were used the bath would ultimately attain such a high temperature that the loss of iron by combustion would be very high indeed. Preheating the blast has a similar effect. The conclusion was reached that the basic-bessemer process will become restricted in its scope as soon as more rational refining processes are introduced.

In Dudelingen, Flohr insures the desired lowering of the dephosphorizing temperature in the Thomas process, not by cooling with lime and scrap, but by adding toward the end of the period a mixture of iron scale and slaked lime in the form of briquets. By this means the time required for finishing the charge is shortened.

A new deoxidizing agent for steel which has of late been recommended is calcium silicide. It would have the advantage over aluminum of eliminating at the same time traces of sulphur. Of the success of the experiments made in this direction nothing has become public.

Magnet Steel

A small field, as yet little explored, is that of the production of permanent steel magnets, which consist mainly of tungsten steel. Hannack says with regard to this subject:[31] "The essential thing is that the steel should be fine-grained; this is attained by adding tungsten. The tungsten content is, however, bound within certain definite limits; moreover, the tungsten alone does not determine the quality of the magnet. This depends on the simultaneous effect of a number of constituents in the alloy. The composition of an excellent magnet steel is as follows: C, 0.597 per cent.; S, 0.038; W, 5.369; Si, 0.255; Mn, 0.176; Cu, 0.004; P, 0.018; Cr, *nil.*

Hannack also succeeded in preparing a magnet steel free from tungsten, but containing chromium and vanadium. This, however, is only of scientific interest. The quality of magnet steel depends not only on the proper chemical composition but also in a large measure on the mode of hardening. The relation between the chemical compositions and the magnetic efficiency of the product is as yet but imperfectly understood.

Howe has endeavored to determine the influence of the rate of cooling and size of blocks on the liquation in steel blocks. One would think that the latter would be favored by slow cooling and large dimensions, but this is not the case. The cause of this, according to Howe,[32] must be attributed to the addition of aluminum, which prevents the expulsion of the foreign constituents by gases.

The chief alloys in which chromium is a constituent are ferrochromium, ternary chromium steel, quaternary chromium steels, such as chromium-nickel steel, chromium-tungsten steel, chromium-manganese steel and chromium-molybdenum steel.

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[29] *Metallurgie*, 1908, p. 673.

[30] *Metallurgie*, 1908, pp. 131, 171.

[31] *Stahl u. Eisen*, 1908, p. 1237.

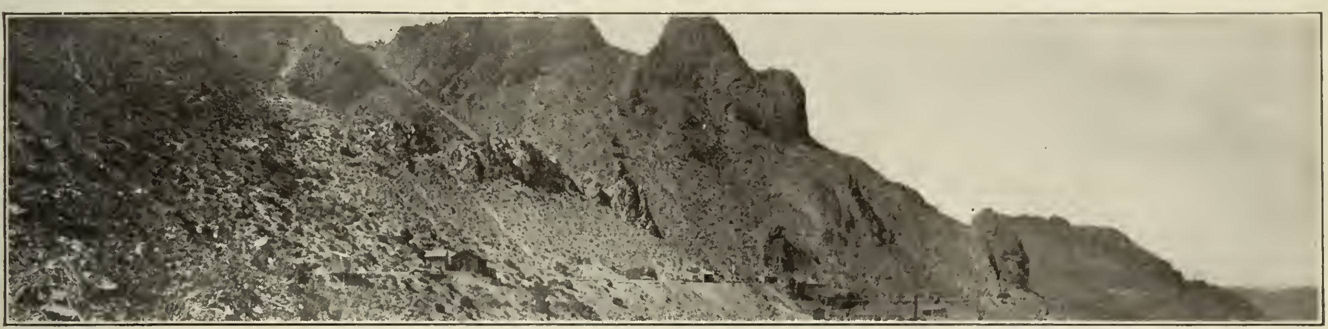
[32] *Stahl u. Eisen*, 1908, p. 1256.

The Cabrillas Lead Mines of Coahuila, Mexico

Lenses of Lead Carbonate Ore, Carrying Silver and Zinc; Gangue High in Iron and Low in Silica; Gypsum Bed below Orebody

BY S. J. LEWIS[*]

The Cabrillas group of lead mines is in southeastern Coahuila, close to Cabrillas on the main line of the National Railway. Saltillo is one hour's ride to the west and Monterey two hours to the east. The mines are about 2000 m. from the station. The three mines have produced over three million pesos in six years.



CABRILLAS MINE, SHOWING TRAMWAY AND OUTCROP AS SMALL PEAKS IN THE FOREGROUND

OUTCROP ALONG FAULT, SHOWING UPTURNED STRATA. THE PALOMA MINE IS TO THE LEFT OF THE CENTER

EARLY HISTORY

The sketch map and section shows the formation in its essential features, as well as the positions of the three orebodies constituting the group. The most westerly, as well as the oldest, is Higueras, which was denounced in 1889; across the gulch, east of it, is the youngest, the Paloma, upon which work began about three years ago, though it was discovered in 1890; and finally, further east and a little south, on the other side of the same hill, is the Cabrillas, which has given general interest to the region. The country is rough. From the railway line in the valley to the patio of Cabrillas, the elevation is not less than 500 meters.

All three properties were discovered by the same prospector, Atanasio Sanchez, now president of the Cabrillas and Paloma companies. Under his management, Higueras was developed into a promising prospect, sold, and the money put into Cabrillas. The purchasers of Higueras subsequently shipped much high-grade ore and made large profits. The total production of the mine, in four years, probably exceeds a million pesos. In Cabrillas, development was slow, as no bonanza ores were found, and the property was kept alive only by shipping the low-grade ore first encountered, as an iron flux to a local smeltery. In 1904 the mine was leased to the Torreón smeltery, which has operated it since. In this period the smeltery has made settlements for ore amounting to 2,000,000 pesos. Paloma only recently began shipping. Its output so far is about a quarter of a million pesos.

GEOLOGICAL FEATURES

The limestone ridge in which these orebodies occur has a general east and west axis, with spurs radiating northward into the valley. The mineralization is in a belt of black, shaly, badly crushed limestone, about 50 m. in thickness, having a strike the same as that of the main range and dipping to the north about 60 deg. These shales outcrop in the form of small isolated buttes and are easily followed. They contain more silica at this side of the hill than at the Higueras side, grading into a finely granular, silicious limestone in the bottom of the Cabrillas *arroyo*. Below it is a large deposit of gypsum about 50 m. thick, dipping 30 deg. toward the north. In the Higueras *arroyo*, erosion has cut down to the gypsum; in the Cabrillas *arroyo*, the latter is from 200 to 300 m. below the surface.

Fig. 1 shows the relative position of the various developed orebodies and formations. The gypsum seems to be the lower limit of the ore.

The mountain spur in which these orebodies occur has been dislocated from the main mass by a fault, traversing the formation. The disturbance and movement incidental to this break were the primary factors determining the existence of ore at this point. The fracture is shown in the photograph of the Paloma side of the mountain, taken from Higueras. The end of the undisturbed anticline is seen, rapidly grading into the broken strata. In the center is seen a series of more or less parallel zones of fracture. The pyramid of limestone to the left of the center, with a prospect hole at its base, is a piece of capping like that of the anticline and seems to have settled down into its present place subsequently to the upheavel. On the Paloma side, the orebody begins below the foot of this pyramid. It has a general dip a little west of north and goes down the hill at a gradually increasing angle, becoming almost vertical in the lowest workings.

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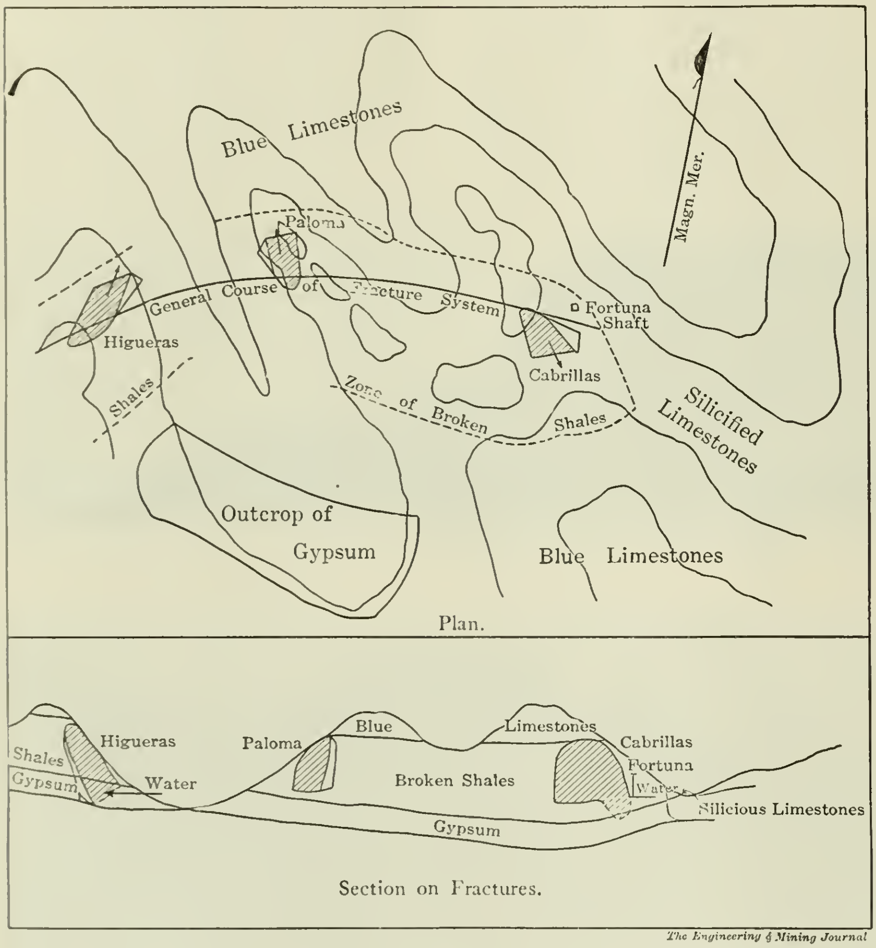
[*] Monterey, Mexico.



Plan.

Section on Fractures.

The Engineering & Mining Journal

Geological Sketch Showing Fault System and Relative Position of the Orebodies

Development Work

As developed, it is about 150 m. from top to bottom, 35 m. thick, and a little over 100 m. long on the strike of the lens. This has been developed by adits, all in ore, and communicating winzes. A tunnel 60 m. below these, and farther south, passes through the gypsum, getting above it, and turning north, enters the iron envelop of the footwall. It cuts a previously unknown orebody about 25 m. south of the main lens. The smaller lens is about 2 m. thick, principally siderite, and carries some zinc as a replacement of the iron. The high-grade zinc is being explored downward by a winze following the ore. It will be of interest to see how far down this can be carried before encountering the gypsum. Still lower down on the Paloma side of the hill another adit has been begun and is now in 300 m.; the first 100 m. in limestone, the remaining 200 m. in the gypsum. It will practically crosscut the mountain, dewater the Cabrillas workings and reduce the cost of mining in both properties as well as from any other lenses that may be cut. It is too far south to go directly under the Paloma, but the latter will be reached easily by crosscutting.

On the Cabrillas side of the spur, the orebody begins at the small workings shown in the upper left-hand corner of the first illustration. It comes down the hill nearly vertically, keeping fairly close to the fault, and forms a solid chimney of iron ore with a lead core. The discoverers developed it over its whole extent, chiefly by a tunnel on the level of the tramway, and an interior vertical shaft down through the center. The lens has a width of 300 m., a length of about 200, and an average thickness of 30 m. The shaft is entirely in ore for 120 m., when gypsum is encountered; the remaining 27 m. are barren. No development work has been done toward the finding of other orebodies. A winze in ore is being carried down below the level of the shaft bottom, but further north, and still above the gypsum.

Origin of Ore

The extensive fractures, followed by intense shattering of the softer limestones, left open a considerable channel for the percolation of mineral-bearing solutions. Favorable conditions for the precipitation from these acid waters were furnished by the belt of shattered calcareous shaly rock now overlying the gypsum. It seems altogether possible that much, if not all, the ore may have come down directly as carbonate without passing through an intermediate sulphide stage. A simple interchange of the acid ions of the percolating solutions for the basic ions of the limestone would have resulted in the deposit of most of the metallic contents as carbonates and oxides, leaving the acid radical free to combine with the lime as calcium sulphate. The reaction is one with which all water chemists are familiar and is sufficient to bring down as carbonate much smaller traces of iron salts than would probably be carried by the solutions. The one important factor necessary is alkalinity, which, evidently, would not be lacking in a limestone fracture.

Conditions underground indicate that the bulk of the ore was deposited in open caves, beginning with a thin sheet on the walls and gradually forming toward the center. The walls are smooth, slickensided and clean. No fragments of country rock as breccia are found in the ore, and such few large boulders as are encountered as horses are isolated and evidently fell from above. On the footwall at various points, calamine crystals occur in thin sheets, deposited on the limestone, and evidently undisturbed since. The concentric relation of the iron and lead is marked, as is their separation from each other. The same is true of the zinc body found in Paloma. Both point clearly to deposition in open channels. The remains of one of these openings can be seen in the upper level of Paloma; it is one meter wide, and about 15 m. in length and hight, separating the hanging-wall from the iron envelop of the lead core. The soft iron ore adheres to the wall without sign of replacement processes.

Character of Ore

The Cabrillas ores are carbonates of lead and iron, carrying unimportant percentages of zinc. The Paloma mine contains high-grade carbonates of zinc, with occasional perfect calamine crystals. In the orebodies proper, the occurrence of galena is rare, and then only as a small core in a lump of carbonate. In the lower part of the Cabrillas property, and in the Fortuna workings, where water is plentiful, there is some pyrite. The type of orebody here presented may be described in a general way as a core of lead carbonate entirely surrounded by iron ore, which contains about 4 per cent. lead and traces of zinc. It is low in silica and has been shipped in quantity both as a fluxing ore and as a mixture with the high-grade lead carbonates. The payable ore varies from 15 to 35 per cent. Pb, with about five grams of silver for each per cent. lead. A large amount of ore carrying 40 to 50 per cent. Pb and 200 to 250 grams of silver was shipped from Higueras during its bonanza days. At present at Cabrillas and Paloma, the various grades are mixed to carry about 20 per cent. Pb, 100 gm. Ag, 15 per cent. iron, about 10 per cent. insoluble, and a little lime. The zinc averages about 5 or 6 per cent. The tenor of the ore in the two mines is practically the same.

The shipments from Cabrillas for several years have been about 2000 metric tons per month. At present, Cabrillas and Paloma are each shipping about 1500 tons of lead ore monthly, in addition to which the zinc at Paloma is being sorted to average about 40 per cent. and shipped to the United States. Higueras has been idle ever since it was necessary to pump water out of the shaft. The shaft is 150 m. deep, with the last 20 m. under water.

Mining

The greater part of the Paloma ore is so soft that it is mined with pick and shovel. In Cabrillas, it is harder, but the expenditure for powder is not great. Extraction of ore at Paloma has been followed by dangerous caving. Heavy timbering has been necessary; 10x10-in. square sets are carried forward as fast as the extraction, and filled with waste when the limit of the block is reached. Work will then be begun on the section above. This is the plan in use at Cabrillas, where the ore is much firmer and drier; round 6-in. poles with footing and header blocks, set about 6 ft. apart, are sufficient to hold up the ground while the ore is being taken out. The waste from other parts of the mine, or more usually from outside the workings, is filled in nearly to the top of the poles, and when the next section above is begun, the poles are drawn out vertically and used over again. At Paloma it is necessary to leave all the timbering in the stope; it will not hold up the ground without being completely lagged, and in addition double sets frequently have to be put in. It is now proposed to cave the ores into the mouths of small, heavily timbered tunnels, carried into the body from various points. The sides are lagged with 6-in. poles, dovetailed into similar poles whose free ends are bedded firmly into the loose waste or ore forming crib work. This construction is expected to resist ordinary pressures and to allow the ore to be taken out safely.

Handling the Ore

At Paloma, all ore is dropped through small chutes to the main working level, whence an 8-h.p. gasolene hoist, inside the mine, lifts it to the top. The buckets are small, and dump into cars running out to the bin at the head of the incline. Two and one-half-ton steel cars are operated on the incline to the *arroyo*, where the ore is loaded into wagons and hauled to the station. Similarly at Cabrillas, the ore is sent to the lowest working level and picked up by a steam hoist, also inside the mine. The buckets are large, dump directly into cars which run out to the surface along the tramway about 500 m., and deliver into a large storage bin at the head of the cableway. An aërial ropeway carries the ore to the lower station, where the wagons take it for transport to the railway. The possible economy by having originally installed the cable complete to the railroad is evident.

The plan of extraction pursued in both these properties is evidently based on the idea common to native companies of taking out the orebody already found from the bottom up, without spending anything outside of this for development. There are few places where proper development expense would be more certainly and adequately rewarded.

Possibilities of the Mines

So far as the future of these mines is concerned, the most important factors that present themselves are two:

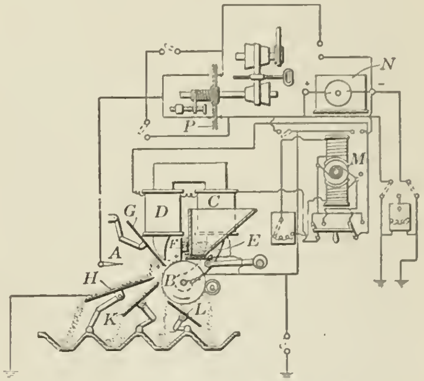
1. The thick sheet of gypsum underlying the oredeposit has been pierced at important points in all three mines, besides being available for study at the surface; at no point is there any indication of its having been even slightly disturbed. From all the evidence at hand the conclusion is inevitable that the orebodies are cut off at the gypsum horizon. Whether they turn and go northward to any extent, along the contact, has never been determined. It does not seem likely.

2. This leaves as the only probability the finding of new orebodies approximately parallel to the lenses now being exploited. In a formation so extensively fractured as this, it is altogether probable that other lenses await discovery. It is known that mineralization took place in at least one minor fracture of this class.

In addition, the amount of water being pumped out of Cabrillas every day makes it clear that the adjoining Fortuna ground, from which this water comes, contains a fracture of no mean size and importance. A shaft in this claim, a few meters north of the Cabrillas line, has reached water level, with rapid increase in the flow as drifting was carried toward Cabrillas. In order to go on working in the latter, the pumps have to operate 6 hours daily, lifting 125,000 liters of water, or about 90 gal. per minute.

Apparatus for Electrostatic Magnetic Separation

An apparatus for the electrostatic magnetic separation of particles is diagrammatically shown in the accompanying figure. With it particles are delivered from the mass in a thin, segregated, sheet form, and are subjected to the action of a magnetic field into or through which is passed an electrostatic charge. It further provides for electrically releasing certain of the particles from others during the separation. The following description is taken from U. S. Pat. 948,599, Feb. 8, 1910, granted to H. M. Sutton, W. L. and E. G. Steele, of Dallas, Texas.



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ELECTROSTATIC SEPARATOR

Referring to the figure, *A* is a pointed electrode, adapted when supplied with an electrostatic charge of delivering a continuous current. An adjacent cylindrical electrode *B* rotates in bearings, that are pole pieces for a pair of electromagnets *C*. Approximately in the center of the bar connecting these magnets is a third magnet *D*. Above the electrode *B* is a hopper containing the material to be separated. Beneath the hopper is a shaker pan *E* oscillated by a connecting rod and eccentric. *F* is an adjustably mounted shield of hard rubber, and *G* is a similar one pivotally mounted, for adjustment in reference to the magnet *D* and electrode *B*. The shields *H*, *K* and *L* are also of hard rubber (*H* is covered by a metallic conducting plate connected to the ground) and deliver the particles into the compartments as shown. *M* is the dynamo for generating electricity for the magnets, and *N* the electrostatic generator for the pointed electrode. An interrupter or pole changer *P* is placed in the circuit of the static generator and electrode.

The Use of Electricity in British Coal Mines

During the last twelve months or more the use of electricity in mines has attracted a great deal of attention in the United Kingdom. In the present circumstances, it may be said there is a feeling of apprehension in many quarters, and the suspicion that this power has played an important part in some recent disasters is gaining ground. It is not so much that electricity in itself as a power has been blamed, although among some of the miners' organizations there has been a mild agitation in favor of Parliament being called upon to enforce the removal of electricity from dry and dusty mines. The outcome of such a procedure would simply be the strengthening of legislation in such a manner as to insure that the electrical apparatus installed in the mines would be of a greatly improved quality, which would insure greater safety.

Indications point to the existing need for closer inspection into this question, and there are suggestions that at some mines the plant is not the most desirable, while other collieries are employing modern electrical plants but are not getting the full benefit because there is not a competent electrical man connected with the running of the plant. The price is allowed to enter into the problem and too often the wages offered are much below those deserved and justified. The recommendations implied in a paper before the Institution of Mining Engineers, read by Robert Nelson, electrical mines inspector, are pretty clear, and in view of the importance of the question an extract may suitably be made. Mr. Nelson said:

Inferior Equipment is False Economy

"A coal mine is the last place in the world where ill-designed electrical apparatus should be used. The risk of employing inferior material is too great to be run. The best advice should, therefore, be obtained on the design of an installation and on the purchase of apparatus. Later the most careful and competent supervision is required during progress of the work, but given due attention to these important matters successful operation in the future is much simplified. A daily test of the operation of all automatically opened circuits is advisable; but a complete test as regards the proper working and insulation of all parts should be made at least every three months, and the results recorded for future reference. It is also advisable that the danger of touching current-carrying apparatus, such as cables and motors, should be pointed out from time to time to all the workmen employed in the mine, or in some way kept constantly before them.

"The majority of accidents it is fair to say have partial or complete ignorance as their primary cause. The unskilled should treat all electrical apparatus as 'live' for in that direction only lies complete security for them. Finally, although the special rules which the home office has issued impose certain precautionary measures, the personal element enters so largely into the case as to become a vital element if successful operation is to be achieved. By 'successful operation' is meant economical and safe operation. It is only by the selection of careful and competent officials that these conditions can be fulfilled and preventable accidents altogether avoided. In this connection it may be said again that the risk of employing inferior material is too great to be run. An opportunity for unremitting vigilance occurs in the avoidance of accidents and dangerous occurrences in coal mines, and any attempt to utilize inferior skill or inexperience is more than likely to result in failure and disappointment.

At an inquest in Yorkshire early in the year 1909, arising out of the death of two miners, the possible fatal effects of deficient appliances were strongly emphasized. W. H. Pickering, mines inspector, said that electrical engineers were not always good mechanics, and if colliery owners and managers took the grave responsibility of installing electricity in the workings of fiery mines, they should not altogether rely upon the opinions of electrical experts, who might have vague ideas concerning mining dangers and of the rough conditions apparatus must endure. The accident into which the inquiry was made, Mr. Pickering said, appeared to draw attention to "the necessity for the motors, starters, terminals and connections to which electricity, special rule No. 37 applied, being inclosed boxes which were gas tight under all conditions, constructed so that the covers could not be removed unless the current was switched off, securely locked, and so designed that any packing intended to make a gas-tight joint between the cover and the box was certain to be in position if reasonable care were taken. No person other than a competent person authorized in writing by the manager, should remove or interfere with the covers of such boxes, which should be tested from time to time."

Following the West Stanley colliery explosion and inquest in February, 1909, John Wilson, M. P., in a circulor to the Durham Miners' Association dealing with this disaster in which 168 miners were killed, directed special attention to the evidence of Doctor Thornton, professor of electrical engineering at the Armstrong College at Newcastle on Tyne, in which he made it clear that the electrical plant was as good as any in the district, and that certain defects described were general. Mr. Wilson made an appeal for the defects to be remedied, pointing out that while there may be expense, the life of the miners is in the other balance, and his view is that in these circumstances, the duty of the community is to the living. "Speaking for myself alone," Mr. Wilson added, "I am convinced that the explosion was caused by electricity within the points fixed by the three mining experts."

The veteran Parliamentary representative of the miners, the Right Hon. Thomas Burt, a leader who has been honored by King Edward VII, also recently called attention to the dangers arising from the use of electrical appliances in mines, offering some suggestions for the mitigation of such dangers by stricter supervision, and better inspection by the appointment of properly trained men. In so doing, he threw cold water upon the suggestion that electricity should be removed from the mines.

The Question of Giving Certificates

Arising out of his comments, Mr. Burt has had some correspondence with "a consulting and inspecting engineer and colliery expert, who is in active practice in the northern counties." This expert says he feels "strongly on the question of having certificates given to the mechanical engineers of collieries, who are in charge of the electrical plant, and who are more or less responsible to the colliery manager and to the owners." He further says that "although many colliery engineers have a good knowledge of electricity, there are many mines indeed where the electrician has only a very inadequate knowledge of electricity, and is certainly not competent to design or superintend the installation of an electrical plant of any consequence. In some cases consulting engineers have been employed, but again, the man appointed has usually been an electrical expert pure and simple, and he has had to gain his mining experience at the expense of the owners, and sometimes at the expense of the workmen." Mr. Burt's corresponding expert and engineer suggests that the miners' association should appoint their own electrical expert "to attend inquests, and make a report on every fatal accident, and to make suggestions for their prevention; and such a record would not only be valuable to the miners themselves, but would be of material assistance to the owners when installing electrical plants, and would thus do very much to remove the present feeling against the use of electricity in mines, which can do much to improve the conditions of the men underground if properly installed and used."

Faulty Construction

Dissatisfaction with the prevailing conditions is general, and one of the strongest impeachments is contained in a Blue Book emanating from the home office. The electrical inspector of mines, Robert Nelson, refers to common faults or defects of construction embracing:

1. Exposed high- and medium-pressure conductors at surface; and exposed high- and medium-pressure conductors and switch gear underground.
2. Frames, bedplates, covers, etc., of high- and medium-pressure apparatus not "earthed" or efficiently earthed.
3. Switch gear and cables, the former mounted on wood and surrounded by as much wood as possible and the latter a confused mass, placed frequently in the main intake airway. The whole arrangement inviting two occurrences; (a) shock by accidental contact with an exposed live part; (b) fire.
4. Defective points in cables.
5. The omission of insulating brushes where frames of machines and switch boxes are pierced by cables.

Mr. Nelson also summarizes defects of organization as follows:

1. The absence of a trained electrical engineer.
2. The handling when not absolutely unavoidable of live cable or apparatus for adjustment or repair.
3. The absence of a definite and distinct rule that unskilled men may handle electrical cables and apparatus only when the pressure is "off" and only then if the work be under the direct supervision of an electrical engineer.

Reasons for Inferior Work

Assuming that interest in this question is not confined to Great Britain, it may be permissible to make the following extracts from Mr. Nelson's report:

"The very general lack of technical knowledge which exists has serious results. Tenders are obtained for electrical plants from several contracting firms, and the lowest bidder is usually accepted. The purchaser having no special knowledge of electrical matters is quite unable to judge whether the work is good or bad, his only guide being the outward appearance of the fittings. The result is frequently disastrous."

"Electrical plants for mines should first be bid for according to strict specifications; and secondly should be constantly supervised during progress. There are firms of contractors who are willing and anxious to do good work, and such firms prefer to follow strict specifications and welcome close supervision. The loose and short-sighted methods which, however, so frequently obtain with colliery owners, result in firms of this class being unable to compete against more ignorant or less scrupulous rivals, with a consequent lowering of the general standard of electrical engineering as applied to mining."

Day of Awakening at Hand

It is evident that in Great Britain the day of awakening is at hand. The Government is moving in the matter, and there has been appointed a departmental committee to inquire into the working of existing rules for the use of electricity in mines, and to consider what amendments are required. There is reason to believe that the best evidence available will be placed before the committee. The Council of the Institution of Electrical Engineers are considering the evidence to be submitted, and observations of members to this end are being invited. Then the institution of Mining Electrical Engineers (referred to below) will also supply evidence, and as the majority of the members of the latter may be said to be experts, the report to be drawn up and presented to the departmental committee will contain the condensed views of a body of experts, and for that reason be likely to influence any regulations that may be recommended by the committee.

Undoubtedly the way is being paved for the ambitious working electrical engineer to find a promising field for his energies in connection with mining work, and it is interesting to note that on Dec. 20, 1909, a large body of electrical engineers assembled in the city of Manchester, England, to take part in the opening general meeting of a new society to be known as the Institution of Mining Electrical Engineers. Although in its infancy, the institution has a membership approaching seven hundred. The first president is William Maurice, general manager of the Hucknall Torkard collieries in the county of Nottinghamshire. The objects of the institution appear to be agreeable to, and have the support of colliery owners and the management of the mines.

The Advance of Electricity

The address of the president is not without interest and some of the points may be surveyed. It appears that 70 years ago there were only some three or four electric-power installations in the mines of Great Britain. In 1889, there were only 42 mines sufficiently advanced to have adopted electric lighting. Of these 42, 20 were in south Wales, 7 in Staffordshire, 4 in Derbyshire, 5 in Lancashire, and 6 in Durham and Northumberland. Today practically every colliery in the country has its own electric generating station, and many of these rival in the extent and perfection of their equipment, the central power stations of large municipalities.

The purposes for which the institute is established, are cited as follows:

1. To consider means for minimizing the risk attending the application of electricity to the industry of mining, and to promote the adoption of approved methods and devices tending to increase safety.
2. To promote the general advancement of electrical science in its applications to the industry of mining; to facilitate the exchange of information and ideas on this subject among the members of the institute and otherwise; and generally, to extend the experience, increase the efficiency and elevate the status of those engaged in such applications.

"Who is there among you," Mr. Maurice, the president, inquired of his audience, "who cannot recall accidents and narrow escapes from accidents by the dozen, almost everyone of which had its origin in some form of neglect or carelessness? In fact (and it is an indisputable fact, lying at the root of the whole problem of the safe use of electricity in mines) accidents do not happen at all on account of some mysterious and incalculable property of electricity, but simply and solely for want of order, cleanliness and common care. Merely a little elementary technical knowledge, if associated with intelligent application, would work wonders in the prevention of accidents. At many collieries there are dynamo attendants, motor drivers, wiremen, and others associated with electrical plants, who have had no technical training. They have in fact, picked up all they know, in course of the performance of their work." The president hopes that many such men will avail themselves of the opportunities the Institution offers for self education and training. Enlightened men, he says, already pay their doctors in order that they may be kept in health. The true function of the engineer also is to prevent rather than to repair breakdowns. As a rule, he who prevents breakdowns prevents accidents. The question of the complete development of all his faculties is one that ought to attract the attention of every young man.

Blown-out Shot Causes Explosion

Six coal miners were killed at Wilburton, Okla., March 31, as the result of a blown-out shot at the Wilburton mine. The miners were driving a slope and were just preparing to quit work when the accident occurred. The slope caved in and the body of the sixth victim was not immediately recovered. The mine is owned by the Great Western Coal and Coke Company and is located about three-quarters of a mile from Wilburton. The injuries to the mine were slight. This is the second fatal mine accident as a result of a "windy" shot in Oklahoma in less than a week. On March 26, four men were killed as the result of a blown-out shot in the Kali Inla mine, situated 25 miles east of McAlester.

Mine Gases and Safety Lamps

By W. Hartman[*]

Different inventors have tried to produce an apparatus which will successfully announce the presence of gas in mines and warn in time to prevent disasters. No doubt such a device would be of enormous importance, but unfortunately, none has so far proved its practicability.

Some of these so called indicators are based on that physical quality of gases that makes the lighter gas penetrate a porous substance, such as clay or an animal skin, quicker than a heavy one. In a vessel closed on its open side with an animal skin and brought from the ordinary atmosphere into a room filled with a certain gas mixture, for example, methane (CH_4), an exchange will take place. The CH_4 forces its way through the skin into the vessel pressing the atmospherical air out of it. The lighter gas, in this case CH_4, of course, can pass the separating skin considerably quicker than the heavier air can escape. This results at first in a higher pressure inside of the vessel which power has been used to ring electric bells as a warning.

Such devices, although cleverly constructed, could not be introduced into practical mining. In a gaseous mine, danger may exist in the remotest corner, and since the workings are continually pushed forward, the location of the device would have to be changed constantly.

The only reliable means to establish the presence of gas is with the ordinary safety lamp. If the atmosphere necessary for combustion contains CH_4 in small quantities only, this mine gas around the lamp flame will burn and produce enlargement and lengthening of the flame. Fortunately this extension of the flame can easily be observed even if only 1 or 2 per cent. of CH_4 is in the air. When gas is present in small quantities, a pale blue cone of light can be noticed; however, this is only possible when the lamp flame is screwed down as low as possible, otherwise the brighter light of the lamp will surpass it. Therefore, when the presence of a small percentage of gas has to be determined, a flame as small as possible should be used. The visibility of the cone of light is different when benzine is used. Benzine, on account of the higher heat its flame produces, indicates gas when only 1 per cent. is present.

When from 1 to 2 per cent. of gas is present, the lengthening of the flame is very little. When 3 per cent. CH_4 is present, the top of the light cone is a little bit lower than the upper edge of the glass chimney; at 4 per cent. the cone is about the breadth of a finger above the glass chimney, and at 5 per cent. the gas cone reaches the top cover and broadens out. When more than 5 per cent. of gas is present, the original flame of the lamp extinguishes, while the gas in the lamp burns as long as new mine gas keeps entering it; at more than 14 per cent., the flame is extinguished entirely. When oil is burned in the lamp, the process is similar, only the presence of gas cannot be observed with certainty unless above 2 per cent.

With ordinary benzine and oil lamps, the observation and determination of smaller bodies of mine gas are prevented by the illuminating power of their flames. Also, the glass chimney is a drawback on account of its reflecting qualities. Therefore lamps using a burning material which, though producing a great heat, gives but little light, are adapted best for the determination. Furthermore, it is proper if the character of a lamp does not forbid it, to omit the glass chimney entirely.

THE PIELER LAMP

Such a lamp which works excellently is the Pieler lamp, but, of course, this lamp can be used for testing purposes only. Instead of oil, pure alcohol or methyl-alcohol is used. A small brass chimney hides the original flame so that the eye is not blinded by the light. The glass chimney is missing. Before entering gaseous parts of the mine, the flame is so adjusted that the point of the flame cone is on the same level as the upper edge of the brass chimney; with such a lamp, even ¼ per cent of methane (CH_4) in the air can be traced, and at 2½ per cent., the point of the flame reaches already the top of the chimney.

An especially favorable indicator of mine gases is the hydrogen gas flame on account of its giving an extraordinary heat and yet possessing a very small illuminating power. This gas is used in the Clowes and Hempel lamps, both of which are also fitted out with the common benzine or oil burners, but besides, have another burner for hydrogen gas. When testing, the illuminating flame has to be extinguished.

The Clowes lamp is another excellent type. The handle of the lamp is at the same time used as a vessel which contains the compressed hydrogen sufficient for quite a number of tests. There is a main and also a hydrogen burner. If the vessel containing the hydrogen runs empty it has to be refilled.

On the same principle, Hempel has constructed his lamp, with the difference only that the necessary hydrogen itself is produced in the vessel attached on the side of the lamp by sulphuric acid and zinc. This is more convenient as the refilling with these chemicals can be done in the mine.

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[*] With Whitney & Kemmerer, 143 Liberty street, New York.

Reinforced Concrete Mine Props

Armored-concrete forms of construction for mine props are now largely in evidence in coal-mining operations. One special form of mine prop constructed of reinforced concrete, and recently introduced into English mines, is cylindrical in shape and is constructed by taking a hollow cylinder of steel, fitted at each end with a flange. It is lined internally with concrete, leaving a hollow space longitudinally through the center of the cylinder. The lining is then closed at each end and reinforced with a steel lattice.

In order to give a homogeneous internal structure, the whole exterior of the structure of the cylinder, together with the flanges and lattice, is then incased with a layer of cement concrete. It is evident from the description, that the whole construction constitutes a compact and efficient design of reinforced concrete.

This style of prop was designed by F. E. Gulley, and is manufactured in Northumberland, Durham and Scotland. The props are made 5 in. in external diameter, and of assorted lengths to suit the requirements of the position in which they are to be placed. This form of support is adapted for use in mines, because of its great strength and length of life as compared with timber props. As compared with brick work, there is the advantage of greater facility in obtaining and transporting the material. There is the additional advantage of a saving in space.

A prop 5 ft. in length weighs only about 80 lb. Decay is avoided internally and externally, as all parts of the metal are covered with cement concrete.

GREATEST COST IS INCURRED IN SETTING PROPS

One point brought out by the advocates of reinforced-concrete props is that in mines through which foul air travels, the life of a timber prop is generally less than two years, and because of this short life, 75 per cent. of the cost connected with the use of timber is expended in the labor of setting the props.

Estimating that each timber prop costs 10c., and that the labor of renewing each prop is 30c., then comparing this total with a cost of $1.50 for each reinforced-concrete prop, it can be shown, if allowance is made for renewing timber once every two years, that the saving resulting from the use of concrete props would be equal to 65 per cent. In a similar manner, one engineer figured that the saving effected through the use of concrete props, as compared with brickwork, is about 58 per cent. It would appear from the foregoing that the concrete-steel prop has some valuable feature as pertains to economy, and is deserving of investigation by coal-mine operators.

Mining Coal in Mexico

By H. Brendel *

Mexico consumes about 4,500,000 tons of coal and about 2,000,000 tons of coke per annum. As the total coal output of the Republic is less than 1,000,000 tons each year, the consumers are dependent on the United States and Europe for the remainder of their fuel supply. Up to the present time there are no import duties on coal and coke brought into Mexico; however, the coal-mining companies in Mexico representing a large capitalization, are urging the government to impose a duty on coal and coke. The railroads have recently advanced the freight rate on these commodities imported through El Paso, Eagle Pass, Laredo, Tampico and Vera Cruz, $1 per ton, allowing the old rate on domestic coal to remain. As Mexico imported about 3,000,000 tons of coal and 1,500,000 tons of coke last year, this will either mean added revenue to the railroads of approximately $4,500,000, or else an increase in the price of domestic coal.

The production of coke in Mexico will soon become an important industry, as the Mexican coal is well adapted for making an excellent coke. So far there are only about 400 ovens operating in the Republic; the beehive style of oven is used exclusively.

Cost of Mining

Mine timber in Mexico sells for a high price, as most of it has to be imported from Texas. This timber expense, however, is largely offset by the cheap labor; another additional advantage is that there are no strikes instigated by labor agitators. The government does not look with favor upon unionism, and although the Mexican mining laws are becoming more stringent each year, they show more favor to the operators in cases where injuries and deaths occur through accidents than is shown in the United States. The average cost of mining coal in Mexico, including royalty, timbering, wear and tear and depreciation of plant, surface expenses, etc., until loaded on board cars ready for shipment, averages from 2 to 2.50 pesos ($1 to $1.25 gold) per ton. Good, clean, washed coal in Mexico sells f.o.b. cars at the mines from 6 to 6.50 pesos ($3 to $3.25 gold) per ton. Coke sells from 15 to 17 pesos ($7.50 to $8.50 gold) per ton f.o.b. cars at the mines.

From the foregoing figures it is easy to estimate the possible profit attending coal mining in Mexico. Figuring on a 4-ft. seam of coal, good authorities state that such a bed will produce 4000 tons per acre. Drill holes put down in many parts of the Mexican coalfield have shown that some of the seams run more than 4 ft. in thickness.

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*Muzquiz, Coahuila, Mexico.

An Emergency Breathing Apparatus

An emergency breathing apparatus has been invented by Clarence Hall, of the United States Geological Survey. As perfected, the apparatus weighs a little more than 2 lb. and can be carried without laborious effort by each shot-firer. The machine consists of a metallic cylinder, divided into two parts by a diaphragm. The upper part is used as a water reservoir and cooler. The lower part contains an oxygen generator, and layers of chemicals for generating oxygen. A rubber nose and mouth piece is provided, and a rubber cloth breathing bag is connected to the cylinder by a seamless steel tubing. The generator containing fused sodium peroxide, together with 15 layers of crushed sodium peroxide, supplies the wearer with sufficient pure oxygen for half an hour's use; or, in the smaller apparatus, for about 15 min. use. By means of the chemicals, the carbonic acid gas exhaled is absorbed and the oxygen used by the lungs is replaced.

When an emergency arises, a brass needle valve is released, allowing the water to drop into the sodium peroxide, producing oxygen, which rises to the nose and mouth of the miner through a sheet-iron tube. This tube is 6 in. x 1 in., and extends from the base of the rubber nose and mouth piece through the water tank. Two and two-tenths cubic feet of oxygen are generated by the amount of water and chemicals used to charge the apparatus.

It is stated that but three seconds are required to adjust and start the apparatus. The basic principle of emergency breathing apparatus has depended, heretofore, on the utilization of the outside air. In such machines, however, if any appreciable amount of carbon monoxide gas is present, the usefulness of the apparatus of that type is destroyed. For this reason the invention of Mr. Hall is likely to be of much benefit to the mining industry.

Smoke Consumers for Coke Plants

One of the latest practical innovations connected with the coal and coke industries is the tar and ammonia extracting process now in use at the Tower-Hill No. 2 coke plant, near Brownsville, Penn. This mechanical arrangement is operated by the Manufacturers' Purifying and Reclaiming Company, of Philadelphia. Stacks are erected over the ovens, three in number, two ovens to each stack, and the smoke is drawn through a conducting pipe to the extracting tanks, which are located on the east side of the coke plant and about 75 yd. distant. These stacks rest on rollers and are connected with the main conducting pipes in such a manner that they can be moved from one oven to the other at regular intervals of from 22 to 24 hours.

The smoke is drawn from the oven through the pipe by a suction apparatus, which operates on the same principle as the centrifugal pump. This apparatus works in a tank which is at all times kept half full of water, so the smoke passes through a smaller tank before it gets to the suction apparatus.

In the first tank, the tar is separated from the gas, lamp-black and other constituents. The gas and dust then pass through the second tank, where the dust forms lamp-black and settles, and the remaining matter passes off, which, however, is but small in quantity after the smoke has gone through the process.

The water in the tank is not constantly running, but stands for several days, and the gaseous matter passing through gradually turns it into ammonia. The ammonia must then be refined thoroughly before it is ready for the market. The tar made by this process is said to be of a superior quality and needs but little refining. There are about 40 to 50 lb. of tar manufactured every 24 hours per oven.

The plant was erected for experimental purposes, and if it meets with the approval of the company officials, the installation will be enlarged. The quality of the coke is in no manner changed by the process, neither does the appliance interfere with the charging, watering or drawing of the ovens.

Explosiveness of Coal Dust

Concerning the explosiveness of coal dust, one English engineer discussing the matter before an institute meeting said: "I have now come to the conclusion that watering a place where a shot is about to be fired does no good at all, because if the atmosphere is charged with a certain amount of fine coal dust, there will be great risk of a blown-out shot kindling the dust and causing an explosion, even though the sides and roof are thoroughly watered. Judging from experiments, if an abundance of stonedust is used instead of water, in the neighborhood of the spot where a shot is about to be fired, I think there would be no risk of an explosion taking place. When water is used for laying coal dust in a dry mine, where the temperature is up to about 70 deg. F., the water in a short time dries up; but if an abundance of stonedust is used, the coaldust that is given off from the full cars going to and fro would be neutralized and the place kept safe."

M. R. Campbell, of the U. S. Geological Survey, estimates the coalfield acreage of New Mexico at 870,400 acres, and the available tonnage 30,805,000,000 tons, mostly in Colfax county.

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The Field Practice of Railway Location, by Willard Beahan. $3. Engineering News Publishing Company.

Year Book for 1908: Illinois State Geological Survey. Bull. No. 14, 1909. H. Foster Bain, Director. Univeristy of Illinois.

Report of Topographic and Geological Survey of Pennsylvania, 1906-1908. Harrisburg Publishing Company, State Printer.

Die Grundlage der Petrographie mit Einem Anhang Ueber Erzlagers Taettenlehre, by J. W. H. Adam. 1 mark. Craz and Gerlach.

Tiefbohrtechnische Studien Ueber Oelgruben-betrieb und Spuelbohrung, by Richard Sorge. Fachliteratur G. m. b. H., Berlin.

A History of the Logarithmic Slide Rule and Allied Instruments, by Florian Cajori. $1. Engineering News Publishing Company.

Report on the Mines and Mineral Resources of Natal (Other than Coal), by F. H. Hatch. Published by Order of the Natal Government.

General Index of the Reports of the Bureau of Mines, Ontario, Volumes I to XVI (1891-1907). Compiled by Frank J. Nicholas. L. K. Cameron, Toronto.

Mitteilungen aus dem Eisenhuettenmaennischen Institut der Koenigl. Techn. Hochschule Aachen, by F. Wüst. 10 marks. Wilhelm Knapp, Halle a. S., Germany.

Mineral Resources of the United States, Calendar Year, 1908. Part I: Metallic Products. Part II: Nonmetallic Products. U. S. Geological Survey. Government Printing Office.

A Reconnaissance of Some Mining Camps in Elko, Lander, and Eureka Counties, Nevada, by William H. Emmons. U. S. Geological Survey, Bulletin 408. Government Printing Office.

Petroleum Mining, by A. Beeby Thompson. $5. D. Van Nostrand Company.

A guide to the exploration of petroleum lands, and a study of the engineering problems connected with the industry. It also contains statistical data of the important fields, and notes on the origin and distribution of petroleum.

California Oilfields, with Indexed Maps. $1. Barlow & Hill, Bakersfield, Cal.

The book contains maps, size 12x14 in., of the Kern River, Coalinga, Devil's Den, McKittrick, Midway and Sunset fields. These maps are indexed, showing the situation of the property owned by each company. The individual maps may be obtained in size 36x60 in., as follows: Blueprints, $2; white paper, $2.50; and cloth, $3. The latter are corrected daily and contain the latest developments.

Modern Coking Practice, Including the Analysis of Materials and Products, by T. R. Byrom and J. E. Christopher. $3.50. The Norman W. Henley Publishing Company.

This book, as is stated by the authors, is a handbook for those engaged in coke manufacture and the recovery of by-products. The volume is broad in its scope, treating the subjects of coal washing, classification of fuels, sampling and valuation of coal, coke, etc., as well as the science of coke manufacture. The illustrations showing various modern plants are excellent, and the drawings have been well selected and carefully executed. Not least in merit are the many useful tables, showing specific gravities, melting points, weights of materials, heat units, calorific values, etc.

From Prospect to Mine. By Etienne A. Ritter. $2. The Mining Science Publishing Company.

This little volume, unique in its composition, method and contents, will be valuable not only to youths graduating from mining schools and entering upon the practice of their profession, but to prospectors, working miners, promoters and to intending purchasers of mining properties or shares in mining companies. The story is told in an interesting and conversational manner of how the prospect is discovered, and the methods of making it a mine, all with an absence of confusing technical terms. Thirty-three illustrations add to the ready and full understanding of the simple text, and the book will be alike instructive to the boy of fourteen and the man who has grown gray-haired in the profession.

The Davis Handbook of the Cobalt Silver District with a Manual of Incorporated Companies. By H. P. Davis. Published by the Canadian Mining Journal. Price, $1.50.

Mr. Davis' book is a handy compilation of the official data concerning the numerous companies operating in the Cobalt-Ontario district. It also contains interesting chapters treating of the mining methods, estimations of ore reserves, the geology, and an historical sketch of the district, together with useful maps and numerous interesting illustrations. The book apparently is an impartial and reliable compilation. The records in a book of this character are naturally more or less transitory and the author has therefore planned to issue annual revised editions which will furnish a needed and valuable standard reference book for this new and remarkable district.

The Mining Year Book, 1910, containing Directories of Directors, Secretaries, Mining Engineers and Metallurgists; also Glossary of Mining Terms. Edited by A. N. Jackman, Introduction by J. W. Broomhead. 15s. "The Financial Times," London.

This comprehensive and carefully compiled directory of mines is commended for its timeliness. The 1910 issue is under date of February and apparently the book is entirely complete up to that date. It includes a careful summary of the essential data of the important British mining interests, which by reason of their world-wide scope make the book international in aspect. A number of American operations are also included, but the book cannot be considered a directory of American mines. It contains also valuable lists of secretaries and mining engineers, and a glossary of mining terms. It is a convenient and valuable annual reference book.

Iron Ores, Fuels and Fluxes of the Birmingham District, Alabama. By Ernest F. Burchard and Charles Butts. Chapters on the Origin of the Ores. By Edwin C. Eckel. United States Geological Survey, Bull. 400. Government Printing Office, Washington.

This bulletin is a report of the results of field work extending over three years in the district which has Birmingham as its center. This comprises a belt approximately 75 miles long and 10 miles wide, in which iron ores, coking coal, limestone and dolomite are found in close proximity, as they are found nowhere else in the United States. It is this conjunction which has made the district a large and successful iron producer. Other regions have ores of higher grade, but in Alabama there is no problem as to the transportation of fuel to the ores or ores to the fuel; they are already together. There have been previous reports on the district, notably by the Alabama Geological Survey, and the present bulletin presents little that is new, beyond the general summary and harmonizing of our knowledge of the district. It contains chapters on the general geology; the Clinton ores; the brown ores; the coal, including mining and coke-making methods; the dolomites and limestones. Notes on the probable origin of the ores are added by Edwin C. Eckel, who was in charge of the work when it was first begun. It is illustrated by a number of maps and geological sections, and by some reproductions of photographs.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

H. S. Washington has returned from Brazil.

John Hays Hammond has been visiting Mexico, accompanied by a party of friends.

John T. Fuller has returned from New York to the diamond mines in Pike county, Arkansas.

Leo Von Rosenberg, of New York, has gone to Georgia to make examinations of gold properties.

Francis A. Thomson has returned to Pullman, Wash., from a professional trip to Republic, Washington.

Charles L. Newcomb, Jr., is now with the Denver Rock Drill and Machinery Company, Denver, Colorado.

S. S. Fowler, of Nelson, B. C., was in New York, May 16 and sailed for Europe May 17. He expects to return in July.

J. B. Tyrrell, of Toronto, Ont., has been elected president of the Canadian Institute, the oldest scientific society in Canada.

A. A. Blow will deliver the annual address at the commencement of the Colorado School of Mines at Golden, on May 27 next.

Oscar Cartledge, of Benton, has been appointed inspector of mines for the ninth district of Illinois, to succeed W. S. Morris, resigned.

E. L. Dufourcq is in San Francisco, whence he will come East by way of Colorado, expecting to arrive in New York early in June.

Elton W. Walker, recently appointed superintendent of the Mass Mining Company in the Lake Superior copper district, has taken charge.

E. J. Sweetland is in Guanajuato, Mexico, to complete arrangements for the Sweetland slime-filter installation at the Tajo de Dolores mine.

Carl F. Dietz, of Dietz & Keedy, Boston, has gone to New Mexico on professional business and before returning to Boston will go to Mexico.

J. H. Plummer has been elected president and C. S. Cameron secretary-treasurer of the consolidated Dominion Steel and Coal Corporation of Canada.

R. E. Rowley has been appointed assistant general manager of the Indiana Steel Company, at Gary. He has been for some time chief civil engineer of the company.

T. M. Dickinson, of Birmingham, Ala., has been appointed assistant State mine inspector of Alabama, to succeed James Hillhouse, recently promoted to be State mine inspector.

E. A. Wiltsee announces that on account of his business interests in California, he has discontinued his New York office, and that his address is at Bakersfield, Cal.

Frederick W. Baker has resigned as chairman of the London Venture Corporation, in order to give his time to his duties as managing director of the Hirsch mining syndicate.

W. Anderson, of Dawson, Anderson & Warden, left Vancouver, B. C., on May 3, for Peru, to report on a hydroelectric power scheme for the Cerro de Pasco Mining Company.

Capt. Timothy Dunn, lately in charge of the Hartley interests at the Norman mine on the Mesabi range, has been placed in charge of the ore docks at Superior, Wisconsin.

Arthur Howe Carpenter, son of the late Dr. Franklin R. Carpenter, Denver, Colo., will continue the professional business of the firm of which he was formerly the junior member.

A. G. Larson, for several years in charge of the Le Roi mine, at Rossland, B. C., has gone north to examine mining properties on Queen Charlotte islands, and in Portland Canal district.

Gardner F. Williams, of Washington, has gone to California to attend the celebration of the fiftieth anniversary of the founding of the College of California, from which the present university has grown.

F. A. Heinze, president of the United Copper Company, has been acquitted of the charges in connection with the Mercantile National Bank, on which he was recently tried in the United States Court at New York.

On April 25, while engaged in professional work in South Carolina, Morril B. Spaulding met with a serious accident, breaking both legs. Fortunately, no other complications have arisen and his speedy recovery appears now to be assured.

C. P. Byrne, of Carnegie, has been appointed inspector for the Twelfth bituminous district of Pennsylvania, in place of Roger W. Hampson, who recently resigned and will take charge of the Cortez mine, at Punxsutawney.

W. Fischer Wilkinson, of London, has been appointed principal of the new Cornwall School of Metalliferous Mining, and will assume his duties on Sept. 1 next. He is a graduate of Freiberg and has had extensive experience in different parts of the world. For several years he was engineer for the Consolidated Goldfields of South Africa. For some years past he has been in consulting practice in London. He has been a frequent and most acceptable contributor to the technical press. His wide knowledge and experience and his faculty of clear expression of ideas will make him an admirable head for the new school.

OBITUARY

George Schaible died at Silver City, N. M., May 2, aged 50 years. He was born in Indiana, but had lived in New Mexico over 20 years, and was well known as a prospector and miner. At one time he held a lease on the Cooney mine.

Joseph T. Wolfe died at Los Angeles, Cal., May 5. He was born and brought up at Washington; from 1896 to 1906 he was engineer for the Westinghouse Electric Company, working in the United States, Europe and Australia. For four years past he had been superintendent of the power plant of the Tonopah Mining Company, of Nevada.

Carl McKinney died April 19 at Scranton, Penn., aged 68 years. He was born at Kutztown, Penn., was brought up in Scranton and rose from office boy to general manager of the Lackawanna Iron and Coal Company. When W. W. Scranton retired from that company in 1880, Mr. McKinney went to the new Scranton Steel Company as superintendent, continuing in that position after the consolidation of the two companies under the name of the Lackawanna Iron and Steel Company. In 1897 he became superintendent of the Maryland Steel Company's plant, but after four years returned to the Lackawanna company as general manager, continuing until the Scranton plant was dismantled for removal to Buffalo in 1902, when he retired.

Carl Hesse, a mining engineer, well known on the Pacific coast, died at Reno, Nev., Feb. 9, of heart failure. He was a native of Saxony and a graduate of Chemnitz and Freiberg. After having practised his profession for a number of years in Spain and at Laurium, Greece, where he erected the first Piltz furnaces, he came to the United States with the late Mr. Cohn, the representative of Baron Erlanger in the Old Telegraph Mine, to take charge of the smelting works. After the collapse of that concern, he erected and ran the Gregory works for the Seligmans in Montana; was with Clark's Colusa for a while and then became metallurgist of the Mulatos mine in Sonora. Later he bought and worked the Odin, a placer mine, near Nevada City, Cal., then went to West Australia, where he built a mill near Freemantle for an English company. He returned to California, where he bonded and arranged the sale of several mines.

SOCIETIES and TECHNICAL SCHOOLS

American Society of Mechanical Engineers—The regular semi-annual meeting will be held at Atlantic City, N. J., May 31-June 3. Among the subjects to be discussed are machine-tool construction, gas power and power transmission.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

May 15—The new baghouse to be installed by the Mammoth Copper Company at its smeltery at Kennett, in Shasta county, is to contain 2960 woolen bags 18 in. in diameter and 30 ft. long. The American Bridge Company has the contract for the structural steel, which will weigh about 800 tons. The fumes after passing through a series of pipes will enter the baghouse and finally reach the air free from all substances deleterious to vegetation, through small stacks. The total cost is estimated by Manager Geo. W. Metcalfe at $300,000. There are 60 men employed on the baghouse-construction work; 400 at the smeltery; 550 at the mine, and about 60 men at Quartz hill, where silicious ore is mined for a flux to the copper ores of the Mammoth. The cost of installing the Cottrell process at the Coram smeltery, Shasta county, is estimated at only $100,000.

There is a probability of the further development of the Friday-Lowdon copper claims adjacent to the Mammoth and Trinity properties, Shasta county. Chicago capital is said to be interested. About $100,000 has been expended on these claims. It is likely that any ore will be shipped to local smelteries.

The United States Gold Dredging Company and the Consolidated Gold Dredging Company, of Berkeley, are operating in Shasta county, chiefly with suction dredges. W. D. Egilbert, a director in both companies, controls extensive tracts of dredging land in Shasta, Siskiyou and Trinity counties and these lands will be exploited by the above companies.

Recently 4000 acres were bonded by Eliel & Aubury interests in Shasta county, along the Sacramento river, south of Redding. The tracts include the McCormick-Saelzer ranch of 1300 acres, and the Fitzgerald ranch of 300 acres. Drilling has been done and six Keystone drills will be shortly put to work to determine if the pay gravels exist to warrant the installation of a bucket dredge. That W. P. Hammon was interested in the venture is denied.

The San Francisco Stock and Exchange Board has absorbed the California Stock and Oil Exchange, and changed its name to the San Francisco Stock Exchange. The Nevada and California mining and oil stocks are largely dealt in on this exchange.

A railroad is planned from Eugene, Ore., to Coos Bay, which, if built will open up a market for the Coos Bay coal in the interior of Oregon. A considerable subscription is said to have been made and surveyors are now at work west of Eugene laying out the route.

A delegation of oil men from San Francisco, Los Angeles and the San Joaquin valley, left for Washington May 6 to make a formal protest against provisions in the Pickett bill now before Congress. A hearing has been arranged before the Senate committee. Specific protest will be directed against that portion of the bill which seeks to ratify the withdrawal order of last September, by which several thousand acres of oil lands already located were placed in the reserve. It was pointed out that the legislation contemplated was retroactive and of a nature forbidden the States under the Federal constitution.

Denver

May 17—On the Australia claim of the El Paso Consolidated, on Beacon hill, Lessees Middagh & Co. are reported to have made a strike of ore from 4 to 14 ft. wide, showing calaverite and sylvanite, and of an average of $50 per ton in gold without handsorting, the screenings, of course, running a great deal higher. The last shipment returns were at the rate of $90 per ton for 27 tons. The ore in the Australia is found at a contact between granite and phonolite. The gold is chiefly in the calaverite, but in the ores of the El Paso group galena, stibnite, chalcopyrite and tetrahedrite have been found. On the C. K. & N. vein of the same company, Brass & Clifford, lessees, have opened a shoot of ore 6 ft. wide, which can be sorted to run $30 per ton. The C. K. & N. is a sheeted zone in granite, and the ore, calaverite, is in narrow veinlets. The workings are in the same formation as the El Paso mine, viz.: granite, cut by a number of small phonolite dikes.

The Cripple Creek output for April was 2400 tons, yielding an average of about 1½ oz. gold per ton.

The St. Louis, at Leadville, continues to produce rich ore, and it is stated that a fine shoot has just been opened in the porphyry, 70 ft. below the quartzite, a streak a little over an inch in width in the main orebody giving 1 lb. of pure gold to 25 lb. of ore. Twenty-five pounds of this gold is on exhibit at the American National Bank.

After lying idle for three years, the smeltery at Golden was blown in April 9. It is now operated by the North American Smelter and Mines Company, H. A. Reidel, president, and George C. Vivian, manager. It is stated that $35,000 has been expended in remodeling the plant, and the company has enough ore saved and in sight in its Banner group of 400 acres, in the Clear Creek district, to keep the smeltery in operation, although at the same time it is in the market for custom ores, of which large quantities are offering.

The Mary Murphy mine, opened in the early '80s, in the Chalk Creek mining district, Chaffee county, was one of the great producers of the State, but when the workings got below the zone of oxidation into the sulphide ores, the grade became too low for profitable extraction. About a year ago the mine was purchased by London people, and under the management of Charles J. Moore seems destined to enter on a new and profitable life. The ore carries silver-lead and zinc, with pockets or kidneys which yielded gold. Rich gold ore has just been opened in the 1400 level.

Butte

May 15—A special meeting of stockholders of the Alice Gold and Silver Mining Company will be held at Salt Lake, May 27, to consider the sale of all property to the Anaconda Copper Mining Company. In the report to stockholders which accompanies the call of meeting it is stated that the company's mines were operated from 1880 to 1893 and for a short time during 1897 and 1898 but have not been in active operation since. The loss for three years and nine months ended Dec. 31, 1909, is given as $21,400. In 1906 the Butte Coalition company purchased a majority of the Alice stock and has since been in control.

The Great Northern will begin the construction of a branch from Lewistown, Fergus county, to Mondak, on the Montana side of the Montana-Dakota line and condemnation proceedings for a right of way have been started.

The United States Assay Office at Helena reports the receipt of $141,432 worth of precious metals during April. Fergus county ranks first with $46,397 and Choteau county, second with $41,051. While the receipts from Silver Bow county are only $114, yet the Butte mines produce nearly $500,000 per month in gold and silver which is sent to the eastern refineries with the blister copper.

In an official statement from Senator W. A. Clark, relative to the sale of his Butte copper mines, his manager, A. H.

Wethey, says the sale includes what is known as the Original Consolidated Mining Company, which comprises the Original and Stewart shafts, with all the copper interests immediately adjacent to them, in all 15 or 20 small claims. The only other mining property involved is two small fractions between the Alice and Magna Charta claims, which latter already belong to the Butte Coalition Company and gives the latter a solid block of claims in the Alice group. The Amalgamated company acquires the Butte reduction works so far as furnaces are concerned. Senator Clark retains the use of the concentrator for a term of years and all the shops. The concentrating plant will be operated on zinc ores and it is contemplated that the zinc business will greatly develop. Senator Clark will soon commence work on mining properties that have been lying idle. Elsewhere in Montana the senator has also enlarged his business.

Goldfield

May 17—The total gross output of the mines of Nevada for 1909, according to the official data of James F. Haley, State bullion tax agent, was $24,969,947. This total, it is estimated, will be increased more than $1,000,000 if the output of the very small companies not reporting were added. The 1908 production was $14,373,545, according to the same authority.

The figures show that Esmeralda county led, with an output of $9,587,831. White Pine county was second, with a production of $7,114,354, and Nye county third, with $5,740,581. Eureka is fourth, with a production of $815,088. On the other hand, the copper properties of White Pine county led in the point of tonnage of ore handled, as it shows 1,678,895 tons of ore produced, as against the 509,801 tons produced by Esmeralda county, with its gold, silver and lead properties. Nye county comes third, with 374,827 tons of ore produced during the year. The official figures for the year show that there were produced and officially reported in the State of Nevada during 1909, 2,906,825 tons of various kinds and grades of commercial ores. The expense of producing this ore and turning it into metal and marketing the same is given as $20,033,947. That there are discrepancies between the figures as to mine expenses as submitted to the bullion tax agent and to the stockholders is shown by the fact that the dividend record of the State for the year 1909 was more than $5,000,000, while Mr. Haley's report shows that total net profits were but $4,900,000. Bullion taxes are paid upon the net profit, and the State received bullion taxes upon that amount of profit, the State revenue from this source for the year amounting to $224,579.

The Nevada Central railroad will be rebuilt into Austin at once, insuring a resumption of activity in that old camp.

Morgantown, W. Va.

May 17—The coal mines in the Kanawha field that were shut down in April, pending the adjustment of the wage-scale, have now started up. Nonunion miners have generally been granted an increase in wages to forestall discontent. The Villa Coal Mining Company has recently been incorporated to operate near Villa.

The rejection of the first lot of tenders on March 25 from the New River-Pocahontas district for the Panama railroad coal contract, on the ground of collusion between bidders, was a surprise. The second bids were opened April 25. The contract calls for a minimum of 14,600 B.t.u. (with a penalty for deficiency but no premium for excess) and involves 500,000 tons.

The new Superior Thacker Coal Company expects to mine at Willianson in the Thacker field and the new Mary Helen Coal Company at Hatfield, while the Great Bend Coal Company will operate near Sprigg.

At Thacker mines, James Collins, superintendent, plans to spend $100,000, in opening and equipping four new mines to produce a total of 3000 tons daily. The output will be brought by retarder-conveyers to one tipple where there will be five loading tracks and a box-car filler, all built by the Link Belt Company of Philadelphia. There will be six 150-h.p. boilers and two 200-kw. generators, to furnish current for the hauling and coal-cutting equipment.

The Crystal Block Coal Company, which lately took over the Rawl mines, has begun shipping and is planning to build a tipple and make improvements.

New companies at Fairmont are the Fairmont & Southern Coal and the West Fork Coal companies. The mines of the New England Coal and Gas Company have been sold to the Keystone Coal and Coke Company, of Greensburg, Penn., and the output will be increased.

At War, in McDowell county, the Excelsior Pocahontas Coal Company will open mines and make coke, while on Dry Fork creek, near Berwind, a new producer will soon be started by the Berwind-White company of Philadelphia.

The Davis Coal and Coke Company will open new drift mines at Davis, on Beaver creek and on Pendleton run; and at Thomas will soon start at shaft mine.

Birmingham, Ala.

May 16—The Anniston Iron Company, formerly Woodstock Iron Company, is rushing work on the furnace at Anniston, and will soon be in readiness to resume making iron.

The Woodward Iron Company, of Woodward, has let the contract for the construction of 60 Koppers by-product coke ovens.

Joseph H. Hoadley, of New York, president of the Alabama Consolidated Coal and Iron Company, visited the Birmingham district last week and inspected the properties.

The new rod mills of the Southern Iron and Steel Company, at Gadsden, are now rolling rods. Within another 30 days wire and nails will be coming from the plant.

Three wells are now flowing natural gas in Fayette county, 80 miles west of Birmingham. Steps are being taken for the construction of a pipe line to Birmingham; several of the large manufacturing companies which can use gas are figuring on making contracts for a supply. Columbus, Miss., citizens are also making effort to have a pipe line constructed to that city.

Scranton, Penn.

May 17—It is asserted that 3000 men are idle in the counties of Lackawanna and Luzerne owing to the fact that the mine-examining boards are dilatory in issuing miners' certificates. It is certain that a large number of men cannot secure work at the mines owing to this fact. In former years, the examination for miners' certificates was a farce, and any person could buy such a certificate at almost any saloon, but now unless the applicant is fully competent to pass the examination in all its details, he is turned down. The mine superintendents say that examiners are too scrupulous, and are rejecting capable miners upon technicalities.

Although no serious cave has occurred in Scranton for some time past, slight subsidences of the surface are continually occurring. A few days ago a school in West Scranton was affected by a cave and numerous slight subsidences of the streets in the neighborhood of this building had superficial rents caused by squeezes in the surface veins underneath.

For the first time since the sliding scale went into effect the anthracite miners will not receive an increase in their wages for April on the basis of the average selling price of coal at tidewater. When the average price of coal per ton at tidewater exceeds $4.55 the miners obtain a proportionate increase in wages. During April, prices did not exceed $4.45 per ton.

Dawson, Y. T.

April 30—From indications, the Klondike camp has a busy season ahead. The Five Fingers Coal Company has been prospecting all winter, and will begin work this spring on greater developments. The Morrison coal leases will also be fully prospected this season with diamond drills.

The Dome Lode Development Company has resumed work on the largest quartz enterprise so far attempted in the territory. The company plans to build a mill soon. The Lone Star has the first quartz mill in operation; it has tapped rich ore, which will be worked on an enlarged scale. New quartz properties in Green gulch, upper Hunker, Bonanza, Dublin, and other localities are also being opened.

A large amount of dredging will be done in this territory the present season, foremost among which are the enterprises of the Yukon Gold and the Canadian-Klondike company.

The North Fork Power Company and the Northern Light and Power Company have started work. The former has 150 tons of machinery *en route* for power and placer operation.

Cobalt

May 15—The Bartlett mines, the promotion of which was to a considerable extent responsible for the stampede into the Gowganda district, are to be reopened. McLaughlin and McIntyre, the original stakers, have contributed 350,000 shares to be placed in the treasury and sold at 25c. Besides this a large sum has been raised to carry on the work. The Bartlett controls a large acreage in the best section of Gowganda, and has several good surface showings. The ground, however, has not been prospected. The mine has a splendidly equipped plant much too large for its present needs.

The Gowganda district as a whole is picking up, the shipments made last winter having helped to reëstablish confidence. The Reeves-Dobie, has much tonnage blocked out above the 80-ft. level, and the shaft is being sunk. The option on the Morrison, held by a British syndicate, has been extended for six months. The syndicate was to spend $100,000 in proving up the property, but the early breakup, prevented it getting in machinery.

A fire at the Government townsite, Porcupine, partially destroyed that place. On account of the lowering of the waters in Night Hawk and Frederickhouse lakes, navigation will be restricted to canoes, until steps are taken to cut a channel at the southern end of the latter lake. Additional discoveries have lately been made in the district, that tend to enhance the prices at which claims are held. On the Vipond property, a 5-ft. quartz vein with a 2-ft. pay streak, showing high free gold, has lately been discovered. It has now been traced for 400 ft. and a shaft is being sunk on it. The plant at the Dome is running and two shafts, one of which is in high-grade ore, are being sunk. Three more will be started in the near future. Many other properties are showing up well under development, and there is a strong demand for good claims which are commanding excellent prices. Although there is considerable movement into the district transportation is far from being an easy matter.

The power situation in Cobalt still continues to be unsettled, on account of the failure of the Hydraulic company to furnish air. There are two companies now furnishing electricity and the service is good. The Mines Power Company is running three of the 5000-ft. air compresors, but the service so far has been intermittent. The company expects that when the four generators are running there will be no further difficulties.

Toronto

May 17—Hon. William Templeman, Canadian Minister of Mines, states that the department has in preparation a bill to be presented at the next session of Parliament providing for the organization of an explosives division of the department and the establishment of a Government explosives testing station. To this division will be assigned all matters relating to the manufacture of and trade in explosives and investigation into accidents due to explosives. All explosives to be used in Canada are to be subject to examination and test at the Government testing station. At present mine managers and other users of explosives have no way of determining which are safe to use or whether imported explosives are up to the standard required in the country where they are manufactured. The investigations to be carried on will determine which explosives are fit and which unfit for certain classes of work, and the conditions under which they may be used. The minister will be authorized to appoint inspectors with large powers of search and inquiry to enforce the law, and heavy penalties are provided for its violation. The sum of $10,000 has been approximated for the preliminary investigations, and the services of one of the experts employed by the British Government at the explosives testing station at Woolwich will be secured to examine the conditions under which explosives are manufactured and stored in Canada, and make recommendations as to the regulations required.

The opening of navigation witnessed the sending out of a number of exploring parties to the lignite fields along the Metagami river in northern Ontario, and it is reported that in several instances cannel coal has been found beneath the overlying lignite deposits. Many additional claims have been taken up. R. E. G. Burrows has staked ten claims for a New Liskeard syndicate and has obtained samples of cannel coal. R. Horschitz, of Pittsburg, Penn., has located four claims for an American syndicate. R. J. Flatterty and party are prospecting in the interests of the United States Steel Corporation and claims to have made discoveries of coal and iron. Foster Shields, of Sudbury, has gone into the district to begin active development for a syndicate which has taken up extensive iron claims. It is reported that petroleum indications are promising.

Twenty-four field parties are being sent out this season by the Canadian Geological Survey, some of the more important investigations undertaken being as follows: D. D. Cairnes will examine the ore deposits of the Atlin district, B. C.; R. G. McConnell, assisted by G. S. Mallock, will study the country at the head of the Portland river, B. C., which has recently attracted much attention; W. W. Leach will continue explorations in the Hazelton district, B. C.; Charles Camsell will complete the geological mapping of the Tulameen district, B. C.; C. E. Le Troy, will pursue investigations in the Slocan and other districts of British Columbia; D. B. Dowling will make further examinations of the coal areas of Alberta, near the Grand Trunk Pacific Railway; J. Dresser will continue his researches in the eastern townships of Quebec; E. R. Faribault will spend part of the season as a member of the commission sent by the Quebec Government to explore the Chibougami district and will also be in charge of a party to investigate the gold-bearing rocks of Lunenburg county, N. S.; W. H. Collins will make a geological study of the country lying west of Gowganda.

D. D. Mann, vice-president of the Canadian Northern railway, and who is heavily interested in mining, has offered to purchase at a high figure, the rights for the world in a patent smelting process invented by Dr. James S. Island, of Toronto, and now controlled by the Island Smelting and Refining Company. Mr. Mann is erecting a plant of 10-ton capacity here, where a complete commercial test of the value of the Island process will be made, and should this result satisfactorily, the deal will be completed.

Mexico

May 17—The Mexican Iron and Steel Company, the Boston concern now in possession of the Tula iron mines, foundry, timber and lands in the Tapalpa district of Jalisco is placing a bond issue of $1,500,000 in France. The bond money will be used in the establishment of a modern iron and steel industry. Modern smelting furnaces will be erected at the iron mines, and a steel plant and implement factory built. Tramways to handle the pig iron and finished products will be constructed. Charcoal will be used exclusively in the production of iron at Ferreria de Tula, and the company will give much attention to the manufacture of charcoal byproducts. The Mexican Iron and Steel Company has a capital of $5,000,000. The purchase price of the Tula properties was $500,000.

Effective May 1, the Sud Pacifico de Mexico road announces the opening of freight and passenger service as far south as Yago in the territory of Tepic, almost to the southern bank of the Santiago river and 880 miles south from Nogales at the Arizona line.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

Paul Denhart and associates, of Nome, have purchased the cinnabar property on the Kuskokwim river and will erect a reduction plant.

A large number of the miners in the Mayo district have stampeded to the Rainbow district, a name applied to Duncan creek, and vicinity. Good strikes are reported.

Alaska-Treadwell—Returns for month ended April 15 show: Tons crushed, 49,756; total production, $127,333; net operating profit, $36,698. Average yield per ton milled, $2.55.

Arkansas

PIKE COUNTY

Arkansas Diamond Company—This company intends to begin active operations as soon as the necessary machinery can be obtained.

Arizona

COCHISE COUNTY

Superior & Pittsburg—The Briggs shaft is bottomed in ore of high grade. The water in the shaft is now controlled.

Shattuck-Arizona—This Bisbee mine is shipping 150 to 200 tons daily to the Copper Queen smeltery and reports earnings in excess of $150,000 monthly. The stock has been listed on the Boston Stock Exchange.

GILA COUNTY

Miami—At 570 ft. the second haulage level is being established at the main shaft and the driving of a drift from the shaft toward the orebody at that depth has been commenced. This haulage level will be similar to the one already established 420 ft. from the surface and will be equipped with motor cars. Above the 420-ft. level, virtually all the blocking out is completed except on two of the sublevels, where a little drifting is in progress. The main shaft has been bottomed at a depth of 710 ft. and has been permanently timbered throughout. The steel frame of the concentrator building is practically done and a part of the equipment has arrived at the mine. Nearly all the machinery for the power house and hoisting plant is on the ground. The twelfth churn-drill hole is now being begun on the Captain claim. The pipe line, which will conduct water from the pumping station about one mile south of Globe to supply the concentrator, is nearly finished. The management's records show that 722 ft. of drifting was accomplished during the week ended May 2.

Inspiration—At the Joe Bush shaft, nearly all development is being done at present on the tunnel level, which has been established 127 ft. above the fourth. In this part of the property, 12 drifts are being advanced. One of these drifts is being driven west toward the Scorpion shaft and at present measures 500 ft. The drift driven south from the Scorpion on the 275-ft. level is 600 ft. long and will eventually connect with the drift mentioned above. The company has commenced sinking a prospect shaft on the Colorado claim, 2500 ft. west of the Joe Bush shaft and 400 ft. east of the Taylor tunnel. The extraction tunnel has been driven 600 ft. from its portal toward the Joe Bush shaft. The advance work in this tunnel last month was 319 ft. Engineers are working on plans for the experimental mill which will be erected near the Joe Bush shaft.

Live Oak—The second churn-drill hole is 40 ft. deep and in granite capping common to the Miami district. Underground, drift No. 208, driven east on the second level, measures 45 ft. and for this distance has been in concentrating ore of fine grade. The vertical shaft has been sunk 109 ft. below the third level.

Warrior—The third churn-drill hole is 225 ft. The El Paso smeltery is receiving from 95 to 100 tons of 9 per cent. copper from the Warrior mine daily.

Old Dominion—The new hoist to be installed at A shaft was shipped from the Nordberg factory May 1. Two steam turbines of the horizontal type are ready for installation. These turbines, actuated by the exhaust from the engines, will run two generators.

YAVAPAI COUNTY

United Verde—This company certified for assessment a bullion yield for 1909 as follows: Copper, $4,763,778 rated on the valuation of 12.982c. per lb., average New York quotation; gold, $351,801; silver, $255,181 rated at 51.502c. per oz.; total for the year, $5,370,761.

United Verde Extension—Development of the recently opened orebody is being pushed. The ore is of high tenor, but nothing positive as to its extent can yet be determined. The company has electric power and will install a tramway a mile long.

Ohio Mines—This company, of Columbus, Ohio, is operating the Jessie group, near McCabe, in the Big Bug district. A. L. McCarthy is manager.

Independence—This property, near Chapparal, is shipping gold concentrates. W. H. Jones is manager.

Mt. Elliott—This mine, 4 miles from Poland, is shipping concentrates. Additional stamps will be added and electrical connection made to the Arizona Power Company lines. H. W. Stevens is manager.

Federal—This company is building a mill. E. Kidd is engineer.

YUMA COUNTY

Clara Consolidated—The smeltery has been blown in. The plant includes a blast-furnace and converter plant. The company has installed a pipe line for water from the Bill Williams river and a broad-gage railroad from Bouse to Swansea. George Mitchell is president.

California

AMADOR COUNTY

Original Amador—The officials of the company have refused to allow A. L. McSorley to transfer his 19,337 shares of stock and McSorley has entered suit to have his stock declared personal property.

Bellwether—This mine was sold in the Superior Court, April 11, to R. I. Kerr, for $29,975. As the mine was relocated April 5 by H. D. Emerson, litigation is likely to ensue.

Treasurer—At this mine, situated between Bunker Hill and Fremont, the shaft is down 400 ft. and a new hoist is being installed.

Central Eureka—The shaft is now down 2700 ft., and a connection with the South Eureka shaft will shortly be made.

Lincoln Consolidated Mining Company—This company has been formed to take over the Lincoln, West Lincoln, Stewart, Iowa and Isola mines at Sutter Creek. The Lincoln shaft is 2000 ft. deep.

Ross—This mine is to be opened up with L. R. Poundstone in charge.

Argonaut—A new orebody is reported on the 2800 level, 600 ft. south of the main oreshoot. The shaft is 3400 ft. deep and the lowest level 3300 ft. deep.

Zeile—A new orebody is reported 2000 ft. north of the shaft on the deepest level, which gives indications of containing higher grade ore than the large orebody already developed.

SHASTA COUNTY

Evening Star—This mine has been sold to a German syndicate for $115,000 and is to be developed with George Bayha as superintendent. The mine is in the Old Diggings district, adjoining the Reid.

Reid—The ledge on the 1000 level has been encountered and is reported to be 12 ft. wide.

Milkmaid—The new 10-stamp mill has been completed and is crushing 35 tons per 24 hours. A diamond drill is being used for prospecting. Clifford Wiegal is superintendent.

Midas—The cleanup of this mine in Harrison gulch resulted in $33,000 bullion for March.

Siskiyou County

Golden Eagle—Operations have been resumed on this mine on Indian creek, 6 miles from Fort Jones.

Mono—The 10-stamp mill is crushing about 20 tons of ore per day. The mine is on Humbug creek, 9 miles west of Yreka. B. M. Newcomb is the manager. The workings are over 500 ft. deep.

Oro Fino—Frank Star has uncovered a vein of high-grade ore in the tunnel and has drifted 40 ft. on it, near Fort Jones.

Freitas-Lynn—The tunnel, near Quartz valley, has opened a quartz lode 20 in. in width.

Old Turk—Kirk & Son, of Quartz valley, have a lease on the Old Turk vein and have extracted 25 tons for a mill test.

Johnson—These quartz claims at Fort Jones were prospected for several years by George Addison without discovering any ore. On the expiration of the bond in April, Severman & Holgate took charge and in three days opened up a rich lode.

Classic Hill—Certain stockholders claim that the mine of this company at Happy camp, has been in operation for two years unknown to the stockholders, during which time it has twice been sold at sheriff's sale.

Red Ant—Ore is being hauled to Yreka from the Red Ant, for milling. The mine is near the Mono, on Humbug creek. R. M. Brown is superintendent.

Pickard—The mill at this property, Oro Fino, is crushing about 13 tons daily.

Cub Bear—The Siskiyou syndicate owning the Cub Bear or Borden group of quartz claims in the Salmon river district, has let a contract for 100 ft. of tunnel. I. J. Luce is president.

Trinity County

Trinity River—This company has run a tunnel to turn the river from its bed. C. E. Goodyear, of Weaverville, is superintendent.

Tinsley & Treloar—Operations on this high gravel bench, at Cox, have been conducted with a No. 3 giant, but on account of the small water supply not much washing could be done. Good results, however, were realized.

Homestake-Ellerbrook Consolidated—At this mine, south of Weaverville, about 20,000 sq.ft. of bed rock was uncovered in the winter's run. This is a good showing with a limited water supply and a gravel bank 60 ft. deep. Two No. 3 giants throwing 4-in. streams were used. The water is conveyed from Brown creek in a 7-mile ditch. In the early '60's the gravel here was washed with a canvas hose, one of the first attempts at hydraulic mining in Trinity county. W. B. and C. J. Testy are the owners.

Headlight—The Trinity Gold Mining and Reduction Company, operating the Headlight, has made the second payment of $40,000. The company is installing a 40-stamp cyanide mill, with a 500-h.p. hydroelectric plant.

Oro Grande—This quartz mine, on Coffee creek, has changed hands and will be operated by H. L. Cleary.

Colorado

Clear Creek and Gilpin Counties

Gambetta—This Republican Mountain mine is shipping 100 tons of zinc ore monthly to Oklahoma.

Prudential—This tunnel, now in 850 ft., will be extended to cut the Gambetta vein.

Cliff—This mine, on Democrat mountain, is a steady shipper, under charge of Thomas Randall.

Reliance—This company, operating the Sporting Times mine, Alpine mountain, will install machinery using electric power. A. H. Colburn is manager.

Park County

The new smeltery at Alma is taking contracts for ore from near-by mines, and will open the Atlantic & Pacific properties. The London mine is producing about 30 tons per day.

Routt County

C. H. Collins & Co., of Leadville, have taken a bond and lease on 90 acres, which includes a copper lode deposit about one mile from Yarmony, on the Moffat road. Some rich oxidized copper ore has been found. The vein will be thoroughly proved by sinking and drifting.

San Juan Region

In the Sneffels district, near Ouray, the wagon roads are opened, and teams are busy hauling concentrates down to the railroad from the Camp Bird, Atlas and Revenue mines.

Sunnyside—This mine continues profitably productive.

Little Maud—A portion of this gold and silver mine has been leased to William Anderson.

Hoosier City—This property on Anvil mountain, under the management of C. A. Sugart, will erect a mill. A drift is being extended on the Hoosier City vein to the outcrop of milling ore.

Gold Prince—Operations have been resumed at the mine and mill, near Animas Forks, and shipments of concentrates are awaiting the opening of the Silverton & Northern road.

Silver Ledge—The Red Mountain railroad has been opened from Silverton to the mine, and shipments of zinc concentrates have commenced.

Teller County—Cripple Creek

Mitchell—This mine, owned by the Pinnacle company, on Bull hill, and operated by the Pinnacle Mining and Leasing Company, is reported to have struck a rich orebody, 18 in. wide.

Free Coinage—The Bison claim, leased by Rose & Co., has made a shipment of 60 tons, which is expected to yield 10 oz. gold per ton. The vein is 4 ft. wide.

W. P. H.—Fogleman & Roach, lessees on this mine on Ironclad hill, have received returns of 6 oz. gold to the ton from the last carload of screenings shipped.

Dante—Fifteen carloads per month are being sent out from the Dante mine on Bull hill. M. B. Rapp, leasing on No. 2 shafts, is shipping 2-oz. gold ore.

Modoc—Eight feet of ore has been opened in the Ocean View vein, which parallels the Medoc vein, and three carloads have been shipped, the coarse rock yielding $30 per ton, and the screenings about 7 oz. gold to the ton. This mine is in the saddle between Bull hill and Battle mountain.

Rigi—This mine, which adjoins the Modoc, and owned by the Baroness Von Richtofen, of Berlin, Germany, is operated by lessees, and after a long period of inactivity, is now shipping again. The lessees have just sent out a carload of ore estimated to yield about 2 oz. gold per ton.

Idaho

Coeur d'Alene District

Stewart—This mine, purchased by F. Augustus Heinze in 1906, has been reopened and shipments have begun at the rate of 200 tons per day. It is a lead-silver property. Fully 10,000 tons of lead and silver are lying on the dump taken out in development. The ore in sight is reported sufficient to guarantee the continuation of shipments for a year. The closing of the mine two years ago was due to an injunction secured by the Cœur d'Alene Development Company which owns property adjoining the Stewart ground. The Stewart did not have a favorable site for a mill and under agreement with the Development company, built a mill on the latter company's land. After the mill was up the Development company alleged the Stewart had promised to buy the two mining claims on which the mill stood. The Stewart would not buy the land and the injunction was obtained. After trying for two years to settle the matter the Stewart has decided to ship any way and has obtained a lease on the Mammoth mill of the Federal, at Wallace.

LEMHI COUNTY

Yellow Jacket—The Proprietary Mines Company of America has obtained control of this gold mine, which has for years been tangled up in the John E. Searles estate. It will be reopened under the management of the Proprietary company. It has a 60-stamp amalgamating mill to which a cyanide department will be added. The mine was operated by Searles between 1895 and 1898. The vein is said to average 50 ft. wide.

Illinois

The Governor of Illinois has appointed the following commissioners to establish fire-fighting and rescue stations in the State, under the law recently enacted: Operators, J. W. Miller, of Gillespie, and John L. Schmidgall, of Murphysboro; miners, Charles Krallman, of Glen Carbon, and Charles Bennett, of La Salle; Hector McAllister, State mine inspector, Streator; H. H. Stoek, State University, Urbana; Dr. J. A. Holmes, United States Geological Survey.

Indiana

DAVIESS COUNTY

Mandabach—This coal company, Washington, is advertising for several hundred miners. The company has just closed a contract with a firm of Chicago coal brokers to take the entire output of the mines for one year.

GREENE COUNTY

The Vincennes Railroad Company has resumed work in the mines on the road. Nearly 2000 miners were added to those put to work immediately after the suspension was at an end. The indications are that all the mines of the Jasonville field will be in full operation soon.

Massachusetts

The Senate has passed the bill granting permission to the New England Gas and Coke Company to improve Island End river channel to provide a way for ships from the Mystic river to the proposed iron works of the company on the Everett shore.

Michigan

COPPER

Isle Royale—From "A" shaft on the Baltic lode a drift is being driven at the 750-ft. level toward a point from which a good drill core was taken, a change being noted in the character of the rock and copper ground may be encountered at any time. From a point in this drift a crosscut has been started west to explore the ground on the hanging-wall side of the lode.

Houghton Copper—No. 2 drill hole has penetrated a 17-ft. copper-bearing lode, which is believed to be the west vein lying just above the Baltic lode.

Victoria—This mine continues opening a good grade of ground in both drifts extending from the twenty-second level. A large mass was encountered recently in the west drift. At the eighteenth level an improvement has been noted in the character of the rock in the east drift.

New Baltic—No. 4 drill hole going down in the northwest quarter of section 16 has encountered a copper-bearing amygdaloid formation at 350 ft. The core shows the formation to be 20 ft. wide, with 10 ft. of it carrying copper in commercial quantities. This lode is probably the same as exposed in No. 5 hole on the Onecc some time ago. In the No. 3 hole at 1200 ft. the New Baltic lode was reached, the core was badly broken but showed copper throughout. This is the second core taken from this formation which has also been exposed on surface.

Lake—The shaft is being sunk in the foot-wall of the lode exposed in the shaft at the sixth level. When the new 50-drill compressors are ready, greater progress can be made and a much larger tonnage shipped. The company is operating 11 drilling machines.

Quincy—No. 9, or Pontiac shaft is sinking below the 900-ft. level with copper appearing from time to time throughout. An order has been placed for a 300-kw. low-pressure turbine generating set to operate from the exhaust steam of the hoisting plants. This unit will furnish the electrical power which the company is now buying.

IRON

Davidson Ore Mining Company—This company has been organized to operate in the Iron River district, Menominee range. Spencer Kellogg, of Buffalo, and M. S. McDonough, of Iron River, are among the incorporators.

Cleveland-Cliffs—This Ishpeming company is opening the Northwestern property in the Swanzy district, Marquette range.

Minnesota

Chandler—The reopening of this mine at Ely by the Hanna interests is under way. New orebodies have been found and machinery is being installed.

Kennedy—This iron property, owned by Rogers-Brown company, will be the first shipper from the new Cuyuna range this season.

Section 30—This Vermilion iron mine, known also as the Shagawa or St. Claire, will probably send out 100,000 tons this season.

Montana

BUTTE DISTRICT

Alex Scott—The shaft is down about 1524 ft., having been sunk 106 ft. during April. When 1600 ft. has been reached a station will be cut and an electric pump installed and a crosscut run. On the 1400-ft. level an orebody 20 ft. in width has been exposed.

Butte Central—Three boilers are now being set up on foundations and a compressor will be installed. Work of unwatering the shaft will begin May 20. The shaft, down 500 ft., will be sunk to the 1000-ft. lever before further exploration work is done. The mine has been idle for two years.

Amalgamated—A crosscut has been run from the 2800-ft. level of the High Ore mine to a point underneath the Anaconda shaft, now 2400 ft. deep, and a raise will be run from the crosscut to connect with the shaft.

Raven—The company has retired $35,000 of its bond issue, leaving outstanding $30,000 which the management states will be paid during the present year.

Butte & Superior—The company has recently acquired full control of one-half of the Basin concentrator, and will hereafter concentrate its ore according to its own method and without the supervision of the La France company officials. The concentrates have heretofore averaged about 49 per cent. in zinc; it is expected that they can be made to run much higher. The management proposes to treat 500 tons daily within the next month. At the Black Rock mine mining is being done on the 1000-, 1200- and 1400-ft. levels. On the 1600-ft. level the orebodies are being developed and a crosscut run to the new Colonel Sellers claim. Much of the structural steel for the new concentrator has arrived and construction is under way.

JEFFERSON COUNTY

Blizzard—At 175 ft. a vein carrying gold, silver and lead has been cut. Joynt & Thompson are operating the property, near Wicks.

LEWIS & CLARK COUNTY

Copper - Silver Montana—A 65-h.p. boiler, a hoist good for 600 ft. and a pump are being installed at this property, 5 miles north of Helena. The shaft is down 315 ft. and sinking will be begun. E. R. Purnell is manager.

MADISON COUNTY

Valley View—Two tunnels are being run, one now in 71 ft. and the other 80 ft. The ore runs high in gold.

MISSOULA COUNTY

Bullion—The construction of a 4-mile wagon road from the mine to the railroad will be completed soon when shipments of copper ore will be begun.

Nevada

ESMERALDA COUNTY

Booth—The Lind lease has encountered the northeasterly extension of the Red Top vein of the Consolidated workings at 360 feet.

Atlanta—Development is being prosecuted with full forces on both the Precious Metals and Maloney leases.

Consolidated—The Laguna shaft, now 400 ft. deep, is being unwatered preparatory to sinking. A new surface plant will be installed and the shaft used for hoisting both Red Top and Clermont ores.

LYON COUNTY

Mason Valley—Work was begun on the new Mason Valley smeltery at Wabuska, May 8. The Copper Belt railroad, the new line from Wabuska to Mason City and the mines, will build a spur to the smeltery site.

Ramsey-Ottawa—This company has properties in the Ramsey district adjoining the Ramsey Queen mine. Francis H. Griffin is president. The stock has been listed on the New York Curb.

NYE COUNTY

Tonopah shipments are as follows: Tonopah, 3500 tons; Tonopah-Belmont, 1350; Montana-Tonopah, 968; MacNamara, 260; West End, 170; Tonopah Extension, 800; total, 7038 tons.

Tonopah Extension—The first full month operation of the mill shows 2981 tons treated; extraction 89.12 per cent. and net profit $15,042.

Tonopah—Development is being confined principally to the levels above the 700. Prospecting at 2200 ft. with diamond drills has as yet given no definite results.

Thanskgiving—A 4-ft. vein in the west drift on the 425-ft. level shows remarkably high assays.

Eclipse Development—The cyanide plant is now running in connection with the stamps and amalgamating plates.

Johnnie—It is proposed to extend the electric line from Rhyolite to supply cheaper power to the mill.

Pocahontas—A cement water tank of 8000 gal. capacity has just been completed.

WHITE PINE COUNTY

Boston Ely—The inclined winze from the drift in the Emma shaft has left the ore and is now in the footwall, the vein having flattened. The winze will be carried downward 50 ft. and a drift run to the contact.

Giroux—The company will now start six churn drills at first on the original Giroux estate and later on recently acquired claims. The big shaft, 12 ft. by 10 ft. 4 in., has been sunk 1200 ft. in 10 months, a record in shaft work.

Cumberland-Ely—On March 31, 1,269,222 shares had been exchanged for Nevada Consolidated, or about 98 per cent. The mines are still idle and the operating income from working up the by-products has stopped. The only revenues is from the company's interests in the Steptoe smeltery and the railroad.

New Mexico

Chino—The May 1 report gives the ore reserves 17,948,566 tons, assaying 2.6 per cent. copper. The total increase for the last month amounted to 395,056 tons. The reserves may be divided as follows: Developed ore, 7,875,579 tons, assaying 2.41 per cent. copper; partially developed, 10,072,987 tons, assaying 2.75 per cent. copper. The company has developed a water supply from the Apache Tajo spring, from which it is estimated that sufficient water for a 10,000-ton mill can be obtained. The deepest hole drilled, namely, 1040 ft., with the bottom still in high-grade ore, had to be abandoned as the drill had reached its workable depth. The company is installing drills capable of operating to 3000 ft. or more.

Tennessee

The Grasselli Chemical Company, of Cleveland, O., has purchased the property of the New Market Zinc Company and has leased the property of the Roseberry Zinc Company, at Mascot, and intends to develop the mines on a large scale.

Utah

JUAB COUNTY

Tintic ore shipments in carloads for the week ended May 6 are as follows: Iron King, 20; Iron Blossom, 19; Sioux Consolidated, 17; Dragon Iron, 15; Colorado, 8; Gemini, 7; Eagle & Blue Bell, 4; Grand Central, 4; Scranton, 4; Eureka Hill, 4; Opohongo, 3; Chief Consolidated, 3; Uncle Sam, 2; Beck Tunnel, 2; Lower Mammoth, 2; May Day, concentrates, 1; Gold Chain, 1; East Tintic Development, 1; Swansea, 1; Yankee, 1; Bullion Beck, 1; May Day, 2; total, 122 cars.

Eagle & Blue Bell—Orders have been received from Eastern headquarters to purchase new hoisting equipment, and to sink the old Eagle & Blue Bell shaft, now down 220 feet, to 1000 ft. A drift is being extended under the shaft on this level, and raising and sinking will be carried on at the same time. A Hendrie & Bolthoff hoist has been ordered, which will be capable of sinking to the 2000-ft. level. Timbers for the shaft have been ordered, and sinking will be started as soon as possible. The mine is now producing 16 cars per month, which net the company about $20 per ton.

Lower Mammoth—The drift south of the shaft on the 2000-ft. level recently broke into heavy sulphide ore. Development on this new strike is being continued, and shipments will be made from it. Ore is also being mined for shipment from between the 1700- and 1800-ft. levels.

Tintic Central—The shaft has just passed the 700-ft. level, and will be sunk to 900 or 1000 ft. Three shifts are being worked.

Centennial-Eureka—Hoisting ore was resumed May 5. After the installation of the electric pump on the 2200-ft. level, the ore output has been gradually increased up to the normal production of 300 tons per day.

Iron Blossom—Shipments have been heavier than usual. No action was taken regarding the June dividend at the meeting in Provo, May 10.

Colorado—The No. 1 or South shaft is being sunk from the 300- to the 500-ft. level.

Tintic Standard—The shaft has been sunk 65 ft. below the 700 level. Streaks of lead ore and bunches of silicious ore, carrying gold and silver, have been encountered. Mineralization is said to be increasing with depth.

Yankee—Preparations are being made for the installation of the new hoisting plant.

SALT LAKE COUNTY

Cardiff—This property near the head of Big Cottonwood cañon has mined about 70 tons of ore from development. Ore 2 to 3 ft. thick, carrying copper, lead and silver, was recently developed on the tunnel level. A raise has been driven on this ore, and is now up a distance of about 65 ft.; it is following the vein to the limestone-quartzite contact.

Columbus Consolidated — Shipments were resumed May 5. The ore bins are filled with crude ore and concentrates awaiting shipment. Two shifts are employed in the mill, and about 75 tons of ore are being treated daily. Approximately $60,000 out of the $70,000 due on the recently levied assessment of 25c. per share has been collected.

SUMMIT COUNTY

Park City ore shipments for the week ended May 6 are as follows: Daly-Judge, 1,376,000 lb.; Daly-Judge (zinc), 798,580; Daly-West, 1,260,000; Silver King Coalition, 762,800; total, 4,197,380 pounds.

Silver King Coalition—The main working shaft is to be repaired, which will take 30 days. The working force will not be reduced during this time, but will be sent into the mine by way of the Alliance tunnel. Some ore and waste will be hoisted on night shift.

East Carbonate—A small mineralized stringer cut on the tunnel level has been drifted on a distance of about 30 ft., and is reported to have opened into 2 ft. of ore carrying lead and silver.

Canada

British Columbia

Pacific Coast Collieries—This company will erect a plant at Merritt, capacity 500 tons per day.

Granby—The eight furnaces are in operation, treating about 4000 tons daily.

British Columbia Copper—The settlement of the strike which has tied up operations since April 19 has been effected. As soon as a new force of 500 men can be collected, operations will be resumed.

Mother Lode—A plant will be installed on this property this spring. John McMartin has control.

Ontario

The shipments from Cobalt for the week ended May 6 are as follows: La Rose, 339,803 lb.; Nipissing, 190,280; Kerr Lake, 256,468; Crown Reserve, 138,225; Temiskaming, 125,330; Peterson Lake, 100,00; Trethewey, 64,500; Coniagas, 59,300; Buffalo, 52,010; Beaver, 60,350; total, 1,386,266 pounds.

Beaver—In the fight for control of this property the present management was sustained.

Buffalo—The monthly report shows that the mill treated 3523 tons, averaging 37.2 oz., and recovered 103,865 oz. of silver.

Peterson Lake—The annual report shows a cash balance of $47,237, with an additional 160,000 shares placed in the treasury. During the year 111 tons of ore were shipped netting the company $11,313 from the 25 per cent. royalty.

Nipissing—Surface prospecting has resulted in the discovery of two good veins.

La Rose Consolidated—The management reports: "Fine showing silver No. 11 vein at the Lawson showing 9 in. high-grade ore on the 48-ft. level. The No. 2 vein at the Lawson is also looking good on the 88-ft. level."

Cobalt Provincial—This property consists of 30 acres adjoining the Nipissing and Savage. Development and trenching are being done. John Reddington is superintendent and John T. Milliken and Frank G. Logan are directors.

Mexico

Chihuahua

Cusihuiriachic—It is announced that the Mexico Northwestern Railway is to immediately begin construction on the 24-kilo. line from San Antonio station to this silver camp. Interest in the camp has been augmented of late by the profitable operations at the Promontorio mine of the Cusi Mining Company and by the pending sale of the Reina mine to the Pearson interests.

Rio Tinto—The copper furnace was blown out May 1 so as to facilitate the addition of a second furnace and converter, and the remodeled plant is expected to be in commission July 1. During the year the copper matte has been accumulated and there is on hand 2,500,000 lb. of copper, which will be converted on the ground.

El Rayo—The company has completed a 1000-ft. crosscut from the upper or San Jose tunnel and encountered the Volga vein on the northern portion of the property. Drifting on this vein from the intersection has progressed 40 ft. and exposed ore for the entire distance, showing a width of 3 ft. and assaying from $18 to $20 per ton.

International Gold Mines Company—This company has again taken over its property from the Socorro Mines Development Company and is carrying on developments under the direction of J. Gordon Hardy, consulting engineer, and D. Gordon Smith, superintendent.

Cherokee—This company, in the San Julian section, south of Parral, has resumed under direction of H. D. Higgins and C. S. Allen. The English stockholders subscribed $100,000 for the work. The mill will be remodeled and enlarged.

Guanajuato

Oro Grande Mines Company—This company has purchased control of the property of the Guanajuato Amalgamated Gold Mines Company, owning 160 acres at La Luz, adjoining the Oro Grande groups. The deal includes the 100-stamp cyanide mill and a reservoir of 100,000,000-gal. capacity. It is proposed to proceed at once to increase the capacity of the mill by installing additional machinery and equipping it with improvements in cyanidation (Just process) recently perfected by the Guanajuato Development Company. An aërial tramway of 100 tons hourly capacity will connect this mill with the properties of the Oro Grande company.

Jalisco

Virginia & Mexico—The one-hundredth bar of bullion has been marketed. The bars average 1000 pesos each. The company is also shipping concentrates averaging 350 pesos per ton.

Mina Grande—The reopening of this *antigua* has been started by a company in which French capital is principally concerned. It was purchased from Dwight Furness for 75,000 pesos. W. A. Hoeing is in charge.

Altamira—Work will be soon resumed at this group, near Ahualulco. Dennis Ryan, of St. Paul, Minn., is the principal owner. A reduction plant and an aërial tram are projected.

Sonora

Neill Development Company—This corporation has been launched by Spokane, Wash., people to work the Paloma placer mines, Altar. The price paid for the property, consisting of 12,000 pertenencias, was $750,000, plus one-third of the company's stock. About $400,000 will be expended. R. K. Neill is in charge.

Cienguita—The litigation in the Arizona courts involving the corporation affairs of this company, brought by Thomas Farish and others, has been decided in favor of the company.

Mines Company of America—Results at the Creston-Colorado, for December, January and February, show a total profit of $63,112. The company is engaged in extensive development on the new unprospected territory.

Zacatecas

San Carlos—The 50-stamp mill and cyanide plant of this English concern are again in commission. From 100 to 150 tons daily are being handled.

Mexico-Milagros—This company, operating at Chalchihuites, has been listed on the New York Curb. B. F. Howland, Brooklyn, is president.

Asia

India—Mysore

Kolar Goldfield—Gold production in April is reported at 46,842 oz., being 193 oz. less than in March and 714 oz. more than in April, 1909. For the four months ended April 30, the total was 181,136 oz. bullion in 1909, and 185,889 oz. in 1910; an increase of 4753 oz. The bullion reported this year was equal to $3,458,091, or 167,300 oz. fine gold.

Australia

New South Wales

The gold production of New South Wales is reported at 15,381 oz. for April, 1910, and 75,301 oz., or $1,556,471, for the four months ended with April.

Western Australia

Gold production in April is reported at 125,248 oz. For the four months ended April 30, the total was 520,141 oz. in 1909, and 481,109 oz., or $9,944,523 in 1910; a decrease of 39,032 oz., or $806,791 this year.

Victoria

Gold production in February was 47,676 oz.: for the two months ended Feb. 28 it was 87,268 oz., or $1,803,830, an increase of 815 oz. over last year.

New Zealand

The gold output in April was 28,253 oz. bullion in 1909, and 38,796 oz. in 1910; an increase of 10,543 oz. The bullion reported this year was equal to $743,228, or 35,957 oz. fine gold. Silver reports for the month were 147,983 oz. in 1909, and 126,078 oz. in 1910, a decrease of 21,905 oz. for 1910.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, May 18—Coal trade in the West is still in an uneasy condition. The settlement of the new wage scales proceeds slowly, and in the important State of Illinois no settlement at all has been reached or is even in sight. A new conference is now in session and this may reach some basis of agreement, but it is not certain. In the Pittsburg district, Ohio and Indiana there is still some friction, but the mines are getting to work and business promises to be good. In the Southwest no agreement is in sight, and the operators are discussing the question of reopening their mines on the open-shop basis.

Where mining has been resumed there is much activity, as the stocks of coal which were accumulated before the suspension have been almost exhausted. New supplies are needed, and the working mines are receiving orders which will keep them busy for some time. One month or more of suspension had its favorable side for the operators.

Lake trade, so far, has been rather slow since the first rush of loaded boats started. The Northwest does not seem inclined to take coal freely so far, and the trade has been rather a disappointment.

In the East there is nothing special about the bituminous trade, and no change from the conditions for several weeks past. There is no great rush for coal anywhere, but a fair trade is being done at most points. The anthracite trade is steady and without special incident.

COAL TRAFFIC NOTES

Coal and coke tonnage Chesapeake & Ohio Railway, nine months of fiscal year from July 1 to March 31, short tons:

	Coal.	Coke.	Total.
New River............	5,932,093	273,866	6,205,959
Kanawha............	4,921,997	46,403	4,968,400
Kentucky	408,291	228	408,519
Connecting lines.....	77,105	36,865	113,970
Total..................	11,339,186	357,362	11,696,848
Total, 1908-9.........	9,096,732	275,677	9,372,409

Deliveries to points west of mines this year 5,963,617 tons coal and 173,274 coke; points east, 1,507,603 tons coal and 153,395 coke; tidewater, 3,796,537 tons coal and 30,693 coke: anthracite to line points, 5700 tons. The total increase this year was 2,324,439 tons, or 24.8 per cent.

Coal tonnage passing Sault Ste. Marie canals for the season to April 30 was: Anthracite, 179,596; bituminous, 360,327; total, 539,923 short tons.

Bituminous coal and coke tonnage of leading railroads in Pennsylvania and West Virginia three months ended March 31, short tons:

	Bituminous.	Coke.	Total.
Pennsylvania......	11,267,286	3,985,861	15,253,147
Balt. & Ohio........	6,704,767	1,175,551	7,880,318
Buff., Roch. & Pitts.	1,933,620	185,098	2,118,718
Buff. & Susqueh'na	337,505	71,057	408,562
Penn. lines, N. Y. C.	2,536,167	13,546	2,549,713
Pitts. & L. Erie.....	2,596,371	1,914,191	4,510,562
Pitts., Shawmut & N.	160,336	4,821	165,157
Norfolk & Western.	4,026,662	826,667	4,853,329
Ches. & Ohio.......	4,005,071	129,738	4,134,806
Total..............	33,567,785	8,306,530	41,874,315
Total, 1908........	25,238,610	5,504,642	30,743,252

Total increase this year, 11,131,063 tons, or 36.2 per cent. The Pittsburg, Shawmut & Northern tonnage in 1910 is for two months only. Anthracite tonnage of Pennsylvania and Baltimore & Ohio is not included.

Coal receipts at Boston, four months ended April 30, reported by the Chamber of Commerce:

	1909.	1910.	Changes.
Anthracite...........	556,101	557,936	I. 1,835
Bituminous	1,067,693	1,349,295	I. 281,602
Total domestic....	1,623,794	1,907,231	I. 283,437
Foreign..............	95,985	100,311	I. 4,326
Total.........	1,719,779	2,007,542	I. 287,763

The foreign coal is almost all from Nova Scotia mines.

New York

ANTHRACITE

May 18—There is nothing especially new in the trade. Business is steady, and so far, little affected by the coming of warm weather.

Schedule prices of domestic sizes are $4.35 for broken, and $4.60 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, $3@3.25; buckwheat, $2.20@2.50; No. 2 buckwheat or rice, $1.65@2; barley, $1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

BITUMINOUS

Current business is about the same as last week, and there is still a preference for the lower-priced coals. A few contracts come in, but many are still dragging.

The miners in the Central district in Pennsylvania come in slowly, and hardly any of the mines is working with a full force. It is understood that the New River and Pocahontas operators have decided to shut down two days in each week, as their coal seems to be in oversupply and they do not want to pile up stocks.

Car supply is falling off a little. Transportation is not quite as good as it has been, coal taking a day or two over schedule time to come through to tide.

New York harbor trade is fairly active, but prices are unchanged. West Virginia coal can be had at $2.40, f.o.b. shipping point; while $2.50@2.55 is paid for Somerset and $2.65@2.70 for good Miller vein steam coal.

In the coastwise market there is talk of advancing vessel rates, but that will not be easy at this season, and with boats in good supply. Going rates from Philadelphia are 70@75c. to Boston, Salem and Portland; 75@80c. to Portsmouth; 80@85c. to Lynn, Bath and Bangor; 80@90c. to Newburyport; 65c. to Providence and the Sound.

Birmingham

May 16—With wages advanced 2½c. per ton, the miners in Alabama are working well, and there is a better production of coal. The product is being handled about as quickly as it is being mined. The railroads are the largest consumers here of coal at present. Some good contracts are in hand by Alabama coal producers. Other contracts are said to be pending which will require full operation of the mines for the balance of the year. Coal prices are down considerably, and some complaint is to be heard on that score.

Coke is in good demand, and production is being kept up. Coke prices have not fallen.

Chicago

May 17—The coal market shows activity in Indiana coals and in those from the East, with supplies plentiful for all purposes. Illinois coal, of course, is wholly out of the market and the fine coals on which an increasing number of steam users have come to rely are supplied chiefly from Indiana at prices about the same as those that prevailed shortly before the suspension in Illinois. The country trade, however, which is short of supplies, is buying largely of lump from Eastern mines. Danger of a coal famine seems to have become obviated by the general resumption of mining outside Illinois and as yet prices show no sharp tendency upward. Storage supplies of the largest consumers are near exhaustion.

Indiana lump at $2.25@2.50, run-of-mine at $2.15@2.40 and screenings at $2@2.25 represent the available Western supply. Smokeless sells well at $3.55 for lump and $3.15 for run-of-mine, with none of the old-time surplus on track. Hocking remains at $3.15 and is steady as regards demand and supply. Anthracite has a fair sale in both city and country.

Cleveland

May 16—Ohio mines continue to operate rather irregularly. Supplies of coal are sufficient, however, and stocks are not cleaned up yet, apparently, as demand is light. Lake trade is still slow.

Prices quoted are, Cleveland delivery: Middle district, $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.65 for slack; No. 8 district $2.20 for 1¼-in., $2 for ¾-in., $1.90 for run-of-mine and $1.85 for slack; Youghiogheny, $2.50 for 1¼-in., $2.35 for ¾-in., $2.25 for run-of-mine; Pocahontas, $2.85 for lump and $2.45 for run-of-mine. Slack is in a little less demand than it has been.

Indianapolis

May 16—Coal operators and miners are in good spirits over the outlook for heavy coal traffic during the next few months. Manufacturers are sending in orders for immediate shipments of coal and the Northern people who draw their supply from Indiana mines, are sending representatives to contract for coal.

The railroads have increased the rates on coal on an average of 8c. a ton, to go into effect June 1. This fact and the nearly exhausted supply of manufacturing coal accounts for some of the orders for immediate delivery.

A meeting was held in this city during the past week by local and other State representatives for the purpose of securing uniform mining laws in the respective States. Better living and social conditions for miners were advocated. Unsightly mining camps, it was declared, should be replaced with better houses at moderate rent.

Pittsburg

May 17—The mines are running full, except in certain nonunion districts where there are still strikes. The Westmoreland district is almost entirely down. This idleness, with heavy shipments in the Lake trade, makes a good demand for coal, and prices are fairly well maintained at the higher basis quoted after the suspension, there being only occasional shading by a few interests, and we continue to quote: Mine-run and nut, $1.25; ¾-in., $1.35; domestic 1½-in. lump, $1.50; slack, 85c. per ton.

Connellsville Coke—The furnace-coke market has found a trading basis, some operators making concessions on contracts and meeting furnace views. Following one or two contracts placed at about $1.85, we can report the following fresh business this week in furnace coke: 12,000 tons monthly, July to June inclusive, $1.85; 9000 tons monthly, second half, $1.80; 5000 tons monthly, second half, $1.75. One of these contracts was with an Eastern furnace interest, another with a Valley interest and the third with a Lake front interest. We note also 15,000 tons of furnace coke sold for May and June shipment at $1.65. There is some contract business under negotiation for second half. The prices are quite unsatisfactory, but it has become evident to some at least of the operators that when pig iron is down practically to cost of production, on purchased ore, that profitable prices for coke cannot be expected. Foundry coke is moving slowly, at unchanged prices. We quote: prompt furnace, $1.65@1.75; contract furnace, $1.75@1.85; prompt foundry, $2.25@2.35; contract foundry, $2.35@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended May 7 at 394,414 tons, an increase of 22,000 tons over the previous week, and shipments at 4063 cars to Pittsburg, 5860 cars to points west of Pittsburg and 1020 cars to points east of Connellsville, a total of 10,943 cars.

St. Louis

May 16—Conditions took a material turn this week as a number of large industries have been forced to come on to the market, owing to the fact that their storage supply was exhausted. This includes a number of railroads; consequently prices have advanced from 30 to 40c. per ton in the last several days. The demand far exceeds the supply at present. Coal is being shipped in here from six or seven different sources now, as it is coming from several districts in Kentucky and both the northern and southern districts of Indiana, with considerable reloaded screenings from Illinois.

Current prices are as follows for the St. Louis market:

	Mine.	E. St. Louis.
Kentucky mine-run.. ...	.....	$2.60
Indiana mine-run.......	.....	2.55
Kentucky lump	.....	2.80
Indiana lump............	.....	2.75
Illinois:		
Reloaded screenings........	.....	2.00
		St. Louis.
Pocahontas and New River:		
Lump or egg..............	$1.50	$4.00
Mine-run.................	1.10	3 65
Pennsylvania Anthracite:		
Nut, stove or egg..........	.....	6.55
Grate	.....	6.30
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	.....	5.40
Gas house	.....	4.50
Smithing.................	.....	4.15

Prices for Kentucky and Indiana coals are on track, East St. Louis.

The anthracite market is in good shape and tonnage moving is normal. Prices are being maintained in both the wholesale and retail trade. The retail conditions are much more favorable than last week, and while the circular price is lower than in former years, there seems to be no cutting.

FOREIGN·COAL·TRADE

German Coal Production—Coal production in the German Empire, three months ended March 31, metric tons:

	1909.	1910.	Changes.
Coal............	36,477,870	36,370,787	D. 107,083
Brown coal.....	16,815,920	16,147,198	D. 668,422
Total mined..	53,293,790	52,518,285	D. 775,505
Coke made.....	5,243,747	5,636,781	I. 393,034
Briquets made.	4,518,916	4,469,226	D. 49,690

Of the briquets reported this year, 3,433,910 tons were made from brown coal or lignite.

German Coal Trade—Exports and imports of fuel in Germany, three months ended March 31, metric tons:

	Exports.	Imports.	Excess.
Coal.....	5,222,961	1,990,741	Exp. 3,232,220
Brown coal...	16,893	1,760,587	Imp. 1,743,694
Coke....	937,241	150,299	Exp. 786,942
Briquets......	383,077	51,328	Exp. 331,749
Total.......	6,560,172	3,952,955	Exp. 2,607,217
Total, 1909..	6,415,752	3,980,741	Exp. 2,435,011

Of the coke exported this year, 4585 tons went to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on May 7: Best Welsh steam, $3.96; seconds, $3.81; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.16; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, May 18—The iron and steel markets are still in a waiting mood, and there is little change to be noted from the proceeding week.

The pig-iron business has been quiet, although it is generally believed that consumers have drawn down their stocks rather low. Users of foundry iron do not seem much disturbed by the movement to reduce production. Some orders have been placed, both in the West and in New England territory, but they seem to be only for immediate needs. It is not that buyers do not expect to require iron, but they seem to believe that the bottom of the market has not yet been reached, and they are waiting for the turn.

In finished material there is a moderate business reported in most lines. Sheets and bars are in the best condition. A good deal of structural business is forward and more is ready for contract, but differences over price are delaying the final placing of orders. Railroad orders e rather scarce for the time being, but must be remembered that very heavy ntracts for new equipment, placed some ne ago, are still unfilled. A good deal small bridgework is being placed.

Taking the finished-steel trade as a hole, the mills are running chiefly on d contracts, much of the tonnage having en booked last year. Even with the ghtly reduced rate of output the total nnage of business on books is decreas- g. Without any general change in the uation, consumption will probably war- nt the continuance of the present rate output, but as contracts run out there ll have to be much new buying, and th mills indifferently occupied there ll obviously be sharp competition for e business, so that some recessions in ices within the next three months are to expected, and touching the majority finished-steel products outside of rails d tinplates, rails by reason of custom d tinplates by reason of heavy demand ing well established in price.

Alabama Iron Production—Pig-iron tput in Alabama in April, is reported 172,885 tons; for the four months ded April 30, it was 676,741 tons, an crease of 109,581 tons over last year.

Baltimore

May 17—Imports at Baltimore for the eek included 500 tons manganese ore om Antwerp; 2400 tons ferromanga- se from Great Britain; 16,100 tons on ore from Cuba; 400 tons copper ore d 2835 tons cupreous pyrites from uelva, Spain. The exports included 61 tons steel rails and 597,450 lb. lice-bars to Argentina.

Birmingham

May 16—The Southern pig-iron mar- t, while a little quiet, yet gives promise material improvement before long. ie curtailment in production is pre- nting accumulation of iron, and this having some effect on general condi- ons. There are a few inquiries being ceived indicating that there is a need r some iron. There is no hesitation nong the cast-iron pipe makers and the undries and machine shops recently ok on a little more business so that the me consumption of pig iron is keeping well. The shipments to other sec- ons are not so good. One prominent terest in the Birmingham district in eaking of the general conditions said at while the lull at present is a little pressing, within 60 days there will be siness on all sides and the make will cared for easily. The quotations at esent in the Southern territory are ound $12, No. 2 foundry.

Chicago

May 17—Conditions in the iron market em on the turning point. A larger nnage has been contracted for in the last week and inquiries are numerous on last-half requirements. That the bottom of the market has been reached would seem to be the general conclusion of melters of pig iron. Below the $12 Birmingham price ($16.35 Chicago) which has been standard for several weeks no selling interest seems to be willing to go. Northern iron remains at $17. At these prices a good deal of business is done for deliveries in the next 30 to 90 days, with an occasional large order given for last-half needs.

Iron and steel products continue largely in demand. Sales of practically all forms of iron and steel are good.

Cleveland

May 16—Nothing doing in iron-ore sales. The ore shipments reported in April reached a total of 1,520,305 tons, more than was expected.

Pig Iron—The market is quiet. It is reported that offers of Southern No. 2 foundry have been made at $11.50 Birmingham, on large quantities. Current quotations, Cleveland delivery, are $17.90 for bessemer; $16.50@16.75 for No. 2 foundry; $16.10@16.35 for No. 2 Southern; $16@16.25 for forge.

Finished Material—The lull in buying is still the feature of the market. Shading on sheets and plates is reported. Local mills are running only five days a week, for the most part.

Philadelphia

May 18—Sales during the past few days aggregate a slight increase over last week, both in foundry No. 2 and forge, while the movement in basic is at a standstill, no inquiries having been received and negotiations of a week or two ago halted. At the present time, makers say, large consumers are more likely to be early customers for large lots than for small ones. The mill owners are indisposed to buy in a large way until the effect of curtailment in other markets can be sized up. The makers of special brands who are usually well sold ahead will have material on hand before July 1, unless the market improves. Any downward tendency in prices will be resisted by Eastern furnace interests, as they are not afraid to permit an accumulation of stock. Quotations for No. 2X foundry are given at $17; gray forge at $16.25; and basic, $16.75 per ton.

Steel Billets—There has been an absence of orders and consumers are delaying inquiries until the effect of fluctuations in crude material can be discounted. The asking prices remain firm.

Bars—There is a noticeable falling off in bar iron at mills; but local storekeepers report an improving distribution in the local and near-by trade.

Sheets—Sheets have been shaded in a small way on inquiries for large supplies for summer and autumn delivery. In a general way the sheet-iron industry is strong and the production of mills shows no falling off.

Pipes and Tubes—An unexpected activity has been developed in tubes, probably because of the postponement in the placing of orders which were withheld in view of an expected drop in prices. Wrought-iron pipe is weaker and sales have not improved. Cast pipe is strong and the pipe works are busy.

Plates—Latest orders for plates from large concerns call for only a part of supplies for which inquiries were made from two to three weeks ago.

Structural Material—The probability of any weakness in structural shapes has disappeared as shown in latest quotations given on bridge material.

Scrap—The scrap market remains quiet and supplies are large, covering nearly all lines of scrap usually dealt in. Dealers are quietly holding their stock for their own prices and foundries and other buyers are not in the market at present.

Pittsburg

May 17—The finished-steel trade shows no improvement, but seems to maintain the better rate of business shown early in the month as compared with April, which was a poor month. It remains, however, that in some lines, such, for instance as wire products, plates and shapes, there is not enough absolutely new business to test the market seriously, and mills are running chiefly on specifications on old contracts. In hoops and bands there is fairly good new buying, and in steel bars and sheets a moderate amount.

There has been sharp competition in spikes lately, and standard railroad spikes have sold down to $1.60 per 100 lb., for prompt shipment, the market having been $1.75 early in the year. Contracts can be made at $1.65@1.70.

Wrought-iron pipe is down a point, making the nominal discount 74 off and the inside price 75 and 5, so that iron pipe is four points instead of five points above full-weight steel pipe, the latter remaining at 79 and 5 for full weight and 80 and 5 for "catch weight."

Pig Iron—The market has become weaker all around. Basic iron has been sold at $15, Valley, and it is believed that a round tonnage, running into thousands of tons, has been done at this figure, although details are not available. Foundry iron can be had at $15 on an attractive tonnage for early delivery, although no sales of importance have yet been made. For either basic or foundry a contract for extended delivery could hardly be made at less than $15.50, as cheap iron has been sold chiefly to clear off stocks, and for iron still to be made, using the new ore at the season's advance of 50c., the furnaces insist upon a higher price. Bessemer iron has not moved, and the old quotation of $17 has become purely nominal. It would be quite impossible to sell any iron at the price, but the market does not know what price could really be secured. Some reports have been circulated of sales at $16.50 and $16.25 but there is good ground for believing that the alleged transactions were not *bona fide*. A more cheerful tone pervades the market as furnaces believe the situation is being shaken out and a real trading basis is coming in sight through prices being pushed down to the cost limit. The market is quotable as follows: Basic and No. 2 foundry, $15@15.50; malleable, $15.50@15.75; forge, $14.50@15, all at Valley furnace.

Ferromanganese—The market has been quiet locally, but it is reported that a large sale, about 5000 tons, has been made in the East. Prices remain at $40@40.50 for prompt at $40.50@41 for forward delivery, f.o.b. Baltimore.

Steel—The market has been quiet, and prices show no change from last week, when we quoted bessemer 50c. lower, quotations remaining: Bessemer billets, $25.50@26; sheet bars, $26.50@27; open-hearth billets, $28.50@29; sheet bars, $29@29.50; rods, $32, all f.o.b. maker's mill, Pittsburg or Youngstown districts.

Sheets—The Canton Sheet Steel Company has broken ground at Canton, O., for six sheet mills, C. A. Irwin, W. W. Irwin and other Canton people being interested. The Phillips Sheet and Tinplate Company, which recently completed and put in operation 10 tin mills at Wierton, Hancock county, W. Va., is adding 10 sheet mills to the plant. Demand for sheets is rather quiet, but a heavy tonnage is being turned out. A few mills are idle or running light, simply because there has been such a large increase in capacity in the past year and a half. Such mills are shading black sheets $1@2 a ton and galvanized sheets $2@3, regular prices being 2.40c. for black, 3.50c. for galvanized, $1.70 for painted corrugated and $3 for galvanized corrugated. Specialties are very firm. Blue annealed at the regular price of 1.75c. cannot be done for any early delivery, 1.85c. being done on delivery six weeks ahead, while for spot shipment 1.90c. or 1.95c. could be obtained. Pickle-finished sheets command a premium of $2 a ton for prompt shipment, being held at 2.50c. base, plus the regular extra.

St. Louis

May 16—The pig-iron market remains in a state of lethargy. A few inquiries are coming in and little business has been closed during the last week. Prices remain unchanged. All firms in this part of the country seem to have all on hand that they will need for the present and do not seem inclined to buy ahead at all.

The price of $13 f.o.b. Birmingham, or $16.75 per ton St. Louis, remains unchanged.

Lake Iron Ore

The records kept by the Cleveland *Iron Trade Review* show the shipments of Lake ore through Lake Erie ports to furnaces for the year ended May 1, 1910, as follows:

Stocks on docks, Dec. 1, 1909	8,965,789
Stocks, May 1, 1910	5,444,080
Winter shipments	3,521,709
Season shipments, May 1-Dec. 1, 1909	30,077,304
Total shipments to furnaces	33,599,013

The total shipments to furnaces through Lake Erie ports for the years ended May 1 have been, for 12 years past:

1898-9	12,122,982	1904-5	20,057,070
1899-1900	15,882,881	1905-6	28,984,358
1900-1	11,165,260	1906-7	30,099,769
1901-2	17,216,065	1907-8	31,692,146
1902-3	21,905,251	1908-9	20,521,923
1903-4	18,739,995	1909-10	33,599,013

The stocks on docks May 1 have not varied greatly for three years past. Those reported for May 1, 1910, show an increase over 1909 of 73,812; but a decrease from 1908 of 36,220 tons.

FOREIGN IRON TRADE

Iron Production in Great Britain—The total production of pig iron in Great Britain in 1909 was 9,664,287 long tons; an increase of 374,447 tons, or 4 per cent., over the previous year.

German Iron Ore—The production of iron ore in Germany, including Luxemburg, for the full year was 24,278,157 metric tons in 1908, and 25,505,409 in 1909; an increase of 1,227,258 tons.

Belgian Iron Trade—Foreign iron and steel trade of Belgium, year 1909, metric tons:

	Exports.	Imports.	Excess.
Pig iron	19,362	477,311	Imp. 457,94
Other iron and steel	1,177,693	360,255	Exp. 817,438
Total	1,197,055	837,566	Exp. 359,489
Total, 1908	1,054,479	662,390	Exp. 392,086
Iron ore	434,548	4,389,892	Imp. 3,955,344
Iron ore, 1908	446,233	3,342,404	Imp. 2,996,171

Belgium imports—chiefly from Germany—much pig iron, which is worked up into finished material in Belgian mills.

METAL · MARKETS

New York, May 18—The metal markets generally do not show any material changes, and continue rather quiet.

The cable reports the gold output of the Transvaal in April at 619,000 oz., or $12,794,730. This makes for the four months ended April 30, a total of 2,403,109 oz., or $49,672,263; an increase of $158,684 over last year.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
April 1910	$36,283,625	$ 2,100,918	Exp. $34,182,707
" 1909	6,337,994	3,345,861	" 2,992,133
Year 1910	47,199,706	11,669,276	" 35,530,430
" 1909	44,316,626	15,504,136	" 28,812,490
Silver:			
April 1910	4,696,534	3,840,495	Exp. 856,039
" 1909	4,952,251	4,222,147	" 730,104
Year 1910	18,336,081	15,238,634	" 3,097,447
" 1909	19,426,181	14,675,365	" 4,750,816

Exports from the port of New York, week ended May 14: Gold, $30,380; silver, $670,692, chiefly to London Imports: Gold, $12,235; silver, $54,152, from the West Indies, Mexico and South America

Foreign trade of the United States four months ended April 30, as valued by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1909.	1910.
Exports	$ 547,230,803	$ 545,766,431
Imports	477,271,628	560,736,040
Excess	E.$ 69,959,175	I. $14,969,609
Deduct excess of exports, silver		3,097,447
Deduct excess of exports, gold		35,530,430
Net export balance		$ 23,658,268

Gold and silver movement in detail is given in the table at the head of this column.

Gold—There was no special demand in London, and prices on the open market remained unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. No exports from New York are reported.

Platinum—The market remains quiet but steady, and prices are unchanged. Dealers ask $29@29.50 per oz. for refined platinum and $34.50@35 per oz. for hard metal.

Silver—During the whole of the week ended May 18, the silver market has remained steady around 24⅞d. on Indian bazaar buying; closing slightly easier at 24 13/16d. in London. The general tone of the market continues good.

SILVER AND STERLING EXCHANGE

May.	12	13	14	16	17	18
New York	54	53¾	54	54	54	53⅞
London	24⅞	24 13/16	24⅞	....	21⅞	24 13/16
Sterling Ex.	4.8660	4.8675	4.8700	4.8695	4.8700	4.8720

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to May 5, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India	£1,519,300	£2,282,600	I. £ 763,300
China	1,038,200	1,113,500	I. 75,300
Straits	82,800	.....	D. 82,800
Total	£2,640,300	£3,396,100	I. £ 755,800

India Council bills in London brought an average of 16.03d. per rupee.

Copper, Tin, Lead and Zinc

May.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
12	12⅞ @13	12⅝ @12¾	56½	33⅜	4.25 @4.27½	4.10 @4.12½	5.00 @5.05
13	12⅞ @13	12⅝ @12¾	56⅛	33⅛	4.25 @4.27½	4.10 @4.12½	5.02½ @5.07½
14	12⅞ @13	12½ @12¾	....	33⅛	4.25 @4.27½	4.10 @4.12½	5.05 @5.10
16	12⅞ @13	12½ @12¾	....	33⅛	4.27½ @4.32½	4.12½ @4.15	5.07½ @5.12½
17	12⅞ @13	12½ @12¾	56	33¼	4.27½ @4.32½	4.12½ @4.15	5 12½ @5.17½
18	12⅞ @13	12½ @12¾	56¼	33½	4.27½ @4.32½	4.12½ @4.15	5.12½ @5.17½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

In the table published last week, the price of standard copper in London on May 5, was given at £59 9/16. This was a misprint, the correct figure being £55 9/16—£55 11s. 3d.—for that date.

Copper—An effort was made during the last week by some of the leading sellers to advance prices, but buyers could not be tempted to come in and some sellers then switched from their position and offered copper at a small concession. During the latter part of the week, electrolytic has been freely offered upon the basis of 12.60@12.62½, net, cash, New York, while the Calumet & Hecla has been offering its Lake copper at 13c. Some moderate sales of Lake have been made at about that figure, but the sales of electrolytic have been of small proportions. European buyers, true to their previous tactics, withdrew upon the recent advance in the market, while American buyers have all along been conspicuous by their absence, although their supplies are now believed to be low. At the close the market shows a weakening tendency, with Lake at 12⅞@13c., and electrolytic in cakes, wirebars and ingots at 12½@12¾c. Casting copper is quoted nominally for the week at 12¼@12½ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

The London market for standard copper has crumbled away from day to day, and the close is practically at the lowest, being cabled at £56 5s. for spot, and £57 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £59; best selected, £59 15s.@£60 5s.; strong sheets, £68@69 per ton.

Visible stocks of copper in England and France—including copper afloat from Australia and Chile—are reported at 243,308,800 lb. on May 15; a decrease of 3,561,600 lb. as compared with the May 1 report.

Exports of copper from New York and Philadelphia for the week were 3228 long tons. Our special correspondent gives the exports from Baltimore at 2967 tons.

Tin—The London market retained its firm undertone throughout the week. Transactions, however, decreased considerably and the absence of American demand was manifest. The close is cabled as strong at £151 5s. for spot, and £152 12s. 6d. for three months.

While the buying in the domestic market has subsided, the smaller shipments during the present month to the United States tend to keep prices firm, and a premium is again asked for spot shipments of tin.

Messrs. Robertson & Bense report receipts of tin ore and concentrates from Bolivia at Hamburg, Germany, in April at 752 metric tons.

Lead—At the beginning of the week, prices eased off somewhat more, but toward the close prices hardened slightly under the impetus of a better demand and the market is quoted at 4.27½@4.32½c. New York, and 4.12½@4.15c. St. Louis.

The London market is somewhat higher, the close being cabled at £12 12s. 6d. for Spanish and £12 15s. for English.

Spelter—The advance has made further progress. The smelters are disinclined to sell since ore is not coming out freely on the basis of the lower prices recently established. The output in the Joplin district as a result has shown a falling off. Under relatively small transactions, prices have advanced from day to day, the close being steady at 5.12½@5.17½c. St. Louis, and 5.27½@5.32½c. New York.

Spelter quotations in New York, May 12, were 5.15@5.20c.; May 13, 5.17½@5.22½c.; May 14, 5.20@5.25c.; May 16, 5.22½@5.27½c.; May 17 and 18, 5.27½@5.32½ cents.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Business is good, with a steady demand and plenty of inquiries. Current quotations are 23¾@24c. per lb. for No. 1 ingots in large lots, New York. The market abroad continues strong, with an upward tendency.

Imports of aluminum into the United States during the 12 months ended Dec. 31, 1909, were 5,109,843 lb., valued at $745,963; an average of 14.6c. per pound.

Antimony—The market remains extremely dull, and in the absence of business prices are nominally unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—Spot stock in New York is exhausted, and no sales can be made until supplies on the way from California arrive. Prices, however, are unchanged at $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for small lots. San Francisco, $47.50@48 for domestic orders, and $2 less for export. The London price is £9 per flask; with £8 17s. 6d. quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio.

German Metal Trade

Imports and exports of metals other than iron, in the German Empire, for the three months ended March 31, were, in metric tons:

	Imports.	Exports.	Excess.	
Copper..........	48,444	17,718	Imp.	30,726
Copper, 1909...	39,122	15,298	Imp.	23,824
Tin.....	3,552	2,484	Imp.	1,068
Tin, 1909.......	3,301	1,610	Imp.	1,691
Lead.............	13,320	9,027	Imp.	4,293
Lead, 1909......	16,930	7,677	Imp.	9,253
Zinc...............	8,763	24,913	Exp.	16,150
Zinc, 1909......	7,310	23,549	Exp.	16,239
Nickel............	1,251	293	Imp.	958
Nickel, 1909....	380	504	Exp.	124
Aluminum.......	2,132	452	Imp.	1,682
Aluminum, '09.	1,388	410	Imp.	978
Miscellaneous....	374	2,967	Exp.	2,593
Miscellan's, '09	331	2,399	Exp.	2,068

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the year were, in metric tons:

Ores:	Imports.	Exports.	Excess.	
Gold ore.......	6	....	Imp.	6
Gold ore, 1909	23	....	Imp.	23
Silver ore......	296	....	Imp.	296
Silver ore, '09	372	....	Imp.	372
Copper ore....	4,540	5,602	Exp.	1,042
Copp'r ore,'09	3,757	1,819	Imp.	1,938
Tin ore........	3,892	63	Imp.	3,829
Tin ore, 1909.	2,779	4	Imp.	2,775
Lead ore......	23,751	263	Imp.	23,488
Lead ore, '09	25,424	430	Imp.	24,994
Zinc ore.......	45,266	12,263	Imp.	33,003
Zinc ore, 1909	36,855	6,702	Imp.	30,153
Nickel ore	62	....	Imp.	62
Nickel ore,'09	2,027	....	Imp.	2,027
Chrome ore....	7,135	69	Imp.	7,066
Ch'me ore '09	6,474	21	Imp.	6,453
Pyrites	125,255	3,225	Imp.	122,030
Pyrites, 1909.	108,123	2,396	Imp.	105,727
Miscellaneous.	1,260	192	Imp.	1,068
Mis., 1909....	1,038	103	Imp.	935

Miscellaneous ores include tungsten, molybdenum and other ores of the minor metals.

Zinc and Lead Ore Markets

Platteville, Wis., May 14—The highest price paid this week for zinc ore was $39 per ton. The base price, 60 per cent. zinc, was $38@39. The base price of lead ore was $48@49 per ton.

SHIPMENTS, WEEK ENDED MAY 14.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	1,104,900	55,000	....
Platteville	830,760	139,730	1,037,400
Highland	780,400	75,000	....
Cuba City	346,051	....	....
Galena	330,440	....	....
Rewey	87,000	....	....
Shullsburg	....	160,000	....
Total	3,479,551	429,730	1,037,400
Year to date	30,989,426	2,250,169	6,115,490

In addition to the above there was shipped during last two weeks to the separating plants, 6,242,203 lb. zinc concentrates.

Joplin, Mo., May 14—The highest price paid for zinc sulphide ore was $43, the base being $38@41 per ton of 60 per cent. zinc. The high price for zinc silicate ore was $28, the base being $20@23 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $37.64 per ton. The highest offering for lead ore was $48 for ores of 80 per cent. lead or better, with deductions on ore grading lower. Some lead was shipped this week on last week's price of $49, and the average, all grades, was $48 per ton.

The sharp advance in zinc-ore prices prevented a number of mining companies from joining the movement to close down their mills, inaugurated two weeks ago. None of the mills closed down, however, have been restarted.

SHIPMENTS, WEEK ENDED MAY 14.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,119,760	1,187,200	$108,828
Joplin	1,530,460	185,450	35,825
Alba-Neck	914,330	4,280	19,297
Duenweg	383,770	77,310	8,852
Spurgeon	383,720	86,270	7,346
Aurora	274,150	52,310	6,600
Granby	409,200	22,680	6,215
Miami	435,370	66,000	5,937
Galena	246,390	64,580	5,772
Carthage	252,980	10,140	5,544
Carl Junction	193,830	......	4,070
Oronogo	97,250	87,410	3,636
Sarcoxie	163,230	......	3,182
Badger	119,200	......	2,438
Cave Springs	108,750	5,860	2,254
Quapaw	57,620	......	1,037
Totals	9,690,010	1,849,490	$226,833
20 weeks	218,942,560	33,110,860	$5,319,902

Zinc value, the week, $182,399; 20 weeks, $4,445,000
Lead value, the week, 44,434; 20 weeks, 874,902

MONTHLY AVERAGE PRICES

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, May 18—The general market remains quiet, with only a moderate business coming in.

Copper Sulphate—Business has been steady and prices are unchanged at $4 per 100 lb. for carload lots and $4.25 for smaller orders.

Arsenic—Prices are a shade off, at $2.40@2.45 per 100 lb. for white arsenic. Sales continue to be light.

Nitrate of Soda—Sales are moderate, as usual at this season. This article is quoted at 2.15c. per lb. for spot lots, while 2.05c. per lb. is named for futures.

Potash Salts—The German Reichstag on May 11 passed a bill providing that all companies mining potash salts must limit their production to the allotments made to each mine by the official Kali-Syndikat. The penalty is a tax of 16 marks—$3.81—per 100 kg. on all production in excess of the allotment. The bill was passed notwithstanding a protest from the mines controlled by American interests. The anticipation of some action of this kind was doubtless the cause of the extraordinary exports to the United States in the first quarter of the year, as shown in the statement published last week.

Petroleum

Production of petroleum from Midcontinent and Gulf Coast fields in April, reported by *Oil Investors' Journal*, in barrels of 42 gal. each:

	Production.	Shipments.
Oklahoma	4,576,164	4,002,165
Southeast Texas	597,606	1,111,619
Louisiana	319,313	287,366

Stocks of Oklahoma oil on May 1 were 55,766,422 bbl. Texas shipments again largely exceeded production for the month. New wells reported in Oklahoma in April, 348 oil and 14 gas; Southeast Texas, 79 oil and 3 gas; Louisiana, 13 oil wells.

MINING STOCKS

New York, May 18—The general stock market has been on the whole rather stronger than last week, but rather dull; the volume of business has been less, and there has been little interest shown in trading. The market may be characterized as dull, but not especially weak.

On the Curb trading in copper stocks was inclined to be slow. Prices were variable, some issues advancing and others declining. The market, indeed, was without special interest. Cobalt issues were more active, and prices were pretty well held. Other mining issues were dull.

In the Ohio suits against Hocking Valley the court has appointed receivers for the company. This will prevent for the present the transfer of the road to the Chesapeake & Ohio control.

Boston, May 17—Copper shares generally have been inclined to dullness, but there have been no marked declines in price. The exception to the general

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	February.	March.	April.
Arizona, Ltd	2,658,000	2,886,000	2,340,000
Balaklala	989,102	1,263,733	1,109,311
Boleo (Mexico)	2,331,832	2,148,383	2,777,800
Copper Queen	8,927,203	10,809,488	9,920,000
Calumet & Ariz	2,024,000	2,820,000	... .
Cananea (Mexico)	3,586,000	3,700,000	4,262,000
Detroit	1,486,400	1,698,975	1,930,000
Imperial	750,000	825,000	800,000
Nevada Con. (Est.)	5,115,723	5,339,466	5,500 000
Old Dominion	2,035,000	2,674,000	2,325,000
Shannon	1,526,000	1,468,000	1,288,000
Superior & Pitts	1,864,000	2,370,000	... .
Utah Copper Co	5,913,465	7,853,288	....
Butte District	13,758,620	24,000,000	25,000,000
Lake Superior	18,250,000	19,250,000	11,250,000
Total production	71,099,622	89,366,867	....
Imports, bars, etc.	14,093,381	20,178,202	....
Imp. in ore & matte	6,063,764	6,181,476	....
Total	91,256,767	115,726,545	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
V, 1909	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369.518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31,332,403
	Visible Stocks.		
	United States.	Europe.	Total.
V, 1909	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338 392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

rule was Isle Royale, which was strong and active on reports of an important strike on the 500-ft. level. A gain of $2.25 was recorded today, with little disposition to sell. North Butte also had a small advance. Indiana was in some request. Calumet & Arizona was off again today, closing weak.

The Quincy dividend for the quarter is $1.25, which is 25c. less than that declared three months ago, but 25c. more than a year ago.

Trading on the Curb was not very active. While there was no special pressure to sell, prices today were a little lower for most stocks. Chino was prominent, and there was fair trading in Davis-Daly, but both showed fractional losses. All of the declines were small, however, and a few stocks held their own.

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	May 31	June 21	$0.10
Blue Bell, Idaho	Mar. 14	June 1	0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Bullion, Nev	May 8	June 6	0.05
Columbus Con., Utah	....	May 11	0.25
Con. Imperial, Nev	Apr. 19	May 12	0.01
Con. Virginia, Nev.	May 9	June 3	0.20
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal	May 10	....	1.25
Hector, Idaho	Mar. 28	May 26	0.00¼
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	......	2.50
Mexican, Nev	May 17	June 9	0.15
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich	Mar. 10	....	1.00
Ophir, Nev	Apr. 22	May 16	0.25
Overman, Nev	Apr. 6	Apr. 27	0.10
Savage, Nev	May 2	May 27	0.10
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr 30	0.02
Ton. North Star	Apr. 21	....	0.03
Utah, Nev	Apr. 22	May 3	0.05
Utan Con. of Tintic, Utah	May 15	... .	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	......	24.343	......
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56[illegible]	12.733	12.93[illegible]	13.091	57.363	57.238
May	12.893	......	13.238	......	59.338	......
June	13.214	......	13.518	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.790	......	13.690	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.2[illegible]	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32.403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	......	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS May 17

Name of Comp.	Bid.
Listed:	
Acacia	.05¾
Cripple Cr'k Con.	.02½
C. K. & N.	.11
Doctor Jack Pot.	.08
Elkton Con.	.70
El Paso	.79½
Fannie Rawlins.	.01¼
Findlay	.07¼
Gold Dollar.	.12¼
Gold Sovereign.	.03
Isabella	.16½
Mary McKinney.	.48
Pharmacist.	.02
Portland	1.05
Vindicator	.78
Work	.03
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.07

SALT LAKE May 17

Name of Comp.	Clg.
Carisa	.47
Colorado Mining.	.65
Columbus Con.	‡.47
Daly Judge	3.95
Grand Central	1.30
Iron Blossom	.99
Little Bell	1.25
Little Chief	‡.45
Lower Mammoth.	.17
Mason Valley	7.00
Maj. Mines	‡2.32½
May Day	.05
Nevada Hills	.66
New York	.13
Prince Con	.71
Red Warrior	‡6.00
Silver King Coal'n	2.30
Sioux Con	.30½
Uncle Sam	.33
Victoria	‡1.07½

SAN FRANCISCO. May 17.

Namo of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.12	Belmont	3.82
Belcher	.56	Daisy	.06
Best & Belcher	.25	Jim Butler	.27
Caledonia	.48	MacNamara	.31
Challenge Con	.26	Midway	.29
Chollar	.12	North Star	.11
Confidence	.90	West End Con	.52
Con. Cal. & Va.	1.20	Atlanta	.12
Crown Point	.89	Booth	.13
Exchequer	.22	C.O.D. Con	.06
Gould & Curry	.26	Columbia Mt.	.04
Hale & Norcross	.36	Comb. Frac.	.51
Mexican	1.12	Great Bend	.03
Ophir	1.30	Jumbo Extension	.23
Overman	.96	Oro	.06
Potosi	.30	Red Hill	.04
Savage	.35	Sandstorm	.03
Sierra Nevada	.26	Silver Pick	.08
Union	.24	St. Ives	.10
Yellow Jacket	.82	Tramps Con	.05

N. Y. EXCH. May 17

Name of Comp.	Clg.
Amalgamated	70⅜
Am. Agri. Chem.	‡46
Am.Sm.&Ref.,com	79½
Am. Sm. & Ref., pf.	87¼
Anaconda	43¾
Bethlehem Steel	‡30
Col. & Hock. C. & I.	7⅜
Colo. Fuel & Iron.	38
Du Pont P'd'r, pf.	87½
Federal M. & S.	‡41
Great Nor., ore ctf.	63
Nat'nalLead,com.	77¾
National Lead, pf.	109
Nev. Consol	20⅞
Pittsburg Coal	‡19¼
Republic I&S,com.	33⅝
Republic I & S, pf.	97½
SlossSheffi'd,com.	‡73½
Sloss Sheffield, pf.	‡117½
Tennessee Copper	27½
Utah Copper	46¼
U. S. Steel, com.	82¾
U. S. Steel, pf.	118
Va. Car. Chem.	59¾

N. Y. CURB May 17

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	17½
Braden Copper	4¼
B. C. Copper	6⅜
Buffalo Mines	2½
Butte Coalition	20½
Caledonia	1 5/16
Chino	12¾
Cobalt Central	.08
Cobalt Prov.	56
Con. Ariz. Sm.	2 5/16
Cumberland Ely.	9
Davis-Daly	2⅛
Dominion Cop.	‡7
Ely Con	.50
El Rayo	3⅛
Florence	‡3⅛
Gila Copper	6¼
Giroux	7¾
Gold Hill	1⅛
Goldfield Con	8½
Greene Cananea.	8½
Guanajuato	‡1⅜
Guggen. Exp	185
Kerr Lake	.08 13/16
La Rose	4 9/16
McKinley-Dar-Sa.	.91
Miami Copper	21⅞
Mines Co. of Am.	54
Mont. Shoshone.	‡⅞
Mont.-Tonopah	‡.70
Nev. Utah M. & S.	1
Newhouse M. & S.	3½
Nipissing Mines.	10 7/16
Ohio Copper	3 1/16
Pacific Sm. & M.	⅝
Ray Central	2½
Silver Queen	‡.12
Standard Oil	630
Stewart	13/16
Tonopah	8⅛
Tonopah Ex	1.08
Tri-Bullion	11/16
W. Va. Wyo. Cop.	‡2 1/16
Yukon Gold	4 7/16

LONDON May 18

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	11	0
Esperanza	2	19	6
Tomboy	0	18	9
El Oro	1	7	3
Oroville	0	8	9
Mexico Mines	8	11	3

BOSTON EXCH. May 17

Name of Comp.	Clg.
Adventure	6⅝
Allouez	43
Am. Zinc	‡25½
Arcadian	6
Arizona Com	15½
Atlantic	7
Boston Con	15
Butte & Balak	12¼
Calumet & Ariz.	63
Calumet & Hecla.	580
Centennial	17½
Con. Mercur	.10
Copper Range	67
Daly-West	8⅝
East Butte	8¾
Franklin	13⅛
Granby	42
Hancock	20½
Helvetia	‡2¾
Indiana	21⅝
Isle Royale	22
Keweenaw	3⅞
Lake	55
La Salle	13¼
Mass	6½
Michigan	5
Mohawk	51
Nevada	20⅞
North Butte	33¾
North Lake	12¾
Ojibway	7¾
Old Dominion	37½
Osceola	136
Parrot	15
Quincy	77½
Shannon	11¾
Superior	41½
Superior & Bost.	11¼
Superior & Pitts.	12¼
Tamarack	52
Trinity	6
U. S. Smg. & Ref.	43
U.S.Sm. & Re., pd.	49⅞
Utah Apex	3⅛
Utah Con	24
Victoria	3
Winona	8½
Wolverine	120
Wyandotte	1⅞

BOSTON CURB May 17

Name of Comp.	Clg.
Ahmeek	170
Bingham Mines.	3
Boston Ely	2⅝
Boswyocolo	.08½
Cactus	3¼
Calaveras	5⅜
Champion	.08
Chemung	9
Chief Cons	1¾
Cons. Ariz	2¼
Corbin	.08⅝
Crown Reserve	3
First Nat. Cop.	4⅛
Indiana	21⅝
Inspiration	7¼
Mackinaw	.14
Majestic	.66
Nat'l Mine	.31
Nevada-Douglas.	2
New Baltic	8
Oneco	3¼
Raven Copper	.34
Ray Con	18¾
Rhode Island Coal	8⅛
San Antonio	7¾
Shattuck-Ariz	30⅝
South Lake	5¾
Superior & Globe.	.40
Trethewey	1⅞
Tuolumne Copper	3⅝
Vulture	9⅜
Yuma	.55

‡Last quotation.

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The Outlook for Spelter

The price for spelter has recovered a little from its slump in the early part of this month, but it does not appear as if any great thing in the way of a rise were to be expected in the near future. In 1909 the smelters made a production that was far in excess of actual consumption, the eager buying that occurred in the second half of the year and the sharp rise in price being due to misconception of the conditions. For this error the penalty had to be paid. It is now known more accurately how the industry stands.

Consumption of spelter is large, but the manufacturers of finished products having been in an overbought condition, they have not lately had to make any urgent purchases. In other words, the demand for spelter has lately been slack. On the other hand, the supply has been abundant.

It does not look as if there would be any dearth in the supply, because with a price for spelter in the neighborhood of 5.50c., St. Louis, all of the older zinc-mining districts of the United States appear to be able to maintain their production and new ones are coming in. Of the latter, the most important is Butte, Mont., which promises in the near future to furnish the ore equivalent of 40,000 tons of spelter per annum, or about 16 per cent. of the present rate of consumption, and there is not much question about the ability of the Butte mines to make that production at the present price for spelter. The smelters of Oklahoma, especially, have been making plans to take this new ore supply. Certain works that heretofore have bought some calamine are now providing full roasting capacity and will probably retire from the market for oxidized ore.

The spelter market is characterized by sharp ups and downs. If it should settle for a while at 5¼ to 5½c., producers might as well make up their minds to be satisfied. The tariff imposed last year on zinc ore has failed to create a permanent artificial level of prices, chiefly because of the new domestic supply of ore. The tariff is, however, an irritation to those smelters whose roasting capacity is deficient, or whose gas supply is short, inasmuch as there is no longer the old freedom in obtaining calamine ores.

Arizona-Morenci Copper Company

This company, with a capital of $10,000,000, divided into 1,000,000 preferred shares of $5 each, and 1,000,000 common shares of $5 each, is being promoted in London for sale of 500,000 preferred shares of treasury stock at 21s. per share. Out of the proceeds from these shares, which are being offered by the Clifton-Morenci Syndicate, Ltd., the company will be provided with funds for the construction of the plant referred to in the prospectus and for working capital. The directors of the Arizona-Morenci Copper Company include Ex-Senators J. B. McCreary, J. P. Jones and S. W. Dorsey, besides several former Government officials.

According to the prospectus, the company "owns over 2000 acres in the recognized and proved copper-bearing zone of the Clifton-Morenci district of Arizona." As to ore developments, it is said: "On the properties belonging to the company, the surface condition, outcrops and geological features are exactly the same as those on the other mines of the district, and the underground workings show similar indications. From most of these claims ore has been taken from near the surface where it was easily obtained. These workings, in conjunction with the later developments, point to the existence of enormous orebodies below. The openings show oxide and carbonate ores at or near the surface, and in the lower levels the underlying sulphides typical of the district. The surface enriched oxidized ores can be relied upon to furnish an average of 7 per cent. copper or better, and the sulphides 2½ to 4 per cent. Most of the mines were worked only for the high-grade oxides of 10 to 12 per cent. copper, which led to a most irregular development of the orebodies. Consequently, any exact estimate of ore as blocked out is not practicable, but the amount of ore available is estimated, on a most conservative basis, at over 2,000,000 tons at present."

However, the company apparently does not consider it necessary to develop its orebodies so as to make an exact estimate practicable, inasmuch as it proceeds to outline its plans for concentrating mill of 2000 tons daily capacity and smelting works of 1000 tons daily capacity. Prospective investors are then given an estimate that a smeltery of 1000 tons daily capacity should yield conservatively 24,000,000 lb. of copper per annum at a cost of 8½c. per lb., delivered at New York. A table beginning at 13½c. for copper, and running up to 20c. per lb., shows the average profit to be expected, and it is stated in black letters that "by increasing the daily output to 2000 tons smelted, these earnings would be doubled." Finally, a table shows the beautiful dividends that have been paid by Calumet & Hecla, Boston & Montana, Anaconda, United Verde, *et al.*

It is stated that the properties of the company have been subjected to very careful examinations by four engineers of Clifton, Ariz., and two of New York, but nothing specific as to their reports is repeated in the advertisement before us.

The Arizona-Morenci Copper Company appears to be the successor of the Copper Mines of Arizona, Ltd., which issued a prospectus in 1909. The earlier prospectus also referred to the reports of a list of engineers, but included only that of J. O. Baylor, of Clifton, Ariz., who is entitled "assistant engineer, the Copper Mines Company of Arizona, Ltd." Mr. Baylor talks about elegant assays, early shipments, shows of copper ore, extension of proved orebodies of which there is no reasonable doubt, admirable tunnel sites, etc., with a cheerful vagueness, but he fails to mention any blocks of ore that may be regarded as proved. Mr. Baylor's report was of July 9, 1909.

The Cost of Butte Copper

The Anaconda and Boston & Montana companies have made their reports for 1909, which give more information about their operations than for several years previous. It appears that in 1909 the Boston & Montana produced 101,951,350 lb. of copper, 1,882,046 oz. of silver, and 11,769 oz. of gold, at a cost of $10,778,503. It is not a sound method of figuring to deduct gold and silver proceeds from expense of production as basis for estimating the copper cost; but this method is common, and following it in this case, reckoning the silver at the average price for the year and the gold at $20.50 per oz., it appears that the copper cost was 9.38c. per pound.

Anaconda produced 76,335,433 lb. of copper, 2,363,184 oz. of silver, and 7466 oz. of gold, at a cost of $9,820,897. Reckoning in the same way as in the previous case, the copper cost was 11.07c.

Incidentally, it is worth while to remark that the Boston & Montana is the largest single producer of copper in the world. The Anaconda divides honors with the Copper Queen, Calumet & Hecla and Utah, the annual output of each ranging from 75,000,000 to 100,000,000 lb. per annum.

The Boston & Montana and Anaconda reports do not permit any minute analysis. However, we have believed for a long time that these companies report all of their costs, allowing liberally for depreciation of plant and equipment and abstaining from deferring charges on development accounts. In the Anaconda report for 1909, this is certified by the outside auditors. In other words, the figures reported represent the real operating cost, rather than what may be fancied. The only other charge remaining to be considered is that which is due for amortization of capital.

It will be useful if those who are considering that copper may break below 12c. will think of these two great companies, whose combined output of 178,000,000 lb. of copper in 1909 cost upward of 10c. per lb. without regard to the enormous capital invested in them and the necessity for obtaining not only a satisfactory interest upon that capital, but also a redemption of the principle.

The Director of the Bureau of Mines

Last week, and elsewhere in this issue, our Washington correspondent has referred to the discussion respecting the forthcoming appointment of a director for the new bureau of mines. The names of several candidates have been mentioned. Among these there seems to be one perfectly logical appointment, viz: Dr. J. A. Holmes.

Doctor Holmes is at present the head of the Technologic Branch of the U. S. Geological Survey, which will be the nucleus of the new bureau. The work of the latter for a long time will be chiefly on the present lines, and consequently it is desirable that it should be continued under a head familiar with the plans. The directorship of a bureau like this is something that calls especially for administrative capacity. As chief of the Department of Mining and Metallurgy at the World's Fair, at St. Louis, Doctor Holmes showed that he possessed such capacity to a remarkable degree, and to that capacity and the spirit of diplomacy that beneficially accompanies it were due the absence of friction and general success in the management of that department.

The future of the new bureau of mines will depend greatly upon the formulation of its early policy. As the sapling is bent, so will the tree grow. We believe that Doctor Holmes has sound ideas and that in his hands the bureau will not introduce the dangers that many persons prominent in the mining industry have feared, and that on the contrary the work of the bureau will be developed upon broad, helpful lines.

If the President decides to appoint Doctor Holmes for this position, his choice will meet with the approval of the mining-engineering profession.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Single and Five Stamp Batteries

I notice in the JOURNAL of May 14, 1910, some comments upon the order of drop for five-stamp batteries and that Mr. Warren considered the five-stamp batteries obsolete. There is no doubt but that the question of the preference of the single or the five-stamp battery is a serious one and cannot be too lightly considered. Few engineers have given the question the consideration it deserves.

SINGLE UNIT MILLS FOR ORE NOT REQUIRING AMALGAMATION

Surely if there is any advantage to be derived from the single-unit mills, the ores at Cobalt are ideal for this style of mill. The main feature being concentration the single unit will crush a better concentration product, that is, less slimed material and at a less cost per ton than the larger unit. A 1500- or 1600-lb. single-unit mill arranged in series of two or three in a set would be most suitable for that class of ore. Having individual feeders for each stamp, to be able to employ the same help as for the larger-unit mills, advantage should be taken of any appliances where labor can be saved. For this reason the feeders should be worked by a grip feed instead of the usual pawl feed and the guides should be of the removable shell type. Neither this grip feed nor the guides have bolts, which ordinarily take up much of the millman's time.

For any class of ore that does not require amalgamation or cyanidation there is no doubt that the single-unit mills are more economical. When amalgamation becomes important great care must be taken in the choice of batteries; just as great care must be taken in the design of the mortar. For the sake of amalgamation efficiency the California millman prefers the sequence of drop 1 4 2 3 5, knowing that this gives a more regular wave but not necessarily as great a crushing capacity as 1 3 5 2 4.

The Western States are strewn with wrecks of single-unit mills where it was fondly imagined that amalgamation with these mills would give a result somewhere near that obtained by the usual tests. Those who have tried amalgamating with these mills know the difficulties and seldom care to duplicate the experience. When a cyanide plant follows the mill the preference is one that must be worked out by thorough tests. If the cyanide process includes a slime plant the single-unit mills with regrinding machinery may be the most economical.

HISTORY OF MANY MILLS

The operator often finds himself in a position where the scarcity of financial resources is at variance with good engineering practice. He cannot afford a trial mill so takes a mill that crushes at the least expense—the single unit. He now finds a cyanide attachment necessary so he erects a sand plant and allows the slime to go to waste. He now finds the slime must be treated, hence a slime plant. There seems no end to the expenses; his backers object and there the project stands. It might have been better to have erected a couple of five-stamp batteries, amalgamated as closely as possible, and to have allowed the sands to accumulate for future treatment. This is the history of many mills of which I am personally cognizant.

As a rule the ores of California yield an economical percentage of gold by amalgamation and concentration without a cyanide plant and amalgamation being the basis of the process would suffer by the use of the single-unit mills; in fact the policy of their general use would be out of the question. There are a few mills, to my knowledge, in California doing better work with the single-unit type; but there are many that have been discarded for the five-stamp batteries.

The future of the stamp mill appears to be heavy single-unit mills between 1500 and 1800 lb. and moderately heavy five-stamp batteries with stamps weighing about 1050 lb., the former to be used where crushing is the object in view, the latter where crushing and amalgamation go on simultaneously.

ALGERNON DEL MAR.
Los Angeles, May 20, 1910.

Fifth Annual Report of Utah Copper Company

Referring to the analysis of the fifth annual report of the Utah Copper Company in the JOURNAL of May 7, page 949, there is one feature which Mr. Moore neglected to point out, although, doubtless, he was aware of it. In calculating the smelting deduction on copper he shows that it was exactly 5 per cent. of the gross contents, and that the concentrates averaged 26 per cent. copper. From this it appears likely that the deduction was not on the basis of 5 per cent. of the contents, but is the old Welsh allowance of 1.3 units.

It may also be of interest to attempt to split up Mr. Moore's figure for "freight, refining, and selling" of the Utah Copper Company for 1908, viz., 1.328c. per lb. The freight itself was probably about $10.74 per ton of 2000 lb. on 98.5-per cent. material, or 0.529c. per lb. fine copper. If the selling expenses were 1 per cent. of the returns, on the JOURNAL price per lb. for 1909, they would be 0.132c. per lb. fine copper. Deducting the sum of these items from 1.328c. per lb., would give 0.667c. per lb., or on 98.5-per cent. material, $13.14 per ton. We might surmise then, that the toll for 1908 was about $13 per ton of bullion, beside which there would probably be some gold allowances. Or, if the selling expenses were only ½ per cent., then the toll was 0.733c. per lb. fine copper, or on 98.5-per cent. material, $14.48 per ton: In even figures, $14.50, which appears the more likely supposition.

DONALD M. LIDDELL.
Grasselli, Ind., May 20, 1910.

Loss of Copper in Slag

I wish to call the attention of the copper smelters to a fact that is frequently overlooked in considering the reasons for the loss of copper in slag. It is generally assumed that the greater the tenor of copper in the matte, the greater will be the tenor in the slag, but this is not the only explanation for slag losses. If we have two furnaces running with the same quantity of coke, and making slags of similar composition and mattes of the same tenor in copper we can have nevertheless, different losses of copper in the slags. I consider that the percentage of copper in the furnace charge causes this. We have, e.g., in Chile two smelteries which are running mattes containing 50 per cent. copper, but one making slags containing 0.3 per cent. copper, and the other 0.6 per cent. The blast-furnace charges at the first contain 3.5 per cent. copper, and at the second 10 per cent. copper. Another smeltery is running 40 per cent. copper mattes and 1 per cent. slags where the blast-furnace charge assays 18 per cent. copper.

I have obtained the following formulas for calculating the percentage of copper lost in slag: Assuming 100 parts of furnace charge, if the weight of slag is x, then the weight of matte is $90—x$, (considering the weight of gases, SO_2, SO_3, CO_2 and H_2O to be 10 per cent). If the percentage of copper in the charge is p_{ch}, the per cent. in the matte p_m and the per cent. in the slag p_s, we can say that the copper in the charge equals the copper in the matte and slag, dust not being considered. This gives

$$x \cdot \frac{p_s}{100} + (90 - x)\frac{p_m}{100} = 100\ p_{ch}$$

or

$$x = \frac{90\ p_m - 100\ p_{ch}}{p_m - p_s}$$

and the weight of matte,

$$(90 - x) = \frac{100\ p_{ch} - 90\ p_s}{p_m - p_s}$$

The efficiency of smelting is,

$$E = \frac{Cu\,m}{Cu\,ch}$$

or

$$E = \frac{p_m}{10\ p_{ch}} \cdot \frac{9\ p_m - 10\ p_{ch}}{p_m - p_s}.$$

The loss is,

$$1 - E = L = \frac{p_s}{10\ p_{ch}}\ \frac{9\ p_m - 10\ p_{ch}}{p_m - p_s}.$$

With the above formula I can determine the percentage of copper loss. I cite the following examples to illustrate the application of the formula:

CALCULATION OF COPPER LOSS.

	Per Cent. Cu. Lost.
Slag 0.4%, and Matte 50% Cu.	
Furnace charge containing 4% Cu.	8.3
Furnace charge containing 8% Cu.	3.7
Furnace charge containing 20% Cu.	1.0
Slag 0.6%, and Matte 50% Cu.	
Furnace charge containing 4% Cu.	12.4
Furnace charge containing 8% Cu.	5.5
Furnace charge containing 20% Cu.	2.0
Slag 0.4%, and Matte 30% Cu.	
Furnace charge containing 4% Cu.	7.7
Furnace charge containing 8% Cu.	3.2
Furnace charge containing 20% Cu.	0.5
Slag 0.6%, and Matte 30% Cu.	
Furnace charge containing 4% Cu.	11.7
Furnace charge containing 8% Cu.	4.8
Furnace charge containing 20% Cu.	0.7

From the above it is evident that tenor of copper in the matte is not the only factor to be considered in reckoning the percentage of copper lost in slag.

F. A. SUNDT.

Casilla 1807, Santiago, Chile, S. A. April 2, 1910.

More Anaconda Listed

The application of Anaconda for the listing of $75,500,000 additional stock, issued in connection with the absorption of Amalgamated, was granted May 20 by the New York Stock Exchange. All the subsidiaries of Amalgamated which receive Anaconda shares in exchange for their properties and plants pledged themselves not to dispose of these shares until a distribution is brought about by dissolution proceedings, and Amalgamated agreed not to dispose of 1,425,862 shares out of the 2,425,862 shares it will receive without giving 30 days' notice to the Stock Exchange. This is in compliance with the rule of the Exchange for preventing the officers of a corporation from speculating in the stock of subsidiary companies.

Johannesburg Notes

SPECIAL CORRESPONDENCE

The work of developing the far-eastern portion of the Witwatersrand goldfield is being taken seriously in hand. In this region, known as the East Rand basin, the beds dip at a very flat angle over an area about 10 miles square. The Geduld Proprietary is mining from shafts from 1000 to 2000 ft. deep. At from 3000 to 4000 ft. the Brakpan mines have to date opened up 900,000 tons of payable ore on a capital expenditure of about £450,000 for mining work. Where the reef lies at a shallower depth and outcrops, it has long been mined in the New Kleinfontein, Van Ryn and New Modderfontein mines: The Van Ryn Reef and Apex mines are now developing on the dip of these mines. Further south the Rand Collieries and Van Dyk mines are also developing and to the East on the Grootvlei, Welgedacht and Springs shaft sinking has been started. In a few years this section will add largely to the output of the Rand.

MARRIOTT COST SCHEME NOT GENERALLY ADOPTED

Discussion is still active over the merits and demerits of the new scheme of comparing working costs proposed by Mr. Marriott. It is not considered likely that the scheme will be generally adopted outside of the Rand Mines, Ltd., and other mines controlled by Messrs. Eckstein, and even there it will probably be only partially adopted.

EXTENSIVE DEVELOPMENT FAVORED

The total ore reserves of all the Witwatersrand mines are estimated at about 70,000,000 tons. In this district few drives require timbering and therefore the maintenance of ore reserves and extra development is a trifling matter. It is also considered that the loss of interest on money locked up and spent in excess development is warranted by the continuity of output and ease and cheapness in working thus guaranteed. For these reasons the practice of having large ore reserves is growing in favor on the Rand. The East Rand Proprietary mines are spending nearly a million pounds in excess development to enable the hastening of better schemes of working and ventilation. In many other mining fields, however, excess development becomes unremunerative, owing to the expense and difficulty of keeping development work timbered and secure.

INVESTIGATION OF IRON RESOURCES

The usual agitation to establish an iron and steel industry in a new country before the time is ripe has lately been in evidence in the Transvaal. Statements were made about enormous bodies of excellent iron ore, fluxes, and coal being available, but the troubles that have overtaken the attempt to smelt iron ore in New South Wales where conditions are much more favorable to the establishment of the industry, were never mentioned. The Government was induced to call for a report from Mr. Harbord, an English iron expert, and his report is now made public.

The report states that most of the accessible orebodies are silicious and would be expensive to smelt; most of the limestone also carries silica. It has not been proved that high-grade coke can be produced on a large scale cheaply from Transvaal coals or that electric power can be produced at a low enough cost to justify electric smelting. Mr. Harbord therefore recommends that further prospecting of the orebodies be carried out and that experiments be made in the production of high-grade coke. If this work shows favorable results and the government is prepared to take iron and steel for railways at a suitable price, he considers that an industry might be started on a small scale.

The Bureau of Mines' Head

SPECIAL CORRESPONDENCE

Pressure upon the President in behalf of the appointment of Dr. J. A. Holmes, now head of the Technologic Branch of the Geological Survey as chief of the newly created Bureau of Mines continues to be strong. An influential delegation which recently waited upon the Executive included in its numbers Senator Oliver, of Pennsylvania, Ex-Governor Fleming, of West Virginia, John H. Jones, of Pittsburg, Hugh Murray, of Illinois, Edward Orton, of Columbus, O., Thomas H. Johnson, consulting engineer of the Pennsylvania Lines west of Pittsburg, W. J. Richards and P. H. Nelson, of Philadelphia. President Taft has as yet definitely committed himself to no one, but has merely listened to the representations made him. There seems to be very strong indorsement for Doctor Holmes among the coal operators particularly. Some opposition to his appointment has, however, apparently developed in influential quarters in the Administration, and the chances of Doctor Holmes' selection will be improved if this can be definitely overcome or set at rest. Meanwhile, new candidates are developing their claims from day to day. The argument of Doctor Holmes' opponents is that the man to head the new bureau should be one not now in the Government service, preferably a mining engineer of experience, who has had his active career in private employment and is prepared to devote the results of his career to the Government service in developing the new bureau along original lines.

William Phipps Blake

Dr. William Phipps Blake, who for years past has been the dean and senior of American geologists, died at Berkeley, Cal., May 22. He had gone there to attend the anniversary exercises of the University of California, and caught a cold, which rapidly developed into pneumonia. He was 84 years old, having been born in New York in 1826, though he came from an old New England family. He graduated in 1852 from the Yale Scientific School, being a member of the first class in that school, then newly established, and since developed into the Sheffield Scientific School. Only two members of the class survive him.

He had devoted himself to the study of geology, and his first appointment after graduation was as geologist and mineralogist attached to the exploring expedition sent out to survey lines for a railroad to the Pacific Coast. After several years' work in the West and in California, he returned to New York and for two years was editor of the old *Mining Magazine,* then published in this city. In 1862 he went to Japan as geologist in the service of the Japanese government and remained there for two years. On his return to this country he was again employed by the United States, this time to make geological explorations in Alaska, then just acquired by the United States from Russia. He made an elaborate report later on the Stickeen river country and adjoining sections.

In 1865 Dr. Blake was made professor of geology and mineralogy in the College of California, now the University, and held that position for several years, still continuing his work of exploration and geological study. He held several other public appointments, being geologist to the Santo Domingo Commission of 1871-2, and later one of the commissioners of the Centennial Exposition of 1876. He was also a member of several important exploring expeditions, and his reputation as a geologist, then well established, brought him constant work. He had made his home in New Haven, Conn., and always retained his residence there, but he spent a large part of his time in the Southwest, especially in Arizona, to which territory he became attached by many ties. In 1894 he was appointed director and professor of geology in the Arizona School of Mines at Tucson, and devoted much time to building up the school. He held the position for 11 years, becoming *emeritus* professor in 1905. In all those years he spent about half the year in Tucson and about half in New Haven, and he was also actively employed in exploration and consulting work. Advancing age seemed to have no effect upon his activity, and he was a student up to the last.

With all his active work, Professor Blake was a constant writer. He published several books, among them "Geological Reconnaissances in California," "Silver Ores and Silver Mines," "Ceramic Art and Glass" and "Mines of Arizona."

His contributions to scientific societies and the scientific press were numerous. He was for many years a frequent contributor to the ENGINEERING AND MINING JOURNAL; his last article appeared in the issue of Jan. 8, 1910. His command of geological and mining subjects, and his faculty of clear expression and vigorous writing made him always a welcome contributor. Personally, he had no mercy upon indolence or false pretense; but his genial and unaffected manner and his interest in his own and others' work made him friends everywhere.

He received many honors from colleges and societies, and was member of many associations. He was an active member of the American Institute of Mining Engineers and a frequent contributor to its *Transactions.* He was an active member of the American Philosophical Society and a fellow of the Royal Geographical Society of London.

Professor Blake was married in 1855 to Charlotte H. L. Hayes, of South Berwick, Me. His wife died some years ago. He leaves three sons, Francis H. Blake, of Litchfield, Conn., Dr. Joseph A. Blake and T. W. Blake, of New York.

Cement Production in 1909

The following preliminary estimate of the production of cement in the United States in the year 1909 has been prepared by Ernest F. Burchard, of the United States Geological Survey. As shown by the quantities reported by the various cement plants, the production of portland cement in 1909 was between 61,300,000 and 62,000,000 bbl., which, valued at 85c. per bbl., was worth at the mills between $52,105,000 and $52,700,000. This represents an increase in quantity of at least 10,227,000 bbl. over the production in 1908. The increase in quantity was at least 20 per cent. over that of 1908. The reported selling price per barrel averaged the same as in 1908.

The returns for natural cement indicate that the total production in 1909 was not far from 1,500,000 bbl., valued at about $675,000, an average value of 45c. per bbl. These figures show a slight decrease as compared with those for 1908, when the production was 1,686,000 barrels.

The production of puzzolan cement, as reported, shows a slight increase, about 160,646 bbl., valued at $99,453, having been produced in 1909, as compared with 151,451 bbl., valued at $95,468, in 1908.

Mohawk Mining Company

The Mohawk Mining Company, Mohawk, Mich., produced its copper at a total cost of 11.207c. per lb. in 1909, of which 10.22c. represented its cost at the mine. The summary of results is given in an accompanying table, and another table gives the segregated mining and treatment costs.

RESULTS AT MOHAWK IN 1909.

Rock hoisted	902,691 tons.
Rock stamped	819,019 tons.
Mineral produced	14,690,200 lb.
Yield of fine copper	11,248,474 lb.
Yield per ton of rock treated	13.73 lb.
Cost per ton of rock hoisted	$1.27
Cost per ton of rock stamped	$1.40
Cost per lb. refined copper at mine	10.22c.
Smelting, freight, marketing, office	0.875c.
Total cost per lb., refined copper	11.095c.
Total cost per lb., including construction	11.207c.
Average selling price per lb.	13.20c.

COSTS AT MOHAWK.

Underground expense	$739,994
Superintendence, freight on mineral, mine office and general	67,246
Rock house	53,349
Transportation	98,049
Stamping	157,401
No. 6 shaft	33,639
	$1,149,678

There were 968 ft. of shaft sinking, 12,723 ft. of drifting and 52,918 cu. fathoms of stoping done during the year. The average new openings showed no improvement in copper content. Under date of March 17, President Joseph E. Gay stated that the new shaft, No. 6, was at that date rapidly approaching the fifth mine level, and that the rock seemed to be above the average in grade. The company closed the year with a surplus of $508,291 after paying $300,000 in dividends.

Smelting in Bond

SPECIAL CORRESPONDENCE

Another delay has occurred in the formulation of the new smelting-in-bond regulations, which have been in course of preparation by the Treasury, and which are designed to carry into effect the smelting provisions of the Payne-Aldrich tariff. The delay has been due to dissatisfaction on the part of the smelting interests, to whom the regulations have been submitted. The smelting people have been able to enlist the powerful aid of Senator Aldrich, who has been frequently at the Treasury Department for the purpose of consulting with the authorities. The fact that the language of the tariff act is ambiguous and crude has hampered the Treasury in its effort to arrive at a decision, and has increased the disposition to listen to the arguments of the interests that will be affected by the regulations. New drafts of the regulations have followed one another in rapid succession. It is admitted that the smelting provisions of the tariff act are in need of drastic revision.

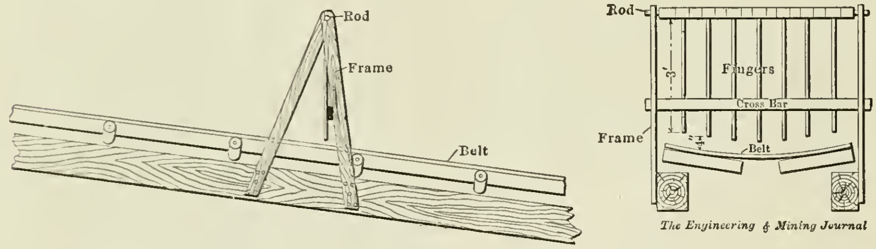
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Safety Device on Dredge Tailings Stacker

Where a long tailings stacker is required and a high bank must be carried, much trouble is caused by large rocks rolling back down the stacker belt. The Folsom No. 6 boat, of the Natomas Consolidated, of California, digs to a depth of 54 ft. below water line and carries a bank 30 ft. high. This necessitates an unusually long tailings stacker (150 ft.), and so much trouble was caused by large rocks rolling back down the stacker that an apparatus had to be devised to intercept them.

Uprights from either side of the stacker frame carry an iron rod on which are suspended a number of iron strips or fingers which are free to swing in the direction of belt travel, but cannot swing back on account of a lower crossbar against which they hang. The supporting frame is built heavy enough to sustain possible shocks. The fingers are made of strips of iron, about ½x2 in., bent about the axle rod and also so as to present their narrow faces to rocks. Rocks can pass up the belt under these traps but cannot force through from the upper side. The traps are set sufficiently close together so that rolling rocks will not acquire enough momentum to wreck one upon striking it.



The Engineering & Mining Journal

SAFETY DEVICE ON DREDGE TAILINGS STACKER

Cost of Concrete Battery Foundation

The literature on detail costs is scarce enough to warrant the following cost statement and description of a concrete battery foundation that was built for the Tanguay Mining and Milling Company at Idaho Springs, Colo. The foundation supports ten 1000-lb. stamps dropping 5 in. 108 times per minute. The base of the foundation is 5x16 ft. The top is 2 ft. 4 in. x 12 ft. and 8 ft. high. It contains 2 cu.yd. of rock and 14 cu.yd. of cement. The weight is approximately 62,000 pounds.

The mortars are held in place by 16 hold-down bolts 1½ in. x 5 ft., threaded 6 in. from the end and fitted with two nuts. The lower ends of the bolts were forged to take a 12-lb. rail. Four 13-ft. rails pass through the forged eye and connect all of the bolts, not only for the mortar but for the battery posts as well. The battery posts are held down by the bolts passing through special cast-iron angle irons. The upper 18 in. of each bolt is surrounded by 1½-in. pipe, which allows a slight springing of the bolts in case they do not line exactly with the holes in the mortar. A piece of soft rubber packing ⅛ inch thick was inserted between the mortar and the foundation.

The cost as given by J. H. Haynes (*West. Chem. and Met.*) was as follows: Labor, excavating, $32.30; labor, foundation, $68.30; bolts and castings, $50; cement, $33.70; lumber, $10; gravel, $30; and rock, $7.25; or $231.55 for the complete foundation.

A Blow Pipe Bead without Platinum Wire

A method of obtaining a blow-pipe bead without the use of the platinum wire is described by L. Kopa and B. Kőnig, in *Chem. Zeit.*, March 12, 1910, One end of a glass rod is heated in an alcohol flame and dipped into a thorough mixture of two parts by weight of powdered borax and one part of litharge. This end of the rod is then heated again, whereby an easily fusible bead of lead borate is formed. This is cooled off slightly, dipped into the substance to be examined, heated again and after thorough fusion cooled off. The bead will then show the characteristic color.

Wear of Diamonds in Drilling Various Rocks

The most important consideration affecting the wear of diamonds is the hardness of the minerals composing the rock. The next in importance is the cleavage of the minerals. Some minerals, like mica, are so easily cleaved, that it is difficult to scratch them without splitting off plates. Feldspar and the carbonates possess perfect cleavage, and that of hornblende is easy. Zoisite and epidote present more difficulty, while quartz, magnetite, and pyrite are practically uncleavable, and therefore need more grinding. Quartz is brittle. The commonest rocks in Western Australia are granite, amphibolites, and greenstones. The accompanying table[1] gives the cost of diamonds for drilling in the various rocks based upon the actual wear of the diamond cutting a 1 1/16-in. core.

COST OF DIAMONDS PER FOOT DRILLED.

Granite: Kookynie, Leonora	$1.45
Amphibolite: Moderate grain; Bellevue	3.65
Amphibolite: Fine grain: Cumberland	1.70
Amphibolite: Very dense: Gwalia, Wiluna	4.37
Quartz-dolerite greenstone (micaceous): Great Fingall and Day Down.	2.40 to 2.90
Quartz-dolerite greenstone (chloritic): Kalgoorlie	1.20
Quartz-dolerite greenstone (sericitic): Kalgoorlie	0.75

COARSE GRAINED ROCK EASIEST TO DRILL

Of these rocks, the granite and the quartz-dolorite greenstone contain a notable amount of quartz, and yet the costs for these rocks are exceeded in the case of amphibolites, which contain little or no quartz. The cause of this anomaly is due to the texture and structure of the rock.

Granite is a coarse-grained rock, and the structure is simple. The bounding surfaces between any two minerals are plain or slightly curved and there is little interlocking. The softer and more easily cleavable minerals, mica and feldspar, are easily ground away, and the quartz, becoming isolated, is then broken in large pieces. In the quartz-dolorite greenstone, secondary changes have produced a great deal of chlorite, carbonate and sericite, all soft and easily cleavable minerals, and the quartz, iron ores, or sulphide are practically surrounded by these. In the micaceous quartz dolorite from the Day Dawn, these secondary changes have not proceeded nearly as far as in the Kalgoorlie rock, and the rock, though consisting of similar minerals to granite, has a far more interlocked structure, and consequently needs more grinding down.

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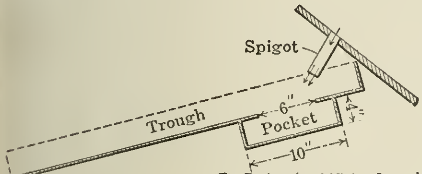
[1] *Monthly Journal of the Chamber of Mines, of Western Australia*, Feb. 28, 1910.

Fine Grained Dense Rocks Produce Excessive Wear

In amphibolite, hornblende is always a secondary mineral and has a tendency to be fibrous, with interlocking boundaries, so that though an easily cleaved mineral, only small fragments are able to split off at a time. The finer the grain, and the more the amount of interlocking, the more the rock will require grinding away, and the less it will break, thus increasing the cost of drilling. The amphibolite from the Gwalia Consolidated is quite an abnormal rock. The texture is so dense, that the separate minerals can be distinguished with difficulty, under the highest powers of the microscope. It is a rock consisting of two parts, the one green, like the Cumberland rock, and mostly made up of interlaced hornblende, and the other brown-gray, and apparently made up of fibrous zoisite. It is the latter that is responsible for the excessive wear and the polishing of the diamond.

A Pocket to Prevent Launder Wear

A launder which conveys products from jig and classifier spigots usually wears through in a short time at a point where the sands from the spigot strike the bottom of the launder. A scheme that is used in some of the Joplin mills for saving this wear consists of a pocket about 4 in. deep, 10 in. square, with an opening about 6 in. square connecting it with the bottom of the trough. Concentrates accumulate in this pocket, thus affording a protection from the abrasive effect of the discharge.



The Engineering & Mining Journal

Launder with Sand Pocket

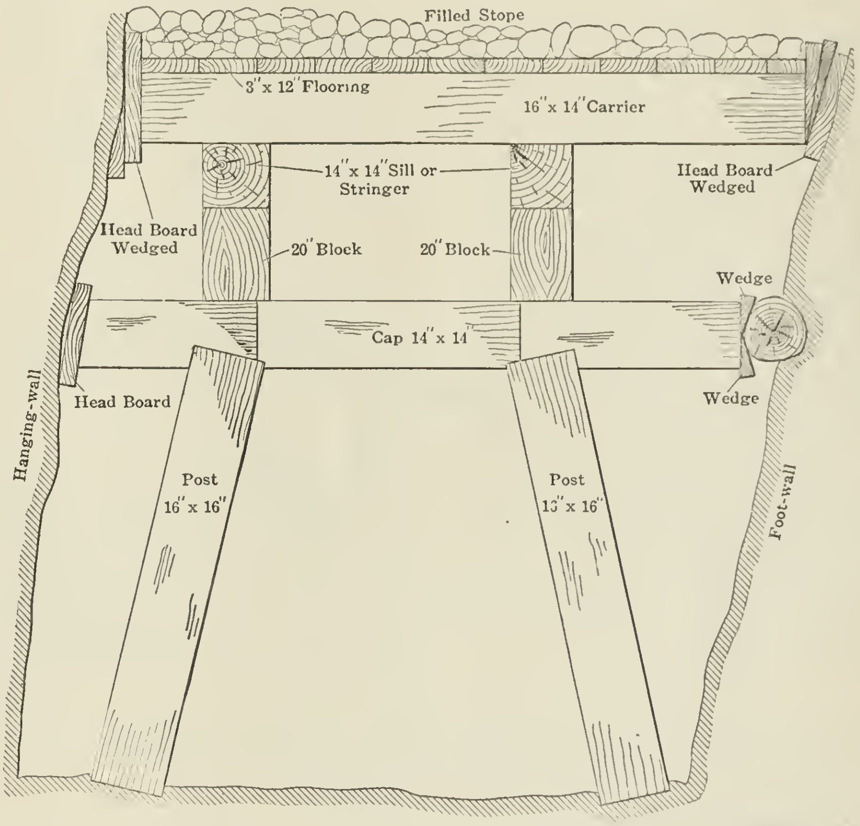
Laying Mill Dust with Water Sprays

In the crusher house for the new West mill of the Bunker Hill & Sullivan company, at Kellogg, Ida., the dust is almost entirely eliminated. Ordinary fruit-tree sprayers are directed over all crushers, rolls and at the discharge end of conveyer belts. The fine mist serves to collect and lay nearly all the dust. The only possible objection to the use of the sprayers is from the wetting of the floors and machinery in the plant. This is, however, not nearly so objectionable or dangerous to health as an atmosphere full of dust particles. Then, too, it is easier to clean up the moistened material than the light, dry, all-pervading dust.

Drift Timbering for Heavy Ground

On the Mother Lode of California especially where mining is conducted in the black Mariposa slates, great difficulty is experienced in keeping the drifts open. It is not uncommon to see huge drift timbers crushed and splintered within two weeks' time. Occasionally drift sets require retimbering so often that by the time a stope is worked out the drift below, originally 8 ft. high in the clear, will be barely high enough to allow the passage of an ore car. It is usually considered economical to run the drifts in the orebody.

Above the drifts in the Kennedy mine at Jackson, a system of carriers on stringers is used to support the stope filling above. The accompanying sketch shows the usual method of timbering drifts in such heavy ground. The cap of the tunnel set is blocked against the walls and blocks set above the posts carry the stringers, locally termed sills. These in turn support the carrier timbers which extend across the drift and are also blocked against the walls by head boards. The flooring of the stope is laid on these carriers. In most cases the horizontal swell or pressure of the walls is sufficient to hold the carriers so firmly that they will support the stope filling during any necessary replacement of drift sets. In this manner the drifts are kept open for their full hight and plenty of head room is assured in the main passageways of the mine.



The Engineering & Mining Journal

Drift Timbers at Kennedy Mine, Cal.

Errors in Testing Cyanide Solutions

As the effect of potassium iodide in testing cyanide solutions for protective alkalinity described in a paper by Bede Collingridge before the Institution of Mining and Metallurgy, and an abstract of which was published in the JOURNAL of March 12, was contradicted in the discussion, H. L. Sulman and Frederick Reade undertook further experiments.[1]

Findings of Sulman and Reade

They found that the presence of potassium iodide obscured the end point to an extent which may or may not be neglible according to other conditions. They said:

"The facts are these—in presence of silver cyanide and potassium iodide, phenolphthalein does not give a sharp end reaction; the indistinctness is a double one, due, principally, to the constant return of the phenolphthalein color indicating alkalinity after its discharge by standard acid to an apparent neutral point, and, to a minor extent (owing to the employment of unnecessary amounts of potassium iodide and silver solution), due to the masking of faint alkaline colorations by the iodide of silver suspension."

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[1] *Bull.* No. 67, I. M. M., April 14, 1910.

TITRATION ERRORS

When using a strong acid solution, say one-tenth normal, the end point of the reaction is sufficiently sharp to give accurate results, but if one wishes to determine small amounts of protective alkali in small quantities of highly dilute cyanide solutions (such as may be derived from the treatment of slimes by decantation) one is entitled to employ standard acid of a dilution commensurate with requirements, say 0.04 normal. Under such conditions the error becomes noticeable, and is further accentuated by the use of silver nitrate in excess in the first (or cyanide) titration. If, however, no iodide be used, the results with the weak acid are absolutely accurate and the reactions quite normal.

The phenomena are explained as follows: "In the titration for cyanide, with silver, all potassium cyanide (which would otherwise give its full alkali value on titration with acid) must first be converted into the double cyanide KCy, AgCy, a compound which is not decomposed by dilute acid, in which the combined moiety of KCy does not therefore show alkalinity on titration with standard acid and an indicator.

"The end point of the cyanide reaction is, however, necessarily marked by the precipitation of silver cyanide as a cloudy suspension. This precipitated silver cyanide now reacts with potassium iodide, forming yellow silver iodide, and free potassium cyanide, of course with its equivalent alkalinity."

CONCLUSIONS

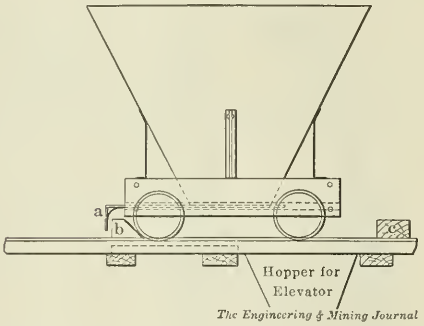
Sulman and Reade conclude by restating Mr. Collingridge's proposition thus: "If small amounts of protective alkali are required to be measured by dilute standard acid solutions, the use of potassium iodide as an indicator for the cyanide reaction point will give rise to serious error in regard to protective alkalinity present.

"Further, the error will be greater in proportion to the overdoing of the cyanide end reaction with silver-nitrate solution, in presence of an equivalent addition of potassium iodide; this is due to the reaction between argentic cyanide and potassium iodide in producing free potassium cyanide."

At the Ready Bullion mine of the Alaska United Gold Mining Company, Douglas Island, Alaska, there were only four accidents, one of which was fatal, among 489 employees exposed to risk in 1909. At the 700-Ft. Claim mine of the same company there were no accidents to any of the 306 employees.

Self Dumping Car

The accompanying illustration shows a handy device for a haulage system of small capacity. The car here described has a capacity of 1 cu.yd. and two cars handle 175 tons per shift. The car in question is hopper shaped, is about 4 ft. square at the top and 1 ft. square at the bottom. A sliding door *a*, made of ½-in. steel plate, is placed in the bottom as shown, and as the car approaches the elevator pit the end of the door plate *a* strikes a lug *b*, between the rails, and pulls it open. A bumper *c*, is placed in front of the car to prevent it from going too far and drawing the sliding door out of its place. To close the gate, or door, a 2x6x30-in. plank is fastened at one end to a tie. This plank has one free end, which is moved out to the middle of the track, and as the car is pulled back by hand, the gate strikes it and is pushed back in place. When the gate is closed the free end of the plank is pushed out of the way and the car sent to the stock pile for loading. This car is hauled by one horse, and is used for handling tailings that are being retreated in the Joplin district.



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SELF DUMPING CAR USED AT JOPLIN, MO.

New Use for Small Hammer Drills

Small hammer drills are used with a chisel bit in the Hecla mine at Burke, Ida., for cutting off the crushed ends of timbers. In the stopes the greatest pressure is from the squeeze of the walls, and as the ends of the stulls and caps become splintered and crushed, it is necessary to cut them off and put in new blocking. It is often difficult to get at the crushed timbers, and, even when accessible, it is not an easy job to chisel or saw the wet and twisted fibers by hand. The cutting of the wood is rendered quite easy with the drills, and by using sufficiently long bits, almost any desired place can be reached. The drills and chisels may also be used to great advantage for chiseling wall plates when an extra shaft compartment must be added, or in cutting off posts to ease up drift sets in heavy ground. In a number of mines, the blocking on drift caps is shot out when it is necessary to ease up on the sets; this work can much more safely and surely be accomplished with the drill.

Magnet for Removing Iron from Ore and Pulp [*]

The Premier diamond mine handles over 30,000 tons of material per day which contains more or less metallic iron as a waste product from the tools used. The concentration methods are so good that about one ton of concentrates per day contain the entire diamond output.

The concentrates are fed by hand into a hopper which distributes them over a slowly moving canvas belt 4 ft. wide; on this belt they first pass under a narrow magnet placed across the width of the belt, and along the face of this magnet runs a small canvas belt. All metallic iron particles are attracted and lifted up by this magnet and carried and thrown on one side by the small belt. They amount to about 10 per cent. by weight of concentrates.

The remainder is then carried on by the main belt, and allowed to fall between the poles of a pair of powerful magnets, where they are divided by a knife edge; the nonmagnetic particles dropping straight down and the others being deflected. The field which produces second separation is an exceedingly powerful one (B 20,000 per sq.cm. estimated). The pole pieces are about 4 to 5 ft. wide, and are wedge shaped, tapering from 6 to 8 in. to a curve of about ¼-in. radius, at which part, of course, the flux is concentrated. The main coils are four in number, each resembling one of the field coils of a large two-pole dynamo. The current taken by these is about 40 amp. at 500 volts.

A Timber Skip

At the South Eureka mine, near Sutter creek, Cal., a special skip is used for lowering timbers. The shaft is inclined at angles varying up to about 70 deg. The timber skip is hung below the rock skip from a ring on the bottom of the latter. It is made from an old skip by taking out the top plate and using an extra long bail, hung from the axles of the front wheels. By having the top of the skip open, timbers can be taken out by simply swinging them down, thus obviating the necessity of raising and lowering the skip for jacking. The extra length of bail enables long timbers to be handled.

It is reported that flint pebbles from the Colorado river are being used in the tube mills of the Gold Road and Tom Reed mills in Mohave county, Arizona.

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[*] *Trans.* South African Inst. Elect. Engr., Feb., 1910.

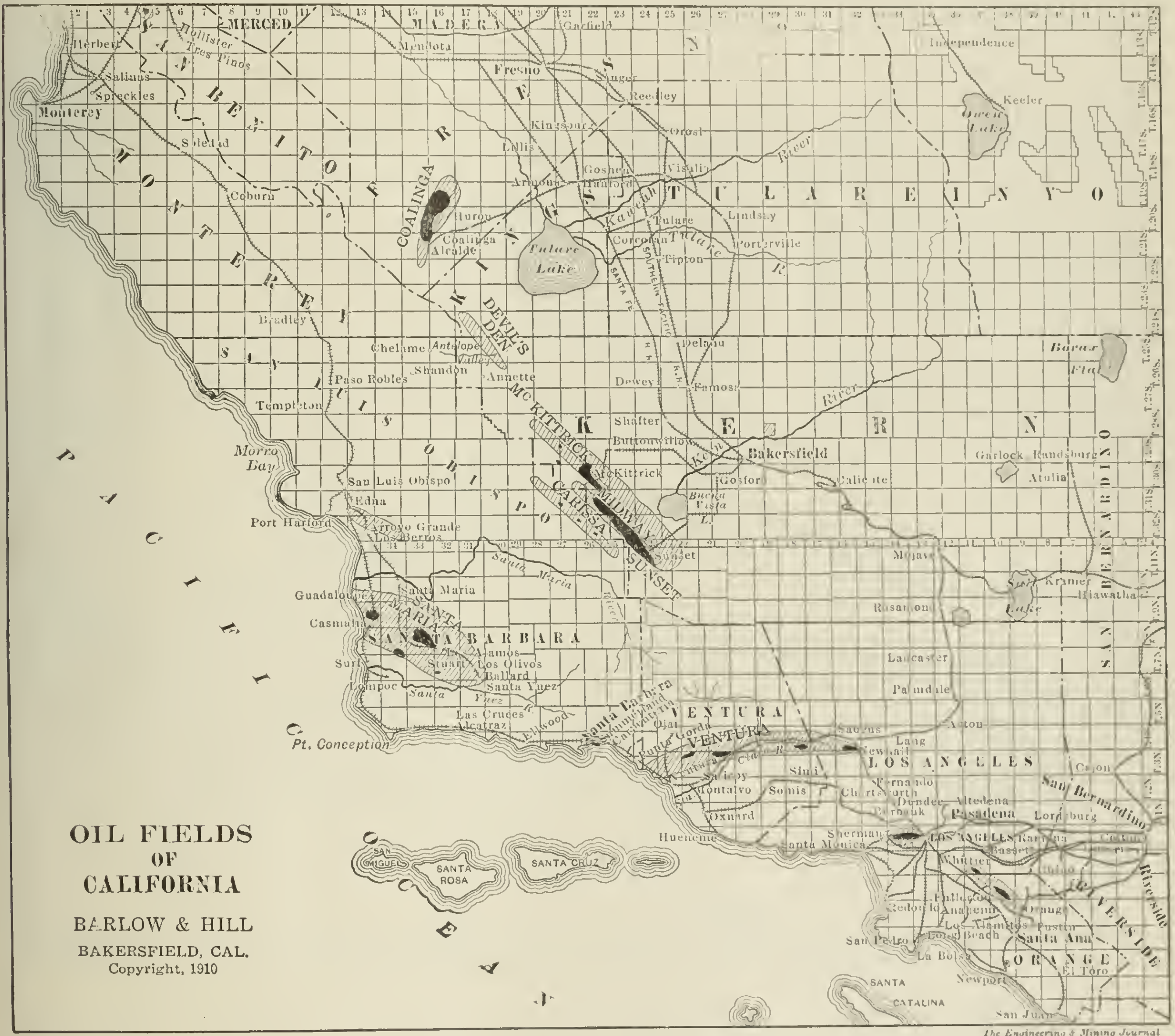
Oil Developments in California

The American National Bank, of San San Francisco, in its April financial letter, says: "Most active of all the industries of California is that of oil. The revival of interest stimulated by a few remarkable gushers, is rapidly attaining the proportions of a boom. One collateral result of great importance in this connection is the future effect of cheap and unlimited fuel in the development of manufactures. Possessing great resources of raw material, California is now being supplied with one of the essential factors necessary to the expansion of the creative industries." The amount of capital invested in oil properties exclusive of the lands, is estimated at $113,000,000, of which the chief items are: 420 wells, $42.000,000; 2100 miles of pipe lines, $12,600,000; 35 tank steamers, $12,250,000; 35 refineries, $18,000,000; 20,000,00 bbl. of oil in storage, $10,000,000; field equipment, pumping machinery, etc., $12,250,000.

Effect of Land Withdrawals

Curtis H. Lindley, in an address to the San Francisco Bar Association, April 29, states that there are 2,400,453 acres of presumptive oil land withdrawn from entry, and that 70 per cent. of the adjacent lands are owned by the Southern Pacific Company and affiliated companies, and the Standard Oil Company. Since the oil occurs in underground reservoirs of considerable horizontal dimensions, Judge Lindley raises the point that while these lands are being conserved, these corporations are gradually sucking out the oil therefrom, through their wells on lands adjacent. Thus, the reservations, if long continued, inure to the benefit of the monopolies and in reality do not conserve. Judge Lindley also pointed out the injustice to industries under the present laws, which make permits to operate hydroelectric plants on the government reservations revocable at the will of the Secretary of the Interior instead of being granted for a sufficient time to warrant the installation of expensive electric plants.

On April 30, a meeting of oil men was held in Coalinga and resolutions were adopted to be forwarded to Congress calling attention to the injury which would result to vested rights if the Pickett bill now before Congress were passed with the clause that makes invalid claims located prior to the with-



OIL FIELDS
OF
CALIFORNIA
BARLOW & HILL
BAKERSFIELD, CAL.
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drawal of Sept. 17, 1909, in case oil was not actually known on the claims at that time; and asserting as does Judge Lindley, that wholesale withdrawals are for the benefit of the large corporations as their wells draw on the common reservoirs of reserved and nonreserved lands.

The production of the California fields for March was the greatest in the history of the oil industry in the State, amounting to 5,598,745 bbl. The Sunset-Midway oilfield reached first place in March in production. This practically is due to the big wells brought in in the Midway field, such gushers as the Lakeview and the Standard's well adding tremendously to the output. The March yield of the Sunset-Midway field was 1,300,000 bbl. The production of the same territory for December was 560,000 bbl. The official figures for March are as follows:

SAN JOAQUIN VALLEY.

District.	Bbl.
Coalinga	1,125,000
Kern River	1,120,000
Sunset-Midway	1,300,000
McKittrick	430,000
Total	3,975,000

COAST FIELDS.

Santa Maria	582,000
Lompoc	57,000
Cat Cañon	55,000
Edna (Arroyo-Grande)	2.100
Watsonville	4,500
Summerland	6,400
Total	707,000

SOUTHERN FIELDS.

Salt Lake-Sherman	280,740
Whittier	80,000
Coyoles	35,000
Los Angeles City	44,000
Newhall	11,005
Ventura county	38,000
Fullerton, Bear Cañon and Puente	427,000
Total	916,745
Total of all fields	5,598,745

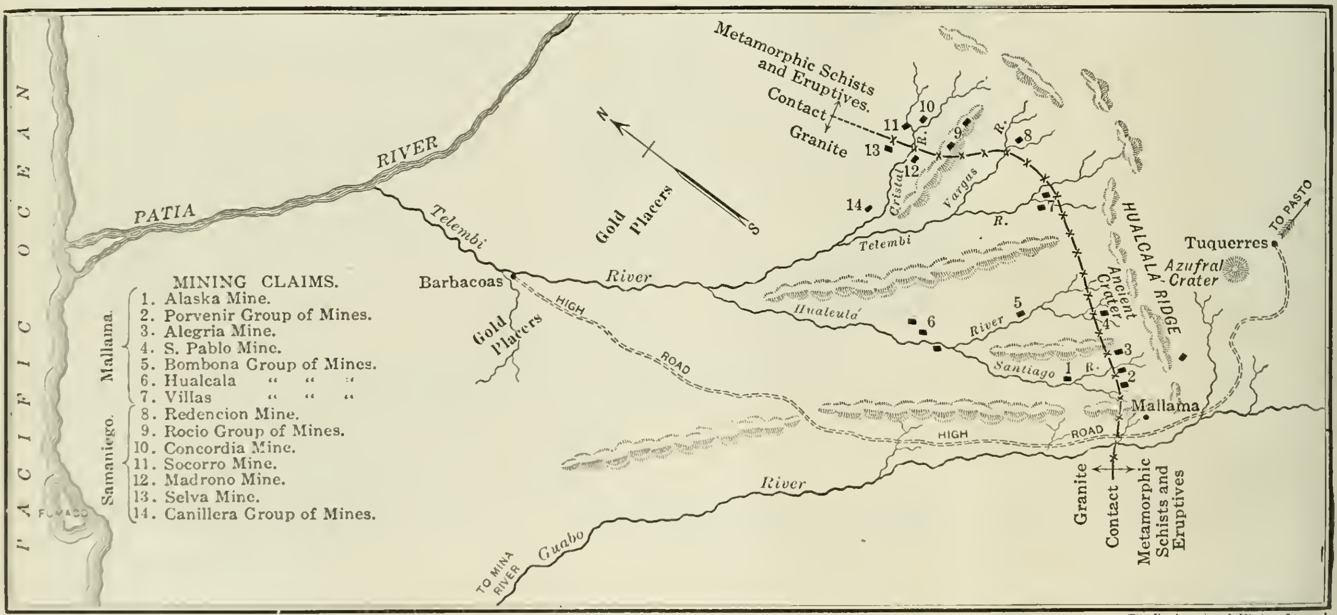
Storage in southern fields about 350,000 barrels.

OIL IN OREGON

While there are misleading reports in print as to the oil possibilities of Malheur county, Oregon, it appears that oil mixed with water has actually been found at 1100 ft. in a well near Vale. Drilling is actively going on at a number of points in this county.

Mining in the Department of Pasto, Colombia

The mining districts of Mallama and Samaniego are reached from the port of Fumaco, Colombia, via Barbacoas, from which point a wagon road leads to these districts. The accompanying sketch and data contributed by F. P. Gamba, show the general geographical distribution of the mines and the situation of the principal ones along the contact between granite and schists.



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SKETCH MAP OF THE MALLAMA AND SAMANIEGO DISTRICTS, COLOMBIA

The Porvenir mine is owned by a native company, and is on the zone of contact between the granite-syenite formation and the metamorphic schists of Hualcalá ridge. Development is going on at the present time, chiefly on the surface, and a great many veins have been discovered in the granite, on the contact and in the metamorphic schists. Large quantities of free gold are found in the outcrops and in the decomposed zone. The average value of the ore is $47 per ton, of which $22 is gold. An interesting feature here is that true granite is impregnated with ore and will carry $7 per ton. It is probable that this mine will develop into a large producer.

The Bombona mine is owned by an American company. A large plant is in course of erection and will treat the ores by an all-slime cyanide process. This plant is expected to be in running order next summer. The ores are similar to those of the Porvenir mine.

The ores of the Hulcalá group are quite different from those of the Porvenir and Bonboma. They carry pyrite, but are also rich in chalcopyrite. The ore is of low grade and occurs in thick lodes one of which is 25 m. in thickness. This group is owned by an Ecuador company and is being developed.

A native company owns the Pendencion mine, and a stamp mill is under erection to treat the low-grade, free-milling ores of this property. The ores are aplitic segregations from the granite. Another native company is also erecting a mill to treat the free-milling ores of the Rocio group of mines.

The Concordia mine, the most important in these districts, has been extensively developed and has opened up large bodies of free-milling quartz which carries 1½ to 2 oz. gold per ton. A native 50-stamp mill is on the property, but a large modern plant is in course of erection. The tailings will be treated by cyanide. This property is also owned by a native company.

The Madrono mine is owned by the same company as the Concordia and has a native stamp mill of 20 stamps. This mine is situated in the granite. The Madrono was the first vein mine worked in this department. The Selva mine is in about the same condition as the Madrono. An American company owns the Canillera group of mines and is developing.

PRODUCTION

Outside of these, there are many claims granted and many undergoing preliminary exploration. The yearly production of the lode mines in this department is: Concordia, $234,000; Socorro, $75,000; all others, $51,000; total, $360,000. Gold placers are worked by negroes for a yearly production of $240,000, making a total yearly production of $600,000 from the Department of Pasto.

The Elements of Slime Concentration[*]

Considering the progress of concentration methods for the last 30 years, it appears possible to draw certain conclusions which may be considered as elements governing the probable developments in the future. There have been hundreds of inventions, and there have been a few new types which have survived the struggle for existence. The most striking fact is the wide and increasing use of two types of machines, the shaking belt and the jerking tables. Mr. McDermott restricted the discussion to the treatment of material which has passed a screen with apertures of 0.0125 in., in other words, a slime.

FIVE CLASSES OF MACHINES

The machines in common use are divided into five types: (1) Fixed inclined tables, including slowly traveling tables; (2) jerking tables, including bumping tables; (3) shaking traveling belts; (4) jerking or bumping traveling belts; (5) shaking side-inclined belts or tables.

Fixed tables include various forms of frames, the old Cornish buddle and various forms of revolving buddles and side-inclined, non-shaking belts. The slow revolution of a buddle or belt and the intermittent automatic discharge of a frame will not affect the action of concentration on the surface, so they may be included in this class. These machines depend simply upon the greater resistance of the heavy minerals to the wash of water down an inclined surface as compared with the resistance of a lighter waste. These machines have to make a middle product in order to yield a clean concentrate. The second class, jerking tables, depends on a combination of greater movement across a table, and greater resistance to wash of water down the table, of the heavy particles as compared to the lighter waste particles. This class, also, for high efficiency must produce a middle product.

The vanning motion of the third class of machines not only settles the heavy minerals on the traveling surface of the belt, but also prevents the larger particles from clinging to its surface. This class makes no middle product. Jerking belts act in the same way as jerking tables. A slowly revolving buddle with a shaking or bumping motion works in effect the same as does a shaking side-inclined belt. The shaking motion yields some of the advantages of the third class, shaking belts, by assisting the settling of the slime mineral, but a middle product is produced.

CLOSEST SAVING MADE BY HAND VANNING

To understand the conditions for a close saving of fine minerals, it is advisable to begin by examining the action of the simplest and at the same time the most perfect appliance in use, and this is the vanning shovel or some equivalent tool in the hands of an experienced man. In this shovel the surface must be smooth and it must be slightly curved in all directions. Its perfect work is shown by the fact that it will always give a definite head of the fine mineral which is going to waste from the most efficient concentrator. The conditions which are essential to good work irrespective of the skill of the operator are as follows: Sufficient time for settling; a smooth surface for final separation; a gentle movement of the washing water; and a motion to assist in differential settling and in separation.

Considering these essentials, the point necessary to insure the commercial success of a concentrating machine may be outlined. It is quite evident from the fact that time must be allowed for the preliminary settling of material on the vanning shovel, that no machine will do close work on slime mineral unless the fine particles are given adequate time to settle from the water in which they are suspended.

SMOOTH SURFACE ESSENTIAL

What is well known to be an essential for satisfactory hand vanning—a smooth surface—has been proved by general experience in the use of concentrators for slime mineral to be also the best in mechanical work. It is a constantly recurring fallacy that a rough surface must be good for saving slime mineral. The fact that it is also good for saving fine waste quite annuls the supposed benefit of any roughness. Tables, buddles and belts have been made of wood, glass, slate, marble, cement, rubber, etc., all with a view to getting a necessary degree of smoothness.

The bad effect of an excessive rate of flow of water over the concentrator surface is twofold. A rapid current is, of course, in the first place unfavorable to the settling of fine mineral, and in the second place it is apt to refloat and carry off some of the particles which by rolling contact with the surface of the concentrator have succeeded in settling. The best motion either in a hand or mechanical concentrator is such as to keep the lighter waste in some semi-suspension in the water, free to move over the clinging, sluggish mineral particles; whereas if both waste and mineral are allowed to once settle fully, the waste cannot be moved except by such a strong wave of motion as is certain to pick up and move much of the fine mineral also.

DIRECTION OF PROBABLE IMPROVEMENTS

The design of improved concentrators will doubtless fall within one of the five classes described above, unless it falls into a group of certain well traveled and exhausted lines, such as rate of settling in water, resistance to upward flow of water, centrifugal separation, separation by air, separation by a denser medium than water and flotation processes.

Air separation is unsatisfactory on dust, and is usually inapplicable for commercial reasons. The many attempts to employ centrifugal force in concentrating machines have shown that this principle is impracticable. Flotation processes are not within the scope of this paper. It therefore seems probable that new concentrators which require serious consideration will be modifications of established types, and they may be pretty safely judged by the extent to which they meet the conditions which have been hitherto proved.

It may be mentioned here that on ores from which a single concentrate is required, it is not advisable to make a middle product, for middle products entail an additional loss in the tailing. There are often good reasons in practice for using a middle-product-making machine, but in designing improvements over existing machines this principle should be borne in mind and aimed at.

To sum up the conditions which seem to be the most favorable to any new concentrator which may reasonably be expected to prove an advance over existing machines, it can be said that there must be a large and smooth surface, a regular settling motion which does not jar the finest particles from their contact with the surface when settled, and a delivery of clean material without the production of a middle class.

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[*] Abstract of a paper by Walter McDermott, *Bull.* No. 67, I. M. M.

CLASSIFICATION NOT ALWAYS ADVISABLE

The necessity for classification before concentration is so marked in some cases and with some machines that it is accepted by many as a comprehensive dogma with full scientific warrant. However, in material finer than 40 mesh, it is a clearly demonstrable fact that the third class of machines, traveling shaking belts, give better results both industrially and theoretically without classification. Concentration on this type of a table depends upon the various functions of specific gravity, inertia, surface resistance, speed of settling, friction of grain, rate of water flow and adhesion to machine surface. These considerations cannot be involved in a mathematical formula. It is known that classification is not necessary for a sample treated on a vanning shovel.

Furthermore, there is a distinct advantage in treating unclassified pulp by machines of this class. The coarser particles form a bed on the belt owing to its upward travel, and the slime, instead of floating down in unchecked waves over the belt surface as it would if treated alone, flows more slowly by a filtering process in part, and so affords better chance for the settlement of the fine mineral.

In practice, the blind adherence to the belief in classification has led to some curious results. An unsatisfactory method of classification is usually adopted, that of simple pointed boxes. By this system the coarser or bottom discharge is of necessity accompanied by a steam of the finest slime. This last goes to a class of machine not adapted to its treatment in some modern mills, arranged especially with a view of keeping coarse and finer parts separate for treatment. The first step, that of classification, is thus most imperfect.

The experience in some of these mills has led to the supposed discovery that machines of the third class are not proper machines for slime treatment, and they are therefore given an intermediate product of the classification system. This conclusion is quite opposed to general experience, because the machines of this class were originally developed for and are continuously used for the direct treatment of ores, crushed fine in batteries and containing small quantities of finely divided and brittle minerals which are valuable enough to demand a close saving. The explanation of the error is simply that by working on diluted slime alone, the machines of the third class are not working under the best conditions.

AN EFFICIENT RETREATMENT OF SLIME TAILING

It is a usual thing to treat the tailings of one slime machine by another machine of the same or different construction. For example, buddles are often made double, or a convex surface may be followed by a concave one, and frames or canvas tables may be used in a long succession, each saving a little. This double treatment can be used with great effect on machines of the third class, treating unclassified pulp but is seldom attempted.

To get the best results from the second machines it is advisable to use a large pointed box between to get rid of some excess of water introduced by the first machine. An increase in belt surface on the second row will add to the efficiency. By this system the slime mineral has a double chance of being saved, there is no excessive dilution of the slime, clean concentrates can be produced, the losses due to rehandling of middle products are avoided and the whole plant is most automatic in character.

Electrolytic Process for Low Grade Zinc Ores

BY EDUARDO SANNA*

During the last 20 years many experiments have been made with electrolytic processes for the extraction of zinc from simple and mixed ores containing zinc, lead and silver. Many new methods for such extraction have been patented in Europe, Australia and America, but none of these methods, known to me, has as yet been accepted for the commercial treatment of such ores. Australia has probably been foremost in such undertakings, but even there they have not succeeded in producing pure spelter in a commercial way by electrolytic methods.

Most of the electrolytic processes for the treatment of the zinc ore are based upon the transformation of the zinc minerals contained to sulphates or chlorides by scorification and lixiviation, and from the solution of these salts the zinc is precipitated by electricity.

DIFFICULTIES OF THE USUAL METHODS

The treatment of such solution would be simple, if during the process only zinc salts were dissolved, but the contemporaneous solution of other metallic salts with the zinc prevents the precipitation of pure zinc by electrical treatment. To separate these other metallic compounds from the zinc solution there are processes more or less efficient, though few have been able to do this economically within commercial limits.

At present the most successful method for treatment of low-grade zinc ores commercially is by producing zinc oxide from them by the Wetherill or some similar process. Two zinc-oxide plants have been installed in Sardinia for treating low-grade calamine ore, though the price of fuel at present is prohibitory for treatment of ores containing less than 15 per cent. zinc, and the market for the oxide is limited in Italy.

THE SANNA ELECTROLYTIC PROCESS

The best method of extraction and the one by which the greatest per cent. of recovery is obtained, is by the solution of the zinc mineral by alkaline salts, followed by electrolytic separation. However, the product thus obtained is a metallic-zinc sponge, which turns to oxide as soon as it is exposed to the air and therefore, cannot be used in commerce.

After many years' work I have succeeded in obtaining compact blocks of zinc commercially by the treatment of the zinc sponge from electrolytic precipitation with pressure and heat combined. I have also found that it is possible to treat a solution of zinc oxide in caustic soda with a current of five volts, and to obtain all of the spongy zinc precipitate without loss of solution of caustic soda, which latter may serve for the same operation for many months.

This discovery will doubtless be found advantageous for the mines which have low-grade zinc ores, as one can treat such ores directly with an economical installation and at a low cost. It will also permit the retreatment of low-grade ore dumps which have long been regarded as valueless.

I estimate that an installation of this process of sufficient capacity to yield 1500 tons of zinc per year would cost 300,000 fr. The cost of treatment is estimated to be 300 fr. per ton of zinc produced, which would be 30 fr. for treatment of ore containing 10 per cent. zinc, the cost being directly proportional to the content of zinc in the mineral treated.

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*Director, Societa di Pertusola Miniere di Gennamari e Ingurtosu, Iglesias, Sardinia Italy.

The Bagoslowsk Reduction Works in the Urals

The plant of the Bagoslowsk Reduction Company in Russia is one of the most modern in the Ural district. The company is treating ores of iron, copper, gold, manganese and chromium and is engaged in the manufacture of steel and the production of sulphuric acid and bichromate.

Ore Supplies

The iron ore used by the company is mainly magnetite with some hematite coming from the surface of the deposit. The ore is largely mined from surface cuts and costs about $1 per metric ton, and the yearly output of the mines is from 82,000 to 100,000 metric tons.

The copper ore used at this plant is mostly copper pyrite, with some oxidized ores. It is mined to a depth of 600 ft., and the copper pyrite is associated with various iron minerals. It averages from 6 to 7 per cent. in copper, and the yearly output of the mines is from 65,000 to 82,000 metric tons. The ore is hand sorted and the dump for concentration runs about 0.5 per cent. copper.

The gold ore is obtained from alluvial deposits, either by dredging or by hand digging; the yearly output of gold is about 11,000 oz., but is decreasing.

The manganese ore runs from 20 to 35 per cent. manganese and 4 to 8 per cent. iron and is mined in a small way to supply the need of the iron furnaces. The chrome-iron ore contains from 40 to 50 per cent. chromic acid. It has been found more profitable to use in the chemical works a richer ore, which runs from 50 to 60 per cent. chromic acid, which is also found in the Urals.

The Iron Furnaces

The company operates two iron plants, one at Nadeschdinsker and the other at Soswaer. The former plant has five blast furnaces and a sixth furnace is under construction. The blast is furnished by two blowing engines and heated from 600 to 700 deg. C. in six Cowper stoves. The blast-furnace gases are utilized by means of two gas engines of 500 h.p. each, which are direct coupled to dynamos for light and power; and by two gas engines from 800 to 1000 h.p. which furnish the light and power for the rolling mill. The yearly pig-iron output is about 82,000 metric tons, and the manufacturing cost about $9.50 per ton. The pig iron is made into steel in six basic-lined open-hearth furnaces, which are heated by gas producers using wood. A rolling mill is also operated in connection with these works.

The Soswaer plant is much smaller. It has only one blast furnace, one open-hearth furnace and a small rolling mill. The yearly output is 13,000 metric tons.

Copper Plant

The company's copper smelting works produce about 4600 metric tons of copper yearly. Until recently the ore was roasted in heaps and stalls and smelted in blast furnaces with charcoal, but more recently pyritic smelting in water-jacketed blast furnaces has been adopted. The matte is converted and the blister copper refined in reverberatory furnaces.

The sulphuric-acid plant has a daily output of 6½ metric tons of chamber acid of 53 deg. B. The bichromate plant has a yearly production of 734 metric tons of potassium and sodium bichromate, which is about one-third of the total yearly consumption of this article in Russia.

Mining in Amador County, California

Mining in Amador county is in a satisfactory condition at the present time. For several miles along the great Lode, the deep mines are producing steadily and the fact that the Kennedy mine at Jackson is operating a large shoot of ore with good profit at a vertical depth of 3300 ft. counts for a great deal in the minds of those who have had an abiding faith in the Mother Lode and its possibilities. Adjoining the Kennedy on the south, the Argonaut mine is working a vein, stated to be 27 ft. in width, and of good grade, at a depth of 3300 ft. on the incline. To the south of Argonaut is the property of the Kennedy Extension Mining Company, locally known as the Muldoon mine. This property has only lately been reopened, after an idleness of several years. It has never been a producer. The shaft is down 800 ft., from the bottom of which a crosscut has recently been run easterly several hundred feet, intersecting three veins, on one of which a drift is being driven. At the point where this latter vein was cut, the quartz was of low grade, showing little mineral other than pyrrhotite, but in drifting the vein has shown a decided improvement and some pay ore is being found in the drift.

Kennedy Extension vs. Argonaut for Trespass

The Kennedy Extension company is suing the Argonaut company for an alleged trespass in the lower levels of the latter mine: The former company claims that the Argonaut company has been mining beneath the surface of ground owned by the latter, and on a vein that apexes within the surface boundaries of the Kennedy Extension's ground. This suit, which is the most important since the famous suit between the Argonaut and Kennedy, is now pending, and as it involves some nice points at law, its progress will be watched by mining men with unusual interest.

South of Jackson there is considerable work in progress in a comparatively small way, and some rich ore is being found in association with arsenical sulphide ores. The high-grade ore seems to occur in pockets.

The Kennedy Mining Company has purchased the Bellwether mine situated on the hillside east of the town of Jackson, paying for it about $30,000. It is stated to be the intention of the new owners to sink a shaft on the Bellwether and to develop it in depth. The Bellwether differs from the other mines in this county. It has a large outcrop which consists principally of ankerite, with an abundance of scales of mariposite, the entire mass being filled with reticulated quartz veins, large and small. It is stated that in the early days this mine produced a number of large pockets of gold, but its chief value now lies in the large tonnage of mill rock said to exist there.

Sutter Creek Mines

In the neighborhood of Sutter creek, the South Eureka mine continues to furnish the anomaly of a great mine being developed from great depth upward. The vein which has made this mine famous, after years of disappointing development, was discovered in a crosscut driven westward into the foot-wall country of the old workings on the 2800 level. Crosscuts have been driven in this foot-wall ground on the levels between the 2800 and 2100, and the ore found in each instance. So far there is no indication of the vein getting poorer in the upper levels. Adjoining the South Eureka on the north, the Central Eureka is continuing the sinking of its shaft for the purpose of reopening the mine in great depth. Indications are that the Central Eureka is a mine with a promising future.

Steps are being taken toward the reopening of the old Lincoln mine at Sutter creek, which has been closed for several years. The Lincoln was an important and valuable mine in the early days of mining on the Lode, having produced over $2,500,000 down to a depth of 350 ft., at which level the orebody is faulted. Subsequently a great deal of exploratory work has been done, but the pay vein has not as yet been discovered.

AMADOR CITY MINES

At Amador City, the California Consolidated Mines Company is in trouble, the Amador Keystone Mining Company having brought suit to recover $112,946, being a portion of the amount claimed by the plaintiff corporation as due from defendant. This simply means that the California Consolidated Mines Company, which in April, 1909, bought the Keystone mine for $200,000 from M. Jasper McDonald, who controls the Amador Keystone Mining Company, has failed to pay up on its promissory notes given in security of deferred payments. These notes were secured by shares of the defendant corporation to the amount of $300,000. The California company has been operating the Keystone mine since April, 1909, presumably at a loss, as pay days have been irregular and attachments frequent. The mine has been put in good condition, the stamp mill and works around the shaft having received much needed repairs. It is currently reported that if the California Consolidated Mines Company is unable to take up its notes to the Amador Keystone company there are several other men who stand ready to take the property as soon as it reverts to Mr. McDonald.

Immediately adjoining the Keystone on the north is the property of the Original Amador Mining Company, which has been reopened within the last two years. The shaft is down about 800 ft. and the 20-stamp mill is operating on good ore. Two dividends have recently been paid by this company. North of the Amador the Bunker Hill continues to run steadily, the lowest level being the 1950, where the vein is said to be larger than at any level above, and quite as good. This is another of Amador's great mines that has made wonderful development after many years of unsuccessful operation. The Treasure, to the north of the Bunker Hill, is being developed with a small plant. The shaft is down several hundred feet; the property has no mill as yet.

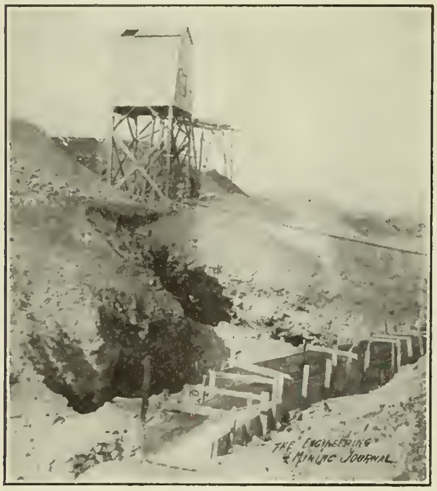
The Fremont Consolidated joins the Treasure on the north and is one of the large mines of the Lode. It has been in continuous and successful operation for many years, and has ore reserves which insure many more years of operation. Northward from the Fremont there is nothing of importance being done in Amador county, though it is said operations are soon to be resumed at the Rhetta Consolidated, north of Plymouth.

The Galena District, Kansas

The mining operations of the Galena district, Kansas, are usually conducted on small tracts of land ranging in size from a few acres to possibly 40 or 60. Lead ore was first discovered on Short creek in 1877 and practically all the mining has been comparatively shallow. There are many open cuts as shown in the accompanying illustration and the larger part of the surface of the ground is covered with waste dirt. In many places the ground has caved so that the surface is not only uneven, but actually dangerous to walk over.

BOSTON MINING COMPANY'S OPERATIONS

The Boston Mining Company owns 400 acres of mineral land in the Galena district. This is an exceptionally large acreage for this district and the result of a consolidation of a number of the smaller tracts worked in the early days. There are 20 or more shafts on this ground which have encountered ore. In addition to this, the company has a 10 per cent. lease on a fully developed 40-acre tract, where the ore can be mined from open cuts with steam shovels. The prospecting done by shafts and drill holes indicates that the orebodies run 4 per cent. zinc and 1 per cent. lead. Several months ago an option was taken on this lease and a number of drill holes put down in the vicinity of the open cut, proving the existence of a large body of ore which can be worked cheaply.



OPEN PIT IN SHALLOW LEAD-ZINC DEPOSITS, GALENA, KANSAS

A 300-ton mill (10 hours) will be ready for operation in June. In addition to the erection and equipment of this mill, the plans provide for a fund to start drill and development work on the 400 acres owned in fee simple.

In this district the ore is found from the grass roots down. Up to this time all the work has been done at a depth not exceeding 100 ft. Much of the work was carried on when prices for lead and zinc were low, and hence only the richer parts of the deposits have been mined. With present prices, large areas of low-grade ore, which in earlier days were left untouched, can be worked profitably.

SHEET GROUND

Recent work, both north and south of Galena, has developed a lower formation of ore at a depth of 200 to 250 ft. This is now being worked at the Herald mine, north of Galena, and at the Fallenback mine south of Galena, and recent drilling would seem to indicate that there is a large territory in this camp with the deeper formation of low-grade ore. This sheet ground level is not the same as the one worked so extensively in the Webb City district, but is considered of a deeper geological horizon.

The Highland Boy Tramway

The aërial tramway of the Bleichert type connecting the Highland Boy mines at Bingham, Utah, with the new smeltery of the International Smelting and Refining Company at Tooele is rapidly nearing completion. This tramway is approximately four miles long and has a capacity of 100 tons per hour. The ore is placed in buckets which weigh 525 lb. unloaded, and 1800 lb. with load. These buckets are spaced 200 ft. apart on the line and run at a normal speed of 600 ft. per min., being attached to a traction rope of 1 1/16-in. diameter and running on a standing rope of 1½-in. diameter on the loaded side and 1-in. on the light side.

Power will be required in starting up the line to haul the loaded buckets over the summit of the mountains. Thence onward the tram will be run by gravity and will develop from 50 to 100 h.p. Two electric motors will be used, one at the summit of the mountains to start the tram in motion, and when the line has been loaded this motor will be cut out and the other, at No. 2 control station, will be put into use. The latter motor is of the induction type and will perform a double service, acting as a brake or controller and as a generator, thus conserving the power developed by the tramline and returning the same over the transmission line to the mine for use. It is estimated that the cost of transporting ore over this line for the first year will be 15c. per ton. However, this cost should be reduced after the line has been thoroughly adjusted.

The San Domingos mine, Portugal, shipped 264,914 tons of copper and sulphur ore in 1909, making a net working profit of £18,582 for the year. It is owned by Mason & Barry, Ltd., of London.

The Anaconda Report

The output of the Anaconda Copper Mining Company during 1909, though greater than that of 1908, was still appreciably below normal. This was due partly to climatic conditions in January, when the railroad was unable to deliver sufficient coke to the Washoe smeltery, and partly to the fact that the Anaconda shaft was practically out of commission for the greater part of the year, on account of the fire in the Anaconda workings.

The Mines

At the Anaconda mine, the gas from the fire had cleared sufficiently to permit repairs to be made down to the 800 level, from which a small amount of ore was raised. No effort has been made to reopen the shaft below this depth, but an auxiliary air shaft which has reached a depth of 1100 ft. is now being sunk to the 1200-ft. level. After this connection is made, the main shaft will be repaired down to the 1200-ft. level; it is expected that the mine will then be put into full operation, as the shaft is practically uninjured below that depth. What little development work was done is said to have been quite satisfactory, and connections have been made with the Belmont shaft at the 1400, 1600 and 1800 levels.

ANACONDA BALANCE SHEET, DEC. 31, 1909.

Assets:	
Fixed:	
Mines and lands	$20,699,957
Buildings and machinery	3,027,888
Investments	534,088
Total fixed	$24,261,934
Deferred:	
Insurance unexpired	43,138
Materials and supplies	2,138,530
Total deferred	$2,181,668
Current:	
Merchandise held for sale	$554,622
Copper, silver and gold on hand	5,986,963
Loans and accounts receivable and cash	3,934,402
Total current	$10,475,988
Grand total	$36,919,591
Liabilities:	
Capital:	
Capital stock authorized and issued	$30,000,000
Current:	
Accounts payable	$1,633,030
Dividend warrants not presented	7,345
Dividend No. 37, payable Jan. 19, 1910	600,000
Total current	$2,240,375
Surplus:	
Balance Dec. 31, 1908	$4,944,412
Add profit from profit and loss	2,134,773
Total surplus	$7,079,216
Deduct dividends	$2,400,000
Grand total	$36,919,591

Extra development was done through the St. Lawrence shaft, and a nominal amount at the Neversweat. In the St. Lawrence, high-grade ore was discovered in the South veins. A successful effort was made to recover ores which were known to exist in the fire zone and a fair tonnage is being mined at the 700-ft. level. A large amount of ore remains in the upper levels in the Anaconda and St. Lawrence mines, which it is thought can be recovered as the fire subsides.

In April, a crosscut on the 1400-ft. level of the High Ore shaft penetrated a large and rich body of ore, the existence of which had never been indicated by workings of the shallower levels of the mines. Since that time this ore has been opened on the 1200- 1600-, and 1800-ft. levels and is being searched for on the 2200-ft. level.

ANACONDA PROFIT AND LOSS ACCOUNT, FOR 1909.

Receipts.	
Sales of copper, silver and gold	$11 591,844
Royalties and precipitates	46,582
Dividends on investments	32,117
Rental of water rights	50,000
Miscellaneous	11,732
Net profit of subsidiary departments, after deducting depletion of coal and timber lands and depreciation of plants and equipment	280,813
Copper, silver and gold on hand	5,986,963
Total receipts	$18,000,084
Disbursements.	
Copper, silver and gold on hand at beginning of year	$6,169,244
Mining expenses, including development and depreciation	5,511,820
Ore and scrap copper purchases	105,489
Transportation to reduction works	160,932
Reduction expenses at Anaconda, including depreciation	2,819,021
Transportation, refining and selling	1,163,306
Administration	60,326
Total disbursements	$15,990,142
Profit	2,009,942
Add interest	124,830
Profit to balance sheet	$2,134,773

The Diamond shaft is now 2956 ft. deep, and from it the South vein has been developed on the 700-, 1000-, 1200-, 1300-, 1500-, 1600-, 1800-, and 2000-ft. level, showing excellent bodies at each point.

A total of 10.11 miles of development work were done in the mines of the company during 1909, and the company claims that a heavy tonnage in excess of that extracted, has been added to the reserves. A total of 1,327,291 wet tons of ore were produced during the year.

Reduction Works

The reduction works treated 3,517,386 dry tons of ore and other copper-bearing material during the year. Of this, 1,282,681 dry tons of ore from the company's mines, 139 tons of precipitates and 15,062 tons of slimes from the old works were treated for the Anaconda company, from which were produced 75,860,194 lb. of fine copper, 2,363,184 oz. of silver, and 7,466 oz. of gold. In addition, 475,239 lb. of copper were produced from precipitates, etc., which were treated at Great Falls. An effort has been made by the management to find out what disposition could be made of acid phosphate, if produced at the Washoe smeltery, but thus far without encouraging results. Constant endeavors have been made at the laboratories and at the plant generally to evolve some method whereby the injurious gases in the fumes might be eliminated, but no success has as yet been met with in these experiments.

Subsidiary Departments

The coal mines at Belt produced 147,263 tons of coal, of which 108,600 tons were sold to outside consumers. The saw mills at Hamilton cut about 25,000,000 ft. of lumber, of which nearly 23,000,000 ft. were sold. The Butte, Anaconda & Pacific Railway paid a 6-per cent. dividend ($60,000) on its capital stock, in addition to carrying forward surplus profits of $183,878, for the year.

Zinc Corporation, Ltd.

The Zinc Corporation, working on Broken Hill tailings, treated 227,502 tons during the year 1909, which yielded 84,698 tons of zinc concentrates, containing 46.02 per cent. zinc, 15.08 oz. silver per ton, and 7.3 per cent. lead; and 6411 tons of leady concentrates, containing 56.98 per cent. lead and 38.49 oz. silver per ton.

The tailings are subjected to a double concentration, the second or retreatment process with Wilfleys raising the value of the concentrates of the first concentration from 48s. 1d. per ton of original concentrates to 57s. 6d. The net profit secured by retreating the concentrates amounted to £20,749. The extractions obtained during the year in the two products combined were 86.3 per cent. of the zinc, 74.7 per cent. of the lead and 75.9 per cent. of the silver, which is an improvement over the previous year.

Working costs ranged from 9s. ($2.19) to 9s. 6d. ($2.31) per ton of tailings. The report states that on account of an insufficient number of Wilfley tables in the retreatment plant, the grade of the zinc concentrates fell off during the period under review from over 47 per cent. zinc to about 45 per cent. zinc. At the close of 1909, the installation of additional tables again raised the grade to over 47 per cent., with a corresponding increase in the production of leady concentrates. A further improvement is anticipated.

The corporation has made a provisional contract for a further purchase of 500,000 tons of Broken Hill residues.

Cadmium

The production of cadmium in the United States in 1909 was 5300 lb., compared with 10,000 lb. in 1908. The price for the metal ranged from 60 to 75c. per pound in lots of 200 lb. and over.

Mineral Output of New York in 1909

By D. H. Newland *

The output of the mines and quarries of New York in 1909, as tabulated by the State Geological Survey, was valued at $34,914,034, or about $5,000,000 more than in 1908. No metallurgical materials have been included in the statistics and the valuations have been based for the most part on the products in their first marketable forms.

Increase in Iron Ore

Among the prominent features of the year's record was a large gain in the iron-ore production which amounted to 991,008 long tons. The increase came chiefly from the Adirondack mines, though there was a substantial increase also in the output of Clinton hematite. A dull market in the early months curtailed activity, or the production would have been considerably larger.

Gypsum and Cement

The gypsum and salt industries have grown steadily and both returned record figures for 1909. The output of gypsum reached 378,232 short tons valued at $907,601 The salt production was 9,880,618 bbl. with a valuation of $2,298,652, showing an increase in both brine and rock salt.

The cement plants reported an output of 2,610,383 bbl., valued at $2,122,902, or about the same as in 1908. A gain in portland-cement manufacture was counterbalanced by a falling off in the natural product which has trended steadily downward in late years. With the recent completion of the plant of the New York-New England Cement and Lime Company at Greenport, Columbia county, there is prospect of a large gain in portland cement during the current year.

Garnet and Graphite

The Adirondack garnet mines experienced a better season than in 1908, although the demand was still below normal. The output of 3802 short tons, valued at $119,190 represented an increase of about 50 per cent., but was nearly 2000 tons less than the 1907 figures.

The production of crystalline graphite amounted to 2,342,000 lb. valued at $140,140, most of it from the American mine at Graphite.

Talc, Clay and Stone

About the usual amount of talc was produced by the St. Lawrence county mines, the average varying little from year to year. The industry is now controlled mainly by the International Pulp Company, which has recently acquired the Union Talc Company and the United States Talc Company, so that the only independent producer last year was the Ontario Talc Company. A new enterprise, the Uniform Fiber Talc Company, expects to begin operations this season. A deposit of talc near Natural Bridge, Lewis county, has been under development by the St. Lawrence Talc and Asbestos Company.

The largest items in the production of the State are clay materials and stone. The total value of the former for 1909 was $12,363,067. The quarry products, exclusive of millstones and limestone used in cement manufacture, were valued at $7,188,630.

MINERAL PRODUCTION OF NEW YORK IN 1909.

Product.		Quantity.	Value.
Portland cement	Bbl.	2,061,019	$1,761,297
Natural rock cement	Bbl.	549,364	361,605
Building brick	M.	1,518,023	8,159,096
Pottery	....	....	1,827,193
Other clay products	....	....	2,365,193
Crude clay	Sh. tons	12,174	11,585
Emery	Sh. tons	892	10,780
Feldspar and quartz	Sh. tons	16,111	52,441
Garnet	Sh. tons	3,802	119,190
Graphite	Lb.	2,342,000	140,140
Gypsum	Sh. tons	378,232	907,601
Iron ore	Lg. tons	991,008	3,179,358
Millstones	....	....	19,247
Metallic paint	Sh. tons	6,560	65,600
Slate pigment	Sh. tons	1,155	9,130
Mineral waters	Gal.	9,019,490	857,342
Natural gas	1000 Cu.Ft.	3,825,215	1,045,693
Petroleum	Bbl.	1,160,402	1,914,663
Salt	Bbl.	9,880,618	2,298,652
Molding sand	Sh. tons	468,609	437,402
Sand lime brick	M.	12,683	81,693
Roofing slate	Squares	21,187	126,170
Slate manufactures	....	....	880
Granite	....	....	479,955
Limestone	....	....	3,300,383
Marble	....	....	380,016
Sandstone	....	....	1,839,798
Trap	....	....	1,061,428
Talc	Sh. tons	65,000	617,500
Other materials[a]	....	....	1,483,000
Total	....	....	$34,914,034

[a] Includes apatite, carbon dioxide, diatomaceous earth, marl, pyrite, sand and gravel, exclusive of molding sand.

Railroad Rates on Iron and Steel

Special Correspondence

Active work is being done by shippers of many classes for the purpose of preventing, if possible, the further increase of freight rates by the railroads. The principal roads operating to Middle Western territory have already filed a large number of advances in rates effective June 1, but it is believed that many others are in process of preparation. Among the advances already filed are many on iron and steel to Western points.

The shippers are expected to unite in complaints to be filed with the Interstate Commerce Commission and meanwhile threaten retaliation through demands for the enforcement of the anti-trust act and of certain provisions in the interstate-commerce act against the roads.

Lead Smelting Notes from Germany

Special Correspondence

The Aktien Gesellschaft für Bergbau Blei-Zinkfabrikation zu Stolberg und in Westfalen contracted in January for several thousand tons of lead concentrates, which will keep the company's lead smeltery at Stolberg-Munsterbusch in operation until about the middle of 1911. The Rhein-Nassauisch Bergwerks und Hutten Aktien Gesellschaft, of Stolberg, Westfalen, has at its lead smelting plant a patented mechanical sinter furnace, with a capacity of 50 tons of roasted material for 24 hours of continuous operation. This furnace replaces part of the Huntington-Heberlein roasting furnaces. The lead concentrates, mixed with lime and sand, are first subject to a desulphurizing roast. The sinter furnace is an improved Dwight & Lloyd mechanical furnace and it allows the separation of diluted and concentrated roast gases.

The Chemische Fabrik Rhenania contemplates erecting a sulphuric plant at its own cost to utilize the concentrated gas of this and another sinter furnace of the same size, which is in course of construction. The European patents of this furnace, as well as those of Dwight & Lloyd, are assigned to the Metallgesellschaft in Frankfurt-am-Main.

Oil on Public Lands

Special Correspondence

Interests concerned in the exploitation of oil lands have offered opposition to some of the provisions of the Mondell bill, permitting the President to withdraw from entry such lands of specified classes as he may deem best. The bill in question passed the House some time ago and is pending in the Senate. The oil men desire that beside providing for the protection of interests already acquired in public lands through the exploitation of mineral deposits, there shall also be provision for recognizing the equities created through the expenditure of money in prospecting for oil, even though no definite result shall have been obtained. A delegation representing California oil interests has appeared before the House public-lands committee for the purpose of representing the case in order that such changes as may be made in the Senate on this topic shall receive due consideration when the bill is returned to the Lower House with amendments. President Taft is desirous that the bill shall be passed, but that it shall be put into such form as will protect all actual rights heretofore acquired on lands that are to be withdrawn for any purpose.

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*Assistant State geologist, Albany, N. Y.

Lead and Zinc Smelting in Upper Silesia

Review of 20 Years' Progress. Sulphur Utilized for Acid. Development of the Huntington-Heberlein Process. Smelteries Controlled by State

BY O. H. HAHN*

The Prussian province of Silesia comprises in its southeastern corner, an elevated tableland known as Upper Silesia, not only the most extensive coal measures on the European continent, but also rich treasures of iron, lead and zinc ores, besides vast forests of pine, spruce and white birch. The coal measures cover an area of about 500 square miles, outcropping in some places and covered in others by Triassic sandstone strata. They continue to the east and south into Russian and Austrian territory. The workable iron ore, limonite, occurs principally in the Trias, the zinc and lead ores more particularly in the dolomite of the Trias. The scope of greatest industrial activity seems to circle around Beuthen, a town of 66,000 inhabitants. The surrounding country is thickly covered with hoisting, dressing and iron works and factories of all kinds. Nearby we have the great smithsonite deposit of Scharley described by Von Cotta in his treatise on ore deposits, and to the northwest the Friedrichsgrabe near the mining town of Tarnowitz, the most important lead mine of Silesia.

Although there are as many as 11 coal seams known in Upper Silesia, there is not much coking coal, and that seems to be confined to the western part as most of the coke ovens are near the town of Zaborze, southwest from Beuthen. The coke is rather friable, which is a detriment to the ironmasters, as it reduces the capacity of the furnaces. However, the coal has one virtue which makes it especially fit for domestic and furnace use, and that is its low ash content, and the fact that the ash does not clinker. There is also a large portion of noncoking gas coal which finds a ready market in the gas works of the adjoining Russian territory.

Early Attempts to Recover Flue Dust

About 20 years ago while attending an exposition at Berlin, illustrating the means for the prevention of accidents in industrial enterprises, my attention was attracted by an exhibit of models, drawings and tabulated statements from the Royal Friedrichshütte near Tarnowitz. As I was much interested in appliances for the saving of flue dust, the Rösing lead pump and a number of minor matters, I procured a permit to visit the works and started for Tarnowitz, which is about 300 miles southeast of Berlin and may be reached from there in about 12 hours.

The Friedrichshütte, named after Frederick II, of Prussia, the conqueror of Silesia, is 3¾ miles northwest of Tarnowitz on the line of the State railways, while the mine from which it draws its main supply of ore, the Friedrichsgrube, is about one mile south of it and connected with the reduction works by a narrow-gage railroad. At the mine are also the dressing works for separating the galena from the accompanying zinc ore and gangue, and concentrating the galena to 75 per cent. lead. The reason for placing the reduction works away from the mine was probably the more favorable site, which is quite level, and the proximity of a creek, the Stola, which furnishes the water supply.

At the time of my visit the chief aim of the government officials was directed to the saving of the flue dust from the blast and roasting furnaces and the condensation of the fumes from the reverberatories and the refinery. For this purpose intricate cooling towers were connected with the blast furnaces (11 in number) through which the fumes were conducted into dust chambers, underneath, and into flues with wires suspended from their roofs (Rösing's friction wires); finally the purified gases entered into a smokestack, 170½ ft. high, to be discharged into the atmosphere. Thus the largest portion of the solid matter suspended in the furnace gases was recovered. In a similar manner the gases from the reverberatory and refining furnaces were cleaned. As the draft of the chimneys was liable to be weakened through the cooling towers, fans had to be installed between the wire chambers and the chimneys to help out whenever necessary.

Poisonous Lead Fumes

Efforts as to sanitation were noticeable in all parts of the works, especially about the slag discharge and at the tunnel heads of the blast furnaces, at the drawing doors of the reverberatory smelting furnaces and the cupeling furnaces, but they did not avail much considering the defects of the system in vogue. There were 15 reverberatory smelting furnaces in operation, running on apparently the same kind of ore as the blast furnaces. The capacity of such a furnace is small enough and the yield in metal only about 65 per cent. Besides, the residues have to be passed through the blast furnace to complete the recovery of the metal. But the worst feature is the poisonous fumes escaping from these furnaces while tapping them and raking out the residues. What wonder, then, that the men would shun them! Seeing these furnaces in operation prevented me from building one in my later practice. In the refinery where the Cordurié modification of the Parkes desilverizing process was used, I saw 15 cast-steel pots of 12 tons capacity each, all in a row and on the same level. This explains the timeliness of the invention of the Rösing lead pump, of which there were five in use. Without it a good deal of human muscle must have been wasted.

Character of Ore and Products

As the ores treated at the works are remarkably free from impurities, especially bismuth, the lead produced contains only 0.6 per cent. of antimony and some zinc. It is, therefore, well adapted for corroding and the rolling mill. The ore must be low in silver as the furnace bullion runs only from 11.67 to 14.58 oz. in silver per ton. The first rich lead from retorting the dried alloy is not rich enough to go to the refining furnace. It is, therefore, desilverized again by zinc, whereby the resulting rich lead is brought up to form 1500 to 1700 oz. This is cupeled to 998 fine. The litharge from the refining furnace is passed through the blast furnaces again on account of its silver contents. If, however, there is a good market for litharge, this is made from commercial lead in special cupeling furnaces of larger size than the refining furnace. The same plan was carried out in the manufacture of hard lead, which was made by adding refined antimony to molten commercial lead.

Zinc Reduction Plant

An anomaly of the works was the presence of a zinc-dressing plant and a zinc-reduction furnace. The manager explained to me, however, that a portion of the *Schlichs* (fines) from the dressing works at the mine was not sufficiently freed from blende to undergo the smelting process and had, therefore, to be jigged over again. The blende from this operation was roasted in a long-hearth roasting furnace (*Fortschaufelungsofen*) and then retorted in the zinc distillation furnace. The resulting zinc supplied the needs of the desilverization plant.

The processes in use and the sanitary

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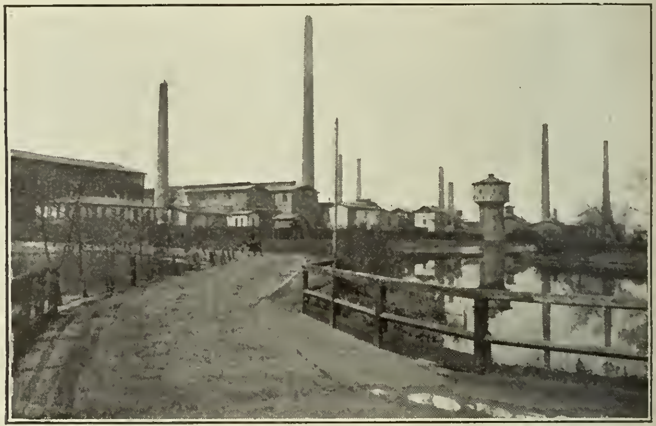
*Mining and metallurgical engineer, Schillerstrasse 6, Jena, Germany.

arrangements made to within a few years ago have been elaborately described[1] by Mr. Seager, formerly a manager of Friedrichshütte and now in charge of the technical management of the Societät Georg von Giesches Erben, one of the foremost mining companies in Upper Silesia.

Important Changes

The sight, during a recent visit, of new smokestacks discharging light curls of hardly visible smoke, of new and lofty buildings constructed of structural steel and brick, told me that a new era had broken in upon Friedrichshütte. The change was indeed a radical one. The cooling towers, the death-dealing reverberatory smelting furnaces, the zinc-reduction plant and the blende washery had disappeared; the old refinery was mostly dismantled to give room for a new and more economical one built on the gravitation plan and equipped with 60-ton cast-steel pots for zinking and 50-ton market pots. Cast steel has been used in these works for many years and proves that castings made of that material can be made without air holes. They are made at Witten-on-the-Ruhr, Rhenish Prussia.

Friedrich Zinc and Lead Smeltery



Zinc and Lead Smeltery at Tarnowitz

Extensive Use of Huntington-Heberlein Process

What characterizes the works at the present time is the extensive application of the Huntington-Heberlein process, which has been developed here to perfection; the aim of replacing manual labor by electric power wherever it is possible, and last, but not least, the utilization of the sulphur in the ore for the manufacture of sulphuric acid. A circular narrow-gage steam railroad connects distant parts of the works.

In the ore yard I saw immense quantities of lump ore and *Schlich* piled up under the railroad trestles that was said to assay 75 per cent. in lead, enough to make an American smelter's mouth water. The ore does not all originate from the Friedrichsgrube, which is owned by the State, but part of it comes from mines owned by private individuals and corporations, who have to sell their lead ores to the Government at a fixed rate by the right of eminent domain. How the Societät Georg von Giesche's Erben came to be an exception I did not learn. That company has a lead smeltery of its own, the Walther-Croneck Hütte, near Klein Dombrowka, close to the Russian line, where it treats the lead ores from its mines. Its production cannot be large, as the Friedrichshütte produced 30,000 tons of lead, during 1909, out of a total of 37,360 tons produced by the whole district of Upper Silesia.

Improvements in Blast Furnaces

In the blast-furnace department I was shown a new, large, circular, water-jacketed blast furnace, with three rows of tuyeres which were arranged in zigzag fashion around the furnace. Its hight from smelting to charge floor was stated to be about 50 ft. It was making bullion at the rate of 150 tons a day, but I suppose this was only temporary, as the general manager told me that it was not the intention of the administration to turn out more than 30,000 tons a year. There was a constant stream of lead flowing from the lead well of the furnace into a receptacle connected with a gutter, pivoted at one end while the other could be swung around in a half circle to fill molds set up for that purpose. The unavoidable dross was, of course, skimmed off previously.

The slag is tapped periodically and removed in conical pots to the dump, where it is broken up to separate the small cakes of matte, the formation of which is due to a small amount of sulphur remaining in the ore after it has gone through the Huntington-Heberlein process. The matte is at present calcined in stalls and smelted with other byproducts in the blast furnace. The slag is used as ballast on the railways. The fluxes I saw used were sand, mill cinder, scale and limestone.

Workmen Protected from Fumes

The arrangements for protecting the workmen from fumes are about the same as formerly. Hoods over the slag tap and the lead well extend into tubes that are connected with the downtakes from the charge floor. No smoke was noticeable on the tapping floor nor on the charge floor. The furnace is open at the top. A tube suspended in its center carries the smoke through a downtake into a dust chamber. Here the solid matter is precipitated by a spray of water introduced through Körting injectors, and the sulphurous acid is absorbed by milk of lime. The chamber is connected with a high stack through which the waste gases pass into the atmosphere. The waste gases are said to contain only three grams of sulphurous acid per cubic meter, while the law protecting the farmers allows five grams. Besides this large furnace a smaller one of the same style with two rows of tpyeres was running on byproducts. There are eight blast furnaces in all, but whether they have been reconstructed or are going to be retained, I did not learn.

Power Plant

The engine room, and for that matter everything else, is fitted up not only in elegant style, but in the most systematic manner and with a view to economy. Being barred from making any close inspection, I can only say that I saw a 750-kw. dynamo coupled to a steam turbine, which furnished the power to the different motors scattered about the works. The blast required for the furnaces is supplied by five Enke blowers, a German pattern, and a number of Roots blowers of ancient make, none of which were running. The Enke blower is a positive blower like the Roots and in its outward appearance resembles the latter; its interior arrangement is different. It runs smoothly, makes no noise and gives good results.

The pressure of the blast is regulated by a magneto-electric device, which presumably changes the speed of the blower automatically. In this connection mention might be made that the furnace bullion and lead are weighed on automatic self-registering platform scales, thus preventing fraud or error. They are manufactured by a firm at Düsseldorf.

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[1] Preuss. Zeit. f. B. H. u. S., vol. 41.

Chemical Laboratory

The laboratory is fitted up on the principle that "cleanliness is next to godliness." On the lower floor there is a room for moisture determinations, for a laboratory crusher, ball mill, grinder, all driven by an electric motor; a furnace room with the Freiberg movable-muffle furnaces; a store room, etc.; the upper floor is occupied by the chemical department with weighing and writing rooms for the chemists.

Utilization of Furnace Gases

The gases from the Huntington-Heberlein process are utilized for the manufacture of sulphuric acid. Several systems are in operation side by side; the old one of oblong lead chambers with Gay Lussac and Glover towers; the Gaillard tower, and the tangential chamber system of Dr. Theodor Meyer, who credits Friedrichshütte, in his pamphlet on the process, with two of his plants. In the United States the Mountain Copper Company, at Martinez, Contra Costa county, Cal., and others are using this system. At Friedrichshütte it has not been decided what system will be finally adopted. After Friedrichshütte has received its finishing touches I expect it will be the model works of the continent.

Social Features

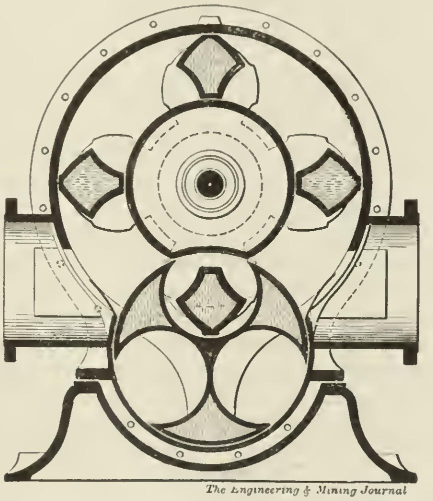
An especially pleasing feature of these works is the paternal benevolence with which the government is taking care of its employees. It has established a rigorous system of sanitation by providing ample opportunities for washing, bathing and other necessities previous to eating or leaving off work; it provides meals at the nominal price of 7½c., to those who have no families; it gives milk free of charge to those liable to be poisoned by lead.

It sells fish fresh from the sea at cost price; it has set apart rooms where the men can take their meals, the largest one being provided with a rostrum for theatricals or other entertainments during the inclement season; it has fitted up a park within the precinct of the works which contains bowling alleys, a music pavilion, stage for summer theater, platform for dancing, and a booth for dispensing beverages other than whisky.

For the convenience of the officials there is a clubhouse partitioned off into three divisions: One for the academically educated class; one for the mercantile department; and one for the foremen and master mechanics.

Private Smelteries

The only lead-smelting works of Upper Silesia in private hands is the Walther-Croneck Hütte, already mentioned. It is not open to inspection by outsiders. An effort was made to gain admittance to one of the zinc works of the most progressive company, the Georg von Giesche's Erben, at Schoppinitz, but without avail. The doors of its works are hermetically sealed to outsiders. Through technical papers I learn, however, that it is extensively engaged in the manufacture of sulphuric acid from its blende ores. The company had much litigation with neighboring land owners and had to buy a number of estates and small farms to keep out of the courts. But to stop all further annoyance, it had to adopt a different style of roasting furnace, presumably the Liebig-Eichhorn, and convert the escaping sulphurous-acid gas in lead chambers into sulphuric acid. Lately it was proposed to change over to the manufacture of sulphuric anhydride. As the market for sulphuric acid is limited, the company had to go into the manufacture of fertilizers and of alum and aluminum sulphate. This involved the importation of phosphate rock from America, and of bauxite from southern France.



Section of Enke's Positive Blower

Smelting Zinc Ore

The zinc ores are treated in the well known Silesian muffle furnaces for the extraction of the metal. The smithsonite and roasted blende are mixed in the proportion in which they arrive at the reduction works with assorted retort breakings and "cinder" (that is, fine coal deprived of its gas, or coke slack manufactured for that purpose) and retorted for 24 hours in muffles of refractory material. The muffles are about six feet long and two feet high, of oblong cross-section with rounded corners. As the length of the muffles is limited by the difficulty of charging and discharging them, Mr. Saeger has constructed machines[2] for doing away with manual labor. These have been introduced at the Giesche works and are going to be tried at other works.

Hohenlohe Smeltery

Through the influence of a friend, I was allowed to go through one section of the Hohenlohehütte near Kattowitz. The principal ore treated there is blende from the company's dressing works near Scharley. Smithsonite forms only 25 per cent. of the ore. The blende is roasted for 12 hours in two-story, long-hearth furnaces with plain fire grates. The roasting gases are discharged into the air. The company has, however, works connected with the manufacture of sulphuric acid in other localities.

The furnaces in which the distillation of the zinc is effected are set up in pairs, back to back. They are of one story and contain 72 muffles each. As there were 12 furnaces in the section visited, this makes 864 muffles in all. The furnaces are provided below the working floor with gas producers and step grates and receive an under-grate, low-pressure blast from a large fan set up in a central part of the yard. As the zinc contains from 2 to 3 per cent. lead, it has to be remelted at a low temperature in a so called refining furnace where the lead separates from the zinc by means of its higher specific gravity. As soon as sufficient lead has accumulated in the cavity of the refining furnace it is tapped into a tap-hearth and ladled into molds. It is remelted in a large kettle and molded again when it is ready for the market. The zinc is ladled from the surface of the lead and poured into flat molds forming the well known slabs in which it enters the market. The separation of lead and zinc is, however, incomplete and a repetition, of the remelting operation may sometimes become necessary. The muffles are made from plastic fire clay and ground clay shale, one man being occupied all the year round in molding them by hand. The material is prepared by women. It was a novel sight to see two women feed a jaw crusher while others were engaged in bringing the shale in clumsy wooden barrows to the crusher platform, and others mixing, watering and tempering the material. Yet they seemed to be a happy lot with all their hard work.

Lead and Zinc Production, 1909

From mercantile papers I gather the following statistics on Upper Silesia for the year 1909: Zinc-reduction works in operation 15, of which 11 were equipped with blende-roasting appliances and produced 154,332 tons sulphuric acid of 50 deg. B; production of spelter, 139,255 tons; zinc dust, 5490 tons; lead, 1231 tons, and cadmium, 37,187 kilograms.

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[2] Eng. and Min. Journ., Apr. 9, 1910.

The two Upper Silesian silver-lead reduction works had nine blast furnaces, five reverberatory, nine roasting, four cupeling and two silver-refining furnaces. They produced: Lead, 37,360 tons; litharge, 2295 tons, and 11,833 kg. of silver.

Twenty-three zinc and lead mines were in operation. They produced 195,235 tons of smithsonite, 402,582 tons of blende, 58,568 tons of lead ores, and 7817 tons of iron pyrites.

PRODUCTION OF COAL, COKE AND IRON

Coké and coke slack (*Zünder*) factories in operation, 14 (one of which manufactures coke slack), with 2157 coke ovens, all of which are arranged for the saving of byproducts. They produced: 1,358,227 tons lump coke; 134,943 tons small coke; 102,739 tons coke slack; 106,819 tons of tar pitch, etc.; 21,780 tons of ammonium sulphate, and about 10,000 tons of benzole.

Fifty-seven collieries were operated, employing 116,593 workmen and producing 34,660,000 tons of coal. The coal trade is depressed on account of the mild winter, the invasion of English coal into the Berlin trade, unfavorable railroad rates and for other reasons.

Eleven iron mines in operation produced 233,368 tons of iron ore with 1290 workmen. Of 36 blast furnaces, 27 were in operation, turning out 849,776 tons of pig iron, with a consumption of 1.184 ton coke per ton of pig iron.

The whole mining industry employed 189,305 workmen, who earned in wages, $47,283,333. The traffic on the Upper Silesian railways is shipped through the port of Kosel on the river Oder. The distance to the seaboard on the Baltic by this river route is about 400 miles. The tonnage in round numbers was about 2,000,000 in 1908. The principal goods shipped are coal, iron and zinc ores, pyrites, phosphates, pig iron and timber.

Rapid Analysis of Commercial Cyanide

BY RALSTON BELL *

A method for the rapid determination of the approximate composition of cyanide for gold extraction consists in converting the metals into chlorides by evaporation with hydrochloric acid, neglecting the effect of the small quantities of impurities usually present, weighing the mixed chlorides and titrating their chlorine content, from which the proportions of sodium and potassium are calculated.

Cyanogen is determined in the usual way by Liebig's titration with silver nitrate. Chlorine is determined by Vielhaber's titration with silver nitrate, deducting the cyanide precipitation value, but it is not considered essential to estimate chlorides as they are a neutral diluent and might almost as well be returned as carbonates. Moisture is estimated as the loss on fusion. A qualitative analysis should be made to insure that silica, heavy metals, earth metals and sulphates are not present in such quantity as to interfere with the results.

It is proposed to assume that potassium has the first claim on cyanogen and to return all the potassium found as cyanide if there is sufficient cyanogen for the purpose. Any cyanogen remaining after satisfying the potassium is to be assigned to sodium, and the remaining sodium is to be calculated to carbonate, unless determined as chloride. If chlorine is determined, it is calculated as sodium chloride, and enough of the sodium is assigned to satisfy the chlorine and the remainder is returned as carbonate. If the cyanogen found should not be enough to satisfy the potassium, it is all calculated as potassium cyanide and the balance of the potassium and all the sodium are returned as carbonates, or chlorides if determined.

EFFECT OF IMPURITIES

The effect of such impurities as might be occasionally met with would be as follows: Silica or sulphates of sodium or potassium would increase the weight of the mixed chlorides, decreasing the per cent. of chlorine and increasing the proportion of potassium found; iron or aluminum would be found as chlorides and would increase the per cent. of chlorine, increasing the proportion of sodium found; sodium chloride has no effect, except that if returned as carbonate instead of as chloride there will be a deficiency in the proportion as 106:117; cyanates have little effect, as the alkali metal is returned as carbonate which is but little less than the corresponding cyanate; isocyanates would be estimated with and returned as chlorides, which weigh almost the same as the corresponding isocyanates. The whole process can be carried out in one hour, but the calculations, though simple, are rather tedious and may take another hour.

OPERATION OF ANALYSIS

The following standard solution is required: Standard nitrate of silver, $\frac{N}{10}$, 17 grams per l., 1 c.c. = 0.0052 gram CN (Liebig's titration), = 0.0026 gram CN (Vielhaber's titration), = 0.00355 gram Cl. If the usual cyanide-plant solution of 13 grams per l. be used, 1 c.c. = 0.004 gram CN (Liebig), = 0.002 gram CN (Vielhaber), = 0.00272 gram Cl.

Sodium-Potassium Determination—Weigh out 0.25 gram in a weighed basin, dissolve in 10 c.c. water, add 5 c.c. strong HCl and evaporate to dryness. When dry, cover the basin to avoid loss by decrepitation and heat evenly till there is no more decrepitation. Remove the cover and heat over a large burner or in the muffle, or by holding in the tongs and moving about over the lamp to just below redness. Incipient redness will not do any harm. This is to insure driving off free HCl and ammonium salts. Cool and weigh as KCl + NaCl. Dissolve in water, transfer to a flask with about 100 c.c. water, add four or five drops of potassic chromate solution and titrate with standard silver nitrate till the chlorides are completely precipitated, and one drop gives the brick-red color of silver chromate which is the end point. When the end point is approaching, which is known by the silver chloride beginning to coagulate, add a few drops more of the chromate first added, or the chromate need not be added till the end point is approached.

Cyanogen Determination—Take 0.25 gram, dissolve in about 100 c.c. water and titrate with the silver nitrate to first turbidity (Liebig's titration). Potassic iodide indicator may be used or not as preferred, it makes no difference on a moderately pure cyanide solution.

Cyanogen Determination—Take 0.25 gram, dissolve in 100 c.c. water, add potassic chromate indicator and titrate as in the sodium-potassium determination to complete precipitation and brick-red end point (Vielhaber's titration). Cyanogen requires 2 c.c. by this method for every 1 c.c. which it requires by Liebig's titration, therefore, multiply the cubic centimeters used in Liebig's titration by 2, and deduct from the amount used in Vielhaber's. The remainder equals the cubic centimeters required by chlorine, which multiplied by the proper factor gives grams Cl in the sample. The effect of any ferro- or sulphocyanides or isocyanates is neglected.

Moisture Determination—Weigh out two or three grams in a weighed porcelain crucible and heat over the burner to a low red heat till all is melted and no longer, as it soon begins to increase in weight. If any ammonia should come off, let it go and let it be included in the moisture returned; cool and weigh. This method gives identical results with drying at 110 deg. C. for an hour, and is more expeditious.

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*Mining engineer, 10 March Hall Crescent, Edinburgh, Scotland.

Examples of Analyses

The analyses of three samples by this method were as follows: Sample *A*, sold as "c.p. potassium cyanide"; sample *B* sold as "gold cyanide testing 98 to 100 per cent."; sample *C*, sold as "lump cyanide, 40 per cent." *A* was not of a good color and did not look like a c.p. article; its nominal KCN test was 95.7; it dissolved readily. *B* was of a clean and white appearance, crystalline, pulverized, easily dissolved and readily tested 96.7 KCN. *C* was fairly white, hard to pulverize, dissolved slowly and evidently contained carbonates as its solution effervesced freely on addition of acid; it tested 46.3 nominal KCN.

The analysis of sample *B* is given (*B* 1), with all the sodium other than cyanide calculated as carbonate, and (*B* 2) with the sodium chloride as determined. The samples were put through a complete qualitative analysis, which proved the absence of any estimable quantity of silica, heavy metals, earth metals or sulphuric acid.

ANALYSES OF COMMERCIAL CYANIDES.

	A.	*B* 1.	*B* 2.	*C.*
KCN	95.7	12.0	12.0	38.7
NaCN	nil	63.9	63.9	5.6
K_2CO_3	0 9	nil	nil	nil
Na_2CO_3	1.5	12.0	1.6	45.9
NaCl	nil	....	11.4	0.2
Moisture	1.0	3.5	3.5	0.6
	99.1	91.4	92.4	91.0

Calculation

The calculation of *B* 2 is given in full as an example. Weight taken, 0.25 grams; weight of KCl + NaCl, 0.26. $AgNO_3$ (N/10) 43.3 cc. (× 0.00355) = 0.153 Cl = 58.86 per cent. Cl (on 0.26). Now, 58.86 — 47.6 = 11.26, and 11.26 × 7.69 = 86.59 per cent. NaCl, and (100 — 86.59) = 13.41 per cent. KCl in the mixed chlorides.[1]

Potassium—13.41 per cent. (on 0.26) = 0.035 gram KCl = 0.018 gram K = 7.2 per cent. K (on 0.25).

Sodium—86.59 per cent (on 0.26) = 0.225 gram NaCl = 0.088 gram Na = 35.2 per cent. Na (on 0.25).

Chlorine—Took 0.25 gram; used 42.1 cc. $AgNO_3$; 42.1 — (18.6 × 2) = 4.9 cc. 4.9 × 0.00355 = 0.017 Cl = 6.9 per cent. (on 0.25).

Cyanogen—Took 0.25 gram; used 18.6 cc. $AgNO_3$ (× 0.0052) = 0.0967 gram CN = 38.7 per cent. (on 0.25), of which 7.2 K takes 4.8, making 12 per cent. KCN and leaving 33.9 CN which takes 30 Na, making 63.9 per cent. NaCN and leaving 5.2 Na, of which 6.9 Cl takes 4.5, making 11.4 per cent. NaCl and leaving 0.7 Na = 1.6 per cent. Na_2CO_3.

The Missing Portion of the Analyses

The question now arises, what is the missing 7 to 9 per cent. in analyses *B* and *C*? Assuming that the analyses are correct as far as they go, which there is no reason to doubt, the missing percentage cannot be any heavy or earth-metal salt, silica, or sulphate, as these were found to be absent. It cannot be water or an ammonium salt, as these were determined by fusion at a red heat. It cannot be any salt of sodium or potassium, for these were determined quantitatively, and, as the analysis of the c.p. cyanide seems to show, with a sufficient degree of accuracy. Any alkali metal not otherwise accounted for has been returned as carbonate, and, in the case of sample *B* at least, even if it were assumed that the surplus alkali metal were present as some organic salt having a much higher molecular weight than Na_2CO_3, it would not nearly account for the discrepancy.

It was thought that the missing percentage must necessarily be organic matter, and as from the conditions of the case it must be white in color, easily soluble in water, and decomposed on boiling with the stronger acids, the presence of a considerable percentage of urea was suspected and some experiments were made, of which the following may be quoted:

Tests Indicate Presence of Urea

Took 2 grams of sample *B*, finely pulverized; extracted with 20 cc. absolute alcohol; withdrew 10 cc. (= 1 gram of sample); evaporated to dryness; weighed; ignited gently and weighed again. On ignition there were evolved copious white fumes, slightly ammoniacal. The material turned black, then melted, and the black color disappeared; on cooling, the color became yellow. Loss = 2 per cent. of the amount of sample taken. Another portion of the alcoholic extract was evaporated to dryness and the residue tested for ammonia by heating with caustic soda. Result, no ammonia.

This experiment points rather strongly to the presence of urea to the extent of perhaps 2 or 3 per cent., but still leaves several per cent. not accounted for. I would suggest that possibly the differences in solvent power, which are sometimes met with, may be due to the presence of urea, as it seems likely that soluble organic matter of this kind would be a destroyer of dissolved oxygen, and therefore deleterious.

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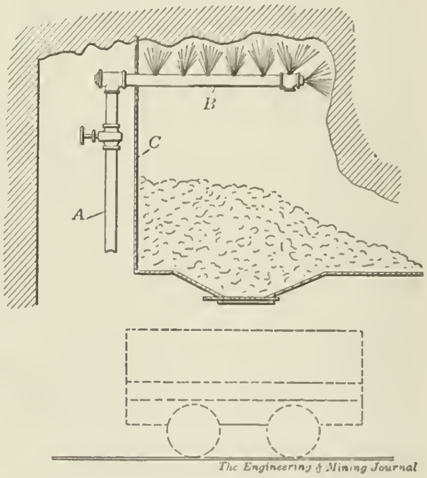
[1] Lowest possible chlorine is 47.6, corresponding to 100 per cent. KCl; highest possible is 60.6, corresponding to 100 per cent. NaCl. Therefore, 13 per cent. in excess of 47.6 = 100 per cent. NaCl, and every 1 per cent. in excess of 47.6 = 100 ÷ 13 = 7.69 per cent. NaCl. Therefore, subtract 47.6 from the per cent. of chlorine found, and multiply remainder by 7.69, result = per cent. NaCl in the mixed chlorides, and 100 — per cent. NaCl = per cent. KCl. This part of the calculation may be eliminated by using a diagram.

Method of Mining Gilsonite

T. W. Blake, of Dragon, Utah, recently patented (U. S. Pat. 950,363, Feb. 22, 1910) a method for mining gilsonite and other substances which when heated to a certain temperature flake or break down without melting. Referring to the accompanying drawing, *A* is the steam or hot-air pipe, *B* the distributing nozzle provided with a number of orifices through which the steam or air is directed against the roof of the mine and also horizontally. A casing *C* is fitted, serving as a receptacle to receive the gilsonite as it drops from the roof, and discharging it into a car below.



Steam Jet for Mining Gilsonite

In raising, the nozzle consists of a pipe with the orifices spaced both circumferentially and axially, those at the bottom being arranged closer together than at the top. While hot air may be used advantageously, steam, however, is preferable, owing to the facility in generating it, and to the fact that the moisture in the steam prevents any dust exploding.

Copper Production in Siberia

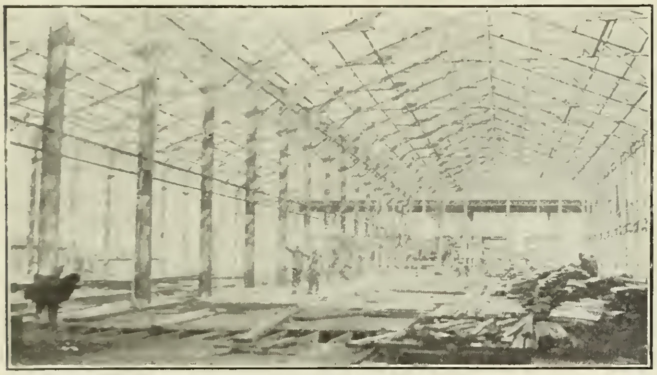
In the last two years two copper smelteries were at work in Siberia—the Spassky-English at Akmolinsk, and the Yuli-English at Minusinsk. According to the Tomsk Mining District report, the quantity of bar copper produced at the Spassky works was 106,286 poods, against 97,546 poods in 1908; and in the Yuli works, 40,073 poods against 50,528 poods. Besides the foregoing, the Dzhiltav electrolytic factory (Warter & Co.), in the Karkuralinsk district of Sempalatinsk, has been at work since Oct. 14, 1908, up to the end of which year it produced 2247 poods, followed by 3857 poods in 1909. Thus, the total Siberian metallic-copper production in 1908 and 1909 was 150,321 poods (2424 tons) and 150,216 poods (2423 tons) respectively.

Smeltery Smoke as a Source of Sulphuric Acid

Plant at Ducktown, Tenn., Utilizing Blast Furnace Gas. Capacity 160 Tons Acid Daily. Chamber Process Employed with Pyritic Smelting

BY W. H. FREELAND* AND C. W. RENWICK†

The conflict between copper smelters and adjacent land owners, growing out of the injurious effect of sulphurous acid on vegetation, is almost as old as the copper industry itself. For many years the world's copper ores were shipped to England or Germany, when Swansea and Freiberg monopolized the smelting industry. It is, therefore, natural that the problem of "smeltery smoke" should have had its first serious consideration in Europe. In the cruder pioneer smelting days little attention was paid to the chemistry of copper metallurgy. In fact, it is still in its infancy as compared with the metallurgy of iron. The effect of the smoke nuisance, however, was only too apparent. Royal commissions were appointed to investigate, experiments were made, time, money and talent were lavishly expended in a search for the means of abating a nuisance that was daily wasting an element known to be of immense commercial value. Sulphur, in the form of sulphurous-acid gas, was well known to be the injurious ingredient of the smoke, but no practical process for its recovery was found.



Interior View of Chamber Building at Isabella, Tenn.

Chamber and Tower Buildings During Construction

Failing to find a remedy, the governments of both countries resorted to the restriction of the industry to certain prescribed territory, and its regulation within certain limits of practice. This is the only measure of relief yet afforded German and English land owners.

Within recent years the "smeltery smoke" problem has become acute in the United States. Various States and the Federal Government have taken it up. Vast plants have been closed, or are threatened with closure, by injunction. At least one large Californian project, after great preliminary expenditure, has been abandoned, rather than face prospective trouble. It is not the purpose of this article to incite sympathy for the copper smelter, but to tell how some of them have overcome their difficulties.

Georgia vs. Tennessee Copper Companies

The State of Georgia sought to enjoin the operations of two copper companies operating in Tennessee near the Georgia-Tennessee boundary line. Proceedings for that purpose were instituted in the Supreme Court of the United States, and in due time that court handed down an opinion that Georgia was entitled to the injunction prayed for, if insisted upon, after allowing the copper companies a reasonable time to carry out their intention of making sulphuric acid from their furnace gases. To the lasting honor and credit of Georgia and her attorney general, Hon. John C. Hart, this State has exemplified the motto "Wisdom, Justice, Moderation," which adorns her seal, and has assisted in successfully solving the smeltery-smoke problem.

Pyritic Smelting

Of the two copper companies operating at Ducktown, Tenn., the Ducktown Sulphur, Copper and Iron Company, Ltd., a British corporation, is the pioneer. As implied by its name, the conception of utilizing the sulphur in its ores dates from its organization (1891). During the long interval between that conception and its realization, the steadfast purpose of Managing Director Joseph G. Gordon, of London, was being worked out step by step at Ducktown. It was early apparent that nothing could be accomplished toward the recovery and utilization of the sulphur contained in the ore, so long as that element was eliminated by open-air heap roasting, conducted by the very nature of the process over an area of many acres. The sulphur must be eliminated within a narrow compass. Pyritic smelting promised the only means of so doing. But pyritic smelting was still largely a matter of theoretical possibilities and disappointing experiments. That, however, is another story, and has been told elsewhere. Suffice to say that the process was developed to successful commercial practice by the Ducktown Sulphur, Copper and Iron Company, Ltd. Under the conditions of the new smelting practice, the escaping sulphurous-acid gas was confined within the furnace smoke stack and thus offered conditions favorable to its further treatment and recovery as sulphuric acid.

From the advent of pyritic smelting, laboratory investigations and experiments were conducted over an extended period by the company's chemist, with a view to adapting one of the well known acid processes to copper-blast-furnace conditions. That known as the ferric oxide contact process was selected and a 10-ton unit was installed, to try out that process on a commercial scale. The results obtained from this experimental plant clearly demonstrated that the process had not yet reached a stage commending it to copper-furnace conditions. An enlightening review[1] of the obstacles to that process was contributed by Thorn Smith, late chief chemist.

The Chamber Process Adopted

Attention was next directed to the possibilities of the chamber process, which, under the able direction of N. L. Heinz, chemical engineer and acid expert, was destined to solve the problem. A contract was made with Mr. Heinz, June 1, 1908, to design, superintend erection, and put into operation a chamber plant of the capacity of 160 tons 60 deg. B. sulphuric acid per day. Mr. Heinz arrived at Ducktown, June 23, 1908. On July 14 ground was broken for a plant covering an area of approximately 2⅓ acres. It may be stated in passing that this is the greatest area covered by any single undertaking of the kind in existence.

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*Retired general manager.

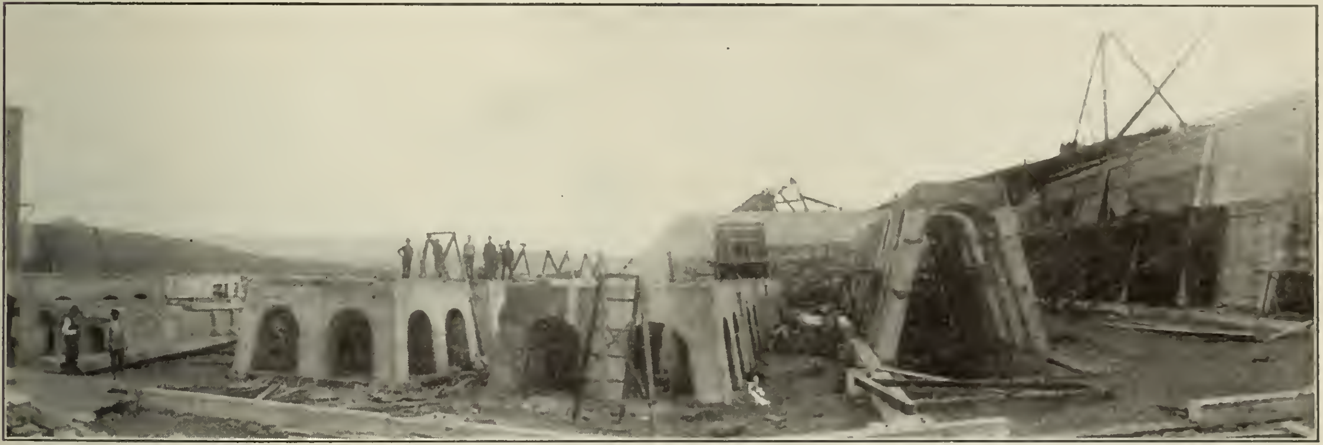
†General manager, Ducktown Sulphur, Copper and Iron Company, Ltd., Isabella, Tenn.

[1] *Trans.* A. I. Chem. Eng., Dec. 28, 1908.

On the morning of June 11, 1909, the fans of the completed system were started up; four hours later the chamber drips were running freely, and a yield equivalent to 83 tons 60 deg. B. acid was recorded for the first 24 hours.

Excavating for Sulphuric Acid Plant

Placing of Concrete Foundations



Reading from Left, Foundations for Glover Towers, Coolers, Gay Lussac Towers, Fan with Acid Egg Pit Underneath; Retaining Wall 32 Ft. High

Record of Construction

It is doubtful if such an achievement in construction could be surpassed in the great industrial districts of the east, in the midst of manufacturing and transportation facilities. To have made such a record so far from industrial centers is indeed an achievement and might suggest that excellence of design and thorough workmanship must have been sacrificed to time. But such is not the case, as may been seen by the accompanying photographs, and proved by the numerous engineers and technical men who, during erection, came from all parts of the country to study the design and structure, and are still constant visitors since actual operation was commenced. Some idea of the magnitude of the undertaking may be gathered from the fact that it entailed the excavating of 30,000 cu.yd. of earth; the placing of 6040 cu.yd. of concrete; and the erection of 1000 tons of structural steel, over 1,000,000 ft. of lumber 1,000,000 bricks and 2,750,000 lb. of lead. It may be a matter of further interest to many to know that with the exception of the structural-steel erection, the entire work was done by native labor and local artisans, under the immediate direction of Mr. Heinz. An exception to the local artisans is that of the skilled lead burners, who were brought together from various parts of the country.

The Solution of a Complex Problem

The problem presented to the acid expert was a novel and complex one. It imposed many conditions foreign to the usual sulphuric-acid manufacturer, such as the contamination of the gases (smoke) by flue dust, unavoidable in blast furnaces; irregularities in furnace conditions and consequent fluctuations in temperature and in composition of the gases; the presence of carbon dioxide from combustion of coke (which, unfortunately, cannot be entirely dispensed with even in pyritic smelting), and further increased by an appreciable quantity from calcium carbonate in the ore, which at furnace temperature yields lime and carbon dioxide.

Owing the the fluctuations in composition of gas an average analysis would convey little idea of conditions to be met and provided for. Under fairly normal conditions the gases delivered to the chambers are approximately as follows: SO_2, 3½ per cent.; CO_2, 3½; and SO_3, trace. The temperature of the gases in the furnace flues frequently records a range of over 200 deg. C. in every eight or 10 minutes.

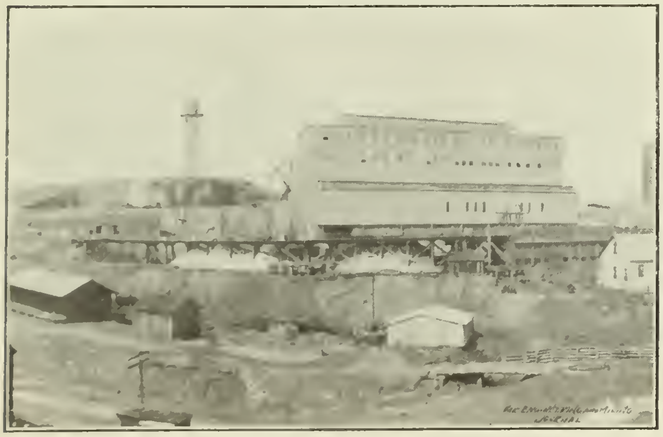
Anyone conversant with the reactions of the process will readily understand that a chamber acid plant of ordinary design would be wholly inadequate to meet such variable conditions. The flue dust calls for special consideration since it carries a large percentage of zinc in the form of impalpable sulphates and oxides, that are prone to be carried into the system, clogging the gas passages and flues, and even the circulating acid pipes. Moreover, zinc in itself is an important by-product to be recovered.

It is in the special provisions, designed to meet these exceptional conditions, that this plant chiefly differs from the ordinary chamber plant.

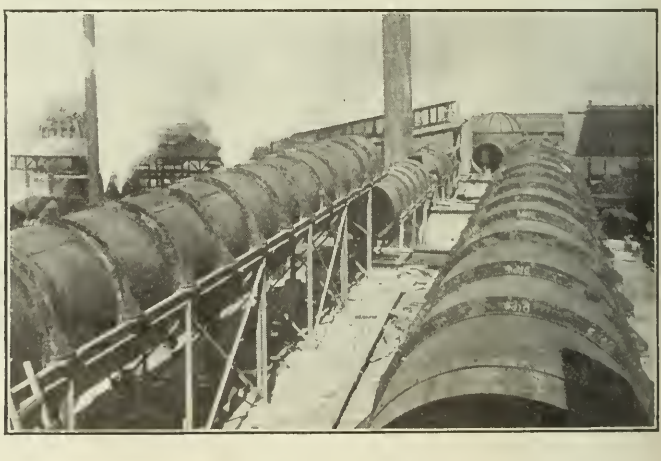
OPERATIONS OF THE PLANT.

The course of the gases may be traced on the accompanying outline plan and elevation. The original smelting plant, before the manufacture of sulphuric acid was commenced, consisted of two furnaces of the usual water-jacketed type, each with an independent brick flue leading to a common brick dust chamber, at one end of which stands the old smoke stack, now cut off by a damper. From the furnace-dust chamber the gases now pass into and rise through a cylindrical tower, thence through a kite-shaped flue to the special dust catcher on a somewhat higher level. This dust catcher, with its connecting and extension flues, claims particular attention, as these control and regulate the temperature of the gases delivered to the Glover towers, as well as eliminate the zinc and other light dusts. The dust catcher proper consists of a rectangular brick chamber containing a system of channel irons. Each channel is held in place by trunnions resting in the walls. On one side the trunnions extend through the side wall, the ends being squared to take a wrench, by which means they can be revolved and their accumulated contents periodically dumped to the floor and later withdrawn through appropriate openings underneath. The coarser particles of flue dust readily come to rest in the anterior flues and furnace-dust chamber. The impalpable metallic oxides and sulphates respond but slowly to gravity at high temperatures, even at the slow speed attained in the flues and dust chamber, hence the introduction of the channel irons offering surfaces of repose at all points between the floor and roof of the dust catcher.

FOUNDATION AND PORTION OF STEEL FRAME FOR TOWER BUILDING



TOWER BUILDING AND STORAGE TANKS



KITE SHAPED FLUE

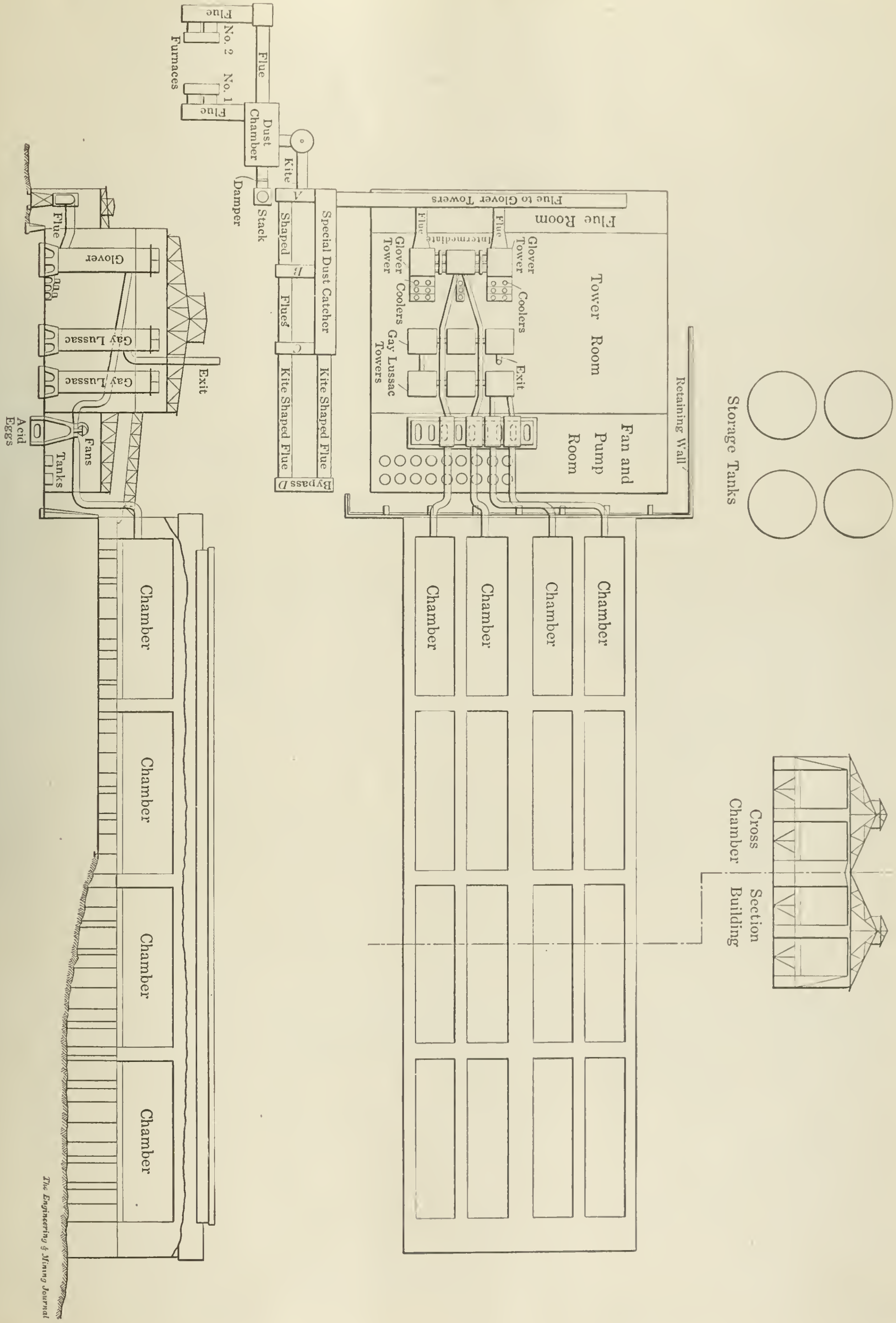
TEMPERATURE AND DUST ELIMINATION

The control and regulation of the temperature of the gases is accomplished by directing their flow through a greater or lesser distance of the kite-shaped iron flue leading into the dust catcher. Referring to the plan, *A B* and *C*, the tower-like extensions of the dust catcher afford entrances thereto, while a fourth point of entrance is seen at its posterior end. By a simple system of dampers the gases may be admitted at any or all these entrances, in any desired proportion. On high temperatures, caused by exceptional conditions of the furnace, the gases are cooled by passing them through the whole course of the kite-shaped flue. On lower temperatures the whole or part may be admitted at any earlier point or points.

From the dust catcher a brick flue runs the full length of the tower building with separate off-takes to each Glover tower. In each of these off-takes are placed niter boxes for the decomposition of the sodium nitrate. There is also an auxiliary set of similar niter boxes at the end of the dust catcher for use in emergencies. In addition to these, a special and original method of dealing with the valuable nitrous compounds has been worked out and put into successful operation.

GLOVER TOWERS

The gases having been cleansed of dust and brought to the proper degree of temperature are now ready for the first step of the process, viz., the two



General Plan and Section of the Sulphuric Acid Plant of the Ducktown Sulphur, Copper and Iron Company, Ltd., Isabella, Tenn.

Glover towers, each 12 ft. square and 45 ft. high, filled with checkered layers of a patent chemical brick. Entering at the bottom of these towers the gases ascend to the top, whence they are led downward again through a system of external pipes to enter the bottom of a special tower through which they again ascend, and pass on their way to the chambers through two lead flues, each 42 in. in diameter. Special mention should be made of the extremely high oxidation of the sulphur dioxide. In these towers fully 40 per cent. of this gas is converted into SO_3. The concentration of the chamber acid is accomplished without any external aid from cast-iron pans, etc., generally used in the ordinary chamber process. While this plant has a normal rated capacity of 160 tons 60 deg. B. acid per day, it has been demonstrated that this quantity does not represent the maximum tonnage that can be produced, and furthermore a concentrating capacity of over 200 tons 60 deg. B. acid per day has been attained when actually needed.

Acid Chambers

Situated between the towers and the chambers are four powerful fans to force the gases through the system. These consist of similar units, two forcing the gases into the front chambers, and two withdrawing them from the rear. These fans are made of hard lead (10 per cent. antimony and 90 per cent. lead) and are of special design.

Next in train are the 16 chambers, comprising two sets of eight each. Each chamber is 96 ft. long, 22 ft. 8 in. wide, and 30 ft. high. The total volume of the chambers is 1,050,000 cu.ft. It is at this point in the process that the contaminating influence of the carbon dioxide is felt, and where special and novel features are successfully introduced to overcome its pernicious effects. As these features are of a proprietary nature, I regret that I am not at liberty to describe them.

Gay Lussac Towers

From the chambers the gases pass into the six Gay Lussac towers, where the nitrogen compounds are recovered in the same manner as in all modern and well regulated chamber plants. It has been the belief of many acid manufacturers that only a "sludge" acid could be produced in a chamber acid plant, utilizing the waste sulphur gases from a pyrite smelting furnace. That such is not the case in this instance has been readily acknowledged by several well known experts, who, after having seen the manufactured product delivered from the Glover towers to the storage tanks, have expressed surprise at the purity and clearness of this acid.

Furnace Operations

In order to comply with the requirements of the State of Georgia, through Attorney General Hart, smelting operations were reduced to a one-furnace basis to meet the capacity of the acid plant. This furnace smelts pyrrhotite ore six days in each week, the seventh day being devoted to the concentration of the low-grade matte produced during the ore-smelting period. The ore treated varies almost daily from 14 to 19 per cent. S., and averages about 16 per cent S., and the low-grade matte about 25 per cent. S. The problem of utilizing the gases from the matte concentration proved a simple one and considerably more acid is produced on this one day than on any of the ore-smelting days.

Due to the irregularity of the gases produced from only one furnace, it might give rise to the suspicion that conditions deleterious to the lead chambers and towers would arise. After more than nine months' operation, large samples of lead were removed from the chambers and towers, cut into squares 12x12 in. and carefully weighed without discovering any perceptible loss in weight.

In conclusion it may be stated that the manufacture of sulphuric acid from "smeltery smoke" is far beyond the experience of most copper smelters. The present achievements and future promise of further acid development by the Ducktown Sulphur, Copper and Iron Company are entirely due to N. L. Heinz, who has worked out the problem to its present commercial success at this plant.

Possible Substitutes for Tree Rubber

By William Weston *

Commercial rubber is a valuable adjunct in the running of machinery, and its use has increased rapidly during the last 15 years, due largely to the advent of the automobile. Rubber stocks are just now having a tremendous boom in the London market, and for the time it is almost impossible to get a hearing on any other enterprise. It would seem that they are getting near the danger line, for the supply of tree rubber having become insufficient to meet the demand, active minds are at work looking for a substitute for rubber, and now apparently with some chance of success.

Among the many materials of an asphaltic nature, classed as hydrocarbons, and which are found in Routt county, Colo., and Uinta county, Utah, are gilsonite, grahamite, ozocerite or mineral wax, and what has been called, and I think erroneously, elaterite or mineral rubber, but which is in reality wurtzilite. Dana describes elaterite as mineral caoutchouc or elastic bitumen, which is found in soft, flexible masses, and was discovered in a lead mine in Derbyshire, a coal mine at Montrelais, France, and in bituminous limestone at Woodbury, Conn. The elaterite of Indian and Sam cañons, owned and worked by the Raven Mining Company, of Chicago, is hard and bright, but not elastic in its crude state, and is manufactured into "kapak," which is used chiefly for waterproof roofing.

Quoting from the Government report on the asphalt and bituminous-rock deposits of the United States: "The relations, chemical and other, between the hydrocarbons show the utmost complexity, for complexity exists in the substances themselves, nearly all of which are separable by the action of solvents, or by fractional distillation into two or more components, that are in turn divisible into series of hydrocarbons, in many instances of great extent."

In the Uinta county region, all these substances seem to differ in character in the different veins found, and now the discovery of a 5-ft. vein is just reported, and from the appearance and action of the mineral under a flame, it is probably wurtzilite, but which when melted in conjunction with a light oil and poured over canvas, makes a good rubber sheet. A mass of the same when cooled is similar to true rubber in appearance, but not quite equal as yet in resiliency or elasticity. The discovery has been made only recently and while patents are being obtained for its manufacture, no information is being given out. As wurtzilite is worth about $50 per ton f.o.b. cars, the value of such a discovery would be great.

A Rubber Plant in Colorado

About four years ago it was discovered that a plant which grows in arid regions all over the State of Colorado, at elevations of 5000 to 8000 ft., contained considerable quantities of rubber in its roots. By plainsmen it was known as "rabbit brush," but Professor Cockerell, of Colorado College, identified it as "a *Picradenia* closely allied to a *P. Floribunda.*" Many tons of this were gathered, and a company formed, which erected some simple wet-grinding machinery, and produced rubber, from which rubber bands, erasers, auto tires, horseshoe pads, shoe heels, etc., were made, all of which appeared and were pronounced to be equal in resiliency and elasticity to tree rubber.

The patents are now in the hands of a company in which Myron Brownell, manager of Mining Science Publishing Company, is one of the chief owners. The cost of gathering and manufacture did not exceed $15 per ton of shrub, and it produced from 5 to 16 per cent. of rubber, which was worth 80c. per lb. when rubber was about half the price it is now.

Mineral rubber, if proved available for use, of course has its limits, and will eventually be worked out, while the vegetable rubber can be cultivated indefinitely.

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*Denver, Colo.

Burro Mountain Mining District, New Mexico

Burro Mountain and Chemung Mines Each Report over 2,000,000 Tons Blocked Out; Savanna Has Large Acreage; Railroad Connection Soon

LOW GRADE COPPER ORES

The Burro Mountain mining district, in Grant county, N. M., was first prospected for silver and later, in 1880, for copper. The ores occur as a disseminated chalcocite through shear zones in a porphyry country. In the early days the production of the district was from rich deposits of carbonate ores at the surface, but latterly the enriched sulphide zone has been sought. Sulphide ores have been found at the surface, and leached areas encountered in the deepest workings (800 ft.). The present water level is at 300 ft.

Low-Grade Ores Developed

The principal companies in the district are the Chemung, Burro Mountain and Savanna. Two Star drilling outfits are now at work on the Savanna, developing the disseminated ores believed to exist. The Mangus Development Company plans to prospect its ground west of the Chemung and north of the Burro Mountain by churn drills; the Azure mine, north of the Mangus, has a turquoise mine along an altered zone in the granite.

The Burro Mountain and Chemung properties have each about 6 miles of workings, and each reports over 2,000,000 tons of 2½ to 3 per cent. ore in sight. The ores are not uniform, masses usually carrying 1 to 3 per cent., and occasional bunches running as high as 20 per cent. copper. Ore about 2½ per cent. is classed as commercial for the concentrators. The Burro Mountain has a 250-ton mill which has been operating for several years, concentrating 9½:1 and saving 75 per cent. Phelps, Dodge & Co. recently acquired the complete ownership of the Burro Mountain, and will close down the mill, holding the property merely as a reserve. The Chemung property has one shaft (No. 2) to a depth of 800 ft., but the bulk of the development is at a depth of from 250 to 300 feet.

The Savanna company owns the Comanche and Copper Gulf groups, contiguous to each other and forming an area of 2577 acres in the Burro Mountain district. Such development as has been done on the Comanche group has been for the most part at two of the shafts which are connected on the 300-ft. level, and which have disclosed about 50,000 tons of ore. The other shafts and workings are confined to the surface. The engineer for this company, I. J. Stauber, says this group lies within the mineralized area and contains three large fractured zones, averaging 250 to 300 ft. in width.

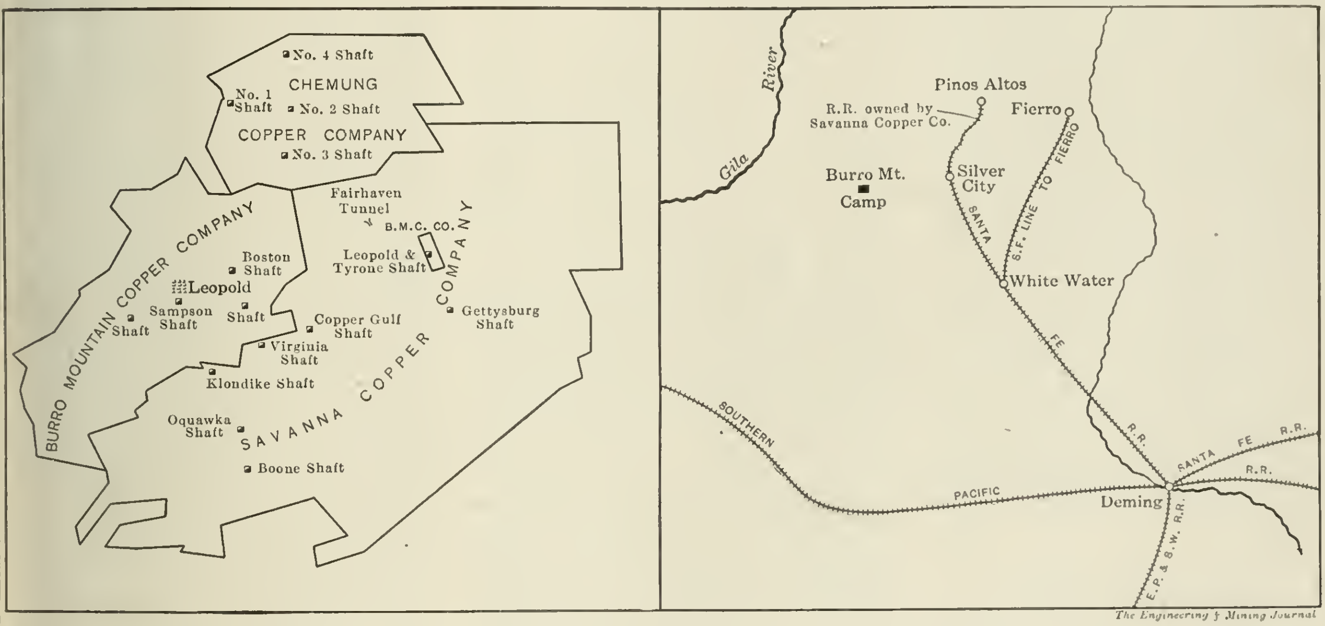
The Copper Gulf group comprises 1440 acres and is opened by five shafts, all about 300 ft. deep. The Old Virginia shipped several thousand tons of 10 per cent. copper ore in 1907, but the principal ore developed on the group carries 3 to 3½ per cent.

Operations Await the Railroad

The mines in this district have been experimenting and working the ores for many years. Several smelteries have at one time or another been built in the vicinity, but high prices for material together with a long wagon haul to the railroad rendered these enterprises unprofitable and they were abandoned.

The smeltery of the Savanna company is on the Santa Fe railway, south of Silver City and was built to trate the lead-silver ores from Silver City at the Pinos Altos district. It contains one 200- and one 300-ton water-jacketed copper furnace. The company also owns a concentrating mill at this point, which with a little remodeling can handle 300 tons of Burro Mountain sulphide ore per day. Iron flux and lime are quarried along the company's railroad near Silver City.

Work is in progress on a railroad to connect the Burro Mountain district with the Santa Fe railroad. This road should do away with the chief reasons given for the failures of the smelting works of this camp, and should pave the way toward the further development of the resources of the district. Upon the completion of this road the Savanna company promises to commence shipments and inaugurate a vigorous campaign of development.



Principal Mines and Situation of Burro Mountain District

The Northern Appalachian Coalfield

Detailed Study of Various Seams Occurring in First Bituminous Basin. Desirable Tracts of Coal Available and Present Favorable Conditions

BY RUSH N. HOSLER*

The structure of the greatest coalfield of the world, which geologists have named the "Appalachian," is simple, consisting in a general way, of a broad canoe-shaped trough. Beginning near the northern line of Pennsylvania, about latitude 42 north, longitude 77 west, it extends southwestward through West Virginia, western Maryland and Virginia, southeastern Ohio, eastern Kentucky, central Tennessee and ending in Alabama about latitude 33 and longitude 88. The deepest part of this canoe-shaped trough lies in a line extended southwesterly from Pittsburg across West Virginia.

While the general character of this rudely shaped canoe is easily understood, the eastern prow is crumbled into a number of nearly parallel folds or troughs, from which complications often arise in making a detailed study. Close observation, however, shows that from the Allegheny front, westward, each succeeding trough is deeper than the one on its east side, and that the arches are correspondingly lower until beds that have an altitude of more than 2000 ft. on its front, extend way below sea level in the center of this great canoe-shaped basin. The upward-bending arches that divide these troughs are called anticlines and the downward-bending troughs are called synclines. The axis of a fold is a line, which at every point, occupies the highest part of the anticline or the lowest part of the syncline; and the part lying between two anticlines, which are separated by one syncline is called a basin.

FIVE GROUPS OF COALS

We find, in this greatest of coalfields, five well defined "series" or "groups" of coals. From the top downward they are as follows:

1. Upper barrier measures, or Dunkard series.
2. Upper productive measures, or Monongahela river series.
3. Lower barrier measures, or Conemaugh series.
4. Lower productive measures, or Allegheny River series.
5. Pottsville measures, or Conglomerate series.

The Lower productive, or Allegheny River series takes its name from the fact that it was first well developed and studied along the Allegheny river and its tributaries, prior to the discovery of coal beds in the Conglomerate series, and was then supposed to be the lowest coal measures.

This group, as now limited by geologists, is found between the two well known rock formations—the Mahoning sandstone above, and the Pottsville conglomerate below. Beginning on the top of the conglomerate and coming up, we find the following well known beds of coal in this series:

Brookville coal, or bed..................	"A"
Clarion coal, or bed..................	"A′"
Lower Kittanning coal, or bed..........	"B"
Middle Kittanning coal, or bed..........	"C"
Upper Kittanning coal, or bed..........	"C′"
Lower Freeport coal, or bed............	"D"
Upper Freeport coal, or bed............	"E"

The scheme for designating the principal seams of coal in the Allegheny River series, as now used by the letters A, B, C, etc., was modified from the one adopted by Hodge and Leslie in studying this "series" in 1840, and also from the scheme first used in the fifth annual report of the first geological survey of Pennsylvania, in 1841.

The bituminous coal measures of Pennsylvania are divided into six principal basins, separated by well defined anticlines. I think it was J. D. Hodge, in the first geological survey of Pennsylvania, who first numbered these basins. He starts just back of the crest of the Allegheny mountains, sometimes spoken of as the "Allegheny front," calling it by the first basin and the anticline next west, the first axis. The second basin and second axis, third basin and third axis, etc., following in regular order going westward; the fifth axis crossing the Allegheny river near the mouth of the Red Bank and the Ohio river just below Pittsburg; placing all west of this axis in the sixth basin, which is again subdivided into several basins, extending into Ohio and West Virginia.

This first basin in Clearfield county has always been a large producer of one of our best "steam coals." The coal from this basin, which has made the region famous, has long been one of the standard coals for comparisons throughout the whole Appalachian region. Generally speaking, the first basin carries all of the "lower productive measures."

FEATURES OF THE FIRST BASIN

Structurally, the pronounced features of this basin are: The tendency to preserve large areas of the lower productive measures; the quantity of coal preserved in the Freeport group, found here from about 30 to 45 ft. apart, and the Kittanning group occupying a space of from 75 to 90 ft.; the nonpersistency of the limestones that are usually found in these measures, yet they are found locally, but in thin beds; and the presence of the best of fire-clay beds, for which the region is also noted, lying directly under the coal measures and on top of the conglomerate, this is especially true near or on the anticlines.

The Mahoning sandstone is rarely found in its massive form within this basin, yet the upper Freeport coal is one of the most persistent and regular beds. It averages from 2 to 3 ft. thick (sometimes reaching nearly 4 ft.) wherever the hills are high enough to carry it. Mostly shales and sandstone from 40 to 50 ft. thick separate the lower Freeport from the upper Freeport.

The Lower Freeport (D), or the "famous Moshannon" is the coal that gave this region its name and has for many years, until quite recently, been the main producer of the district and the standard of comparison. It yields from 4 to 5 ft. of coal, varying locally from 3 to 8 ft. in thickness. In the northeastern part of the basin, it carries a slate parting from 1 to 2 in. thick, from 9 to 14 in. from the bottom, but in the Houtzdale region there is a clean bed without any partings, but sometimes carrying about 6 in. of boney coal on top.

The Upper Kittanning (C′) lies about 40 ft. below the D, and generally speaking, is not of workable thickness.

The geological reports have erred in calling the Middle Kittanning (C) coal a worthless bed in this basin. It is found about 30 ft. below the C′ bed, and in some places is one of the best coals in the basin.

The Lower Kittanning bed (B) about 40 ft. below the C bed, is usually found throughout the entire basin and is worked extensively in most places. There are large areas of this coal undeveloped, and from this bed the region can hope to maintain its reputation as a producer of a number one steam coal.

THE CLARION SEAM

The Clarion bed (A′) and Brookville bed (A), found respectively from 50 to 70 ft. and 75 to 100 ft. under bed B, are being worked at a few places, and the future may expect much from these two seams of coal as they cover large areas;

NOTE—Abstract of paper read before the Coal Mining Institute of America, Dec. 17, 1909.

*Mining engineer, Morrisdale Coal Company, Morrisdale Mines, Clearfield county, Penn.

however, more thorough development of this group of coals may prove them workable only locally.

In mining the B seam in the Winburne district, only the upper and middle benches are shipped, as the lower bench is not a clean merchantable coal. The Clarion, or A′ coal, is being developed in this section and the driller's records show about a 5-ft. seam, not all clean coal, however. There is a coal found some places in this community about 160 ft. below bed B, reported to be about 5 ft., but I have not studied this coal and will not attempt to identify it.

The principal operators in this vicinity are the Clearfield Bituminous Corporation, Penna. Coal and Coke Company, and Peale, Peacock & Kerr, Inc., with several smaller operators.

More can probably be said of the Philipsburg-Morrisdale district of this basin, than any other, for the reason that every one of the seams of coal is found here of workable thickness and nearly all are being developed to a greater or less degree.

The Upper Freeport coal is found about 55 ft. above the Lower Freeport, and is very persistent wherever the hills are high enough to preserve it. It carries a thickness of 2 ft. 6 in. to 3 ft. 6 in. and is usually a brilliant black, light-bodied coal. An average of several analyses of this seam of coal shows as follows:

ANALYSIS OF FREEPORT COAL.

Moisture	0.675
Volatile matter	23.930
Fixed carbon	69.375
Ash	4.750
Sulphur	1.270
With a B.t.u. value of	14.238

The Lower Freeport, the "famous Moshannon," or D bed of coal, is nearly a thing of the past in this part of the basin. It is now being worked only by small operations, and these almost exclusively confined to outcrops left from the original mining of this coal by the larger operators in the past. In this particular region, this coal is found with a thin slate parting from 1 to 2 in. thick, about 15 in. from its floor.

The Kittanning Upper coal (C′), found from 33 to 40 ft. below the "Moshannon" bed, is for the most part worthless. It runs from 2 ft. to 2 ft. 8 in., with a slate parting near the middle from 3 in. to 9 in. thick. In the Morrisdale Coal Company's No. 2 shaft it shows coal 1 ft. thick, slate 7 in., coal 1 ft. It is worked some few places as "country banks."

Geological Reports Seem to Have Erred

It is relative to the Middle Kittanning coal (C) that the geological reports seem to have erred, especially in the Philipsburg-Morrisdale region. These reports speak of the abnormal minimum interval between bed D and bed B in this particular place.

Coal found many years ago in the bottom of an old trial shaft at Morrisdale, was erroneously called the B-seam, and nearly all coal mined as the B-bed in this community was so named because the coal in the bottom of this trial shaft was supposed to be the B-seam; in reality, this seam is the Middle Kittanning bed (C), which subsequent development has proved beyond any question of doubt. This C coal has been worked for many years through shafts by the Morrisdale Coal Company, and through its par-excellence has earned for itself a reputation second only to the "famous Moshannon," which latter seam has been practically exhausted.

This coal at Morrisdale is found from 3 ft. 10 in. to 6 ft. clean coal with an average of 4 ft. 6 in. to 4 ft. 9 in. and sometimes carrying a boney coal about 4 in. thick on top and a coaley slate about 3 in. thick on the bottom. This is a hard, firm, cubical fractured, light-colored coal, capable of much handling without destroying its lumpy character in which it appears on the railroad cars.

An analysis of this coal made by a large consumer in a test with other coals, showed as follows:

ANALYSIS OF MIDDLE KITTANNING SEAM.

Moisture	0.86
Volatile matter	15.08
Fixed carbon	76.30
Ash	8.25
Sulphur (included in ash)	2.01

Coke was manufactured from this coal at Morrisdale for many years.

At Graham Station, about three miles west of Philipsburg, this coal is also being worked and has been for some years and as at Morrisdale was also called by some the B seam of coal. It shows here from 2 ft. 6 in. to 4 ft. and sometimes 5 ft. thick.

It is gratifying, after having supposedly worked out such a large area of the B coal, to find this same area underlaid with the B seam, about 40 ft. under the C, which is so rapidly being exhausted. This fact means much to the commercial stability of the community.

The Lower Kittanning Bed

The Lower Kittanning, or B bed of coal is a typical seam throughout the entire first basin. It is being worked extensively. In developing this seam, the lower bench is not mined for it carries a large percentage of sulphur and ash and in most mines is not taken up at all. The bone separating the upper from the middle bench of coal becomes a rock in some places and has a tendency to thicken and split the vein. The average analysis of five samples from three different mines shows the following:

Moisture	0.95
Volatile matter	21.81
Fixed carbon	70.86
Ash	4.736
Sulphur	1.650

There are remaining several large areas of this coal in this region that have not been developed, but which invite further prospecting to determine their real value.

The Clarion coal (A′) is being worked on One Mile Run, about 1½ miles east of Philipsburg. There is a large area of this coal above water level on this run, and if prepared carefully, makes a good steam coal. The following analysis was furnished by one of the operators:

Moisture	1.64
Volatile matter	20.70
Fixed carbon	69.45
Ash	6.11
Sulphur	2.00
B.t.u.	14.328

The seam shows up better here than at most any other place in the Philipsburg-Morrisdale region, but further development may prove its value to the community in the future.

The Brookville Coal

The Brookville coal (A) is not worked at all in this region, but drillings at Morrisdale and Philipsburg show it to lie from 90 to 125 ft. below bed B. It varies in thickness from 3 ft. 9 in. to 4 ft. 6 in. with small partings showing in one or two places. From the large areas of this coal here, it should invite more thorough prospecting. The largest operators are the Morrisdale Coal Company, Irish Brothers, Atherton & Barnes, T. J. Lee, Ashman Coal Company, Graham Company, Monarch Coal Company, and many small operators.

In the Osceola-Houtzdale district, most of the coals have been, or are being worked. The feature of this district is a series of faults running nearly at right angles to the general direction of the basin, throwing the measures down as they go southwesterly, thereby keeping the coals in the hills. These faults range from 15 to 150 ft., and are nearly square cut-offs, increasing in hight to the southeast and decreasing to the northwest.

There is no E coal between Osceola and Houtzdale, but west of the latter place this coal comes into the hilltops and is worked on a small scale. It runs from 2 ft. 4 in. to 3 ft. 2 in. and is a brilliant black, light-bodied coal, analyzing as follows:

Moisture	0.80
Volatile matter	22.25
Fixed carbon	70.35
Ash	5.58
Sulphur	1.02

The Moshannon Coal

Houtzdale, Penn., may be termed the home of the Moshannon coal, as it is here that it is found at its best, sometimes reaching the hight of 8 ft., with only a parting as thick as a pencil, and this parting a soft streak of mineral charcoal, or "mother coal." For the most part, this seam is exhausted and only the outcrops are left. There are, however, a few hundred acres of this coal still existing in its virgin state, but in most places it is in small patches, or the larger areas lie under water and have to be sloped or shafted.

This "famous Moshannon" has been the mainstay of the whole Clearfield region, and its purity and excellence have made it a standard which has caused it to be mined with great rapidity to supply the constant demand for such a high grade of bituminous coal. An average of many analyses shows as follows:

ANALYSIS OF MOSHANNON COAL.

Moisture	0.801
Volatile matter	21.715
Fixed carbon	73.238
Ash	3.673
Sulphur	0.573

The Kittanning Upper coal (C'), usually found about 45 ft. below the D coal, generally speaking is a worthless bed in this district and shows about the same structure as mentioned in the Philipsburg-Morrisdale region.

The Kittanning Middle coal (C) is being worked on a small scale on Coal Run between Osceola and Houtzdale, and is from 2 ft. 6 in. to 2 ft. 10 in. thick. It is opened in a few other places, but only for "country banks," and the probabilities are that it will never be worked so extensively as the same bed was in the Philipsburg-Morrisdale district. It is light in color and weight with a high percentage of ash.

The Osceola-Houtzdale district of the first basin has largely developed the Lower Kittanning (B) coal. It is found in its characteristic three benches throughout. An average of 8 samples shows as follows:

ANALYSIS OF LOWER KITTANNING COAL.

Moisture	6.330
Volatile matter	20.400
Fixed carbon	72.340
Ash	6.930
Sulphur (in ash)	0.976
B.t.u.	14.325

There are large areas of this coal that are now being opened up and many more that could be developed into very large producing collieries.

The Clarion (A') coal is being worked at Osceola by drifts, and has been opened opposite Retort. With a hard slate and rock floor, this coal is accompanied with many knife-blade partings in it and carries a high percentage of ash and sulphur.

The Brookville coal (A) is unreliable in this district, and perhaps more so than any of the other beds, ranging from about 1 ft. up to nearly 4 ft., and sometimes more. Where it is thick it is slaty and dirty, and where very thin it is usually good, so far as observed, and its future commercial stability has hardly been proved.

Most Promising Part of the First Basin

The Muddy-Run-Madera-Coalport region probably presents greater opportunities for future development than any other part of the first basin. This is especially true in relation to the lower beds of the measures, but with the building of a branch of the New York Central & Hudson River Railroad up Clearfield creek from the town of Clearfield, in the past three or four years a great deal of available territory has been taken up which is reported to have good showings of the different coals; with renewed activity in the coal business throughout the country, we may expect to hear of large operations being planned for this region.

Freeport Coal

The Upper Freeport coal (E) does not carry throughout this entire district, but where it is found you will see the same brilliant-colored coal, characteristic of this seam, from 2 ft. 4 in. to 3 ft. 2 in. thick.

The Lower Freeport coal (D) in the Madera region is found near the tops of the hills and has been largely removed. This coal is characterized by its splitting into two benches in the Muddy-Run basin. This splitting starts in old Mt. Vernon shaft, between Houtzdale and Ramey and continues southwestward to the Coalport region. From a pencil mark at the start, this parting increases to near 25 ft. around Ramey and this interval increases to 50 or 60 ft. along the lower portion of Big-Muddy run. The upper split of this seam is thin and worthless at nearly all places and the lower split thins from its regular thickness to 3 ft. 6 in. on Smoke run and 2 ft. 4 in. to 2 ft. 10 in. at Bacaria and Jonesville. At Coalport and Irvona, this coal is of little importance, maintaining its split condition from the northeast.

The openings on this coal where it is separated by this large rock interval are in the lower bench and it yields one of the best coals in the basin.

Upper and Lower Kittanning

The Middle Upper Kittanning coals (C) and (C') respectively, are of little value through here, yet they are reported in the vicinity of Glen Hope from 3 ft. to 3 ft. 6 in. thick; however, the extent of this coal at this reported thickness is a question that further prospecting will have to answer.

The Lower Kittanning coal (B) is the one coal above all others that much can be expected from here. This coal is opened and worked at Coalport about 100 ft. above water level. In the Madera region it is above water. On the waters of Muddy run and in the Janesville district it is shafted.

At Madera there seems to be some question as to the identity of the (B) coal and if the coal being generally worked there and showing from 3 ft. to 4 ft. 5 in. thick is not the (B) seam, then its value here is of little importance. There are large areas of this coal undeveloped, and we may expect to see uptodate mining plants operating here in the future.

The Clarion Coal Seam

The Clarion coal (A') carries all the way from Osceola southwestward beyond Janesville where it is lost track of from lack of definite prospecting, as it is there below water level. It is characterized by its two partings, a ½-in. to 1-in.-mother coal parting about 1 ft. from the top, and 1-in. slate parting about 1 ft. from its floor. The seam is about 3 ft. 5 in. thick and is of a black nature with a diagonal fracture. Like in other parts of this basin, the development of this coal is being retarded owing to the presence of so much (B) coal of a superior quality.

Little definite is known of the Brookville coal (A), in this section owing to lack of development and prospecting, and it is a question if much can be expected from it. The largest operators in this part of the basin are Berwind & White Coal Mining Company, H. B. Swope, Irvona Coal and Coke Company, Cambria Coal Mining Company, The Blythe Coal Company and many smaller operators.

In conclusion: This first bituminous basin is producing between 6,000,000 and 7,000,000 tons of coal each year finding its way to market over the Pennsylvania and the New York Central & Hudson River railroads, and it will be many years before this basin will cease to be an important factor in the production of high-grade bituminous coal. Prospective coal operators may do worse than locating in this basin for there are many desirable tracts of coal that present favorable conditions for economical mining.

In preparing this paper, I have confined myself as nearly as possible to accurate data and information at hand, in the hope of presenting something more reliable than is found in our geological reports on this basin. I wish to express my appreciation to all who have so kindly contributed data.

Coal and Lignite Production in Texas during 1909

The production of bituminous coal in Texas in the year 1909 was 1,144,108 short tons, valued at $2,714,630. This is the largest production in the history of coal mining in Texas. In 1895, the coal was valued at $2.22 per ton while in 1909 the value per ton was $2.37. The production of lignite in 1909 was 715,151 tons. The lignite had an average value of 82.8c. per ton. The latest estimates of the coal in lignite areas in Texas show 8200 sq.m. of coal area, and 5300 sq.m. in addition that may contain workable seams. It is estimated that there are 2000 sq.m. of lignite seams, while, in addition to the known lignite area, there are about 50,000 sq.m. of territory that may contain workable lignite seams.

A Model Coke Plant

The Phillips plant of the H. C. Frick Coke Company, a few miles northwest of Uniontown, Penn., is rated by many engineers as the model plant of the coke region. There are four blocks of ovens in this plant, three double and one single. All these ovens are drawn by modern coke-drawing machines, there being no hand-drawn ovens in the entire plant. There are seven coke-drawing machines in operation at Phillips, the yard being laid out for this purpose, and in case one of the machines gets out of order a machine from one of the other blocks can be transferred to replace the "disabled" machine by a special arrangement of the track at the end of the ovens.

The Leveling Machine

One overhead electric leveling machine levels all the ovens in the plant. To all appearance the leveler resembles a rock-drilling machine. The leveler is "set" on the oven and two arms are extended which level the coal in the neatest manner.

At one end of the yard an ash sifter operated by electricity is located and all the ashes are brought here and sifted, both the coarse and the fine ashes being sold and shipped away for various purposes. This is an appliance of the coke-manufacturing industry that all the newly erected plants are taking up, it being one of the most resourceful conservation devices in connection with using ashes as fuel.

Electricity is Used Extensively

Electricity is used extensively in the operation of this plant. It is being used to run the drawing machines, larries, sifter, for lighting, etc., and is generated in a modern electrical plant just opposite the boiler house. The heat from the entire block of ovens adjacent to the boiler house is used to assist in firing the furnaces and has proved to be wonderfully successful.

Large tubes from these ovens lead into a main tube which runs to the boiler house. The draft from the smokestack in the boiler house assists these ovens to burn and when they are being watered the tube from the oven that leads to the main tube is shut off and no steam goes into the main tube.

The electrical plant, compressor, fan, boiler house and machine shop are all apart from each other and equipped with all the modern labor-saving machinery.

The Canadian government has appropriated $50,000 for experiments and research work calculated to stimulate the development of the zinc industry. Dr. Eugene Haanel, Director of Mines, Department of the Interior, will be in charge of the work.

Coal Dust and Its Treatment with Calcium Chloride

Following the reading of a paper before an English Mining Institute on the treatment of dust with calcium chloride, several engineers entered into an interesting discussion. Mr. Thomson stated that he did not think that calcium chloride was of any use in preventing an explosion. He said that a superintendent might have the floor of his entries wet with calcium chloride, but this would not prevent the coal dust which came from the cars from getting on to the roof and sides. It is this latter dust with which the mine officials have to contend. Mr. Beveridge said that about a year ago, calcium chloride had been used on dusty parts of roadways in one of his mines. At the beginning, the salt was mixed with water, and the liquid sprinkled on the roof and sides, but difficulty was experienced in the deep roadways. Later, the salt was ground and conveyed in bags underground, where it was sprinkled on the floor and on the timbers of the roadways. The roadways thus sprinkled kept damp for about six weeks, whereas the same roadways, when watered, had to be sprinkled every three days.

One dusty part of a roadway, 150 ft. long, 9 ft. wide and 5 ft. high, had 1½ cwt. of the ground salt sprinkled over it, and it had remained damp for six weeks. Mr. Beveridge further stated that there had not been sufficient time nor experiments made to enable him to speak definitely as to the full results; but this he could say, that calcium chloride kept the air cooler, enabled a clean road to be kept where haulers had their cars, and was better than water for laying the dust. In speaking of stone dust, Mr. Masterson said he was afraid that stone dust would not do much good, for the reason that stone dust was slightly heavier than coal dust. If stone dust were spread tomorrow, would it not be found as the days passed that it gradually settled to the bottom and left the coal dust on the top as explosive as ever?

Explosives in Coal Mines

Special Correspondence

Captain Desborough, government inspector of explosives at Woolwich, England, in his evidence before the departmental committee on use of explosives in mines, said:

"It is very unfortunate that the prefix safety has been applied to permitted explosives, and it cannot be too strongly impressed on the users of these explosives that all that can really be claimed for them is that they are less dangerous than gunpowder, so far as the ignition of firedamp and coal dust is concerned. This misnomer seems to have caused some users to imagine that these explosives are safe under all conditions, in total opposition to what are the true facts of the case, that they are absolutely dangerous unless used with certain definite precautions. That this is not an overstatement is obvious from the number of actual ignitions which have occurred in practical use, and, moreover, it is confirmed experimentally by the fact that ignitions have been obtained at Woolwich with practically all the explosives which have been tested there, when comparatively small alterations have been made in the conditions under which the firing takes place. It cannot, therefore, be too emphatically urged on the users of these explosives that it is most desirable to reduce the number of shots fired to a minimum."

COLLIERY·NOTES

It is generally advisable to have two handles fitted on each end of every mine car. This scheme enables the haulers to grip and guide the cars around the turns, beside saving the fingers of these men from being jammed against the roof or its supports.

In some collieries where fast haulage is employed, the full cars often move against a high air-current velocity, which sweeps the fine dust from the cars to the sides, floor and roof. To avoid this, many engineers advocate having the direction of the air current coincide with that of the full trips.

The effect of high temperature and humidity on men working underground should be carefully studied by all mine superintendents. At a high temperature in saturated air, it becomes difficult for miners to remain, even without working. A temperature of 90 deg. in saturated air is a practical limit above which no work can be done. On the other hand, it is a fact that if the air is dry, much higher temperatures can be borne with comfort. In many coal mines, where the air is dry and in motion, men can work in a temperature ranging from 100 to 120 degrees.

Coke operators have found that the ashes drawn from the ovens each day will generate considerable heat when utilized in firing the boilers at their power plants. The only objection is that the ashes require a force blast. The 72-hour ashes are somewhat inferior to those coming from the 48-hour ovens. The reason for this is that the 72-hour ashes are finer, and consequently more difficult to fire with. In some instances, the ashes are mixed with fine coal or coal dirt, and it has been found that when this mixture is burned under force blast, the heat produced is about equal to that resulting when coal is burned.

MINING AND METALLURGICAL PATENTS
A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

COAL AND COKE

COAL CUTTING—Improvements in or in Connection with Air Compressors for Use Particularly with Coal-cutting Machines. Ingersoll-Rand Co., New York, N. Y. (Brit. No. 6987 of 1909.)

COAL-MINING MACHINE. Jacob Kurtz, Darragh, and Theodore Hochriter, Greensburg, Penn. (U. S. No. 957,510; May 10, 1910.)

COKE—Apparatus for Leveling the Coal in Horizontal Coke Ovens. Bochumer Eisenhütte, Heintzmann and Dreyer of Bochum, Germany. (Brit. No. 25,268 of 1909.)

COKE — Machine for Quenching Coke. Thomas J. Mitchell and James A. McCreary, Uniontown, Penn. (U. S. No. 956,397; April 26, 1910.)

COKE—Method of Distilling Coal. Heinrich Koppers, Essen-on-the-Ruhr, Germany. (U. S. No. 956,371; April 26, 1910.)

COKE—Process of Charging Upright Gas-Retorts. Ernst G. B. Körting, Mariendorf, near Berlin, Germany. (U. S. No. 955,970; April 26, 1910.)

CONVEYERS—Improvements in or Connected with Conveyers for Use in Mining Minerals, Particularly Adapted for Use in Mining Coal and the Like. Mayor & Coulson, Ltd., Glasgow, Scotland. (Brit. No. 7151 of 1909.)

SEPARATORS—Improvements in Centrifugal Separators for Dry Coal and Other Substances. Coal and Coke By-Products Co., of Pittsburg, Penn. (Brit. No. 23,313 of 1909.)

WASHING—Coal-Washing Machine. James A. Montgomery, Birmingham, Ala. (U. S. No. 954,986; April 12, 1910.)

WASHING—Improvements in and Relating to Washers for Coal or Other Like Materials. Horace J. Greaves, Crofton, near Wakefield, Eng. (Brit. No. 1563 of 1909.)

COPPER

AGGLOMERATING or Briquetting Copper-Ore Concentrates Preparatory to Smelting. Thomas Rouse, London, England. (U. S. No. 955,909; April 26, 1910.)

CONVERTING—Process of Treating Impure Copper Matte and Ores. Hermann Maschmeyer, Hoboken, near Antwerp, Belgium, assignor to the Corporation of Usini de Desargentation Société Anonyme, Hoboken, near Antwerp, Belgium. (U. S. No. 957,231; May 10, 1910.)

SLIMES TREATMENT—Process for Treating Metallic Slimes. James Dunstone, Dollar Bay, Mich. (U. S. No. 956,800; May 3, 1910.)

GOLD AND SILVER

FILTERING APPARATUS. David J. Kelly, Salt Lake City, Utah, assignor to Kelly Filter Press Company, Salt Lake City, Utah, a Corporation. (U. S. No. 957,467; May 10, 1910.)

SEPARATION—Means for Separating Water or Solution from Solids, such as Slimy Ores, Pulp, and the Like. William L. Holms, Guadalajara, Mexico, Leonard M. Green, London, England, and John S. Pattinson, Zacatecas, Mexico. (U. S. No. 957,775; May 10, 1910.)

TUBE MILL. Byron L. Morrison, Colorado Springs, Colo., assignor of one-third to Joseph W. Ady, Colorado Springs, Colo. (U. S. No. 957,136; May 10, 1910.)

IRON AND STEEL

BLAST-FURNACE CHARGING APPARATUS. Walter Kennedy, Bellevue, Penn. (U. S. No. 955,885; April 26, 1910.)

BLAST-FURNACE OPERATION. A New and Improved Method of Operating Blast Furnaces, Converters and the Like. James Gay-[illegible] New York. (Brit. No. 13,5[illegible] of 1909.)

HARDENED STEEL—Process of Making Hardened Steel. Hector de Nolly, St. Chamond, France, assignor to Compagnie des Forges & Acieries de la Marine et d'Honrecourt, St. Chamond, France. (U. S. No. 957,706; May 10, 1910.)

ORE TREATMENT—Process for Cleaning Iron Ores. Edward F. Goltra, St. Louis, Mo. (U. S. No. 957,157; May 3, 1910.)

PURIFYING—Process for Purifying Steel. Reginald H. Bulley, Syracuse, N. Y., assignor to Halcomb Steel Co., Syracuse, N. Y. (U. S. No. 955,378; April 19, 1910.)

REFINING—Process for Melting and Refining Iron. Henry Johnson, Saxilby, England. (U. S. No. 952,260; March 15, 1910.)

LEAD, ZINC AND OTHER METALS

NICKEL—Process of Separating Metals in Solution. Walter S. Gates and Herbert H. Dow, Midland, Mich., assignors, by mesne assignments, to the Ontario Nickel Co., Ltd., Worthington, Canada. (U. S. No. 956,763; May 3, 1910.)

ZINC—Electric Furnace. Hiram W. Hixon, Philadelphia, Penn. (U. S. No. 957,058; May 3, 1910, and 957,337; May 10, 1910.)

NONMETALLIC MINERALS

PETROLEUM—Apparatus for Use in Obtaining Petroleum Products. Herman Frasch, New York, N. Y., assignor to Standard Oil Co., Bayonne, N. J. (U. S. No. 951,729; March 8, 1910.)

PETROLEUM—Obtaining Petroleum Products. Herman Frasch, New York, N. Y., assignor to Standard Oil Company, Bayonne, N. J., a Corporation of New Jersey. (U. S. No. 951,272; March 8, 1910.)

SALT—Process of Refining Salt and Recovering Its Impurities as By-Products. Charles Glaser and George J. Muller, Baltimore, Md. (U. S. No. 957,416; May 10, 1910.)

MINING—GENERAL

BLASTING—Miner's Fuse-Cap. Charles F. Spery, Chicago, Ill. (U. S. No. 954,595; April 12, 1910.)

DRILLING—Spraying Device for Rock Drills. William J. Barnett, Germiston, Transvaal. (U. S. No. 956,026; April 26, 1910.)

DRILL—Electric Rock Drill. Olin S. Proctor, Denver, Colo. (U. S. No. 955,899; April 26, 1910.)

DUST—An Improved Dust-Allaying Apparatus for Use in Mines. James M. Holman and John Leonard Holman, Camborne, Cornwall. (Brit. No. 6416 of 1909.)

HAULAGE—An Eccentric Lever Clip to Attach to Tubs and Bogies used in Hauling Minerals or Other Substances by Ropes in Mines or Quarries. Adam Miller, Cumberland, England. (Brit. No. 9109 of 1909.)

HOISTING—Safety Mechanism for Mine Skips and Cages. Henry E. Hyde, Johannesburg, Transvaal. (U. S. No. 956,707; May 3, 1910.)

MINE-CAR COUPLING. James S. Paxton, Luzerne, Ky. (U. S. No. 953,706; April 5, 1910.)

PROPS—Improvements in Mining Props. Emanuel Schafer, Düsseldorf, Germany. (Brit. No. 3433 of 1910.)

RESCUE WORK—System for Ventilating and Rendering First Aid to Entombed Miners. Robert C. Dawson, Wampum, Penn., assignor of one-half to Harry Barlow, Seanor, Penn. (U. S. No. 956,306; April 26, 1910.)

ROCK DRILLS—Improvements in Valve Mechanism for Rock Drills and Other Reciprocating Engines. W. C. Stephens. (Brit. No. 14,255 of 1909.)

TUNNELING MACHINE. William F. Wittich, Erie, Penn., assignor to the Wittich Success Shaft Sinking and Tunneling Machine Co., Erie, Penn. (U. S. No. 956,163; April 26, 1910.)

TUNNELING MACHINE STRUCTURE. John P. Karns, Boulder, Colo., assignor to J. P. Karns Tunneling Machine Co., Boulder, Colo. (U. S. No. 957,687; May 10, 1910.)

ORE DRESSING—GENERAL

CLASSIFIERS—Improvements in or Connected with Hydraulic Classifiers for Metalliferous Slimes. James M. Holman, and John L. Holman, Camborne, Cornwall. (Brit. No. 8060 of 1909.)

CONCENTRATION—Apparatus for Concentrating Solutions by Freezing. Eudo Monti, Turin, Italy. (U. S. No. 955,659; April 19, 1910.)

CONCENTRATION—Improvements in or Relating to the Concentration of Ores. Arthur H. Higgins, Broken Hill, N. S. W. (Brit. No. 26,852 of 1908.)

CONCENTRATION—Ore-Concentrating and Separating Apparatus. Francois Dallemagne, Irun, Spain. (U. S. No. 953,900; April 5, 1910.)

CRUSHING ROLL. Richard Bernhard, Milwaukee, Wis., assignor to Power and Mining Machinery Co., Cudahy, Wis. (U. S. No. 956,878; May 3, 1910.)

DEWATERING—Means for Handling and Distributing Dewatered Crushed Ore Products, etc. Hans C. Behr, Johannesburg, Transvaal. (U. S. No. 956,669; May 3, 1910.)

FLOTATION PROCESS—Process of Treating Ores and Carboniferous Earths. Alfred A. Lockwood, London, England. (U. S. No. 956,773; May 3, 1910.)

ORE CRUSHING—Improvements in or Connected with Pneumatic Stamps for Ore Crushing and the Like. H. C. Embleton, Leeds, England. (Brit. No. 10,618 of 1909.)

ORE-CRUSHING MACHINERY. Ely C. Hutchinson, Oakland, Cal. (U. S. No. 954,295; April 5, 1910.)

SCREEN—Rotary Screen. Samuel W. Traylor, Allentown, Penn. (U. S. No. 957,818; May 10, 1910.)

SEPARATION—An Improved Method for the Separation of Metals or Minerals from their Gangues and Apparatus for Use Therewith. Alfred Simon, London. (Brit. No. 10,381 of 1909.)

SEPARATION—Apparatus for Separating Metals and the Like from Extraneous Matter. Richard M. Simpson, Wellington, New Zealand. (U. S. No. 957,478; May 10, 1910.)

SLIMES SEPARATOR—Centrifugal Slime-Separator. John T. Lindahl, Stockholm, Sweden, assignor of one-half to Göteborgs Nya Vrekstadsaktiebolag, Gottenborg, Sweden. (U. S. No. 954,528; April 12, 1910.)

SULPHIDE-ORE TREATMENT—Process of Treating Ores. Alfred A. Lockwood and Marcus R. A. Samuel, London, England. (U. S. No. 956,381; April 26, 1910.)

METALLURGY—GENERAL

BLAST FURNACE—Smelting Furnace. James Grogan, Prescott, Ariz. (U. S. No. 957,554; May 10, 1910.)

DESULPHURIZING—A New or Improved Apparatus for Desulphurizing or Otherwise Treating Ore. Robert Hürner, New York, N. Y. (Brit. No. 14,541 of 1909.)

ELECTRIC FURNACE—Combined Electric Arc or Resistance and Induction Furnace. James H. Reid, Newark, N. J. (U. S. No. 956,514; May 3, 1910.)

EXTRACTION—Improvements in Processes for Extracting Metal from Ore. C. A. Stevens, New York, N. Y. (Brit. No. 7519 of 1909.)

ROASTER FOR ORES. Allen J. Garver, Clarkston, Wash. (U. S. No. 954,729; April 12, 1910.)

ROASTING—Ore-roasting Furnace. Charlie E. Mark, Chicago, Ill. (U. S. No. 952,680; March 22, 1910.)

SMELTING—Process for the Smelting of Silver-Nickel-Cobalt-Arsenic Ores. Camillo C. Clto, Irvington, N. J. (U. S. Nos. 919,058, 919,059 and 946,261; Feb. 15, 1910.)

SMELTING FURNACE. Charles A. Wettengel, Caney, Kan., assignor to American Zinc, Lead and Smelting Co., Boston, Mass. (U. S. No. 953,105; March 29, 1910.)

PERSONAL

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

B. B. Lawrence has returned from a western trip.

R. M. Atwater, Jr., of Butte, has been visiting New York.

E. G. Spilsbury has gone to Arizona on professional business.

Dr. R. A. F. Penrose has returned from an European trip.

Edwin E. Chase, of Denver, Colo., has gone to South Dakota on professional business.

E. T. Wright, president of the National Ore Concentration Company, of Chicago, is in Joplin, Mo.

E. E. White is now chief geologist for the Cleveland-Cliffs Iron Company, at Ishpeming, Mich.

Francis O'Hara, of Boston and Charles W. Hopkins, of Winchester, Mass., have been visiting Salt Lake City.

George S. Rice, mining engineer for the United States Geological Survey, was a visitor in New York this week.

W. E. H. Carter and Prof. H. E. T. Haultain, are making an inspection of the Porcupine gold area, Northern Ontario.

Marion L. Thomas has been making some mine examinations in Guerrero, and will return to the City of Mexico in June.

B. K. Blair, of Carthage, Mo., has been chosen secretary of the Zinc Ore Producers' Association, of the Joplin district.

L. A. Friedman, manager of the Seven Troughs Coalition Mining Company, of Nevada, has gone to Hot Springs, Arkansas.

H. K. Slater, of the Mysore, India, Geological Survey is investigating the mineral formations of the Lake of the Woods district, Ontario.

Duncan McDonald, of Springfield, has been appointed a member of the Illnois mining investigation committee, in place of Charles Burch, resigned.

Edmund Shaw, of El Paso, Texas, has been placed in charge of the mill of the Picacho Basin Mining Company at Picacho, San Diego county, California.

Dr. J. Bonsall Porter, of Montreal, professor of mining engineering in McGill University, is taking this year's McGill summer mining school to British Columbia.

Hon. William Templeman, minister of mines of the Dominion of Canada, and R. W. Brock, director of the Geological Survey, made a brief visit to New York this week.

R. J. H. Bradley is on his way to examine a placer property in the Cook Inlet section of southeastern Alaska and expects to return to New York about the middle of August.

H. M. Wolflin, of the technological branch of the United States Geological Survey, is in charge of the mine rescue training station recently established at Seattle, Washington.

Quincy A. Shaw, president, and Rudolph L. Agassiz, vice-president of the Calumet & Hecla and subsidiary companies, are visitors at the mines on their semiannual tour of inspection.

H. W. Hardinge is making a professional trip to the silver camp of Cobalt, Ontario, and will also make investigations in Colorado and mines further west before returning to New York.

R. G. McConnell has received instructions from the director of the Canadian Geological Survey to examine and report upon the mineral country in the Portland Canal district of British Columbia.

J. W. Carlton, formerly of Montana, has returned to the United States after a number of years spent in South Africa and New Zealand as mine manager, and will make his home at Salt Lake City, Utah.

C. E. Campbell, consulting mining engineer of Johannesburg, Transvaal, was in New York last week, on his way to Cobalt, Ont. He intends to spend six or eight months in the United States and Canada.

J. J. Beringer, for a number of years principal of the old Cambourne School of Mining, in Cornwall, will join the staff of the new School of Metalliferous Mining, as head of the department of metallurgy.

W. W. Leach, of the Geological Survey, of Canada, left Ottawa early in the month for the Pacific Coast. This will be his third field-work season spent in geologic work in the Skeena district, of British Columbia.

C. W. Purington, who has been in New York during the last month contracting for machinery for his placer mining operations in Siberia, left New York on his way west on May 21, and expects to sail for Siberia from San Francisco the last of May.

Robert H. Chapman, of the United States Geological Survey, who was last year permitted to do topographical work on Vancouver island, B. C., for the Canadian Geological Survey, will this season continue mapping the topography of that island.

Fritz Thyssen, F. Dahl and F. Funke, of Germany, are visiting prominent iron and steel works in the United States. Mr. Thyssen is a director in the Deutscher Kaiser Works and Messrs. Dahl and Funke are general manager and chief engineer, respectively.

OBITUARY

Arthur F. Braun died in the City of Mexico, May 16, from an overdose of morphine. He went to Mexico two years ago from Toledo, O., and has been employed in El Oro district as a mining engineer.

Mark McDonough died at Carnegie, Penn., May 19, aged 46 years. He was born at McKeesport, Penn., and received his early training in the steel mills at that place, gradually rising until he became assistant superintendent of the Chartiers Iron and Steel Company, in 1887. When that concern was absorbed by the Steel Corporation, he retained his position, but was later made superintendent of the corporation's plant at Muncie, Indiana

SOCIETIES *and* TECHNICAL SCHOOLS

Mexican Institute of Mining and Metallurgy—Instead of holding the session on May 26, the Institute will make an excursion to the drainage works of the Valley of Mexico, on June 4. The Minister of Communications and Public Works put a special train at the disposal of the institute for the occasion.

Missouri School of Mines—Owing to the continued demand from mining students, mine managers and superintendents, graduates and undergraduates of engineering schools, and science teachers, the School of Mines and Metallurgy announces a six-weeks summer school beginning June 6. All of the courses will be given in the laboratories at Rolla.

Harvard Mining Club—On May 20, the club held its eighth annual dinner at the Harvard Union. The following were elected officers for the coming year: Ransom Evarts Somers, 1908, Waltham, Mass., president; Ray Potter Dunning, 1911, Springfield, Mass., secretary; Arthur Mason Van Rensselaer, 1911, New York, treasurer. One of the most important events of the evening was the discussion of a plan for the erection of a permanent club house for the organization.

American Institute of Chemical Engineers—Papers on the following subjects have been promised for the Niagara Falls meeting, to begin June 22: A new Product for Use in the Arts; Arrangement of Filter Presses for Bleaching Oils with Fullers Earth; Corrosion of Steel; Design of Plants for Chemical Engineering Work; Loss in Coal Due to Storage; The Manufacture and Industrial Application of Ozone; Development of Water Power; Recent Development in the Use of Metallic Filament for Incandescent Lamps; Vacuum Distillation; Manufacture of Nitric and Mixed Acids; Materials for Chemical Engineering Construction.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

May 21—One of the large dredging companies has obtained control of gravel mining ground in Tuolumne county, not far from Table mountain, and will exploit it. This will be the first dredging done in that county. There are tracts of low-lying gravel in Tuolumne like the one in question, which have not been worked, owing to lack of fall, and excess of water to be handled. None of them are of great extent, however, but in this instance the unusual richness of the gravel, according to the sampling, will admit of a dredge being installed on a smaller tract than is usual.

A matter of interest in gravel mining is the fact that "Swiftwater Bill" Gates, of Klondike fame, has recently purchased in San Francisco a large hydraulic-mine equipment made expressly for him by a local firm to be shipped to Peru. Gates has obtained control in South America of an extensive tract of auriferous gravel, said by him to extend for 90 miles in length, and five or six miles in width. He thinks it is one of the great placer fields of the world and says the gravel will run in value from 60c. to $1.50 per cu.yd. At all events, he had no trouble in organizing a syndicate to take the property, and has paid cash for his expensive purchases of equipment. Little has been made public of this new enterprise.

Kern county is showing activity in developing its old gold mines and opening new ones. At Caliente, some old mines are being opened and a 30-stamp mill is promised on the Ferris mine. The Cowboy is held under bond, and high-grade silver ore has been taken out lately. At the Gwynne, new owners have 30 men at work. The Kern-Piute Company, working the old Borrman mine, is sacking the ore being taken out, awaiting the erection of a mill. Near Amalie, the Barbarossa mine is showing some of its old-time richness. The larger part of Kern county consists of flat valley lands where the wonderfully productive oil wells are, but the mountains back of the valley have gold and in times gone by a very large gold output has annually been made. Even now, when gold mining has been to some extent neglected, except at a few points, the county is yielding nearly a million dollars yearly in gold and silver. Its most productive mine is the Yellow Aster at Randsburg.

Rich strikes have lately been made near Dobbins, in Yuba county, on quartz found in old prospect holes. A miner named Bell found some good indications and sold a third interest to Duttra & Brown for a small sum. In sinking a few feet, the new men took out $35,000 from a small surface stringer. The vein is decomposed and the gold found is coarse. Since this strike, a number of prospect holes sunk years ago but finally abandoned are being reopened, giving renewed activity to that section of the county. The recent finds are on Indiana ranch.

The extensive oil refinery of the Sunset Monarch Company, at Maricopa, was destroyed by fire with a loss of nearly a quarter of a million dollars. All the machinery was ruined and the laboratory destroyed. The refinery had a capacity of 1500 bbl. of asphalt per day. The plant will be rebuilt.

The mythical Peg-leg mine, which has been sought for many times in the last 50 years, is again to be the object of an expedition. Mrs. R. S. Dillman, of Victorville, San Bernardino county, claims to have data by which she can locate the place from which numerous gold nuggets were said to have been taken by a pioneer prospector. It is reported that Mrs. Dillman is about to start in the search accompanied by J. Rockefeller and Matt Thompson.

Captain John E. Carter is making a collection of the representative gold ores of Nevada county to be placed on exhibition in the Chamber of Commerce building in Los Angeles.

Denver

May 23—The North American smeltery at Golden is turning out copper matte, and will blow in its second furnace of 500 tons capacity at once, making a total capacity of 750 tons per diem. This plant is getting custom ores from Gilpin and Clear Creek counties, and has mines of its own as well. This plant has taken over the ores and ore contracts of the Modern smeltery, at Utah Junction, which, after a fitful existence, has "blown out."

The coal operators in the field north of Denver state their intention to reopen all of the 30 mines of that district at once, and if necessary will bring in miners from other States to replace the men who left their employ. They have notified present and former employees, however, that the mines will be operated on the basis of an eight-hour day and on the scale of wages in effect prior to April 1, and former employees are invited to make early application if they want to go to work.

The Cripple Creek deep drainage tunnel, it is stated, is now beginning to lower perceptibly the water in the mines of Beacon hill.

The main unit of the Portland Gold Mining Company mill on Battle mountain, near Victor, which was built at the mine to treat the low grade and dump ores of the mine, is now ready to run. The dumps are estimated to contain 3,500,000 tons of ore, which can be treated at a profit.

The Elkton mine, on Raven hill, Cripple Creek, is credited with a total production of ore to the value of $9,650,000, and has paid $2,554,460 in dividends. The present lowest level shows the oreshoot to be over 1000 ft. in length, and it is estimated that when the deep drainage tunnel is completed, the mine can be worked 750 ft. deeper, a total of 1600 ft. below the surface.

The interest in the rich gold ore produced by the St. Louis tunnel at Leadville continues unabated, and work will soon be commenced in the endeavor to find the extensions of the vein beyond the limits of the property.

Butte

May 23—Confirming the sale of the Clark properties, Mr. Clark said: "I received no Anaconda stock for my Butte mines. The transaction is strictly for cash. The deal has nothing to do with the reported impending copper merger, and I am not interested in the merger in any way." A. H. Wethey, manager of the Clark properties, states that Mr. Clark intends to begin work at several of his claims in the Butte district, which have long laid idle. With this last acquisition, the Anaconda company controls practically all the well paying copper properties in the district.

In the Carter district, Missoula county, the King and Queen mines have been making regular shipments for six months. A 200-ton concentrator will be built shortly. An 1800-ft. crosscut tunnel, now in 700 ft., is being driven and will give an additional depth of 400 ft. The Oregon Railway and Navigation mines are employing a number of men. Adjoining the Oregon Railway and Navigation mine is the Iron Mask, in which a large body of milling ore has been exposed in the upper tunnel. The construction of a concentrator is planned.

At the Hamilton-Cœur d'Alene property a lower tunnel, now in 250 ft., will be driven another 250 ft. to cut the oreshoot. The Glenn Metal Mining Company has recently encountered good ore in the lower tunnel at a vertical depth of 100 feet.

In Lewis and Clark county, the shaft of the East London mine, south of Helena, operated by Thomas Cruse, is down 50 ft. and a new hoist has been installed. At Clark's creek, five miles south of Helena, George H. Rogers is building a 5-stamp mill on a developing property. In the Park mining district, the Caroline lead is being worked. A steam pump and hoist have been installed and a shaft is being sunk. Near the Caroline, the Souvenir Gold Mining Company is running a 10-stamp mill.

In Granite county, the Cable-Ontario company recently incorporated for $500,000 by J. M. Merrill, of Oakland, Cal., A. S. Huffman, of Philipsburg, and John P. Reins, Glenn L. Thompson, J. A. Poore and Charles Mattison, of Butte, has acquired five quartz claims adjoining the Southern Cross mine on the south. The Hidden Lake company is making preparations to begin work under the direction of W. A. Law. Upon the arrival of the plates for the 3-stamp mill, mining will be begun. The company owns 16 claims in which the lode is 25 ft. wide.

Corporations owned by Senator W. A. Clark have recently filed annual reports as follows: Moulten Mining Company, assets, $500,000 and liabilities *nil;* Original Consolidated Mining Company, assets $10,000,000 and liabilities *nil;* Colusa-Parrot Mining and Smelting Company, assets, $100,000 and liabilities *nil;* Western Lumber Company, assets, $850,000 and liabilities *nil.*

In Madison county, the Metzel placer claim at Barton gulch is being worked by E. C. Hosner, who is also working the Copperville group of quartz claims in the same locality. At the Atlas Extension, near Spring gulch, a tunnel is being run on a 6-ft. vein, 3 ft. of which carries free gold. Work has been resumed on the Mohawk group, situated in the Summit district and comprising the Mohawk Extension, Florence and Eureka quartz claims. The Apex company has decided to build an electrically equipped stamp mill on its property at Summit, and work on the power line has been begun. The ores have been treated at the Shafter mill, but the long haulage of coal from Alder has rendered this method too expensive.

Salt Lake City

May 21—A decision adverse to the Government was given in the case of the United States *vs.* the Castle Grand Placer Claims Company. The decision given by the register and receiver of the local land office orders that the case be dismissed, and that the mineral claimants be allowed to make final entry on the land, or patent it, if they so desire. The land in question consists of about 40 acres near Moab, Grand county. The claimants filed on the land under placer rights, but the Government charged that the ground was taken for speculative rather than for placer purposes, that is for a mill site, and for town-site purposes. The Government also claimed that the land was not mineral in character. The Castle Grand Placer Claims Company maintained that it had taken up the ground solely for mineral purposes.

Progress is being made on the construction of the International smeltery at Tooele. The work was delayed for a time by the slowness of steel to arrive, but no trouble has been experienced recently on this score. At the present time there are between 500 and 600 men employed on construction. The power-house machinery is installed. The dust chamber and flues to the stack are finished, the stack itself is done and the dampers are placed. All of the water and air lines are completed, while the main flue and ash and slag tunnel will be completed soon. The railroad trackage in the yard is laid. The roasters are nearly finished. The converter building and casting shed has been erected, and the converters have been installed. The reverberatory building is under way and is being rushed with all speed possible.

In addition to its weather bureau, which is keeping records, the International company has taken steps to investigate farming conditions as they now exist in the neighborhood of the smeltery, or within reach of the fumes. Representatives of the company are at present in the field making a careful examination of the agricultural conditions, regarding crops and soil, growth, production, etc., also in reference to livestock. A study of the farming conditions before and after the smeltery starts will be of value to the company in preparing for possible damage suits.

The Silver King Coalition Mines Company is the defendant in a suit brought for the alleged extraction of ore from the Captain lodes claim in the Park City district. The suit was originally filed by the late James P. Cassidy.

The Gold Springs Mining and Power Company has completed the installation of the machinery for the power plant at Modena, Iron county. The plant consists of gas producers, which operate gas engines, and these in turn drive electric generators. About 300 h.p. will be developed. Electric power will be furnished to the Jennie mine, controlled by this company, and to other properties in the Gold Springs district. The Jennie mine and mill are being equipped with motors to replace the gasolene engines formerly used. The current will be delivered to the mine through a transmission line 10½ miles long.

Goldfield

May 24—J. W. Hutchinson, mill superintendent of the Goldfield Consolidated, is making a trip through the East, visiting various metallurgical plants in connection with the investigation of certain technical problems.

An action entitled the Round Mountain Mining Company vs. the Round Mountain-Sphinx Mining Company, and J. F. Davidson, involving $850,000, on trial in the district court, will decide an interesting question in extra-lateral rights. The five claims of the Round Mountain Mining Company are the Sunnyside 1, 2 and 3, the Sunnyside Fraction and the Gazabo. The Sunnyside claims were located Feb. 20, 1906, and the Gazabo, March 3, 1906. The Gazabo runs within and at right angle to the Sunnyside claims. The vein runs with the length of the Gazabo, therefore the Round Mountain claims extra-lateral rights. In case the Gazabo claim is given extra-lateral rights, it would seem that the location of claims lapping over and at right angles to each other gives locators extra-lateral rights in all directions, instead of merely beyond the sidelines of a claim.

Wallace, Idaho

May 23—Sluicing done by the Chicago, Milwaukee & Puget Sound railway has uncovered a 20-ft. copper lode on the Big Elk property, the lode lying parallel to and 200 ft. from the main vein. Copper ore is strewn along the surface of the newly found vein which is apparently rich. The main vein has been worked on several levels and shipping ore is being opened.

The Snow Storm copper mine paid $22,500 to the stockholders for May, the company having paid a similar amount every 30 days since October. The No. 4 tunnel, the lowest workings in the property, has cut the lode 3350 ft. in. A drift was run 600 ft. to the west, exposing no ore of importance but showing the formation in place and the Revett quartzite extending below that level, both of which conditions geologists declared would not be found. The company then drifted 400 ft. to the east, a drift being run on the north side of the vein and another on the south side. Copper ore was found. A continuation of these easterly drifts for 600 ft. will take the face of the tunnels under the main orebody exposed in No. 3 level.

The Cœur d'Alene Mining Company owns 2000 acres of placer at Murray. The ground has not been worked for six years, owing to drainage difficulties which the Boston owners were not willing to cope with. Prospectors never panned this land to any extent because of the lack of water, and it is estimated that much gold lies in the ground. Bulkley Wells, of Telluride, Colo., vice-president and manager of the New England Exploration company in which Benjamin F. Wells, of Boston, and other Massachusetts men are interested, is here with a party of experienced placer miners from northern California. The ground is being tested and if it is decided it can be mined with success, plans will be formulated for special machinery for dredging. The placer ground is peculiar because of the gold beneath and in the bedrock.

Birmingham, Ala.

May 21—State Mine Inspector James Hillhouse, on the explosion in Mine No. 3, of the Palos Coal and Coke Company at Palos, in his report says the explosion was caused by firedamp. Gas was produced in quantity in the sixth right heading in the mines and considerable dust was allowed to collect. The report also shows that shooting in the mines had been done from the solid, when specific instructions had been given from the inspector's office previously that undercutting had to be done before the shooting. Another statement in the report in regard to a disregard of instructions is that the superintendent had allowed the use of dynamite in the mines, which was strictly forbidden. The fan used at this mine is declared not to be of sufficient size. Sprinklers have been ordered installed before the place can be operated again. No clay or sand had been used, according to the investigations, in tamping shots and this was another error. The company operating the mines had been warned also in making a change of mine foreman to be careful, because the local conditions required a man who was acquainted with them.

As an outcome of the two explosions in the mines in this State, the first one at Mulga, where 40 men lost their lives, and the second at Palos, where 84 men were killed, a thorough inspection is now going on at all mines in the State.

Twenty-six convicts employed in the mines at Lucile, Bibb county, were burned to death last week and one was shot to death, following a fire that was started in the stockade next to the mines. A convict started the fire in the hope of making an escape. The unfortunate negroes could not be reached and were roasted to death. In all, 128 convicts were saved from the burning building, though 21 were more or less burned and bruised.

Harrison Stuart Matthews, vice-president, is in charge of the affairs in the Birmingham district of the Alabama Consolidated Coal and Iron Company. Joseph H. Hoadley, of New York, continues in the position of president.

The Alabama Coal Operators' Association has a subcommittee at work on suggestions for mining laws to be enacted at the next session of the legislature, early next year. Both the operators and the miners are anxious to see some amendments, covering both the operating and the mining. In many accidents, carelessness is charged to both the operators and miners. Efforts will be made also to have a law enacted that will prohibit men from mining coal without experience.

Contracts are being let by the American Steel and Wire Company for the concrete work and superstructures for the new plant near Ensley. The tracks are being laid to the site and by June 1 material will be arriving.

Cobalt

May 23—Engineers for the Dominion Government are in the Cobalt district measuring up the water supply with a view to building dams to regulate the flow in the lower Ottawa river. It is proposed to built several dams on Lake Temiskaming and other places to conserve the supply. These dams will offer practically unlimited possibilities for the generation of power.

The condition of the La Rose mine is improving, the latest favorable development being the finding of very high-grade ore in the drift at the 50-ft. level of the No. 11 shaft of the Lawson. There is about 10 in. of vein matter that will assay very high. The talk of a merger still continues without, however, any positive action being taken.

The plant of the Cobalt Hydraulic Company at Ragged Chutes is at last completed, and the air has been turned into the whole system of pipes. Several companies are using this power and report a steady pressure and clean, dry air. This plant is the largest "natural" air compressor in the world and has a capacity of 5000 h.p. The pressure at the plant is about 125 lb., and air will be delivered to the mines at 100 lb. The Mines Power Company expects to have the generators repaired and working again soon. The electric service has not been, interrupted. The Cobalt Power Company has been delivering electric power for some time and will shortly have the rest of the plant installed. When these three companies are regularly operating Cobalt will be most advantageously situated as regards power, with two plants supplying air and two electricity. The combined capacity of the three companies is approximately 18,000 horsepower.

Porcupine is likely to suffer from a shortage of supplies, and owing to the high cost of transportation these conditions will not improve much as the summer goes by. This shortage is partly due to the early break-up, which left several companies with supplies at the railroad, and partly due to the fact that a much larger number of men are employed than was first thought necessary. A small 15-ton amalgamation and cyanide plant is being erected on the Timmins property. It is stated that the Timmins interests have made the third payment on the six Hollinger and McMahon claims on which they have an option for about $300,000. On the whole, engineers are expressing more and more favorable opinions on the district. The boundaries of the district are being widened as new finds are reported.

Vancouver

May 20—Canadian officials with their parties, which are to continue the survey of the International boundary between Alaska and Canada, have gone north. J. D. Craig, of Ottawa, will coöperate with United States officials in defining the 141st meridian in Porcupine river district, below Dawson. N. J. Ogilvie will do topographical and triangulation work between Chilcoot pass and Chilkat river, about 20 miles from Skagway. Herbert S. Mussell will work on Taku river and tributaries, on the western boundary of Atlin mining division, British Columbia. F. H. Mackie has been assigned work in the Portland Canal district. The marking out of the boundary of the last-named district is of especial present importance owing to the fact that many prospectors are going in and there will be numerous locations of mineral claims made this year.

The breaking up of ice on Klondike river resulted in an ice block at the Ogilvie steel bridge near Dawson and caused the waters to flood the flat on which are the big machine shops of the Yukon Gold company. In the shops the water was two feet deep.

London

May 20—A new company is being formed under the title of the Trinidad Oil and Fuel Company, Ltd., to work on an estate at Williamsville, Ward of Montserrat, Trinidad. The nominal capacity of the company is £100,000, and a working capital of £35,000 is to be provided. The property has been examined by Professor Vivian B. Lewes, who reports that the presence of oil is undoubted, but that the proof of volume, rate of flow, etc., can only be ascertained by putting down a boring.

As regards coal, he reports that a 2-ft. seam of Tertiary coal has been exposed and that there is ample evidence of the existence below this seam of a 4-ft. and a 6-ft. seam. The demand for fuel in the sugar mills is greater than it has ever been, as the megass, which previously had been burnt for fuel, is now being utilized for paper making, and it is expected that this coal will be bought at 20 per cent. less than the American or English coal with which the Trinidad market is now supplied, and this would leave a handsome profit on the working. Boring for oil will be commenced at once, and it is expected to meet with oil in commercial quantities at 800 feet.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

Alaska-Perseverance—The company will erect a 100-stamp mill in Silver Bow basin five miles from Juneau, and drive the Alexandra tunnel from tidewater to the mine, a distance of three miles.

Watson & Snow—This gold quartz property in the Moose Pass district on Kenai peninsula has been bonded to the Tyee Smelter Company, of Vancouver.

Alaska Dredging and Hydraulic Company—The company has taken a bond on the Cappell & Burr placer in the Sunrise district, and will spend a large amount in development work this season.

Arizona

COCHISE COUNTY

Hayden, Stone & Co. say: "The assertion is made in well informed quarters that the trend of affairs in Calumet & Arizona and Superior & Pittsburg is such as will surely lead to their ultimate consolidation. The Calumet & Arizona has practically discontinued work on outside properties, due to which its costs per pound of copper produced are now well within 9c., while current earings are at the rate of about $6.50 per share per annum. The Superior & Pittsburg has shown substantial progress during the last year. In the event of such a merger, the building of additional furnaces is understood to be contemplated, to be followed by increased production. The Calumet & Arizona has opened a sulphide body at 1450 ft. in the Oliver shaft under the orebodies on the 1300 level."

GILA COUNTY

Old Dominion—Recent monthly net earnings of the United Globe have reached $15,000.

California

INYO COUNTY

Casa Diablo—The mill has started on ore from the upper Dry Bone stope and the west stope of the Dawn of Hope vein. Changes are planned to increase the plant to 100 tons per day capacity. The tunnel is being advanced toward the Granite Mountain vein.

MARIPOSA COUNTY

Ferguson—This quartz property on the Merced river has been bonded by G. S. Barker and will be developed.

Penon Blanco—This Mother Lode quartz vein has been bonded by J. C. Wilson and will be developed.

Bismarck—Development is in progress under superintendent W. W. Dunlap. A good shoot of ore has been found on the 50-ft. level.

Hill—This mine, eight miles northeast of Coulterville, is now owned by the Superior Chemical Reduction Company which proposes to develop and to put in a reduction plant.

Champion—The mill at Coulterville is being put in shape for operation.

NEVADA COUNTY

Union and Union Extension—These mines at Banner hill have been bonded by E. M. Parrish. There is a 274-ft. shaft. Machinery is on the ground for sinking.

Posey Cañon—Harry Skewes has leased this gravel mine on a 20 per cent. royalty and is developing.

Fairview—G. A. Nihel is building a mill on this claim at Relief hill.

Black Swan—Work has been resumed on this property at Moore Flat.

Metropolitan Consolidated—Forty gold claims have been bonded by this company at Moore Flat.

Eclipse—This quartz claim, adjoining the Allison Ranch mine at Grass Valley, is being developed through a tunnel. Daniel Hurley is one of the owners.

Norambagua—Development has been in progress for some time and the showing warrants continuing the operation.

Benton G.—A shaft was sunk to the channel and the gravel found sufficiently rich to warrant the sinking of a double-compartment shaft, on which work will be begun at once. Harry Gray is manager.

Northon—These claims in Willow valley have been acquired by a Montana company. J. M. Fly is in charge. The Northon vein parallels the Lecompton. A compressor has been installed and a hoist is arranged for.

Fruitvale—This vein at Moore Flat shows 6 in. of arsenical ore high in gold and the pay shoot has been opened 30 ft.

Montana—The iron work of the 5-stamp mill has been delivered to the Montana mine, Willow valley.

Ancho—The mill near Graniteville will be started at once. George Mainhart is manager.

PLACER COUNTY

Rawhide—This quartz mine on the north fork of the American river near Towle has a tunnel in 1500 ft., giving 900 ft. of backs. Ten stamps are dropping.

Pioneer—This quartz property on the American river is being reopened with Harry Morris in charge. The mill is being repaired.

SHASTA COUNTY

Pittsburg & Mount Shasta—This Pittsburg company has property near the Iron Mountain covering the Little Nellie lode. A tunnel is being driven. W. H. S. Scherman is secretary.

TUOLUMNE COUNTY

Republican—Superintendent Lewis reports that good ore has been encountered. The company has a 20-stamp mill.

Eagle-Shawmut—The work of putting the shaft in shape is still in progress and it is expected that the mill will be in operation this summer. The mine has a good grade of sulphide ore on the lower levels.

Jumper—A lease has been taken of a part of the Jumper ground by W. E. Booker and L. L. Cooper.

Providence—Capt. C. H. Thomas has put men to work preparatory to unwatering the 1300-ft. shaft.

Albany-Grizzly—Supt. W. Elmer has closed down on account of nonarrival of funds for the payroll.

Riverside—E. V. Burke has filed suit for $6464, due for labor and supplies.

App—A strike of more than ordinary importance was made on the 1300 level. Good ore is still being extracted from the 1200 level.

Colorado

BOULDER COUNTY

Logan—Recent shipments of ore from the mine, at Crisman, operated under lease, yielded satisfactory returns, some of the exceptionally high-grade gold ore yielding as high as 50c. per pound.

GUNNISON COUNTY

Dupont—The company is driving a tunnel in Galena and Treasury mountains and has decided to erect a water-driven mill for custom work and its own ores from the tunnel.

Hard Cash—This property, on the north side of Galena mountain, will install a compressor and a pyritic smelting plant.

North Pole—This property, in Crystal basin, is planning to resume and install a matting furnace.

MESA COUNTY

The slags of the old Grand Junction smeltery are being profitably reworked by S. T. McKinney, of Albuquerque.

Lake County—Leadville

A. Y. & Minnie—The surface plant has been burned. The origin of the fire is unknown. Work on the mine will be resumed at once, and the plant rebuilt.

Colonel Sellers—Shipments are being made regularly from the new shaft and the old workings are soon to be attacked through this shaft.

Garbutt—The machinery of the Delaware, on Rock hill will be placed at the Garbutt, on Breece hill.

Garibaldi—Regular shipments of about 25 tons per day continue to be made from this property.

Luema—A strike of gold ore is reported in the Valley shaft by W. F. Page. The vein was encountered at 400 ft. in porphyry. The property is in South Evans gulch.

Yankee Doodle—This mine, on Carbonate hill, is outputting from 25 to 30 tons per day of lead ore of good grade.

Summit County

King Solomon—A strike of high-grade lead ore is reported in the tunnel at Frisco, at 3600 ft. from the portal, and 2000 ft. below the surface.

Teller County—Cripple Creek

Victor—This mine on Bull hill, one of the early day producers, now operated under lease by the Roscoe Leasing Company, is reported as being the scene of a strike, assaying as high as 72 oz. gold per ton. The vein is said to be from 3 to 4 ft. wide. and was encountered 430 ft. below the surface.

Jo Dandy—Lessees are reported as having shipped two cars of high-grade ore, together with a five-ton sacked shipment of ore estimated to carry $1000 per ton.

Anchoria-Leland—This Gold Hill mine is being operated by 12 sets of lessees, and producing about 600 tons per month of $20 ore.

El Paso—Thirty-four out of the 38 sets of lessees on this property are said to be in ore, and so far this month 60 cars of ore have been shipped, averaging $25 per ton.

Henry Adney—This Beacon Hill mine is producing from three to six cars per week of ore yielding from 1½ to 2 oz. gold per ton.

Doctor-Jack Pot—The report of A. E. Carlton, president, shows that during the last quarter the royalties paid by the lessees amounted to $5750, and the average yield of the ore was $24.40 per ton. Lessees on the Ingham mine of this company are reported to have opened a large body of $18 ore.

Gold Dollar—The annual meeting will be held at Cheyenne, Wyo., June 8. Twenty-one sets of lessees are operating the property, and royalties paid since the last meeting amount to $20,870. Cash balance in the treasury, $19,000.

Idaho

Coeur d'Alene District

Cœur d'Alene Mining Company—California placer miners are drilling the 2000-acre placer field of the company. The gold lies beneath bedrock. The ground requires dredging with special machinery.

Stewart—Two hundred tons of lead-silver ore is handled daily in the Federal mill, turning out about 30 tons of concentrates. Half the capacity of the mill is in use and the other half will be worked continuously soon.

Reindeer—To test the ore preparatory to installing a mill, the company has shipped in three hand jigs.

Idaho County

Harmon-Morrow—This group at Elk City is under bond to F. W. Bradley, of San Francisco.

Elk City Mines Corporation—This company has acquired the South Fork mine and will develop and equip. Robert Koontz is in charge.

Indiana

Blackford County

An increase in completed wells and new production is shown in the Indiana oilfields. What looks like a new and productive Trenton rock pool has been opened near the Blackford, Union and Randolph county lines. A number of wells have been brought in in this territory and while none of them are gushers they are sufficiently large to attract attention. During the last week 11 new wells were completed, four being nonproducers. During the month of April, 781,824 bbl. of crude oil were shipped from the Indiana field.

Vanderburg County

William O. Ferguson, receiver of the Chandler Coal Company, has petitioned the court to compel Joseph A. Bryan, former manager of the company, to turn over the records of the company to him. The receivership grew out of a complaint of one of the stockholders alleging that the affairs of the company were entangled. The company's mines are near Chandler and are good producers.

Vermilion County

The Zeller-McClelland Coal Mining Company, of Brazil, has been taking options on coal lands lying on the Evansville & Terre Haute coal switch south of Clinton. Among these tracts is one of 450 acres belonging to W. L. Morey. Two new shafts will be sunk in this territory.

An effort is being made by the mine operators to bring in more American miners and displace the foreigners in the Clinton district. A group of Italian miners were refused admission to mine No. 2 of the Brazil Block Coal Company and were told that their places were forfeited under the clause in the contract which provides for only two days' absence from duty without good excuse. These foreigners refused to resume work at once when the suspension was declared at an end.

Michigan

Copper

Isle Royale—In trenching 1200 ft. east of "A" shaft a copper-bearing lode about 20 ft. wide was exposed. The identity of this formation is not established but it resembles the Baltic. At "A" shaft drifting continues.

Houghton—A formation believed to be the Baltic lode has been exposed by No. 2 hole. This lode was reached at 85 ft. below the copper formation that was cut a couple of weeks ago.

Algomah—An unusual discovery was recently made at this property, adjoining the Lake. In trenching, a deposit of ore high in copper glance was exposed. Sulphide ore has been found in the district but only in limited quantities.

Oneco—No. 7 hole has passed through the Oneco lode and core shows a small quantity of copper. No. 8 hole is in the lode in the eastern portion of the tract and is sinking vertical to reach the formation disclosed by the New Baltic Company.

South Lake—No. 1 drill has been discontinued and moved to No. 3 hole. No. 2 hole continues sinking below 2300 ft. without results.

Missouri

West Twenty—This company has completed its mill at Porto Rico. C. D. Smith is superintendent. The mine will work a deposit in soft ground on the upper levels before working the lower sheet-ground.

Oronogo Circle—This company has been meeting with success in underground drilling at Oronogo. The drilling from the 230-ft. level showed ore to 385 ft., the deepest in the district.

Montana

Butte District

North Butte—The contract for treatment of ores at the Washoe smeltery will shortly be renewed at a saving of $20,000 per month to the North Butte company.

Butte & Ballaklava—President H. P. Nelson states that the ore shipped to the Pittsmont smeltery is averaging 9½ per cent. copper and 16 oz. silver to the ton.

Amalgamated—The Neversweat mine has resumed after a shut down of two months, necessitated by the wrecking of the hoisting engine.

Carlisle and Protection—These two quartz claims, between the North Butte and Butte & Superior, have been bonded to Pittsburg men for $400,000, by the owners, George Casey, P. J. Brophy, Charles Mattison, Mrs. Martha Fisk and W. O. Speer.

BROADWATER COUNTY

Edward F.—The property is near Hassel in the Radersburg district. At 150 ft. the main vein is 65 ft. wide. A 20-stamp mill is being operated and a 60-ton cyanide plant will be erected. The shaft, down 260 ft., will be sunk to 600 ft. when crosscuts will be run.

FERGUS COUNTY

Ryegate—The company has recently been organized with a capital of $250,000. The coal property is a mile northwest of Ryegate.

Nevada

ESMERALDA COUNTY

Goldfield Consolidated—On the 600-ft level of the Clermont a 20-ft. vein breaking more than $50 per ton has been exposed for 100 ft. in virgin ground west of the shaft in the neighborhood of the Gold Wedge Fraction. At 1000 ft. a crosscut for ventilation and prospecting is being driven 2500 ft. to connect with the Grizzly Bear workings.

Nevada Eagles—A vein of shipping ore, discovered recently, is developing well. The property is in the west portion of the Goldfield district, heretofore thought to be unproductive.

Combination Fraction—The Mohawk vein has been picked up on the 500-ft. level and extensive stoping operations commenced preparatory to starting the 90-ton mill of the Nevada Reduction works on June 1.

Black Butte—The Campbell lease continues its regular semimonthly shipments. A new lease has been granted to a Goldfield syndicate and work will be started at once.

Merger—On the Codd lease the old gasolene hoist has been replaced by a 50-h.p. electric. The shaft is to be deepened from 400 to 1500 feet.

Florence—The mill is handling 170 tons daily. With this increased tonnage an extraction of 95 per cent. is being maintained.

Bonnie Clare—Machinery and equipment for the 100-ton mill are being installed.

ELKO COUNTY

The Rex and Hartley mills, at Gold Circle, have been actively engaged in working the ores of the camp. A Lane mill is soon to be erected on the Sleeping Beauty group.

LINCOLN COUNTY

Pioche Metals—An assessment of 1c. per share has been levied. The installation of a compressor and other improvements are under way. Ore stored in the mine will be shipped as soon as the railroad reaches the camp.

NYE COUNTY

Tonopah shipments are: Tonopah, 3350 tons; Belmont, 1200; Montana-Tonopah, 945; MacNamara, 175; West End, 160; Tonopah Extension, 800; Midway, 100; total, 6730 tons.

Tonopah Belmont—The ore bins at the cyanide plant at Millers have been filled and everything is ready to commence operations with 60 stamps. A 2200-ft. pipe line is being laid to the new Belmont shaft, where an entirely new surface plant is being installed.

Montana-Tonopah—The Martha and Triangle veins continue to supply the greater part of the 950 tons being milled weekly.

Tonopah—In the mine extensive operations beneath the Mizpah fault are developing a good grade of ore.

Keane Wonder—Bullion worth $20,000 was taken to Rhyolite by Manager Homer Wilson, the result of the April cleanup.

Eclipse Development—The new cyanide department is producing tailings as low as $1.30 on a good grade of ore.

Round Mountain—A dozen leasers are panning gravel to good advantage on Blue Jacket ground.

WHITE PINE COUNTY

Chainman—This mill now owned by the Coppermines company and under lease to Willoughby & McGill, has been remodeled and will be put in operation.

Mecca Mining and Smelting Company—This company has been incorporated to operate in the Duck Creek district. The incorporators are H. McIntire, S. H. Burrus and J. T. Meyer.

New Mexico

SOCORRO COUNTY

Mogollon—Fire on May 12 destroyed the mill, shaft house and a portion of the shaft timbering, the loss being only partially covered by insurance. The plans for extensive development of the mine will be delayed.

Oklahoma

The Choctaw Coal Company has been organized to develop the Thomason tract of 3500 acres of coal land near Wilburton.

Oregon

BAKER COUNTY

Buckeye—Operations have been resumed. W. H. Gleason has charge.

Mountain View Extension—Frank Johnson, of Sumpter, will operate this property this summer.

CLACKAMAS COUNTY

Amalgamated Nevada—A 10-stamp mill and other machinery has arrived at Blackhorse. James H. Marriot is manager.

GRANT COUNTY

Gold Bug—Arrangements are being made for the installation of new machinery. W. H. Turner, of Spokane, Wash., has a lease on this property, and the work is under the direction of William Kinear, of Susanville.

Zenith—Operations at this mine are to be resumed after having been closed for two years. D. L. Willard is manager.

South Dakota

Pactola Dredging Company—This company will operate on Rapid Creek. Pittsburg capital is interested largely.

Alder Creek—John A. Sandholm, of Des Moines, Iowa, will build a 200-ton mill at this Deadwood property.

Utah

BEAVER COUNTY

Moscow—At the annual meeting, the old officers of the company were reelected.

Cedar Talisman—Another strike of lead-silver ore has been made on the 125-ft. level. There are said to be 3 ft. of shipping ore, on top of which occur about 2 ft. of zinc ore with the boundary well defined. The orebody on the 500-ft. level is being further developed. Hauling to Milford for shipment has started.

Hub—Ore has been developed on the Lady Bryan group, which is said to be of shipping grade. There is about 200 ft. of stoping ground above the crosscut where the ore was discovered.

Wild Bill—Four feet of ore, carrying lead, silver and copper, and an excess of iron, are reported on the 300-ft. level.

IRON COUNTY

Gold Springs Consolidated—This company was recently incorporated to acquire the Imperial group, adjoining the Jennie mine. The company has options on 12 adjoining claims, including the Snowflake, Buck and Charlie Ross properties. Development will be undertaken.

JUAB COUNTY

Tintic ore shipments in carload lots for the week ended May 13 are: Eureka, 2; Iron King, 5; Eagle & Blue Bell, 4; Gemini, 4; Scranton, 4; Cliff, 1; Colorado, 11; Opohongo, 3; Grand Central, 9; Lower Mammoth, 5; Mammoth, 4; Black Jack, 2; Carisa, 1; Dragon Iron, 31; Sioux Consolidated, 15; Iron Blossom, 21; Yankee, 3; Uncle Sam, 3; May Day, 2; Ridge & Valley, 3; Chief Consolidated, 2; Centennial-Eureka, 34; total, 167 carloads.

Chief Consolidated—Ore has been found in a raise from the 1600-ft. level. The raise is 90 ft. and will be continued to the 1400. The shaft is down 1775 ft. and work has been discontinued to allow development on the 1400- and 1600-

ft. levels. During the time that the mine has been in operation, a little over a year, the ore mined is reported to have given returns of $62,000.

East Tintic Development—Sinking in the shaft will be continued from 550 ft. The company is shipping four cars a month.

Opex—Ore carrying copper is reported to have been found in the second diamond-drill hole driven from the 2147-ft. level.

Sioux Consolidated—Work is being done on the 450 level, and ore is being shipped from this part of the mine. Development near the north line of the property has been unproductive.

Victoria—The company will sink its shaft to connect with lower workings. Operations are now being carried on through the Grand Central shaft.

Salt Lake County

North Utah—A crosscut on the lowest level of the Butler-Liberal section of the property has reached the ore-bearing limestone which is found to be wider here than on the upper levels. Heavy pyrite carrying specks of galena has been found in the lower workings of the Redwing section. This is thought to be on the Erie fissure which produced ore 600 ft. above.

Utah Copper—An amendment to the articles has been filed with the Secretary of State, increasing the capital stock from $7,500,000 to $25,000,000. The fee for filing the amendment was $4375.

North Bingham—This property in Barney's cañon, controlled by the Knights, has recently levied an assessment of ½c. a share. A contract has been given for 200 ft. of sinking. The company has driven a tunnel several hundred feet from the bottom of the cañon, and sunk a shaft 220 ft. from the tunnel. Some ore has been found, oxidized and leached and carried little copper.

Columbus Consolidated—At the delinquent sale, May 11, 5700 shares remained to be sold. This brought an average price of 51c. a share. The mill is running three shifts daily on ore from the 400 level. Fifteen teams are hauling ore and concentrates down the cañon. About 800 tons have accumulated.

Summit County

Park City ore shipments for the week ended May 13 are as follows: Silver King Coalition, 739,620 lb.; Daly-West, 1,300,000; Daly-Judge, 888,000; Daly-Judge (zinc), 939,830; total, 3,867,450 pounds.

Daly-Judge—At the meeting held in Jersey City, the old directors and officers were reëlected.

Silver King Coalition—At the annual meeting, May 16 the officers of the previous year were reëlected. M. C. Daly, mine superintendent, and Frank Daly, foreman, have resigned. George D. Blood will succeed superintendent Daly on July 1, and M. F. Sammon is now foreman.

Washington

Ferry County

Globe—Work is progressing under the direction of J. D. Brekenridge. Construction will soon be started on an aërial tramway.

Chicamun—The tunnel on this property, controlled by the Michigan Mining Company, is in 180 ft. W. C. Moore, of Orient, has charge of the work.

Orient Gold—Machinery has been purchased for this mine and a large force will be put to work.

Mountain Lion—This mine will be reopened.

Belcher—A smeltery will be built at Belcher Junction to treat the ore formerly sent to Trail. Meanwhile, the mine is closed.

Kittitas County

Black Hawk—Development is progressing, and the orebody was opened up in the 1400-ft. tunnel.

Stevens County

Bornite—A. Hohneck, president, is planning to have a power line from Newport to the mine. The new tunnel is in 300 feet.

Wyoming

Bear Lodge—Platinum is reported in the ore from this property near Sundance.

Canada

British Columbia

Consolidated—This company has acquired the silver-lead mine of the La Plata Mines, Ltd., in Nelson mining division. The mine, formerly known as the Molly Gibson, was a producer for years of ore averaging 12 per cent. zinc, 8 per cent. lead, and 47 oz. silver per ton. There is a concentrating mill on the property.

Le Roi, No. 2—The Josie shaft house and electric hoisting plant has been destroyed by fire. Loss is estimated at about $10,000.

Northern Texada Mines—Another shoot of bornite has been found on the 360-ft. level of the Cornell mine. It is estimated to contain ore to the value of $160,000.

Rambler-Cariboo—Developments on the 900 and 1000 levels are most satisfactory for several years. New shoots of silver-lead ore have been opened on both levels so the output of mine will be larger.

Lucky Jim—Shipment of zinc ore has been resumed. The April output was 600 tons running 48 per cent. zinc. The erection of a concentrating mill at Kaslo is planned.

Tyee—Returns for April are: One furnace was in blast 28⅔ days and smelted 7492 tons, producing 625 tons of matte, valued at $71,000.

St. Eugene—On this property at Moyie, there is a large crew at work. About 800 tons of concentrates are shipped each month.

Blue Bell—This zinc-lead property has been closed. The outcome of the forthcoming government experiments in zinc smelting will have largely to do with the future of this mine.

Engineer—A strike of rich quartz at this mine, Atlin district, is reported. One shipment is *en route* to Tacoma, and others will follow.

Ontario

Cobalt shipments for the week ended May 13 were: Beaver, 60,100 lb.; City-of-Cobalt, 63,390; Crown Reserve, 289,100; E. T. Corkill, 65,000; Kerr Lake, 114,500; La Rose, 265,180; McKinley-Darragh, 76,950; Nipissing, 192,411; total, 1,126,631 lb. The shipment by E. T. Corkill was of ore extracted from the Provincial mine prior to its sale by the Ontario Government.

O'Brien—Another shipment comprising 17,116 oz. of bullion has been sent to the Bank of England.

Nova Scotia—The new concentrator, having a capacity of 100 tons a day, is now running. Underground development has proved a new orebody carrying exceptionally high-grade ore.

Standard Cobalt—This company, operating for the Cobalt Central Mines of New York, is in the hands of a receiver. The liabilities amount to about $50,000.

Temiskaming—A report for the quarter ended April 30 shows cash liabilities $190,820, cash assets $180,188. The profits for the quarter were $96,684. The concentrator ran 17 days before April 30, treating an average of 92 tons per day. No. 2 vein at the 400-ft. level averages 8 in. and assays 4000 oz. No. 1 vein is in good ore at 350 ft. and No. 3 has 6 in. of high-grade at 390 ft.

Cobalt Lake—In the drift on the lower level, 15 ft. from the McKinley-Darragh some rich finds have been made. There are now 13 stringers of ore in the face of the drift, two of them 3 in. wide. Assays of the smaltite in these stringers run between 2000 and 3000 oz. Three cars of screenings are ready for shipment.

Yukon Territory

Yukon-Pueblo Mining Company—This property at White Horse has been sold to the Atlas Mining Company, of which Wilbur D. Greenough is manager. New machinery will be purchased.

Mexico

Chihuahua

Compañia Minera Ignacio Rodriguez Ramos—The company has voted for a consolidation with the Almoloya Mining Company. The properties at Almoloya are adjoining and are extensively operated.

La Fortuna—B. H. Dudley has decided upon the erection of a 100-ton cyanide plant at this property, Neuvas Casas Grandes section, on the Mexico Northwestern Railway.

Guanajuato

The Guanajuato Power and Electric Company has started the construction of a transmission line from Guanajuato to San Luis Potosi, 87 miles. The San Luis Potosi plant has been purchased. Power will be supplied the San Luis Potosi smeltery and the San Pedro mining district. It is also planned to place power in the Pinos district in the State of Zacatecas.

Guanajuato Reduction and Mines Company—Plans are being made for extensive development of the old Rayas mine. The mill is now running exclusively on dump ore, much of it from the Rayas. An electric line was recently built to deliver the Rayas ore.

Jalisco

Lawson-Mexican Development Company—As the result of an attachment by creditors, the custom reduction plant and several silver-gold mines of the company, Mascota district, are advertised for sale. The appraised value is 85,761 pesos. The claims amount to about 40,000 pesos. The company was organized by Thomas W. Lawson several years ago, with a capital of $5,000,000.

Santa Rosa—Machinery for enlarging the reduction plant at the Santa Rosa, or Chinos, mines in the Ayutla district, has reached the properties. It consists of a No. 5 Huntington mill, Overstrom and Woodbury tables, Richards classifiers and Callow settling tanks. The plant has 10 stamps, concentrators and amalgamating equipment. Much development is in progress.

Santo Domingo—Work has been resumed on this mine on the Santiago river, after a long idleness. It is now controlled by the Redeemable Investment Company, of Boston.

Magistral-Ameca—The 100-ton concentrating plant is about completed. It is the first plant in Mexico using the Elmore process for copper ores.

Mexico

Esperanza—Report for April is as follows: Crushed, 13,128 tons; yield, $175,216; working expenses, $93,605; profit, estimated, $16,572.

Sonora

Creston de Cobre—New pumping equipment is installed at the properties of this company, Magdalena district, and the mines are being unwatered preparatory to extensive work.

Zubiana—E. A. Fisher and Los Angeles associates have taken over this *antigua*, in the Hermosillo district, and will erect a concentrator.

Sante Fe—A drift on the 100-ft. level of the Montoya mine has disclosed a full face of good silver-lead ore. Preparations for the erection of a mill are being made.

Mexican Mining Company—About 40 men are working at the Veta Grande mine of the company.

Mary—The operating force at this property in the Alamos district, has been increased and a 20-stamp mill is nearing completion.

El Temblor—A pipe line has been laid from this mine to Elisa creek, 4 miles away. Several thousand tons of ore is blocked out, though no definite plans for shipping or treating has been decided upon. H. C. Carr and New York parties are the owners.

Badger—This company recently made a shipment of 20 tons of gold ore from near Bariyon.

Greene-Cananea—Minority stockholders in the Greene Consolidated company have brought suit against the Greene-Cananea company and its officers alleging fraud in connection with the consolidation with the Cananea companies. Secretary J. W. Allen, in an interview, specifically denies the charges. L. H. Newkirk, 60 Wall street, New York, represents the complainants.

Chispas—This claim, 10 miles north of Nacozari, has developed a high-grade vein 38 in. wide.

Montenegro—Forty men are employed at this property, Moctezuma district, and 4000 ft. of development has been accomplished.

Australia

New South Wales

Gold production in the State for the four months ended April 30 is reported at 63,522 oz. in 1909, and 66,560 oz.—or $1,375,795—in 1910; an increase of 3038 oz. this year.

Queensland

The gold production for the three months ended March 31 was 92,722 oz. in 1909, and 101,234 oz.—or $2,092,507—in 1910; an increase of 8712 oz. this year.

Victoria

The output of gold in this State in March was 53,118 oz. For the three months ended March 31 it was 141,804 oz. in 1909, and 140,386 oz.—or $2,901,778—in 1910; a decrease of 1418 oz. this year.

Africa

The Transvaal Chamber of Mines reports the gold production in April at 619,045 oz., of which 594,339 oz. came from the Witwatersrand and 24,706 oz. from the outside districts. The total is 11,926 oz. more than in March, and 11,944 oz. more than in April, 1909. For the four months ended April 30, the total was 2,403,154 oz., or $19,673,193; showing an increase of 8222 oz., or $16,949, over last year.

The number of negro laborers reported on April 30 was: Coal mines, 9300; diamond mines, 13,566; gold mines, 183,814; total, 206,680, an increase of 7131 during the month. No Chinese have been reported since January.

Dutch East Indies

At the annual meeting of the Madjan Company, in Batavia, Java, the engineer reported that extensive tests showed an average over 200 acres of the concession of 22.5c. gold per cubic meter, and recommended the purchase of a dredge. It was voted to buy a dredge at an estimated cost of $50,000. This will be the first dredge in the Dutch East Indies.

The Siam-Keedah Exploration Company has secured a concession on the southeast coast of Sumatra, where prospecting has shown some promising gold deposits. Exploration work has been begun at two points.

New Zealand

Gold exports for the four months ended April 30 are reported at 136,014 oz. in 1909, and 145,759 oz.—or, $3,012,838—in 1910; an increase of 9745 oz. Silver exports were 550,675 oz. in 1909, and 536,178 oz. in 1910; a decrease of 14,497 oz. this year.

Philippine Islands

Benguet

The report of the Bua Mining Company for the year 1909 states that operations were confined chiefly to the Gomok mine. Stoping was continued and exploration was carried on by two crosscuts and by drifts, with promising results. The mill was in operation 9½ months, treating 4509 tons of ore. Receipts from gold and cyanide bullion sold were 64,941 pesos—14.39 pesos per ton. Expenses were 52,021 pesos, including 8316 pesos for depreciation, and 3550 pesos for flood and storm damages; leaving 12,920 pesos net earnings. The proportion of assay values recovered in the mill and cyanide works was 90 per cent.

Mancayan

The Lepanto Mining Company has given an option on its copper prospects to the Tellus Company, of Frankfort, Germany. Engineers have completed an examination of the property and sent in their report.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, May 25—The coal trade in the East is in fair condition, with no special changes to be reported.

In the West the trade is still irregular and interest is centered on the wage question and the suspension. The situation in the various districts is summarized below.

The Iowa miners are returning to work this week, the wage scale having been signed by both parties. In Indiana, work is active, while Ohio and the Pittsburg district are gradually settling down to steady operations.

The recalcitrant sections are the Southwest, the State of Illinois and the Irwin field in Pennsylvania. The Irwin field, like Westmoreland county, has been non-union, and the fight there is over the recognition of the union, which has recently organized the miners of the district. A committee of the national board of the United Mine Workers is endeavoring to settle the question.

Representatives of the mine workers and operators of districts 14, 25 and 21, in the Southwest, held a meeting in Indianapolis, May 17 and 18. The difficulties which have confronted the miners in Kansas, Missouri, Oklahoma and Arkansas were considered with a view to effecting a settlement in the wage scale. No agreement has been reached. The operators refused to meet the demand for an increase. This is the only point at issue on which an agreement could not be reached. It is believed another conference between miners and operators will be arranged.

In Illinois, the conference at Peoria took a serious turn last week when the joint committee of nine finally disagreed and the miners decided to call a general strike. Many were of the opinion that when the market was actually suffering for coal the miners and operators would have no diffculty in getting together. However, both sides seem determined to hold out as a matter of principle, and are not inclined to make any concessions. The operators are firm in their demand that the differential between the southern and northern districts be abolished and that the expense of the shot-firers be borne by the miners. These seem to be the chief points of contention, though there is a host of minor ones also, which have, as yet, to be settled. There seems to be very little chance of a settlement for several weeks.

COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, four months ended April 30, short tons:

	1909.	1910.	Changes.
Anthracite........	4,100,868	3,929,146	D. 171,722
Bituminous......	12,109,819	13,720,319	I. 1,610,500
Coke..............	3,336,540	5,143,636	I. 1,807,096
Total..............	19,547,227	22,793,101	I. 3,245,874

Total increase this year, 16.6 per cent. Bituminous tonnage in April was affected by suspensions in the Pittsburg and Central districts.

Coal tonnage reported by the 10 roads in the Ohio Coal Traffic Association for the three months ended March 31, was 3,356,421 in 1909, and 5,752,065 in 1910; increase, 2,395,644 short tons. Tonnage of individual roads not published this year.

Coal receipts at St. Louis, three months ended March 31, were 1,774,835 short tons in 1909, and 2,978,674 in 1910; increase, 1,203,839 tons.

Coal passing through locks on Monongahela river above Pittsburg, three months ended March 31, was 2,371,240 short tons in 1909, and 2,683,820 in 1910; increase, 312,580 tons.

Coal passing Davis Island dam on the Ohio, three months ended March 31, was 1,335,445 short tons in 1909, and 835,180 in 1910; decrease, 500,265 tons.

Receipts of domestic coal at San Francisco, three months ended March 31, were 95,032 tons in 1909, and 77,344 in 1910; decrease, 17,688 tons.

Coastwise shipments of coal from chief Atlantic ports, three months ended March 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	3,672,163	2,799,444	6,471,607	62.0
Philadelphia	420,420	1,166,581	1,587,001	15.2
Baltimore....	51,689	880,300	931,989	8.9
Newp't News	....	782,663	782,663	7.5
Norfolk......	....	660,852	660,852	6.4
Total......	4,144,272	6,289,840	10,434,112	100.0
Total, 1909.	4,412,913	5,435,540	9,848,453	.....

Total increase this year, 585,659 tons, or 5.9 per cent. New York includes all the harbor shipping points.

Coal tonnage originating on lines of the Southern Railway, two months ended Feb. 28, was: Tennessee district, 228,359; Alabama district, 491,297; total, 719,656 short tons, an increase of 109,543, or 18 per cent., over last year.

Anthracite tonnage of Baltimore & Ohio railroad three months ended March 31, was 242,249 tons in 1909, and 258,493 in 1910; increase, 16,244 tons.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the four months ended April 30, were 231,473 tons, an increase of 86,420 tons over last year.

New York

ANTHRACITE

May 25—About the usual spring business is being transacted, and there is no special incident in the trade. Shipments to New England points are beginning to be of interest, and some coal is going to Buffalo for the Lake trade.

Schedule prices of domestic sizes are $4.35 for broken, and $4.60 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, $3@3.25; buckwheat, $2.20@2.50; No. 2 buckwheat or rice, $1.65@2; barley, $1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

BITUMINOUS

The seaboard bituminous-coal trade is irregular. A large business is being done, but it is inclined to come in bunches, and orders are variable. There is still a strong tendency toward the lower-priced coals, and producers of the higher grades find them selling slowly. Pocahontas and New River have pressed on the market, especially in New England territory, and are keeping other sorts back. There is no doubt, however, that total sales are improving.

Eastern territory is still rather slow. New York harbor trade is better, but prices are, if anything, lower. With good West Virginia coal quoted around $2.40, it is difficult to get a higher price for Pennsylvania coal. Gas coal is selling at prices which realize about 70c. for slack and 85@90c. for run-of-mine at the mines.

Strike difficulties are about over. The Lake trade has been slow so far and is taking little coal from the seaboard trade yet. Car supply is rather irregular and mines are beginning to have trouble in getting as many cars as they need. Otherwise coal is coming this way quite freely. Consumers are generally low in stocks, and orders ought to be coming in soon on a larger scale.

In the coastwise market vessels are becoming scarce, and rates are higher. Boats now command 70c. from New York to points around Cape Cod, and nothing can be done below that rate.

Birmingham

May 23—Recent explosions in coal mines in Alabama have unsettled labor a little and the coal production has been off. However, the fear is subsiding, the men are getting back to work and the output of the mines in this State is increasing. There is a good demand for coal and much of the product is being shipped from this district into adjoining States.

The coke production is holding up well. There is a fair demand for coke but the price is not as strong as it has been.

Chicago

May 23—The coal market is yet without notable scarcity of steam supplies, notwithstanding the protracted lack of shipments from Illinois mines. Sales of coals from States east of Illinois are heavy and at prices satisfactory to wholesalers. Indiana coals, particularly, as coming nearest to the usual supply, find a large sale, while smokeless and Hocking have a better market than for many months past. Some of the larger users of coal have yet storage supplies, but the increasing general demand indicates that these are exceptional and Eastern mines must be drawn upon more and more with each new customer in the market. The chief requirements of coal users are screenings and run-of-mine. For screenings the price holds up to the high level established several months ago, though showing no signs of rising higher. To all appearances fine coals can be disposed of profitably for several weeks at least, from whatever source.

For Indiana lump, in fair but not active demand, car prices are $2.30@2.50. Run-of-mine from the same State brings $2.30@2.40. Screenings hold to $2.15@2.35. West Virginia smokeless coal of all names sells for $3.55 lump and $3.15 run-of-mine, circular prices. Hocking—in very good demand—remains at $3.15 for 1¼-in. There is practically no selling at sacrifice prices.

Cleveland

May 23—Notwithstanding the settlement of the wage question, Ohio mines are still working irregularly, and there are many local differences to be settled. Coal supply is irregular, and slack has been scarce. Lake trade is slow, supplies of coal are short, and buyers in the Northwest are holding back. Prices are nominally about the same, but are irregular, like the supply.

The leading firms in the trade have agreed on the following prices for Lake steamer supply: ¾-in., $2.65; run-of-mine, $2.55; nut, $2.45; slack, $2.10. These prices are at car dump; 5c. additional is charged where coal has to be loaded on lighters.

Indianapolis

May 24—The general coal market in Indiana is good. That prices are going to be considerably increased from various causes is now generally predicted. This is due to the increased wages granted to miners and the increased freight rate. Activity in the mines was augmented during the past week because of the strike in Illinois. The Southern Indiana is at present doing some of the heaviest hauling the road has ever had. The railroad is working all its crews and rolling stock to the limit, hauling Indiana coal to St. Louis. Other coal-carrying roads are doing a big business.

The general conclusion reached by the Indiana operators from the situation is that the market is rapidly getting into shape where it is going to be permanently strong, unless the output is increased all out of proportion.

Pittsburg

May 24—Lake shipments are being made at the full rate, and demand from local manufacturers is very good, but relaxation from the pressure caused by the mining suspension has produced a slight easing off in prices, and the minimum of the market may be quoted 5c. lower than formerly, although all producers will not meet the lower figures: Mine-run and nut, $1.20@1.25; ¾-in., $1.30@1.35; domestic 1½-in., $1.45@1.50; slack, 80@85c. The car supply is adequate at present but experienced shippers are looking for a decided shortage later and are pushing Lake shipments so as to be in comfortable position when the shortage develops.

Connellsville Coke—The market has developed farther since our last report, noting that a trading basis had been found by operators making concessions. That report noted three contracts placed totaling 26,000 tons monthly, at $1.75, $1.80 and $1.85, the two lower prices being for second half and the highest for the twelvemonth beginning July. Since that report we note a contract for approximately 11,000 tons monthly for second half, at $1.80, and another contract for 12,000 tons monthly for the twelvemonth beginning July 1, on a scale basis, relative to the monthly average price of pig iron. An inquiry has just been put out for 25,000 tons monthly for second half. The inquiring interest states it is willing to do $1.55, and while operators would hardly accept this figure, it is probable they will make a material cut from $1.80, the business being attractive as the interest is almost certain to run its furnaces. We quote contract furnace coke 5c. lower than last week, other prices unchanged: Prompt furnace, $1.65@1.70; contract furnace, $1.70@1.85; prompt foundry, $2.25@2.35; contract foundry, $2.35@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended May 14 at 396,777 tons, an increase of 2000 tons and shipments at 4256 cars to Pittsburg, 6296 cars to points west of Pittsburg and 986 cars to points east of the region, a total of 11,538 cars.

St. Louis

May 23—The Illinois differences have culminated in the declaration of a strike, as noted elsewhere.

Coal is beginning to be extremely scarce and the demand is strong. A great deal of coal is now coming in from Kentucky and Indiana, and prices have advanced considerably. Mine-run is the principal sort being dealt in and $2.60 f.o.b. East St Louis is the prevailing price for nearly all grades. Screenings are in great demand and are bringing practically the same price as mine-run. In fact, very little screenings are being made, and nearly all plants burning them are crushing mine-run.

The weather has eased up a great deal and is now seasonable, consequently the demand for retail coal is not pressing. The retail coal men are concentrating their attention on collections, which have been lagging, and on the anthracite business.

Anthracite coal is moving very well, and trade conditions are more satisfactory than for some years. While the circular is somewhat lower, yet it is being rigidly maintained. In the wholesale market anthracite is moving very well and the tonnage will be quite large for May. All of the large sizes are in very good demand, though chestnut is a little slow as country dealers, as a rule, are not buying yet. Circular is being maintained.

Current prices are quoted as follows:

	F.o.b. Mine.	St. Louis.
Illinois:		
Lump	$2.50	$3.02
Mine-run	2.25	2.77
Kentucky or Indiana:		
Mine-run	2.60	.....
Lump	2.80	.....
Pocahontas and New River:		
Lump or egg	1.50	4.00
Mine-run	1.10	3.65
Pennsylvania anthracite:		
Chestnut, stove or egg	.....	6.55
Grate	.....	6.30
Arkansas anthracite	3.35	5.35
Coke:		
Connellsville foundry	.....	5.40
Gas house	.....	4.50
Smithing coal	.....	4.15

Illinois quotations are largely nominal, as none is coming in.

FOREIGN·COAL·TRADE

British Coal Trade—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, four months ended April 30, long tons:

	1909.	1910.	Changes.	
Coal	19,066,314	18,583,007	D.	483,307
Coke	353,624	302,918	D.	50,706
Briquets	470,957	485,876	I.	14,919
Total exports	19,890,895	19,371,801	D.	519,094
Steamer coal	6,035,543	6,044,888	I.	9,345
Total	25,926,438	25,416,689	D.	509,749

Imports of coal are very small; they were only 874 tons in 1909, but increased to 12,253 tons this year.

IRON·TRADE·REVIEW

New York, May 25—The iron and steel markets, from all appearances, are beginning to wake up, and there are signs of increased activity, which are very welcome to the trade.

In pig iron the reported curtailment of production seems to have stirred up buyers, and more new business is reported this week than for some time past. There have been some good-sized sales and many small ones; while inquiries have come in from large buyers, who believe that prices are near the bottom. Eastern territory is calling for more foundry iron, while the Central West is taking basic pig. The business is rather sensitive, and does not stand any hint of higher prices.

In finished material there is an increased call for structural steel, and many small contracts are being placed. Here also, hints of any advance in prices are resented. Sheets are in better demand, and the market for bars is active, both East and West. Jobbers everywhere report good sales of small material, and it is evident that much building work is going on, almost everywhere. Roofing sheets and tinplate are strong.

Some export business is noted, including rails and locomotives for China, equipment for Cuba and Mexico. The home railroads are buying equipment more freely, but are doing little on rails or bridges.

Lake Superior Iron Ore—Iron ore shipments from the Lake Superior region in April are reported by the Cleveland *Iron Trade Review* as below:

	1909.	1910.	Changes.
Escanaba........	47,123	223,025	I. 175,902
Marquette	....	135,559	I. 135,559
Ashland..........	8,671	218,703	I. 210,032
Superior	....	355,307	I. 355,307
Duluth............	....	309,427	I. 309,427
Two Harbors.....	....	278,284	I. 278,264
Total	55,794	1,520,305	I. 1,464,511

This year shows the record for April, which has been approached but once, when 1.447,386 tons were moved, in April, 1906. Last year, during April, the mines were not prepared to ship. Of the shipments this year, 179.911 tons were for Lake Michigan ports.

Baltimore

May 24—Exports for the week included 166.574 lb. spelter to Antwerp; 6177 tons steel rails to South Australia; 2,157.024 lb. miscellaneous iron and steel to Panama. Imports included 1604 tons ferromanganese and 353 tons silicospiegel from Liverpool; 355 tons copper ore and 5403 tons cupreous pyrites from Huelva, Spain; 6000 tons manganese ore from Poti, Russia; 11,500 tons iron ore from Cuba.

Birmingham

May 23—Continued improvement is to be noted in the pig-iron market. The improvement is of small proportions and is coming slowly. There is no iron going to the yards now, the curtailment of production being effective. Some of the larger consumers of iron have been nibbling a little in the Southern market, and the belief is expressed that within a few weeks there will be orders placed for the balance of the year. Quotations for iron in this section are still $12 per ton, No. 2 foundry. This price will hardly be bettered during the balance of the year, though some of the furnace companies expect an advancement of 50c. and more. While the curtailment is on furnace repairing will be rushed. Basic and charcoal irons still hold well, several sales of some quantity having been consummated. The sales of foundry iron recently made were in small lots, but the aggregate is good. The time of delivery is extended to the last of the year. There is no verification of iron being sold in this territory under $12 per ton.

No change is noted in steel activities in this section and the steel plants are doing well.

Chicago

May 23—Sales of pig iron are increasing, the feeling being apparent among melters that further reductions in price are not likely to be generally made. Some lots, on the most favorable terms to sellers, are said to have changed hands at $11.50 Birmingham, which means $15.85 Chicago for No. 2. Most of the Southern iron sold, however, is at $12 Birmingham, the price that has been standard for several weeks. Foundry requirements are being more generally contracted for to cover the last quarter, and the volume of inquiries for that period is such as to make it seem certain that most melters are about ready to buy liberally. For early-delivery iron—30 to 90 days—there is still much demand, but the increase is noticeable for more distant deliveries. Some furnace agents, indeed, are offering special inducements to get early-delivery lots placed. Northern iron remains at $17 and has a steady sale that is indicative of a large business on the part of the melters and of fairly close regulation of output. The trade in iron and steel products, while not heavy, is general and indicates no falling off. The tone of the whole market, indeed, may be called firm, quiet and promising. Coke sells well at $5 for the best Connellsville.

Cleveland

May 23—Ore receipts since the first rush are rather slow, and vessels are not getting quick despatch at the upper ports.

Pig Iron—Small sales make up the business reported this week in foundry iron, and there seems to be little disposition to order ahead to any large extent. Bessemer pig is nominally unchanged, with no sales. No. 2 foundry is quoted $16.50@16.75, Cleveland, and No. 2 Southern $16.10@16.35. Some southern has been offered at 25c. less, $15.85 Cleveland.

Finished Material—Quite a number of small structural orders are coming in. Iron bars are being shaded from recent prices to catch orders. Jobbers still report very good trade in bars and pipe.

Philadelphia

May 25—New business has been transacted this week in basic pig for two reasons; stocks among consumers were pretty well exhausted, and prices had receded to a point which in view of curtailment in other markets warranted buying. There has been little important business in other lines. Inquiries are scattering and consumers are showing indifference. Foundry irons have been dragging and Southern makes are offered at $16 for No. 2. A few Northern makes are offered at $17.25, but business has been done at less. Bar mill interests are purchasing in a small way, and some Southern forge has been bought at less than $15.

Steel Billets—Several small sales have been made this week in billets for prompt delivery at recent quotations.

Bars—Bars are commanding more attention at mills than for some time, and refined iron is more in request among small consumers.

Sheets—The sheet mills report further large orders within a few days for all products in which galvanized figures prominently.

Pipes and Tubes—There is no difficulty in keeping business ahead on cast pipe. Merchant pipe is dull and tubes are strong in price.

Plates—The rush of orders is taxing the capacity of the plate mills in this territory. Much new business has been figured upon this week.

Structural Material—The business of the past week included mostly unimportant orders for requirements in this immediate territory.

Scrap—The small consumers of scrap have been more active this week than for some time in picking up small lots for immediate use. Prices are rather weak and a few dealers have shaded quotations on heavy melting steel and No. 1 yard scrap, while railroad scraps which is plenty, is held at the very highest figures.

Pittsburg

May 24—There are cross currents, the market as a whole showing no decisive trend either way. In some quarters sentiment is distinctly less favorable, while in others the outlook is regarded as brighter. Steel bars, hitherto maintaining a strong position, have improved and there has been a slight improvement in bookings of pipe, both merchant and line.

The agricultural-implement makers have placed about 60 per cent. of their steel-bar tonnage for the year beginning July 1, amounting to about 150,000 tons, and paid the full market price of 1.45c., Pittsburg, on soft-steel bars, this being the first year in which they did not obtain a concession. A portion of the tonnage was in hard-steel bars, upon which the regular steel mills met the price of the rerolling mills, using old rail stock, and this was the only semblance of concession given. The implement makers usually order at this time, or earlier, and did not delay further in hopes of getting concessions, because they wished to specify at once on a tonnage of special shapes, upon which they have received very poor deliveries the past season. On regular sections deliveries have been fairly good the past few weeks.

The Harriman orders for 12,440 cars, about 10,000 to the American Car and Foundry Company and the balance distributed among several other interests, constitute the largest batch placed this year. The car shops have business on books to maintain the present full operations for from three to four months.

Pig Iron—Prices are quotably lower on pig iron, and the market is unsettled at the new figures, there being rumors of still lower prices done. The shaking up in the market has brought out more inquiry, but buyers are slow in closing. The Follansbee Brothers Company, after picking up several odd lots of speculative basic iron at very low figures, bought 5000 tons at about $15.10, Midland furnace, equal to $15.70, delivered Follansbee, or a basis of $14.75, Valley, which price, however, the Valley furnaces would not do. The American Steel Foundries has practically closed for 5000 tons at $15, Valley, for delivery over the last five months of the year, and is negotiating for more tonnage at this figure. The business represents a recession in furnace views, since hitherto they would do $15 only on early delivery. Bessemer iron has moved in a limited way and sufficient is known to warrant dropping $1 from the previous nominal quotation of $17, Valley, making the iron quotable at $16, Valley. Reports of foundry-iron sales at far below $15, Valley, are not generally credited, and $15 is probably the market, with malleable at $15.50 and forge at $14.50. Prices delivered Pittsburg are 90c. advance over these prices.

Ferromanganese—The market is quiet and remains quotable at $40@40.50 for prompt, and $40.50@41 for forward delivery, Baltimore, freight to Pittsburg being $1.95 per ton.

Steel—It is reported, but not officially confirmed, that the Pittsburg Steel Company a fortnight ago sold the Jones & Laughlin Steel Company 5000 tons a month of small open-hearth billets for a period of several months, and that this was the chief cause of its starting its steel plant at Monessen last week after an idleness of five weeks. Open-hearth steel continues scarce, although 50c. lower than formerly could probably be done. The market is quotable as follows: Bessemer billets, $25.50@26; sheet bars, $26.50@27; open-hearth billets, $28@28.50; sheet bars, $29@29.50; rods, $32 per ton.

Sheets—It is between seasons and demand is only moderate, although, on the whole, tonnage is large. While a few plants are not running full, the current sheet production is easily ahead of any rate prior to this year, since many new mills were completed and put in operation last year, others following in the past five months. A few producers continue to shade black sheets $1 or $2 a ton, and galvanized sheets $2 or $3 a ton, regular prices being 2.40c. on black and 3.50c. on galvanized, with painted corrugated roofing at $1.70 and galvanized at $3. Blue annealed sheets command the regular 1.75c. price for late delivery, but 1.85@1.90c. is obtained for any early delivery.

St. Louis

May 23—There has been very little change in the market and practically no business has been closed. A number of inquiries were received for third- and fourth-quarter delivery. Southern iron seems to be on the market in great abundance and some producers would evidently like to have some orders for immediate shipment. The price of $12.50 f.o.b. Birmingham, or $16.25 St. Louis, remains unchanged with the 50c. advance asked for third- and fourth-quarter delivery.

METAL · MARKETS

New York, May 25—The metal markets show a slight improvement on some lines, but no marked changes can be noted.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
April 1910..	$36,283,625	$ 2,100,918	Exp. $34,182,707
" 1909..	6,337,994	3,345,861	" 2,992,133
Year 1910..	47,199,706	11,669,276	" 35,530,430
" 1909..	44,316,626	15,501,136	" 28,812,490
Silver:			
April 1910..	4,696,534	3,840,495	Exp. 856,039
" 1909..	4,952,251	4,222,147	" 730,104
Year 1910..	18,336,081	15,238,634	" 3,097,447
" 1909..	19,426,181	14,675,365	" 4,750,816

Exports from the port of New York, week ended May 21: Gold, $87,239; silver, $1,081,054, chiefly to London. Imports: Gold, $177,177, chiefly from the West Indies; silver, $127,791, from Mexico and South America.

Gold—Prices on the open market in London remain at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. The Bank of England is again a buyer. No exports from New York are noted, except $100,000 to Canada.

Platinum—Business is good for the season. The recent advance in prices abroad has been followed here by one of 25 or 50c. Dealers now ask $30 per oz. for refined platinum and $35.50@36 per oz. for hard metal.

Our Russian correspondent writes under date of May 12 that the market and prices remain unchanged both at Ekaterinburg and in St. Petersburg. In St. Petersburg, sales have been made at 24,200@24,300 rubles per pood. Crude metal, 83 per cent. platinum, is generally quoted at Ekaterinburg at 6.30 rubles per zolotnik; in St. Petersburg, at 25,000 rubles per pood—$23.69 and 24.50 per oz. respectively.

Silver—The market has continued fairly steady the past week, closing slightly lower at 24 11/16d. in London, on selling by Chinese banks.

SILVER AND STERLING EXCHANGE

May.	19	20	21	23	24	25
New York....	53⅞	53⅞	53⅞	53⅞	53¾	53⅝
London......	$24\frac{13}{16}$	....	$24\frac{13}{16}$	$24\frac{13}{16}$	24¾	$24\frac{11}{16}$
Sterling Ex..	4.8710	4.8720	4.8740	4.8755	4.8790	4.8750

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to May 12, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India........	£1,553,500	£2,627,240	I. £1,073,740
China........	1,075,100	1,113,500	I. 38,400
Straits.......	82,800	......	D. 82,800
Total......	£2,711,400	£3,740,740	I. £1,029,340

Indian Council bills in London brought an average of 16d. per rupee.

Copper, Tin, Lead and Zinc

May.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
19	12⅞ @13	12½ @12¾	$56\frac{7}{16}$	33½	4.27 @4.32	4.12 @4.15	5.12½ @5.17½
20	12⅞ @13	12½ @12¾	....	33¼	4.27 @4.32	4.12½ @4.15	5.12½ @5.17½
21	12⅞ @13	12½ @12¾	...	33¼	4.27½ @4.32	4.12½ @4.15	5.12½ @5.17½
23	12⅞ @13	12½ @12¾	$56\frac{7}{16}$	33⅜	4.30 @4.32½	4.15 @4.17½	5.12½ @5.17½
24	12⅞ @13	12½ @12¾	$56\frac{5}{16}$	33¼	4.30 @4.35	4.17½ @4.20	5.12½ @5.17½
25	12⅞ @13	12½ @12¾	$56\frac{7}{16}$	33⅜	4.30 @4.35	4.17½ @4.20	5.12½ @5.17½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—A moderate business, both with domestic and foreign manufacturers, was transacted during the week of May 19-25. The market has been quiet, but steady. The leading interests in Lake copper have continued to offer at 13c., and substantial sales have been made at that figure and at a shade lower, while some brands of Lake have been obtainable at 12⅞c. The sellers of electrolytic in general ask 12⅞c., delivered, 30 days, but make concessions when business is actually in sight. Sales have been made at 12.80, delivered, both in Europe and America, corresponding to 12.60@12.65, net cash, New York. Sellers demand slightly better terms for September contracts than for June-July. While most of the agencies profess to be well sold for June and July, they seem to be able to scrape up supplies when business for those months is offered. Consumption continues good and manufacturers both in this country and abroad are busy, and the reports, particularly from Europe, are encouraging. While there was not much buying this week, on the other hand there was no pressure to sell. At the close Lake copper is quoted at 12⅞@13c., and electrolytic copper in cakes, wirebars and ingots at 12½@12¾c. Casting copper is quoted nominally at 12¼@12½c. as the average for the week.

As the price for copper hovers just under 13c., the market seems to have encountered a freezing point. There is plenty of copper for sale at about 12.85 and everybody knows it. The manufacturers, who are well posted as to the statistical position and have been deluged with prophecies about the new supplies of copper to come, are content to pursue a hand-to-mouth policy. Apart from their contracts with the producers for future delivery, they are not believed to have much supply in their yards, but they feel sure that they will not in the near future have to pay more than the present price and think that they may be able to cover their requirements upon a break to a lower level, and in the meanwhile are staving off purchases, using up all their scrap, etc. The producers, on the other hand, are convinced that copper is cheap at the present price, and knowing that our statistics do not tell the whole story are of the opinion that the present situation is not so bad as it looks, and are firm in holding out for what they ought to get. No one less than a wizard could prophesy successfully what course the market is going to take from the present situation.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

The London market for standard copper has fluctuated within narrow limits. There have been some realization of speculative holdings, which sales were readily absorbed. The market closes at £56 8s. 9d. for spot, and £57 6s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £59; best selected, £60@60 10s.; strong sheets, £68@69 per ton.

Henry R. Merton & Co., London, under date of May 14, 1910, report active buying of copper by European manufacturers. The National Conduit and Cable Company, New York, under date of May 20, reports continued good consumption in this country, but indicates that manufacturers are holding back in their orders for copper upon the theory that production is in excess of consumption, wherefore copper may yet be obtained more cheaply.

Exports of copper from New York and Philadelphia for the week were 2043 long tons. Our special correspondent gives the exports from Baltimore at 2608 tons.

Tin—Transactions in the London market increased throughout the week and reached the large total of 1500 tons on May 24. These transactions may have been brought about to influence the market in view of the Banka sale which took place on May 25; if so, however, without much success, as the close is cabled as firm at £150 15s. for spot and £152 for three months.

A good business was done in the domestic market during the latter part of last week. Since then, however, the market has relapsed into its usual lethargy. Transactions are confined to retail lots, which can be bought at about 33⅜ cents.

Shipments of tin from the Straits in April were 4925 long tons; for the four months ended April 30 they were 16,944 tons, a decrease of 1106 tons, as compared with last year.

Lead—The market has been fairly active and the demand, especially for Missouri lead, has been good, and prices have advanced to 4.17½@4.20c. St. Louis, and 4.30@4.35c., New York.

The London market for Spanish lead is cabled at £12 12s. 6d. and £12 15s. for English lead.

Spelter—The market is quiet. Manufacturers are busy, but although their stocks of spelter are low, they are not buying largely at the moment. Prices are unchanged at 5.12½@5.17½c., St. Louis, and 5.27½@5.32½c., New York.

The New York quotation for spelter was 5.27½@5.32½c. for May 19-25, inclusive.

The London market for good ordinaries is £22 2s. 6d., and £22 7s. 6d. for specials.

Base price of zinc sheets is $7.50 per 100-lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The Bartlesville Zinc Company is building two new blocks, which will make a total of eight.

The smelters at Iola, Cherryvale and Neodesha are now sucking their gas pools by pumping.

Other Metals

Aluminum—Business continues on a good scale, and prices are strong at 23¾@24c. per lb. for No. 1 ingots, New York. The foreign market is also strong and steady.

Antimony—The market remains extremely dull, and in the absence of business prices are nominally unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—There has been a reduction of $1 in prices. New York quotations are $47 per flask of 75 lb. for large orders; $48@49 for jobbing lots. San Francisco, $46@46.50 for domestic orders and $2 less for export. The London price has been reduced to £8 15s., with the same figures quoted by second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Spanish Metal Exports

Exports of metal and mineral from Spain, two months ended Feb. 28, reported by *Revista Minera*, in metric tons:

Metals.	1909.	1910.	Changes.	
Pig and manuf. iron	4,325	3,971	D.	354
Copper	2,806	3,124	I.	318
Copper precipitate	2,761	2,474	D.	287
Lead	22,052	25,118	I.	3,066
Zinc	54	238	I.	184
Quicksilver	211	215	I.	4
Minerals.				
Iron ore	1,075,208	1,482,909	I.	407,701
Manganese ore	1,020	416	D.	604
Copper ore	172,575	178,309	I.	5,734
Lead ore	369	678	I.	309
Zinc ore	18,324	22,984	I.	4,660
Pyrites, iron	192,330	203,767	I.	11,437
Salt	89,219	84,262	D.	4,957

Imports of phosphates, 16,692 tons in 1909, and 21,744 in 1910; nitrate of soda, 11,627 tons in 1909, 13,117 tons this year.

Zinc and Lead Ore Markets

Platteville, Wis., May 21—The highest price paid this week for zinc ore was $43.50; the base price, 60 per cent. zinc, was $39@42 per ton. The base price paid for 80 per cent. lead ore was $49@50 per ton.

SHIPMENTS, WEEK ENDED MAY 21

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	624,900	....	....
Platteville	542,550	....	311,400
Dubuque	216,000	....	....
Highland	198,000	50,000	....
Cuba City	82,575	171,120	....
Galena	80,000	....	....
Benton	54,100	180,400	.....
Total	1,798,125	401,520	311,400
Year to date	32,787,551	2,651,689	6,426,890

In addition to the above, there was shipped during the week to the separating plants, 3,206,645 lb. zinc concentrates.

Joplin, Mo., May 21—The highest price paid for sulphide zinc ore was $46 per ton, the base $40@43.50 per ton of 60 per cent. zinc. Zinc silicate sold at $20@22 per ton of 40 per cent. zinc. Shipments were light, the larger part of this week's purchases being unsettled for, leaving the high price based on last week's bids. The average price, all grades of zinc, was $38.34. Lead ore continues weak, with light sales, the highest offering being quoted at $48 for ores of 80 per cent. grade or better, and with the usual deductions of $1 per ton for each unit below 80 per cent. lead. The average price, all grades of lead, was $47.94 per ton.

In addition to 25 of the larger producing mines idle on account of the recent drop in the price of zinc ore, a number of small shallow mines were idle a part of this week on account of surface water from the continuous rains; reducing the output, approximately 1500 tons.

SHIPMENTS, WEEK ENDED MAY 21.

	Zinc, lb	Lead lb.	Value.
Webb City-Carterville	3,716,420	425,150	$86,131
Joplin	1,895,540	141,000	37,138
Oronogo	980,970	104,030	23,364
Galena	983,040	108,010	21,547
Alba-Neck	616,490	......	13,253
Duenweg	434,910	54,390	10,003
Badger	333,930	9,320	7,059
Granby	480,490	22,040	6,530
Spurgeon	162,690	49,830	3,721
Carl Junction	137,060	10,580	3,193
Carthage	123,720	......	2,658
Aurora	192,440	......	1,924
Sarcoxie	62,800	......	1,256
Totals	10,200,500	924,350	$217,777

21 weeks.............229,143,060 34,035,210 $5,537,679

Zinc value, the week, $195,620; 21 weeks, $4,640,620

Lead value, the week, 22,157; 21 weeks, 897,059

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	......	37.42	......	56.59	......
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, May 25—The general market is unchanged and business is on a moderate scale only.

The new plant of the General Chemical Company, at Newell, Penn., on the line of the Pittsburg & Lake Erie road, was formally opened May 13. This plant has all the latest improvements. There are 12 buildings already completed with everything arranged for the addition of others, as the development of the plant goes on. All the buildings are of brick, concrete and steel construction, the roof being of tile resting on steel, so that the buildings will be fireproof in every respect. There will be no boilers in the plant, thus lessening the danger of an explosion, or other accidents. All of the machinery of the plant will be run by electricity, which will be generated by gas engines located in a separate powerhouse, removed from the remainder of the plant.

Copper Sulphate—No change is reported. On an average business, prices remain at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller orders.

Nitrate of Soda—Business is good for the season and contract deliveries are steady. Quotations continue at 2.15c. per lb. for spot lots, and 2.05c. for futures.

Arsenic—Sales have been light and prices are again a shade lower, at $2.37½@2.45 per 100 lb. for white arsenic.

Petroleum

Exports of mineral oils from the United States, four months ended April 30, in gallons:

	1909.	1910.
Crude petroleum	46,916,884	41,335,172
Naphthas	24,003,021	26,158,729
Illuminating oil	336,176,586	295,166,834
Lubricating and paraffin	49,378,906	48,326,448
Residuum	32,789,183	34,120,833
Total	489,264,580	445,108,016

The total decrease this year was 44,156,564 gal., or 9 per cent.

MINING·STOCKS

New York, May 25—The general stock market throughout the week has been almost entirely a professional one and rather dull at that. Movements in price were small and irregular, some stocks advancing, while others declined. There was no general tendency manifest, and the market seems to be simply drifting.

On the Curb, the copper shares were rather sluggish and most of the dealings were small. The exception was Ray Central, which was freely sold at advancing prices. Cobalt stocks, on the other hand, were active and freely dealt in at fair advances in price. The Nevada gold stocks are dead for the present.

At public auction in New York, May 19, Steel Corporation 5 per cent. sinking fund bonds brought 104; 31 shares New Jersey Zinc Company, $405 per share; 500 shares Columbus & Hocking Coal and Iron, $7.25 per share; 11,723 shares Predilecta Mining Company, $1.10 per share; 400 shares Veta Colorado Mining and Smelting, $55 for the lot; 500 shares Manhattan Ely Copper Company, $5 for the lot. A lot of miscellaneous securities consisting chiefly of 731 shares Victoria Silver Mining Company, 200 shares New Eureka Silver Mining Company and one-quarter share Baines Sound Coal Company brought $12 for the lot.

Boston, May 24—The mining-share market is at a standstill. There is an entire lack of business. Specialties have been strong, and the undertone of the whole list has shown undeniable strength. Notable has been the demand for Isle Royale with an advance of $3.37½ for the week and a high at $25.37½. Late underground developments at this property would give indications of favorable possibilities.

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	February.	March.	April.
Arizona, Ltd.	2,658,000	2,886,000	2,340,000
Balaklala	989,102	1,263,733	1,109,311
Boleo (Mexico)	2,331,832	2,148,383	2,777,800
Copper Queen	8,927,203	10,809,488	9,920,000
Calumet & Ariz.	2,024,000	2,820,000	... .
Cananea (Mexico)	3,586,000	3,700,000	4,262,000
Detroit	1,486,400	1,698,975	1,930,000
Imperial	750,000	825,000	800,000
Nevada Con. (Est.)	5,115,723	5,339,466	5,500 000
Old Dominion	2,035,000	2,674,000	2,325,000
Shannon	1,526,000	1,468,000	1,288,000
Superior & Pitts.	1,864,000	2,370,000	....
Utah Copper Co.	5,913,465	7,853,288	....
Butte District	13,758,620	24,000,000	25,000,000
Lake Superior	18,250,000	19,250,000	11,250,000
Total production.	71,099,622	89,366,867	....
Imports, bars, etc.	14,093,381	20,178,202	....
Imp. in ore & matte	6,063,764	6,181,476	....
Total.:	91,256,767	115,726,545	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
V, 1909	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31,332,403

VISIBLE STOCKS.

	United States.	Europe.	Total.
V, 1909	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	151,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

A $2 advance has been established in Amalgamated Copper and, although the market is largely made in New York, there is a scarcity of the stock in this city. Nipissing has done well by adding $1 to its market value. Butte-Balaklava has lately attracted attention by a $5 advance to $17 per share.

There has been little doing in the newer Lake issues, although their prices have bene well maintained. The Amster stocks have steadied and offerings are in a lessened volume. Atlantic and Mass mining shares both had sharp upward movement without any accompanying explanation. There is a constant absorption of North Butte, and Utah Consolidated has benefited in price value.

The Curb market has been quiet with a tendency for the better grade of stocks to show improved values.

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	May 31	June 21	$0.10
Beck Tunnel, Utah	June 14	....	0.01
Black Jack, Utah	....	....	0.01
Blue Bell, Idaho	Mar. 14	June 1	0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Bullion, Nev	May 8	June 6	0.05
Con. Imperial, Nev	Apr. 19	May 12	0.01
Con. Virginia, Nev	May 9	June 3	0.20
Exchequer, Nev	Apr. 27	May 18	0.05
First Natl. Copper, Cal	May 10	....	1.25
Hector, Idaho	Mar. 28	May 26	0.00¼
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	....	2.50
Mexican, Nev	May 17	June 9	0.15
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich	Mar. 10	....	1.00
Ophir, Nev	Apr. 22	May 16	0.25
Savage, Nev	May 2	May 27	0.10
Sierra Nevada, Nev	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21	....	0.03
Utah, Nev	Apr. 22	May 3	0.05
Utan Con. of Tintic, Utah	May 15	....	0.01

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51 750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53 221	23.708	24.483
May	52.905	......	24.343	......
June	52 538	......	24.166	......
July	51 043	......	23.519	......
August	51.125	......	23 588	......
September	51 440	......	23 743	......
October	50 923	......	23 502	......
November	50 703	......	23.351	......
December	52 226	......	24 030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13 893	13 620	14 280	13 870	61 198	60 923
February	12 949	13 332	13 295	13 719	57 688	59 388
March	12 387	13 255	12 826	13 586	56 231	59 214
April	12 56[illegible]	12 733	12 93[illegible]	13 0[illegible]	57 363	57 238
May	12 893		13 238		59 338	..
June	13 214		13 548	.	59 627	
July	12 880		13 363		58,556	.
August	13 007		13 296		59 393	
September	12 870		13,210	.	59 021	
October	12 700		13 030		57 551	.
November	13 125	..	13 354		58 917	..
December	13 2[illegible]		13 647	.	59 906	..
Year	12 982	.....	13,335		58 732	..

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32 403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	......	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	......	4.214	......	13.225	......
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	......	4.974	......	21.975	......
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5 729	......	5.579	......	22.125	......
September	5.796	......	5 646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16 73	18.96	16.09	17.21	15.90	17.38
March	16.40	18 53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	......	15.02	......	15.08	......
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19 75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS May 25

Name of Comp.	Bid.
Listed:	
Acacia	.05⅞
Cripple Cr'k Con.	.02¼
C. K. & N.	.15
Doctor Jack Pot	.08¼
Elkton Con	.78½
El Paso	.82⅞
Fannie Rawlins	.05⅞
Findlay	.07
Gold Dollar	.13½
Gold Sovereign	.03⅞
Isabella	.16½
Mary McKinney	.57½
Pharmacist	02½
Portland	1.12
Vindicator	82
Work	04
Unlisted:	
Golden Cycle	1 92
United Gold Mines	07

SALT LAKE May 25

Name of Comp.	Clg.
Carisa	.50
Colorado Mining	.64
Columbus Con	.48
Daly Judge	‡3.95
Grand Central	1 25
Iron Blossom	.91
Little Bell	1.25
Little Chief	.45
Lower Mammoth	.50
Mason Valley	6.90
Maj. Mines	2.32½
May Day	.05½
Nevada Hills	.81
New York	‡ 13
Prince Con	.73
Red Warrior	6.00
Silver King Coal'n	2.40
Sioux Con	.29
Uncle Sam	.35
Victoria	1.07½

SAN FRANCISCO. May 25.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.13	Belmont	4.00
Belcher	‡.56	Daisy	.06
Best & Belcher	‡.25	Jim Butler	.26
Caledonia	.47	MacNamara	.28
Challenge Con	.24	Midway	.27
Chollar	.10	North Star	.06
Confidence	.90	West End Con	.43
Con. Cal. & Va	.94	Atlanta	.13
Crown Point	.69	Booth	.13
Exchequer	.21	C.O.D. Con	.07
Gould & Curry	.20	Columbia Mt	.06
Hale & Norcross	.27	Comb. Frac	.50
Mexican	.93	Great Bend	.02½
Ophir	1.00	Jumbo Extension	.22
Overman	.82	Oro	.06
Potosi	.27	Red Hill	.04
Savage	.26	Sandstorm	.03
Sierra Nevada	.16	Silver Pick	.08
Union	.18	St. Ives	.11
Yellow Jacket	.58	Tramps Con	.05

N. Y. EXCH. May 25

Name of Comp.	Clg.
Amalgamated	71
Am. Agri. Chem	46
Am.Sm.&Ref.,com	81¼
Am. Sm. & Ref., pf.	86¾
Anaconda	43⅛
Bethlehem Steel	30
Col. & Hock. C. & I.	7⅛
Colo. Fuel & Iron.	‡38
Du Pont P'd'r, pf.	‡87½
Federal M. & S.	41
Great Nor., ore ctf.	64½
Nat'nal Lead, com.	78¾
National Lead, pf.	107¾
Nev. Consol	21
Pittsburg Coal	20¾
Republic I&S, com.	34⅜
Republic I & S, pf.	98
Sloss Sheffi'd, com.	73½
Sloss Sheffield, pf.	117½
Tennessee Copper	‡27½
Utah Copper	46½
U. S. Steel, com.	84¼
U. S. Steel, pf.	118½
Va. Car. Chem	61¼

BOSTON EXCH. May 25

Name of Comp.	Clg.
Adventure	6½
Allouez	46
Am. Zinc	25½
Arcadian	6
Arizona Com	16¾
Atlantic	8
Boston Con	17
Butte & Balak	17¼
Calumet & Ariz	65
Calumet & Hecla	590
Centennial	18½
Con. Mercur	.10
Copper Range	67½
Daly-West	8
East Butte	9
Franklin	13¾
Granby	41½
Hancock	21
Helvetia	2¾
Indiana	21¼
Isle Royale	24⅜
Keweenaw	3⅝
Lake	55
La Salle	13
Mass	7½
Michigan	6¼
Mohawk	51
Nevada	21
North Butte	34
North Lake	12½
Ojibway	‡7¾
Old Dominion	38½
Osceola	141
Parrot	16
Quincy	77½
Shannon	11¾
Superior	46
Superior & Bost.	11
Superior & Pitts.	12⅛
Tamarack	57
Trinity	5⅝
U. S. Smg & Ref.	43⅜
U.S.Sm. & Re., pd.	49⅞
Utah Apex	3¼
Utah Con	24
Victoria	3
Winona	8⅜
Wolverine	118
Wyandotte	2

N. Y. CURB May 25

Name of Comp.	Clg.
Bonanza Creek	‡3
Boston Copper	17½
Braden Copper	3
B C Copper	6
Buffalo Mines	2½
Butte Coalition	20¼
Caledonia	1¼
Chino	13¼
Cobalt Central	.07
Cobalt Prov	59
Con. Ariz. Sm	2¼
Cumberland Ely	‡9
Davis-Daly	2
Dominion Cop	7
Ely Con	.56¼
El Rayo	4
Florence	3⅛
Gila Copper	6⅜
Giroux	8
Gold Hill	⅞
Goldfield Con	8½
Greene Cananea	8¾
Guanajuato	1⅝
Guggen. Exp	190
Kerr Lake	.09$\frac{5}{16}$
La Rose	4$\frac{13}{16}$
McKinley-Dar-Sa.	.91
Miami Copper	22⅜
Mines Co. of Am	66
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1
Newhouse M. & S.	‡3½
Nipissing Mines	11⅞
Ohio Copper	2$\frac{13}{16}$
Pacific Sm. & M.	½
Ray Central	2$\frac{13}{16}$
Silver Queen	.35
Standard Oil	630
Stewart	¾
Tonopah	8¾
Tonopah Ex	.90
Tri-Bullion	$\frac{11}{16}$
W. Va. Wyo. Cop	2$\frac{1}{16}$
Yukon Gold	4$\frac{7}{16}$

LONDON May 18

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	10	0
Esperanza	2	11	9
Tomboy	0	19	3
El Oro	1	7	3
Oroville	0	9	6
Mexico Mines	8	11	3

BOSTON CURB May 25

Name of Comp.	Clg.
Ahmeek	‡170
Bingham Mines	‡3
Boston Ely	2½
Boswyocolo	‡.08½
Cactus	3¼
Calaveras	5$\frac{1}{16}$
Champion	.07
Chemung	‡9
Chief Cons	1¼
Cons. Ariz	‡2½
Corbin	08¾
Crown Reserve	3⅛
First Nat. Cop	3$\frac{15}{16}$
Indiana	‡21⅝
Inspiration	7⅝
Mackinaw	.14
Majestic	.65
Nat'l Mine	.31
Nevada-Douglas	2⅝
New Baltic	8
Oneco	3⅜
Raven Copper	.50
Ray Con	‡18⅜
Rhode Island Coal	8
San Antonio	7⅜
Shattuck-Ariz	29⅝
South Lake	6⅝
Superior & Globe	‡ 4½
Trethewey	‡1⅝
Tuolumne Copper	3¾
Vulture	9½
Yuma	‡ .55

‡Last quotation.

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Production of Lead in 1909

In the JOURNAL of April 9, 1910, we reported the production of refined lead in the United States in 1909. According to that report, the total of domestic origin was 369,164 tons, against 318,876 tons in 1908. In the accompanying table we give the production of lead, according to States. These statistics are based, so far as possible, upon the reports of the producers of work-lead (or base bullion) which bears the same relation to refined lead that blister copper does to refined copper. Consequently, it is not to be expected that these totals should agree with the totals representing refined lead production. Difference may arise through increased accumulation of stock at works or in transit, or the opposite. Also, we fancy that to a more or less extent the refiners include in their reports of lead of domestic origin the "exempt" lead of foreign origin which heretofore has been admitted free of duty, and has been marketed as domestic lead.

PRODUCTION OF LEAD IN THE UNITED STATES.
(In tons of 2000 lb.)

State.	1908.	1909.
Arizona	1,867	1,304
California	490	865
Colorado	26,707	28,413
Idaho	98,394	97,137
Kansas	2,400	1,500
Missouri	125,216	146,829
Montana	2,309	1,331
Nevada	3,676	4,086
New Mexico	611	1,275
Oklahoma	1,000	3,000
Utah	43,995	65,975
Wisconsin	3,486	2,740
Other States	600	629
Undistributed	2,026	3,062
Zinc smelters	1,290	2,796
Totals	314,067	362,851

The accompanying table represents, in our opinion, as near as it is practically possible to come to the source of the lead production in the United States. In the cases where it is possible to obtain reports of the mine production, it is uncertain as to what part of that production is actually recovered in smelting. Moreover, differences between mine and smeltery figures may be explained by differences in the stock of ore in transit or in the bins of the smelters.

The particularly noteworthy features of the statistics for 1909 are the large increases in the production of Missouri and Utah, while the output of Idaho and Colorado remained practically at a standstill. The lead output of Missouri in 1907 for the first time in recent years exceeded that of Idaho. Missouri now holds, without question, the premier position among the lead-producing States of the Union. If we should limit ourselves further and say the lead-producing district of southeastern Missouri, our statement would still be true.

Looking at the situation statistically, which view is confirmed by knowledge of the mining conditions, it appears that the lead mines of the Cœur d'Alene have passed their zenith. Idaho, which is equivalent to the Cœur d'Alene, made its maximum production of 121,584 tons of lead in 1906. Since then the output has decreased annually. On the other hand, Missouri has been making uninterrupted gains for many years, and now, if we lump with Missouri the nonargentiferous lead-producing States of Kansas, Oklahoma and Wisconsin, they account for nearly 50 per cent. of the total lead production of the country. This lead is chiefly produced by concerns that are independent of the American Smelting and Refining Company, and from the present magnitude of their production, it can readily be seen why they are now so powerful a factor in the lead market.

Coal Mining

This issue of the JOURNAL, devoted chiefly to coal mining, is in accordance with the plan, followed for several years, of publishing an annual coal number. The subjects treated in this issue are broad in view and diversified in character; and we believe there is much of interest for everyone who has to do with any phase of coal production, while those who are especially concerned in metalliferous mining may also profit from knowledge of what the coal miners are doing.

No paper on coal, recently published, is deserving of closer perusal than the article dealing with "Safety Precautions in Alabama Coal Mines," by E. H. Coxe, in this issue. If anyone has doubts as to the sincerity of the efforts being made by our great coal companies to insure higher efficiency of operation, and afford greater safety to the employees, he need only read what Mr. Coxe has said, to be convinced that the industry is making forward strides.

Mr. Greer tells us of the moral revolution that has taken place among our anthracite miners, and numerous other writers have herein expressed themselves in a manner that leaves little doubt as to the present wide-awake attitude of coal men generally.

Mr. Young's article describing the "Kansas State Coal Mine" will be found of much human interest, while the paper on "Shaft Sinking," by Mr. Norris, is worthy of careful study, and should be filed for reference by all engineers who may have occasion to undertake such work.

Bituminous Coal Prices

Years ago, during the long period of competition which followed the Gowen management of the Reading road, a high authority in the anthracite trade summed up the situation by saying that it was the one great industry in the United States which had never earned an adequate return to the producers; all the profits had gone to the carrying railroads. Since that time the anthracite trade has passed completely under the control of the carrying companies; and further has been practically unified by tacit agreement and community of ownership, so that competition is a thing of the past. It is to be noted, however, that past custom has been so far followed that the total profits of each concern are divided in such a way that they appear on the transportation rather than on the mining side of the accounts in the published reports.

Taken generally at the present time the bituminous-coal trade of the United States is very largely in the condition in which the anthracite trade was in the days of the Gowen-Packer-Coxe managements. There is no great industry in the United States in which the returns to the producers are so small as in the mining of bituminous coal. The profits, if any, go chiefly to the railroads; and possibly to some extent to the dealers and the commission houses which sell the coal, though the profits of the latter have been growing smaller year by year. The reason for this condition is found in oversupply and excessive competition. It is probably not exceeding the mark to say that the existing mines of this country, if worked to their full capacity, could produce from 25 to 30 per cent. more coal than could possibly be used or marketed. Every producer wants to utilize the full capacity of the mines as far as possible, and to do this must extend his trade to new fields, or must shut out competitors from his established market by underselling them wherever he can. But underselling is a game which more than one can play at, and the players are only too likely to find themselves with the balance on the wrong side of their books at the end of the year.

Numerous concrete examples could be cited, and perhaps some of the more striking can be found in the seaboard bituminous trade. It is well known, for instance, that Pocahontas and New River coals were offered last spring in New England at $2.25 per ton, f.o.b. Norfolk or Newport News. The freight rates from those fields to tidewater through the season have been $1.40; which would leave the price at mines only 85c. per ton. This is not a solitary instance, for all through the past season good grades of steam coal could be bought in New York at prices which realized only 90c. or $1 at mines; while gas coal sold as low as 65c. for run-of-mine and 55c. for slack. There is not room here to calculate the cost of mining; but it must be evident that if coal operators can manage to come out even, or possibly figure a little profit on such prices, they would be realizing nothing to balance the depreciation of their property. That is, they would be poorer at the end of the year by the quantity of coal taken out.

The situation in many of the Western coal districts is substantially similar. It will probably be made even worse by the advances in the mining-wage scale, which have generally been conceded, and which must increase the cost of coal at the mines fully 10 per cent. Whether any corresponding increase in prices can be obtained under the existing competitive conditions remains to be seen—but it is extremely doubtful.

Mining Conditions in Joplin District

The Joplin district, during its long history, has been singularly free from labor difficulties, but now is experiencing a strike of moderate proportion. Irrespective of the merits of the present case, there is no mining district of the United States where we are so well pleased to see the miners get all they can. It is not generally known that the mining conditions of the Joplin district are highly dangerous and unsanitary, but such is the fact.

The mines of the district are operated to a large extent upon a relatively small scale, and with a good deal of carelessness. The ore is extracted in large chambers, untimbered, and falls of roof are a common source of accident. With one thing and another the result is an annual fatality rate of about four per 1000, which is high. If, however, the death rate from causes other than accidents were reckoned, the figure would be found to be far higher.

These mines, especially those of the "sheet-ground" type are opened in a formation of mineralized chert, extremely brittle and breaking into sharp angular fragments. The stopes are generally dry, and the dust inevitably inhaled by the miners makes them peculiarly subject to pulmonary troubles, from which a large number die at comparatively early age. We have been, perhaps, incorrect in saying, "inevitably," because the danger can be avoided, or at least greatly minimized, by simple means for keeping down the dust at the faces, but the miners themselves are not disposed to take this trouble, and the more enlightened operators who have tried to introduce systems for ameliorating the conditions have not met with any great success in making them effective.

This seems to be really a case for the enforcement of a drastic, sanitary law, but until the miners of the district awake to the dangers under which they work and demand such a law, they will continue to court the chance of early demise by disease originating from their occupation. There are no statistics to serve as a basis for a sound conclusion, but we should not be surprised if mining in the Joplin district were really as dangerous as work in an arsenic factory.

Western Coal Situation Nearing a Climax

The strike of coal miners in Illinois and the Southwestern States, although being continued in a quiet, orderly way, is fast approaching the explosive point. The miners in Illinois are now endeavoring to negotiate settlements with individual companies, hoping, in this way, to break the ranks of the operators.

This plan proved successful in past strikes, but it is likely to fail this time. The operators in two Illinois districts (the fifth and ninth), comprising the mines in the Belleville and Mount Olive fields, came to terms with their miners last week by adopting the entire program of the miners. This defection from the ranks of the operators is likely to be the only desertion that will occur, and takes place in an unimportant field.

The operators in the remaining seven districts are strongly united, while the miners are fast depleting their resources. Many locals are showing distress signals over a lock of funds, and we may expect aggressive action in Illinois very soon.

The Southwestern operators are standing firm, while the miners are showing a tendency to desert the union cause. There is the best of reason for believing that many mines in the Southwest will open with nonunion labor in a few days. There is more danger of the miners' organization going to pieces in the Southwestern States than in any other part of the country.

One serious phase of the situation in the Southwest is due to the attitude of the Governors of the various States. These authorities seem to be in sympathy with the miners, and as a consequence may refuse the service of the militia to protect property. It is evident, therefore, that if the mines open on a nonunion basis, the operators will have to employ their own guards, and much trouble will likely result.

The operators in northern Colorado have made but little headway toward opening their mines with nonunion labor.

Cactus Copper Company

The affairs of the Cactus Copper Company, or its promotion, or something about this concern, have impressed us as being mysterious. This company, owning property near Globe, Ariz., was brought out by the Cactus Development Company. Early in 1909 the property was transferred to the Cactus Copper Company. We shall not attempt to analyze the finances and stock arrangements of these companies.

The Cactus Copper Company has its main office at Duluth, Minn., where W. A. Eaton is president. C. W. Pritchett, of Denver, Colo., has been, and still is, the consulting engineer. Mr. Pritchett is a mining engineer of sound reputation and good standing in the profession.

From the beginning the promotion of this company has been accompanied by an active campaign of publicity, and in connection therewith it is obvious that some misleading statements have been made by somebody for public consumption. Mr. Pritchett made reports upon the property under date of Oct. 21, 1908, and Oct. 14, 1909. These were good engineering reports as to the development of a prospect. In neither of his reports did Mr. Pritchett refer to the development of any estimated tonnage of commercial ore. In a letter under date of Dec. 20, 1909, a brokerage house stated that they "understand that from a conservative estimate made lately that 2,500,000 tons of commercial ore are measured in the development works already opened. Four or five million tons can be figured within bounds of absolute safety."

About that time it was stated in various ways that Mr. Pritchett had made a later examination and that his report would be given out, but up to date the officers of the company have not produced it.

The misrepresentation by someone respecting this property became so bald that Mr. Pritchett, under date of Feb. 1, 1910, was led to publish a letter in a local Arizona newspaper, denying that he had ever said that he expects Cactus to develop into a greater property than Miami and Inspiration combined, and saying, "The Cactus property is still in the development stage and hence cannot be compared with developed property of this class in the district."

According to our information, this property is still distinctly a prospect, but misleading reports about it continue to circulate. These undoubtedly are inspired in some interested quarter. The directors of the company should publish the later report of Mr. Pritchett, which responsible officers of the company promised to do five months ago.

Cosmopolitanism in Technical Work

The Wallaroo & Moonta Company in South Australia is completing a copper-converting plant for treating its copper matte in place of the reverberatory refining furnaces, which had been used at this plant for many years. We do not doubt that this change could have been made to advantage long ago and illustrates the benefits to be derived from cosmopolitanism in technical work. That there have been capable and original minds at the head of the Wallaroo & Moonta operations is illustrated by the development of the Hancock jig, but there has undoubtedly been a strong leaning toward independent progress.

There are other districts more or less isolated where similar conditions prevail. Frequently, operators become so engossed with the details of their daily operations that they do not find time for visits to other sections or even other plants in their own district. They thus come to depend entirely upon their own initiative. There are few single minds that can keep pace with the united effort of the remainder of their profession, and we think it behooves every company to see that members of its technical staff are given an opportunity to visit other districts where similar work is being done.

Smelting in Bond Regulations Expected Soon

Special Correspondence

Secretary McVeagh is determined not to wait longer before issuing the new regulations governing smelting in bond, under the Payne-Aldrich tariff. The latest delay of the series which has held up the regulations has been the illness of Assistant Secretary of the Treasury Curtis, who had the matter in charge. Mr. Curtis was in New York when taken sick, and in order not to retard matters further, Secretary McVeagh himself has sent the draft of the regulations to officers of the American Smelting and Refining Company for examination It is expected that the rules will now be issued without additional changes. The only alteration that has been made since the last draft is a small modification in the percentage of wastage. This was intended as a concession to some points criticized by the smelting people in the earlier drafts. The action, however, was taken with the concurrence of Professor Hofman, of Boston, who has been the expert in charge of the subject for the Treasury Department.

Appeals

A new complication in this matter has, however, appeared. It is held at the Treasury that the regulations can be carried to the Board of General Appraisers for review, and from there, if desired, to the new Court of Customs for final adjudication. Whether any of the smelting interests will be sufficiently dissatisfied with the rules to appeal the issue in this way or not is still uncertain, but the prolonged delay, the sharp differences of opinion that have occurred, and the rather severe language that has been used by Secretary Brush of the American Smelting and Refining Company encourage the belief that such an appeal may be taken. The customs court begins operations on June 7, and has already a long list of cases that have been transferred to it from the various circuits that formerly had jurisdiction of them. It would take a good while to get the regulations passed upon if this plan were to be adopted.

Rescue and Experiment Stations

Special Correspondence

The recent accidents in coal mines have led to a renewal of the agitation in Congress for the appropriation of money to extend the service of mine rescue stations that has been inaugurated under the direction of the technologic branch of the Geological Survey, and which is shortly to be transferred to the new Bureau of Mines. Bills have been introduced in both houses for the purpose and it is probable that before the close of the session, the provision desired will have been made. The bill likely to be adopted is that of Senator Dick, the chairman of the Senate committee on mines and mining, which provides:

"That the sum of $160,000 be, and the same is hereby, appropriated, to be paid out of any money in the treasury of the United States not otherwise appropriated, to be immediately available and to be expended under the direction of the Secretary of the Interior, for the establishment and maintenance of mine rescue and experiment stations."

Canadian Iron and Steel Bounties

The statement of iron and steel bounties paid by the Canadian Government during the fiscal year ended March 31 shows a total pig-iron production of 740,244 tons, upon which the bounty amounted to $573,968. Of this total, 547,063 tons were made from Canadian ore, on which a bounty of $480,763 was paid, and 193,181 tons from foreign ore, the bounty on which was $93,205. The production of steel was 740,390 tons and the bounty paid $695,762. The output of wire rods was 89,802 tons, on which a bounty of $538,812 was given. The total bounties paid amounted to $1,808,533. The steel and pig-iron bounties will cease Dec. 31, the wire-rod bounty continuing for six months longer. The largest beneficiary was the Dominion Iron and Steel Company.

Hawthorne Silver and Iron Mines, Ltd.

The Hawthorne Silver and Iron Mines, Ltd., is the latest promotion of Julian Hawthorne. This company claims to have a large iron-producting property in Ontario. Mr. Hawthorne's statements regarding the iron-ore business in general are regarded as ridiculous by those who are well posted respecting the iron business. As usual, however, the prospectus is alluringly written.

The property mentioned is the Wilbur mine. This is a very old mine which has been worked spasmodically in the past. It was last operated by the Lake Superior Corporation, the ore being shipped to its furnace at Sault Ste. Marie. The Lake Superior Corporation took out all the ore it could find which ran between 40 and 45 per cent. in iron, and then abandoned the property as worthless.

Hawthorne's engineer states that there are over 500,000 tons of ore available, showing an average of 58 per cent. iron, and further states that he can begin operations at the rate of 1000 tons of ore per day. A well known and thoroughly competent mining engineer recently examined the property and reported to us that he could see nothing of value there.

Mineral Production of Russia

The gold production of the Russian Empire in 1909, according to the official figures, was 155.1 poods from the Imperial domains, and 2974.3 poods from private mines; a total of 3129.4 poods fine gold, which is equivalent to 1,647,316 oz. If we add, according to the usual custom, 10 per cent. for gold not reported or returned to the Imperial mint, the total is 1,812,448 oz., or $37,455,032. This is an increase of $6,510,471 over 1908, and is $3,295,032 more than the preliminary estimate published Jan. 8 last. The large increase is due to the production of several new mines in Siberia.

Platinum

The production of platinum is officially reported at 322 poods, equal to 169,501 oz. This is crude metal, averaging 83 per cent. platinum, and is therefore equivalent to 140,686 oz. pure platinum.

Other Metals

The production of copper is given at 1,128,940 poods, equal to 40,751,347 lb., or 18,484 metric tons. The production of zinc was 484,745 poods, equal to 17,497,760 lb., or 7937 metric tons. Pig iron reported was 175,000,000 poods, equal to 2,820,078 long tons.

Mineral Fuel

The coal reported for 1909 is 1,493,143,000 poods, equal to 24,447,230 metric tons. The output of petroleum for the year was 490,700,000 poods, or 8,134,251 metric tons.

Chronology of Mining for May, 1910

May 1—Nevada Consolidated listed on New York Stock Exchange.

May 5—Explosion in the Palos coal mine at Birmingham, Ala., killed 83 miners.

May 12—Explosion in the Wellington coal mine near Manchester, England, killed 136 miners.

May 13—F. Augustus Heinze acquitted by the United States Court of alleged irregular banking practices.

May 14—Announcement that Anaconda had acquired the copper mines and works of W. A. Clark, at Butte.

May 16—The President signed the Bureau of Mines bill.

May 17—A. Y. & Minnie surface plan at Leadville burned. Loss $25,000.

May 21—Mogollon mill at Cooney New Mex., destroyed by fire.

May Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during May, 1910, by a number of mining and industrial companies in the United States, Canada and Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Alaska Mexican, g.	Alas.	$0.30	$ 51,000
Alaska Treadwell, g.	Alas.	0.50	100,000
Alaska United, g.	Alas.	0.20	36,400
Amalgamated, c.	Mont.	0.50	769,439
Bunker Hill & Sul., s.l.	Ida.	0.327	98,100
Caledonia, s.l.	Ida.	0.01	13,000
Champion, c.	Mich.	1.00	250,000
Homestake, g.	S. D.	0.50	109,200
International Nickel	N.Y.	1.50	133,689
MacNamara, g.s.	Nev.	0.02½	18,363
Pearl Cons., g.	Wash.	0.01	20,000
Snowstorm, c.	Ida.	0.15	22,500

Foreign Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Buffalo, s.	Ont.	0.03	30,000
Dolores, g.s.	Mex.	0.22½	90,000
Mines Co. of Am.	Mex.	0.03	60,000
N.Y. & Hond. Ros., g.	Hond.	0.10	15,000
Temiscam'g & H.B., s	Ont.	3.00	23,283

U. S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
Cambria Steel	U. S.	0.62½	562,500
Lehigh Coal & Nav.	Penn.	2.00	761,520
U.S. Steel Corp., pf.	U. S.	1.75	6,304,919
Warwick I. & S.	U. S.	0.30	54,601

The Led Mule Lode

At the back of San Bernardino in Southern California (Barnardino is the local pronunciation) lies the desert. It is a land of aridity and inveracity. Those who dangle the bait of wealth say that over the hot and painful waste lies the trail to the lost lode, the Pegleg, the Gunsight, the Lost Cabin, the Spanish mine. Maybe not all of these are exactly in this one desert, but they are all equally lost and equally calling to the adventurous prospector. A fine prospect when the season is right for folk to pluck up their courage to go on pilgrimages.

Into San Bernardino have just come two prospectors, Col. Durham and Lieut.-Col. James Desmond, footsore and empty handed. Five months they have been pursuing a course in practical mineralogy, a liberal education in pure science, for it has brought them no practical result. With them has returned the faithful but ever melancholy companion of their wanderings, to wit, their pack mule; unfortunately the record in our news omits his name, and the omission is regretable because the mule shows himself superior, better man, better prospector. Footsore and empty handed the wandering men, even more deservedly footsore our fellow citizen this mule, but not empty hoofed. In safe, though inconvenient lodgment between coronet and pastern he has brought back from the gold trail the proof of wealth.

He delivered a limp, the chroniclers of San Bernardino tell us, and thus it was discovered that in his hoof he had concealed a nugget "estimated to be worth $500." Let us estimate also; with gold at $20 the ounce troy, that nugget must weigh 2 lb. 1 oz., without allowing a pennyweight to the quartz gangue which must hold it. Considerable of a dornick that; no wonder the mule limped. If only he had done as well with the other hoofs! Fancy the pride of ownership in a mule that assays $2000.

How like a mule this is. If it had been a pebble of barren country rock no bigger than a pea, that mule, any mule, would have trumpeted his woe and have taken no step until the intrusive geology had been extracted. But when he stepped on float and kicked up gold at the grass roots he says never a word until he reaches such civilization as San Bernardino affords. Then he reveals his auriferous deposit and sets the bipeds mad in the sacred famish of gold. Somewhere there is gold like pebbles, but it may be any part of five months back track on the trail of this mule who concealed his limp.

The wisdom of this mule has given the desert one more lure of gold. We hasten to claim the Led Mule Lode wherever it may lie—and a whole lot lies at the back of San Bernardino; we lose no time in staking 600 ft. along the lode, with all its dips, spurs and angles.—New York *Sun.*

Steel Production in 1909

The production of open-hearth steel in the United States in 1909, as collected and reported by the American Iron and Steel Asociation shows, as was expected, a very large increase over that of 1908; the remarkable point is that it exceeded the extraordinary outputs of 1907 and 1906. The figures are as follows, in long tons, for two years:

	1908		1909.	
	Tons.	PerCt.	Tons.	PerCt.
Acid open-hearth	696,304	8.9	1,076,464	7.4
Basic	7,140,425	91.1	13,417,472	92.6
Total	7,836,729	100.0	14,493,936	100.0

The total increase last year over 1908 was 6,657,207 tons, or 85 per cent.; over 1907 it was 2,944,200 tons, or 25.4 per cent. Included in the totals for 1909 are 601,040 tons direct steel castings, of which 295,035 tons were acid and 306,005 tons basic steel. The increase in acid open-hearth steel over 1908 was 380,160 tons; in basic, 6,277,047 tons. The gain last year was in much greater proportion from the basic than from the acid furnaces. The make of basic steel was by far the largest ever reported, while that of acid steel was exceeded in 1907, 1906, 1905, 1903 and 1902—five preceding years.

CRUCIBLE AND SPECIAL STEEL

The production of special steels remains almost stationary; while showing a marked increase over 1908, it was less than that of 1907 and several preceding years. The figures for two years are as follows:

	1908.	1909.	Changes.
Crucible	63,631	107,355	I. 43,724
Electric, etc.	6,132	22,947	I. 16,815
Total	69,763	130,302	I. 60,539

The second heading includes a small quantity of steel made by special processes, besides electric steel. Of the crucible steel reported last year 94,672 tons were ingots and 12,683 castings; of the electric and special steels 14,242 tons were ingots and 7005 tons castings.

Included in the steel ingots and castings made in 1909 were about 182,000 tons of alloyed steel, of which 159,000 tons were ingots and 23,000 tons castings. Of the total of 182,000 tons approximately 42,000 tons were made in bessemer converters, 120,000 tons in open-hearth furnaces and 20,000 tons in crucible, electric or special furnaces.

TOTAL STEEL PRODUCTION

The total steel production of the United States for 10 years past has been as follows, in long tons:

	Converter.	Open-hearth.	Crucible, etc.	Total.
1900	6,684,770	3,398,135	105,424	10,188,329
1901	8,713,302	4.656,309	103,984	13,473,595
1902	9,138,363	5,687,729	121,158	14,947,250
1903	8,592,829	5,829,911	112,238	14,534,978
1904	7,859,140	5,908,166	92,581	13,859,887
1905	10,941,375	8,971,376	111,196	20,023 947
1906	12,275,830	10,980,413	141,893	23,398,136
1907	11,667,549	11,549,088	145,309	23,361,946
1908	6,116,755	7,836,729	69,763	14,023,247
1909	9,330,783	14,493,936	130,302	23,955,021

The open-hearth production approached closely to that of bessemer or converter steel in 1907, and in 1908 it exceeded it. The proportion of bessemer steel has fallen from 65.6 per cent. in 1900 to 39 in 1909; while that of open-hearth has risen from 33.4 to 60.5 per cent. The proportion of crucible steel was 1.03 per cent. in 1900; since then it has been always under 1 per cent., and in 1909 it was 0.5 per cent.

Nipissing

The Nipissing Mines Company, of Cobalt, Ont., has produced from 1904 to April 1, 1910, 13,936,486 oz. of silver, and disbursed in dividends $4,290,000. In addition to this $400,000 was distributed among the original owners. The production for April is estimated at 455,086 oz., and the May figure will probably be about the same. The company is earning approximately $170,000 per month. The financial statement, as of May 21, 1910, shows cash on hand, $669,693; ore in transit, at smelteries and at mines, ready for shipment, $553,392, making a total of $1,223,086.

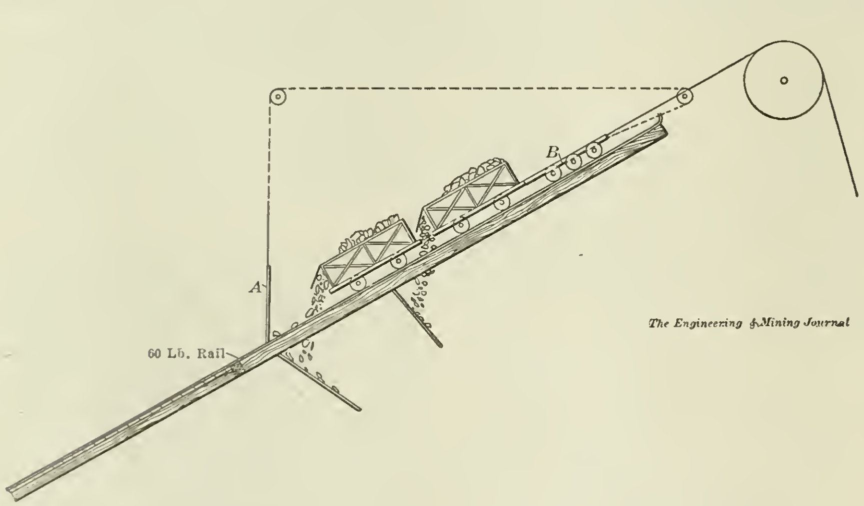
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Head of a Coal Breaker Plane

The accompanying sketch illustrates the general method employed in the anthracite fields of Pennsylvania, to dump cars at the head of an incline or breaker plane. The pitch of the plane is usually 30 deg., which is sufficient to unload the material in the cars by its own gravity. The capacity of the cars is two tons each, and a trip consists of two cars. The accompanying sketch shows the cars in the unloading position.

The part marked *A* is a safety gate to prevent the falling particles from rolling down the plane. This gate slides up and down along the guides and is automatically operated by means of a counterweight *B*, which latter is connected to *A* by a rope as shown by the dotted lines. When a trip of cars is lowered after the coal is dumped, *B* will descend about 10 ft. from the present position, as shown, and then stop as the length of the rope is limited between the gate and the pulley above it. *A* rises as *B* descends with the empty trip; thus, the gate is automatically raised and lowered.



Sketch Showing General Arrangement used at Head of an Anthracite Breaker Plane

A Mine Farm

An experiment in farming in connection with mining is being made by the Hercules Mining Company, Wallace, Ida. A small farm has been started and the products are being used to supply the table of the mine boarding house. As the first attempt of the sort among the larger properties in the district, the experiment is being watched with interest.

Reheating Compressed Air with Steam

The practice of reheating compressed air by mixing it with steam is employed generally in the Cœur d'Alene mines of the Federal Mining and Smelting Company. Results obtained at these mines seem to indicate that this is the most economical and efficient method of getting the full measure of energy from the air.

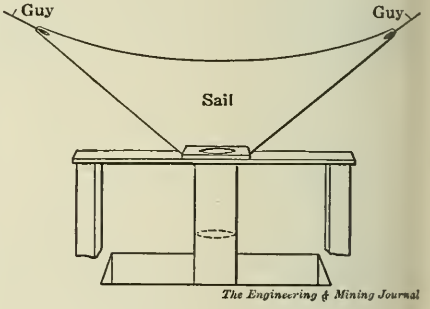
At the Mace mines, air at 90-lb. pressure for drills, and steam for the hoist were formerly conducted the 3000 ft. through the entry tunnel in separate pipe lines. The air is now compressed to 100 lb., mixed with superheated steam at the compressor house and piped into the mine in one line to supply both hoist and machine drills. The daily saving by this arrangement is figured at about $40, and besides an increase of 10 lb. in pressure is gained for drills. The steam plant formerly required 14 tons of coal per day, while from six to eight tons is all that is burned now. The boiler at this plant is rated at 80 h.p. and the capacity of the compressor is 4000 cu.ft. of free air per min. No trouble has been experienced from either freezing or condensation.

At the Morning mine the boiler for generating steam for reheating air will be situated at the underground hoisting station. The shaft will have four compartments and through it 1000 tons of rock per 24 hours will be hoisted. The engine and drills will be run on a mixture of compressed air and steam.

Wing Sail for Ventilating Shafts

By A. O. Christensen*

After sinking our shaft 60 ft. the gas from the powder smoke become so bad that work had to be suspended until we installed a "wing sail." The apparatus consisted of a canvas funnel, held open by hoops made of willow branches, which was run down the shaft, and to the upper end of which a wing sail was attached. The illustration shows the features of this arrangement. The sail is held in place by ropes stretched to nearby trees. Auxiliary ropes fastened to the middle of these can shift the direction of their pull, thus altering the position of the sail without necessitating more than two hitching posts. The sail can be turned to catch wind from any direction.



Sail for Shaft Ventilating

It is necessary to set the sail so that it will draw air out of the shaft. When first tried, the air was blown down but it was found that the heavy gases remained at the bottom while the fresh air merely worked to the surface again. When sucking air out, the draft through the bag is strong enough to carry the heavy gases up without trouble.

Sharpening Steel Underground

Drill-sharpening furnaces underground are not so much used as they should be considering how cheap they are and how easy and comfortable they make the handling and sharpening of drills. This opinion was offered by Thomas Johnson (*Journ.* Chem., Met. and Min. Soc., of South Africa, February, 1910) in a paper discussing mining conditions on the Rand. Mr. Johnson further remarks that, of course, there is no use putting a furnace underground and then bringing the drills in the skip to the level on which the furnace is, as when drills are once put in the skip they may as well go to the surface. To arrange things properly a furnace should be on each level and the drill sharpeners go to each; that is, they travel to the drills instead of the drills traveling to them. Not only does this save time and handling, but it brings the sharpener and user into much closer contact, which is a most desirable thing. It also keeps down capital expense of steel, thus providing the capital for the furnaces. Although the men do not and must not be expected to do as many drills underground as on the surface, it is still cheaper, for, as mentioned above, less steel is wanted, the machine men are much better served and things go more smoothly.

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*Zacatecas, Mexico.

Jigging Practice in the Coeur d' Alene

The Federal company is said to be obtaining satisfactory results from the Hancock jig on the finer sizes of ore. This is not surprising, inasmuch as good experience in the Coeur d'Alene has shown that the Harz jig, as constructed and operated there, is susceptible of great improvement. The Bunker Hill & Sullivan company has achieved such improvement, particularly with the finer sizes, by the classifying Caetani jig, which is considered to do just as good work as the Hancock, while it has the additional advantage of successfully separating all the slimes and sending them to the slime department, directly from the first compartment, without causing them to travel the length of the jig, as the Hancock arrangement demands. The old-style Harz jig will probably, in the course of a few years, be entirely superseded in the Coeur d'Alene by improved jigs of the type of the Hancock and Caetani.

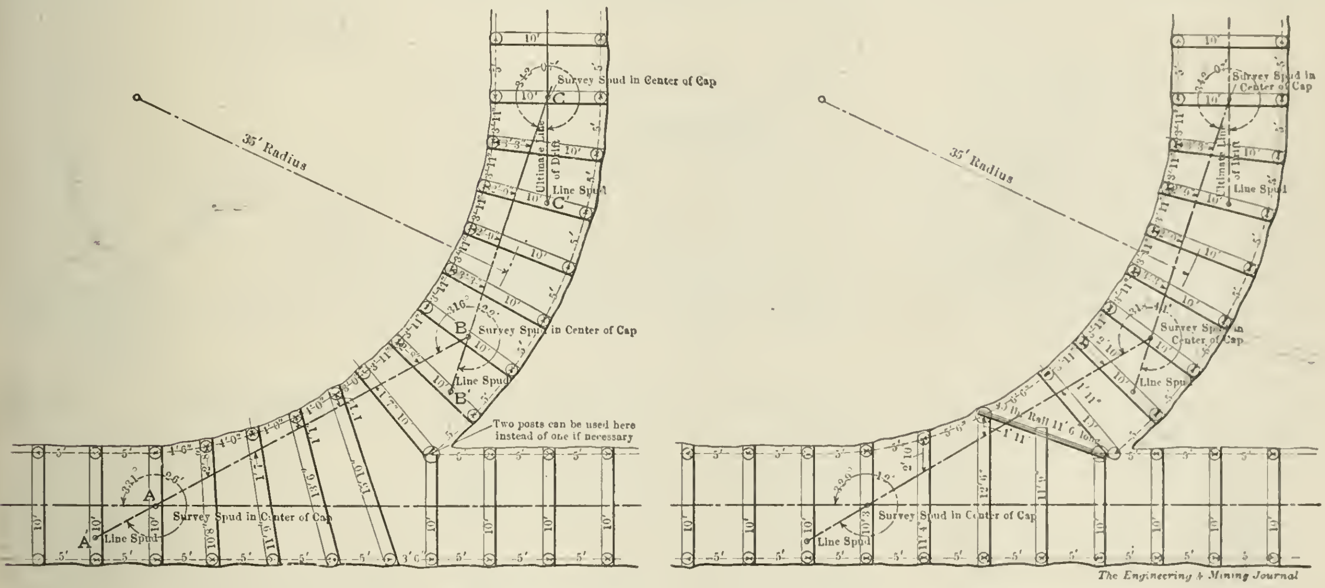
Underground Curves

Engineers in charge of mines experience some trouble in having underground turns put in just as they are planned. It is customary for mining captains to have the engineer spot a place for the beginning of a curve; the shift bosses are then instructed to put in an "easy curve" by setting each post back, say, 5 in. It then often happens that the first three sets are placed as planned and the following two sets are put in straight because the shift boss thinks that he has turned far enough. The engineer is then called upon to give a line for the straight drift and finds that it is necessary to put in a couple of more sets with a setback of 10 inches.

The curve is completed and is unsatisfactory both in the eyes of the general superintendent and to the engineer. The curve itself does not look as badly underground as it does on the flat map in the office, and it stands on these maps as a record of a mistake made in the underground work by the engineer. Errors of this nature can be overcome by having standard curves for the mine, and in having a system for giving lines. Following are curves used in some mines on the iron ranges of northern Minnesota.

Curve No. 1 is a 90-deg., left-hand turn. The turn begins at spud *A*. The instrument is set up here and a backsight taken on the next spud back in the main drift. The angle called for is turned off and the line spud *A'* placed. This is all the instrument work that is necessary for several days. Each shift boss is furnished with a set of blueprints of standard turns and he has but to follow the measurements given until cap *B* is reached, when it is again necessary to call on the engineer. Before placing the cap upon the post or in position, a spike should be driven into the cap the required distance from the end as shown on the blueprint. It is then easy to line the set in with the two line spuds.

Curve No. 2 is another standard turn in use and is a good turn to put in where a turn is wanted from a drift that has been standing for some time. This turn is preferred by some to the one above. When an engineer follows the above method for laying out turns, he not only clears himself from making mistakes, but the chances are that every turn planned for in the mine will be followed closely to the satisfaction of all.


35' Radius
Survey Spud in Center of Cap
Line Spud
C
C'
B
B'
A
A'
Two posts can be used here instead of one if necessary
10'
5'
The Engineering & Mining Journal

STANDARD CURVES USED IN MINNESOTA IRON MINES

Chain Ladders in Waste Chute

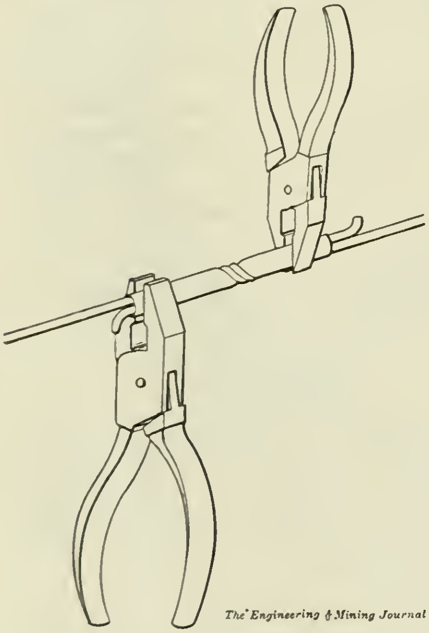
In the Utica mine, at Angel's Camp, Cal., waste is dumped into the stopes through raises from above. When an entrance to the stope is desired, chain ladders are used in the waste chutes. The ladders are built by connecting two chains with round iron rods at proper intervals. The connections are made by simply passing the ends of the rods through links of the chains and bending the rods back so as to have either end of each rod linked to a chain. Such ladders are practically indestructible even when used in chutes through which waste is constantly being passed.

A California correspondent reports that the use of a distillate forge for drill sharpening results in a saving in steel as compared with coal on account of the diminishing of oxidation during heating.

A Simple Joint for Underground Wiring

The need has frequently arisen for a simple joint which can be guaranteed to give good electrical contact without the necessity of having to resort either to complicated mechanical arrangements or to the use of solder. The latter is especially important in connection with fiery mines where any naked flame would bring about the danger of a disastrous explosion. For this reason it may be of interest to mention a useful arrangement for jointing single solid conductors which can be relied upon to give an excellent electrical contact and a joint which cannot be pulled apart.

The method adopted is to take a piece of copper tube from 3 to 4 in. long, according to the size of the wire to be jointed, and slightly flattened into an oval. The tube should be made of soft copper, or, if it has been hard drawn, it should be softened by heating and slaking in cold water in the usual manner. In order to secure good electrical contact the tube should be of such size that the two conductors to be jointed will nearly fill it.



A Wire Joint Without Solder

After slipping the two wires through the tube and bending the ends of the wire back as shown in the accompanying sketch, each end of the tube is given a turn in opposite directions by means of two pairs of pliers. The soft tube will then bend to the shape of the joint and fill up the interstices with a close metal-to-metal grip, so that it will be practically impossible to pull the wires apart and a good contact is secured. This joint is useful not only in mining installations, but also for repairs to overhead telephone, telegraph and small lighting wires in country districts where soldering is difficult or impossible.

Churn Drill Prospecting in the Joplin District

By J. Frank Haley[*]

For many years some prospectors have used the churn drill as a means of proving a piece of ground. It is only in recent years that this method has been universally used in the Joplin district. In former years, most of the prospectors sunk a shaft blindly on a piece of ground with a consequent loss of time, money, and faith in the district. Thousands of these abandoned shafts dot the entire country surrounding Joplin, while in many cases drill holes afterward put down have shown good ore near the old shaft.

Although much prospecting is being done by drilling, a large percentage of the work is practically wasted. In many cases the records are not preserved for any length of time and in the case of a barren hole the record is not kept after the hole is completed. The records that are kept are in many cases vague and untrustworthy. The method used by the St. Paul Mining Company is given below.

Office Records

After each hole is completed the record is made in triplicate and one record is kept by each of the three offices of the company. This is to guard against loss by fire. The records are not kept in loose leaves, but are kept in a ledger in consecutive order. Loose leaves are too easily lost or displaced. Each drill hole represents the outlay of a certain amount of money and should, therefore, be guarded against loss.

Formations Passed Through

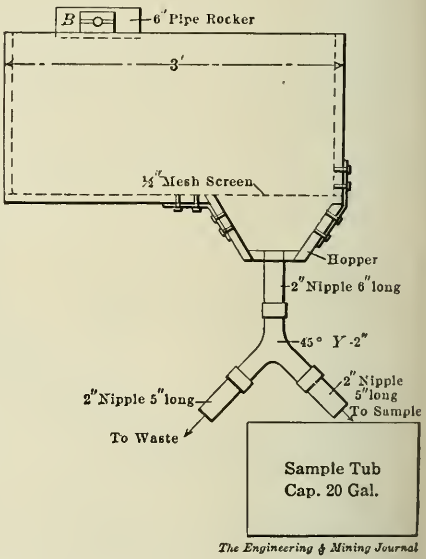
Each formation passed through, and the exact depth and thickness of same, are recorded, as well as the presence of any matter foreign to that formation. Its comparative hardness, color, whether broken or solid and whether or not it is fossiliferous, are carefully noted. The geological position of each different formation is given as near as possible and also the local name.

One point which is often overlooked is the amount of water encountered in a hole. This one point may determine whether the ground can be profitably worked and should, therefore, receive the closest attention, not only the amount of water, but whether or not it contains corrosive acids, should also be determined. Many mines containing good ore have been obliged to close down in this district, owing to the large amount of acid contained in the water, which rapidly corrodes pipe lines and mill machinery.

Sampling the Cuttings

Considering the high standard of intelligence possessed by the average operator and prospector in this district, it is remarkable that no thought has been given to the correct sampling of the cuttings from drill holes.

The common method pursued is to catch as much of the cuttings as possible in an ordinary water bucket, allowing the remainder to go to waste. The amount caught in the bucket is thoroughly washed of all mud and slimes, which introduces another loss of material. In this way only about one-fifteenth of the total amount is caught and a sample for assay taken in this way will give a much higher result than the ground warrants.



Device for Sampling Churn Drill Cuttings, Joplin, Mo.

The Sludge Sampler

The method pursued by the St. Paul company is a simple one and the apparatus used can be easily made at a small cost. A simple rectangular box 3 ft. long, 18 in. wide and 18 in. deep is used. At one end a hopper 12x18 in. at top and 4x4 in. at bottom and 12 in. deep is fitted into the bottom of the box. In the bottom of the hopper is screwed a 2-in. nipple, 6 in. long, to which is attached a 45-deg. 2-in. Y, and to each arm of the latter is screwed a 2-in. nipple, 5 in. long. On the top of the hopper is placed a piece of screen with ½-in. square holes, which catches any large pieces of rock which would otherwise block the outlet pipes.

On top of the box and 9 in. from the end is placed the rocker *B*. This is made of a piece of 6-in. pipe split in two and hung to the sides of the box by 1-in. steel pins. The operation of this device, which I will call the "splitter" is as follows: The pump, having been filled and drawn from the hole, is landed on the rocker and contents dumped into the box. The material flows over the screen into the hopper and out through the Y. The two arms of the Y splits the material into two equal parts, one being allowed to go to waste, the other being caught in a tub. When the hole has been completely cleaned out, the cuttings and slime caught in the tub are sent through the splitter again until about a gallon of cuttings and slimes remains. This is then placed in a pan over a fire, dried and sampled. In this manner a fair sample is caught for each 5 ft. of hole.

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[*] Chief engineer, St. Paul Mining Company, Joplin, Mo.

Preserving the Location of the Hole

It has happened frequently that after a mill has been built on a piece of ground and the tailings spread out over it, several drill holes have been covered up and their situation lost because they were not located by survey and mapped. The St. Paul company takes the following precautions for permanency in the location of drill holes.

After each hole is completed a pole about 10 ft. long and 4½ in. in diameter is placed in the hole, the hole having been first blocked with a large boulder. Stones, mud and dirt are placed around the pole until it is firmly held. It is then cut off square, about two feet above the ground and a brass tag, upon which the number of the hole has been punched, is firmly nailed to the top of the stake with galvanized-iron nails.

When each forty has been sufficiently drilled, an accurate survey is made and the elevation of the collar of the hole is taken. In this way the situation of the hole is permanently kept, and the hole may be found at any time.

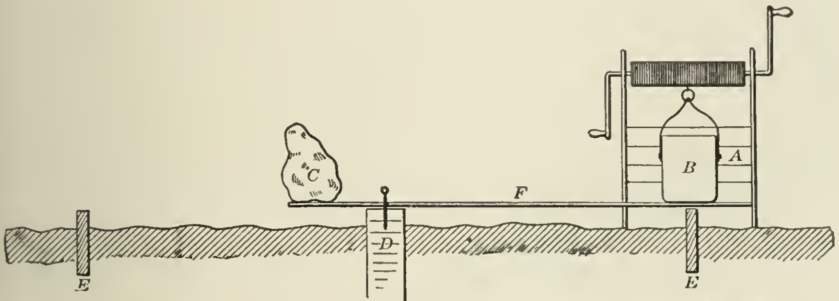
Cost of Drilling

This company has done several thousand feet of drilling at an average cost of 80c. per ft., including all expenses except assaying and surveying, which adds from two to four cents per foot to the cost of each hole.

Disposal of Waste at a Prospect Shaft

By Algernon Del Mar*

The accompanying illustration shows a prospecting shaft where the material hoisted is disposed of by swinging in a circle a counterbalanced bucket sliding on a 1- or 2-in. plank bent in the form of a circle. By giving the circle a greater diameter more space can be covered. It is considered to be a better method of disposing of broken ground than emptying a bucket into a wheelbarrow, for the bucket when hoisted rests on the balanced plank and is ready to be dumped at any point within or out the circle. The runners are kept greased with lard or whatever the prospector may have. In the illustration *A* is the shaft; *B*, the bucket; *C*, the counterweight; *D*, pivot; *E*, circular track on which the bucket slides; it is made of 1-in. board set on edge; *F*, a 2-in. plank.



The Engineering & Mining Journal

Apparatus for Disposal of Waste at Prospect Shaft

Concentrate Feeder for Tube Mill

At the North Star, Grass Valley, Cal., concentrates from the stamp mills all go to the Central cyanide plant where they are ground in a tube mill before being added to the pulp for cyanide treatment. The concentrates are brought to the plant in small, V-shaped, side-dump cars and discharged into a circular vat from which they are fed to the tube mill. Owing to the dense mass into which the sulphurets tend to pack, they are difficult to handle and several types of feeder were tried before the one now used was evolved.

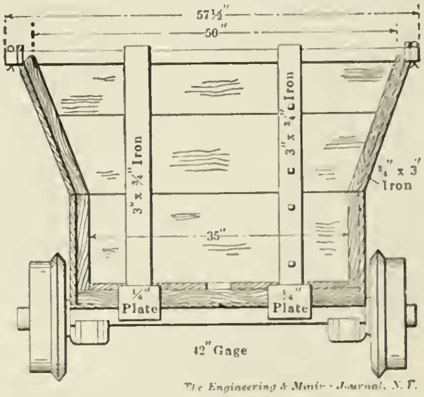
This apparatus is essentially a disk excavator, suspended over the vat and rotating in it. The blades are set on two arms and are inclined and spaced so as to push the material uniformly toward the center of the vat as the feeder revolves. The arms of the feeder are suspended by a vertical shaft which is provided with a sliding keyway and driven by a worm gear. The upper end of the shaft is attached to a rope which passes over a couple of pulleys to a counterbalance weight. By regulating this weight and the speed of revolution of the feeder, any desired rate of feed can be maintained.

When the vat is being filled with sulphurets, a sectional piece of 6-in. pipe is placed over the central discharge gate of the vat. Thus an opening is maintained through the center of the tank. As the feeder lowers, sections of pipe are removed so that the top of the pipe is always kept below the surface of the concentrates in the vat. The material from the feeder is discharged into a launder and washed directly into the tube mill.

Little power is needed to operate such a feeder, and the only attention it requires is for taking out sections of the central pipe at infrequent intervals. It is easy to control and insures a constant feed.

Wooden Ore Car

The accompanying sketch shows the type of ore car to be used by the Sulphur Mining and Railroad Company at its mine near Mineral, Va., as soon as hoisting in cages is adopted in the new vertical shaft. The side, end and bottom boards of the cars are of 1½-in. white oak, braced with ¾x3-in. wrought-iron bars. The cars are designed for a capacity of 41 cu.ft. As the cars will be dumped by a revolving tipple no arrangement is provided for unloading. The car is strong, easily constructed and is to be commended for use at the mine where lumber and labor are cheap. The wheel base is 24 in., length of car, inside, 60 in. and outside dimension 64½ in. The ¼-in. plates are on timbers that extend four inches beyond the end of the car and serve as a bumper.



The Engineering & Mining Journal, N. Y.

Sulphur, Mining and Railroad Company's Ore Car

It is stated that there were 61,895,604 tons in the ore reserves of the producing mines of the Rand at the end of 1909, an increase of 7,105,017 tons over the preceding year. The East Rand Proprietary led with 8,490,636 tons.

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*Mining engineer, Los Angeles, Cal.

The Brandy City Hydraulic Mine

BY GEORGE F. TAYLOR*

The Brandy City hydraulic mine is in Sierra county, Cal., on the ridge between Cañon creek and the North Yuba river at an altitude of about 3500 ft. above sea level. It may be reached by wagon road from Nevada City, 39 miles distant, or from Marysville, 66 miles distant. The material mined is old river gravel of the Tertiary period, and is part of the main channel that extends south from Scales. At Scales the two important forks of this ancient river unite. One fork embraces the deposits at Gibsonville, Bellevue tunnel, Laporte and Poverty hill, and the other fork includes the old workings at Howland flat, St. Louis and Portwine. South of Brandy City, remnants of the gravel deposits of this river have been worked at Grizzly hill, Indian hill, Depot hill, Oak valley and Camptonville.

Numerous streams and cañons of the present drainage system cut across the old Tertiary channel, nearly at right angles, leaving the old river deposits in patches on the ridge tops. The Brandy City property covers all of the channel between Cañon creek on the north and Cherokee creek on the south for a length of about two miles.

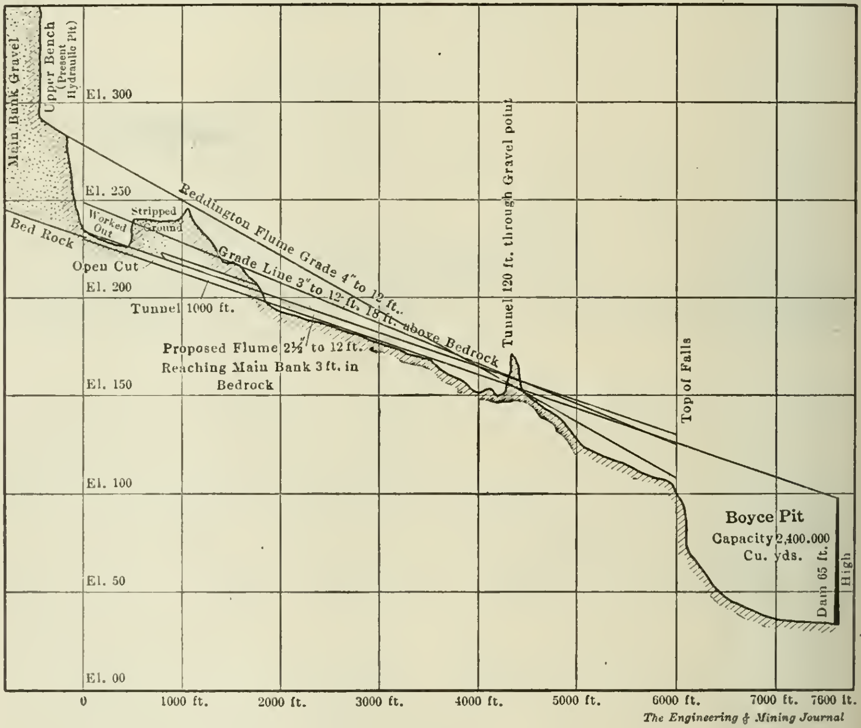
These deposits were first discovered and worked in the early '50s by the methods then in vogue. Water could only be had in limited quantities and the local supply was soon controlled by a few persons who sold it at high rates. Then the Hoosier flume, 9½ miles long, was built from Cañon creek and water sold for 25c. per miners' inch. Work was carried on under great disadvantages until the Brandy City Mining Company obtained control of the water rights and most of the claims.

THE GRAVEL DEPOSITS

The channel has a width of pay gravel varying from 300 to 700 ft., and there are about 10,000,000 cu.yd. yet to be mined. The bulk of this lies at the northern end of the claims. The gravel here has a thickness of about 150 ft., with an overburden of 60 ft. of cement lava (andesite-breccia). The gravel to the depth of 130 ft. is composed of small quartz pebbles ranging in size from walnuts to 3-in. pebbles. The lower 20 ft. consists of cobbles and boulders of quartz, granite and other rocks up to 2 ft. in diameter, mixed with finer material. The whole of this bottom stratum is so tight and compact as to require blasting to loosen it for washing. The bedrock is slate. Aside from the overlying lava ash, the whole deposit is pay gravel carrying near the surface about 10c. in gold per cu.yd., and near the bedrock as high as $2.50 per cu.yd. In the spring of 1909, about 30,000 cu.yd. of the upper part of the gravel was hydraulicked and 10c. per cu.yd. recovered. This gravel came from the east rim of the channel, 60 ft. above bedrock. The general average of the gravel is estimated, from the old records, as 25c. per cubic yard.

WATER SUPPLY

The Brandy City Mining Company owns the entire water supply of Cherokee and Cañon creeks. Two ditches bring water from Cherokee creek to the mine. One ditch is five miles long and has a capacity of 800 miners' inches; the other 3½ miles long, with a capacity of 500 miners' inches. The Cañon creek water is brought to the mine by means of a flume and ditch about nine miles long, with a capacity of 2000 miners' inches.


Main Bank Gravel
Upper Bench (Present Hydraulic Pit)
El. 300
El. 250
El. 200
El. 150
El. 100
El. 50
El. 00
Bed Rock
Worked Out
Stripped Ground
Open Cut
Tunnel 1000 ft.
Beddington Flume Grade 4" to 12 ft.
Grade Line 3" to 12 ft. 18 ft. above Bedrock
Proposed Flume 2½" to 12 ft. Reaching Main Bank 3 ft. in Bedrock
Tunnel 120 ft. through Gravel point
Top of Falls
Boyce Pit
Capacity 2,400.000 Cu. yds.
Dam 65 ft. High
0
1000 ft.
2000 ft.
3000 ft.
4000 ft.
5000 ft.
6000 ft.
7000 ft.
7600 ft.

The Engineering & Mining Journal

PROFILE OF PROPOSED FLUME FROM MAIN BANK TO BOYCE PIT, BRANDY CITY MINE, CALIFORNIA

The flume is 4 ft. wide and 3 ft. deep, with a grade of 7.92 ft. per mile. The sides and bottom are of sugar pine, 1½ in. thick. The substructure is of spruce, with sills 4x6 in; stringers 8x8 in. and side posts 4x4 in. This flume will deliver water at the mine under a 240-ft. head. Logging is done by means of a donkey engine, the company owning its own sawmill. Timber is purchased from the National Forest at the following prices: Sugar pine, $2.50 per 1000 ft.; yellow pine, $2; spruce, $1.50; cedar and fir, $1. The quality of the timber is unsurpassed.

DÉBRIS STORAGE AND DRAINAGE

As the company is operating in a field under the supervision of the United States Débris Commission, storage for the débris or tailing from the hydraulic operations must be provided. In this case there are old hydraulic pits which make admirable storage reservoirs for the detritus. These pits with the dams across their outlets, provide storage for 6,000,000 cu.yd. As these pits contain no natural streams, they require but inexpensive dams to hold back the tailings.

The mine is provided with an electric plant, and during the coming season it is expected that at least 2000 cu.yd. of gravel per day of 24 hours will be washed. The flume to carry the tailings into the Arnott pit is 900 ft. long, with a grade of 4 in. in 12 ft. It is 4 ft. wide and 4 ft. deep. The Boyce pit will be utilized later. The flume to convey the tailing to this pit is 6000 ft. long, 4x4ft. with a grade of 2½ in. in 12 feet.

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*Superintendent, Brandy City Mining Company, San Francisco, Cal.

The cost of mining 500,000 cu.yd. of gravel per year is estimated as follows: Labor: 40 men, 9 mo., $32,400; labor, 10 men, 3 mo., $2600; engineering and superintendent, $3000; powder, $8000; raising and maintaining débris dams, $2000; coal, tools and incidentals, $2000; total, $50,000.

Internal Commerce During April, 1910

Commercial movements within the United States during the month of April, as reported to the Bureau of Statistics of the Department of Commerce and Labor, indicate a rather unsettled condition of trade. While the lumber movement was fairly heavy, in response to the large requirements of the building trade, the movements of bituminous coal and coke showed a check in the upward trend, owing partly to the curtailment of iron production and the partial cessation of operations in the central mining regions pending the settlement of labor disputes. The cotton, wool, and live-stock movements during the month were also light. The grain movement, on the other hand, notwithstanding the slight export demand, proved fairly heavy. As a result the general traffic situation, as measured by the number of surplus cars as well as the total number of cars handled, shows a less favorable picture than for the earlier months of the year.

The volume of building operations during the month, measured by the values of permits granted by municipal authorities of 109 cities in various parts of the country, $93,604,514, shows a gain of 4.3 per cent. over the total for the preceding month and of 7.3 per cent. over April, 1909, although some of the largest cities, such as Chicago, Philadelphia, Boston and San Francisco, show smaller activities in that field than a year ago.

The general freight situation reflects somewhat the unsettled state of affairs in the industrial field. The number of surplus cars reported by the American Railway Association for the 27th of April, was 102,085 cars and a fortnight later, 127,148 cars—a total larger than any reported since August, 1909. Reports from 27 car-service associations and demurrage bureaus in various parts of the country show a total of 2,069,769 cars handled during the month, compared with 2,226,352 cars handled by the some organizations during March and 1,753,048 cars during April, 1909. The number of cars handled during the four months of the year, 8,166,178, was about 19 per cent. in excess of the corresponding 1909 figures and about 35 per cent. in excess of the number reported for the corresponding period two years ago.

Anthracite-coal shipments during the month from eastern producing territory, 6,224,396 gross tons, were exceeded only once in the history of the trade. The four months' total was 21,736,964 gross tons, compared with 21,982,999 and 20,875,474 gross tons for the corresponding periods in 1909 and 1908. Owing to unsettled labor conditions, the monthly traffic of soft coal over eight leading eastern coal-carrying roads shows a considerable shrinkage as compared with the corresponding totals for the earlier months of the year, the monthly total, 6,253,214 tons, being even below the corresponding 1909 total of 6,664,684 tons. The monthly coke traffic over the same roads, 2,052,423 tons, owing to the decreased demand of iron producers, was also lighter than during the earlier part of the year, though 43 per cent. in excess of the April, 1909, total.

The estimated coke output at Connellsville for the four weeks of April, 1,683,837 net tons, likewise shows some abatement when compared with the record output for the earlier months of the year. The production during the first four months of the year, 7,710,208 net tons, however, exceeded the corresponding 1909 total by almost 80 per cent. The pig-iron production for the month, 2,483,763 gross tons, though 43 per cent. larger than the corresponding 1909 total, also indicates a check in industrial activity, when compared with the earlier months of the year. The output of the four months of the year, 10,107,571 gross tons, was over three million tons larger than the year before.

Prospecting Ontario Silver Properties

Prospecting for veins in northern Ontario is usually done by means of trenches, dug over the surface of the properties. This method is advisable on account of the large amount of ground that can be explored at low cost, and also because of the narrowness and comparatively short length of the veins. The Nipissing mine in Cobalt is the best exponent of this system as it has obtained the greatest results. Already this season five veins carrying silver have been uncovered by surface prospecting. The latest discovery is a vein in the Keewatin formation near the boundary of the Gillies Limit, which carries about 3 in. of high-grade ore. This find was made in territory that had been partially explored. This company believes that it will miss many veins unless the overburden is entirely removed and as a consequence a couple of large pumps are being installed that will be used in cleaning the hill above Cobalt lake. As the ground is washed off it will be carefully examined for any signs of veins and when the examination is complete the spoil from the higher ground will be washed down on it again, as this is the only available way to dispose of it.

Surveys in Alaska in 1910

In accordance with the appropriation made by Congress for the continuation of the investigation of the Alaskan mineral resources by the U. S. Geological Survey, 12 parties have been organized for work in Alaska during the season of 1910. As in previous years, the work will consist of explorations, reconnaissance and detailed surveys, a study of the geology and mineral resources and stream gaging in the placer districts.

Districts to be Surveyed

The surveys and investigations of Seward peninsula are more or less complete, and no work will be done there this year other than keeping a record of the flow of a number of streams. J. W. Bagley is at the head of a party detailed to topographic work of the Eagle river district. It is proposed to complete the survey of the gold-bearing belt, which lies between Juneau and Berners bay. His work will be used as the basis for a detailed study of the geology and mineral resources under the direction of Adolph Knopf.

The Matanuska coalfield is included in the work to be done this season. For this work, the topographic map completed in 1909 will be used. The survey will be made under the direction of G. C. Martin.

The most extensive survey undertaken this year will embrace the region lying between the Gulkana and the upper Susitna in the Copper river region. Placer gold has been found in commercial quantities on Valdez creek, and has been reported to occur on other streams in this field. Except for the work of the prospector, this region is practically unknown. The plans for this season also contemplate a topographic and geologic reconnaissance map of the area lying between the Valdez-Fairbanks trail and the upper Susitna river. The work is under the direction of F. H. Moffit. The same party will also make a supplementary study of the Chistochina placer district.

Water Resources of Yukon-Tanana Region

The water resources available for placer mining in the Yukon-Tanana region will be further determined by C. E. Ellsworth and G. L. Parker, who began work in the Fairbanks district in April, and later extended it into the Circle district. The Innoko district is also to be included in the work for this year under the direction of A. G. Maddern.

A party with P. S. Smith in charge, will, this year, undertake work northward from the bend of the Koyukuk to the Kobuk river, and thence southwestward to Candle in Seward peninsula. The Kobuk river section was surveyed in 1901, but has not since been visited by any members of the Survey.

The Corbin District, Jefferson County, Montana

Much Silver Produced before 1893; Companies now Developing Copper Ores; Two Concentrators Proposed; Electric Railway Projected

BY FLOYD BUSHNELL*

One of the busiest mining camps in Montana is the Corbin district, covering an area of approximately 20 square miles in the northern part of Jefferson county. For many years, until 1893, it was one of the most active mining camps in Montana and several of the more prominent properties, such as the Gregory, Alta and Elkhorn, made a large production of gold and silver. The decline in the price of silver caused many of the producers to close their properties. Only those mining the highest-grade ores remained active.

Four years ago, when the price of copper began to rise, many of these abandoned mines in the Corbin district were prospected for the red metal, and during the last three years a number of new companies have been formed. The interest in this district has increased gradually until at the present time more mines are being worked than at any time in the history of the camp.

GEOLOGY SIMILAR TO BUTTE

E. P. Jennings has the following to say regarding the geology of the district around Corbin, which is claimed to be similar to that of Butte:

"Extending from near Helena at the north to beyond Butte at the south and for a width of 40 miles, the country is underlaid by granite which in places is covered by later eruptives, mostly andesites and rhyolites. This great granite mass contains the lodes at Butte and also the copper district around Corbin.

"It is described by the U. S. Geological Survey as a basic, hornblendic granite, containing considerable biotite mica and approaching a quartz-diorite in composition. It is known locally as the 'Butte Granite.' Associated with the granite are many intrusions of aplite, or fine grained silicious granite, in the form of dikes and sheets. Quartz-porphyry dikes occur in connection with some of the veins at Butte and also in the Corbin district. This porphyry is mineralized in the latter district with pyrite, chalcopyrite and bornite.

"In the mineralized area of Butte and Corbin the granite has been disintegrated and decomposed and is easily distinguished from the undecomposed rock by the smooth surfaces and contours of the hills, in sharp comparison with the rugged topography and boulder-covered surface of the surrounding country.

ORES OCCUR IN REPLACEMENT VEINS

"The mineral lodes of Butte, and also of Corbin, consist of zones of closely spaced, sheeted fractures, which have been subsequently mineralized by quartz and copper minerals. They are replacement veins; the shattered granite in the fractured zone being more or less replaced by vein minerals, the resulting mass showing innumerable veinlets of quartz and the granite between the veinlets also being silicified and mineralized, often to so great an extent that it has become a solid mass of copper ore. The inclosing walls are not sharply defined, as the mineralization gradually shades from the lode proper into the walls. The width of the lodes in both districts is from 10 to 100 feet.

"The Butte veins differ from ordinary fissure veins inasmuch as they have been reopened after the first fissure had been filled with copper-bearing pyrite, and this secondary fissuring resulted in shattering both the walls and the lode, making them more permeable to the leaching action of surface water and the subsequent enrichment of the original orebodies by the precipitation of the copper leached from the zone of oxidation by these waters. This enrichment is common in all copper-bearing lodes, but in those cases where the ground is 'tight' the effects of the secondary enrichment extend but a comparatively short distance below the leached zone. At Butte, where the ground has been greatly shattered, the enrichment zone extends downward many hundred feet. The reopening of the Butte fissures has also resulted in another form of enrichment in the deep levels, from the precipitation of copper from ascending waters from below, and the formation of rich bodies of arsenical copper in the deep levels. The subject has been fully entered into by W. H. Weed in his Butte report.

"The conditions required for both classes of enrichment are; (1) A reopening of the fissures; (2) the presence of a later eruptive rock. The latter is furnished at Butte by a flow of rhyolite, and conditions are similar at Corbin. The fissures have been reopened and also intersected by many cross veins. The later eruptions are andesite and probably the copper-bearing porphyry dikes are later than the fissures; these are the conditions essential for secondary enrichment for both ascending and descending waters."

BOSTON & CORBIN IS MOST IMPORTANT COMPANY

The Boston & Corbin Copper Mining Company, the principal holding of which is the Bertha mine a mile west of Corbin, is regarded as the criterion of practically all the mining operations of the Corbin district. The company is incorporated for 100,000 shares of a par value of $5. Ore was shipped from the Bertha during nine months in 1907, when shipments were suspended on account of the panic. Since that time attention has been paid strictly to development work. A three-compartment shaft has been sunk to the 700-ft. level, and 16,000 ft. of development work has been done.

The ore is said to average 5 per cent. copper and carry 1½ oz. silver to each per cent. of copper. However, peacock ore averaging 30 per cent. copper and from 20 to 30 oz. silver per ton was recently uncovered on the 700-ft. level. This is the first time bornite ore has been struck in large quantity in the Corbin camp, and is taken as proof of the argument that the Corbin camp is similar in its geology to Butte.

The Boston & Corbin is installing an electrical equipment, the power to be furnished by the Missouri River Power Company. It is estimated that this improvement will effect a saving of 35 per cent. in the running expenses. The electric hoist will lift 11,000 lb. from a depth of 2000 ft. at the rate of 900 ft. per min. The Ingersoll-Rand compressor, driven by a 100-h.p. motor, develops 1441 cu.ft. of air per min. The hoisting engine is run direct by an electric motor of 100 h.p. A 30-h.p. motor furnishes power for the carpenter shop. The company's engineers are planning the erection of a 300-ton concentrator, and no shipments will be made until the concentrator is finished. There are 50 men employed under the management of H. E. Emerson.

RAPID SINKING AT BOSTON & ALTA

The Boston & Alta Copper Company ranks probably second in point of size and number of men employed. It is incorporated for $3,000,000, par value $10. During the six months the company has been working under the recent incorporation, a double-compartment shaft has been sunk to a depth of 650 ft. and a station has been cut at the 300-ft. level. The company claims the record for rapid shaft sinking. At a depth of 657 ft. in the new shaft, or 100 ft. below the old

*Butte, Mont.

workings, a tunnel will be run 350 ft. to the vein in the old workings. A station will be built and a 400-gal pump will probably be installed.

Under former managements, when silver and smelting charges were both high, much low-grade ore was thrown aside in the workings. Now, because of better concentrating and smelting facilities, it is hoped that this ore will be found valuable.

The Boston & Alta is planning to rebuild the old concentrator in Corbin, which, when reconstructed, will have a daily capacity of 400 tons. The company has its own electric-power plant capable of generating 300 h.p.; later the capacity will be increased to 680 h.p. The generating plant is in old Jefferson City and is connected with Prickly Pear creek by a flume seven miles long.

Like all the other companies, the Boston & Alta is waiting for the construction of the Butte & Helena electric railway. If the line is completed as planned it will go directly through the Corbin camp, and spurs will be built to the mines. A spur is planned from the Alta mine to the old concentrator in Corbin.

Surface Plant at the Boston & Alta Copper Company, Corbin, Mont.

Hidden Treasure Mine of Montana-Corbin Copper Company

The company is financed by Dick Brothers, of New York, and employs 30 men in and about the mine. The officers are William B. Joyce, president; Elliott R. Fowler, treasurer; Marcus L. Hewitt, vice-president and general manager; James Madden, superintendent; Alvin Berry, assistant manager.

Other Companies

The Calumet & Corbin Company, operating the Minnesota mine, has sunk a 500-ft. shaft during the last five months, and has also done 3000 ft. of development work. While the assays show only 3 per cent. copper, the company is prospecting with the hope of finding higher grade ore in the veins that have been uncovered. This company is also depending on the Butte & Helena electric line to carry its ore. The officers are J. M. Wilcox, president; S. O. Arnold, vice-president; Olin H. Espry, secretary-treasurer; W. C. Hosking, superintendent.

The Corbin Copper Company is driving six tunnels to develop a large area of ground about two miles east of Wickes. The company is giving most of its attention to developing the Dewey tunnel, near the center of the property, which has been driven a distance of 800 ft.. On the Rosalie claim, where the tunnel is in more than 600 ft., the ore averages 5 per cent. copper. At the western end of this property a vein was cut that assayed 7 per cent. copper. The company owns and has options on 900 acres of ground, and on the strike of the veins which appear on the surface has about 3¼ miles. The mining operations are in charge of Frank E. Richards.

The Montana-Corbin Copper Company, operating the old Hidden Treasure mine a mile west of Corbin, has been developing the mine for the last three years and recently made its first shipment to the Pittsmont smeltery at Butte. The returns were 14.1 per cent. copper, 19 oz. silver, $1.50 gold, 27 per cent. iron and 19 per cent. silica. The company owns 115 acres of patented ground and is capitalized at $750,000, par value $5; 100,000 shares have been issued. Twenty-two men are employed on the two shifts. Max Schultz, of New York, is president, E. L. Mayo, of Butte, secretary and treasurer and William Gibson, superintendent.

Under the direction of John Hoy, the Corbin Metals Mining Company is developing the old Baldwin property, which has a record of having produced more than $150,000 in silver and lead ores. The ore also carried 3 per cent. copper, but there was no revenue from this, as the smelters did not pay for copper below 5 per cent. at that time. An inclined shaft has been sunk 350 ft. and will be carried to a depth of 700 ft., after which underground development will be undertaken. The vein widens with depth, and measures from 50 to 60 ft. between the walls. In the old workings ore has been uncovered running as high as 50 per cent. lead and 80 oz. silver. The indication for a higher grade copper ore improves daily with depth. The mine is operated by an electric hoist and air for the drills is supplied by an electrically driven compressor. John H. Foye, of Pittsburg, is president of the company.

The Bird properties, a mile and a half south of Corbin, consist of 36 claims, and according to P. A. Bell, in charge, it is expected that operations will be commenced this summer. It is said that Boston and Pittsburg capitalists have become interested. The ground has been proved to a considerable extent.

The London-Corbin Exploration Company, which started operations a short time ago, has uncovered ore in running a 200-ft. tunnel. The breast of the tunnel is in oxidized formation carrying stringers of ore. Thomas Paull is superintending the work on this company's properties.

The recent death of Captain John Mullan, retired, in Washington, at the age of 82 years, recalls the fact that he was one of the first explorers of the territory now included in the States of Montana, Idaho and Washington. In 1853, as a lieutenant of artillery in the United States Army, he was a member of the party under Gen. Isaac I. Stevens sent to survey a route from St. Paul to Puget Sound. Later he was detailed to make surveys for the wagon road from Fort Benton on the Missouri to Fort Walla Walla on the Columbia, which was finally built in 1859-60. When he first undertook this work his only guide was the map made by Lewis and Clark in 1805, with such additions as could be gathered from fur traders and Hudson Bay Company men.

Use of the Terry Core Drill in Mine Operations

First Cost Less Than Diamond Drills. Large Holes Used for Mine Ventilation and Ore Chutes. Ten-inch 2000-ft. Hole Cost $5.50 per Foot

CORES 30-IN. DIAMETER OBTAINED

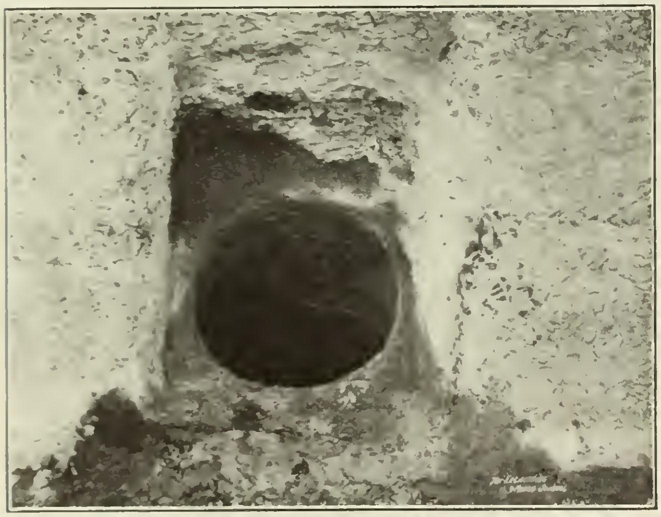
A number of 20-in. bore holes are being sunk through various parts of the pyrite orebody of the Stella mine, Hermon. N. Y., in place of winzes and raises. These holes are to be enlarged by carrying the stopes up alongside them and later will be used as mill holes. The cost of the boreholes is the same as for a raise, $6 per foot. Three holes have been completed, each one being about 50 ft. deep.

DRILLING THE 20-INCH HOLES

In drilling the first two holes there was some delay, due to lack of head room and the removal of the large cores. The longest piece of core removed was six feet. Hole No. 1 was started Jan. 25 and completed March 1, to a depth of 51.5 ft. Thirteen days were lost due to repairs and removing cores.

Hole No. 2 was started March 2 and finished April 30, at a depth of 50.8 ft. Seven shifts were consumed in moving and setting up the drill; 13 shifts were lost on account of broken coupling and gear; three for lack of power: two on account of sickness, and 14 to remove core; actual drilling time 15 shifts.

Hole No. 3 was at a place where there was ample head room. It required only three days to move and set up the drill, including the cementing of the uneven floor and a few repairs to the machine. This hole was put down 50 ft. in eight drilling shifts including the removal of cores. The greatest advance in a single shift was 13 ft., and the least 18 in.; the average drilling was over 6 ft. per shift. The good results obtained at hole No. 3 show that the principle of the drill is such as to meet the demand for large bore holes. By constructing a heavier and stronger machine 30-in. holes may be cut and used for ore chutes.



A 30-INCH CORE DRILL HOLE IN TRAP ROCK CONCRETE

CORE FROM 30-INCH HOLE, SHOWING PIPE AND I-BEAM CUT IN TWO

PROSPECT WORK AT THE STELLA MINE

The 2-in. core drill at the Stella mine has done good work in prospecting, and as shown in an accompanying table delivers a larger percentage of core than does the diamond drill. The rate of cutting is practically the same as with the diamond. During a period of four months one diamond drill bored 1071 ft. of holes. Two, and part of the time three, core drills have also been in use at the Stella mine, drilling 1200 ft. of holes. The diamond core was ⅞ in. and the shot core 2 in. in diameter. The diamond drill was working under ground, while the shot drills were on the surface and had to contend with much cold weather, often 20 deg. or more below zero. For this reason comparison is hardly just.

CORES RECOVERED AT STELLA MINE.

Hole.	Drill.	Ft. of Rock.	Ft. of Core Recovered.	Per Cent. of Core Recovered.
A	Diamond drill, ⅞ in. core	280	223	79.8
B	Diamond drill, ⅞-in. core	97	82.8	89.5
C	Diamond drill, ⅞-in. core	101	93.3	92.6
D	Diamond drill, ⅞-in. core	113	92.4	81.8
E	Shot drill, 2-in. core	182.7	177.2	96.5
F	Shot drill, 2-in. core	230	226.5	98.5
G	Shot drill, 2-in. core	155.1	118.8	76.4[a]

[a] Hole in soft decomposed schist, ferruginous quartzite and conglomerate. All others in hard gneiss and quartzite.

ADVANTAGES OF LARGE CORES

In all friable formations, such as coal, it is absolutely necessary to bore a large hole in order to produce a perfect core. Frequently, a diamond drill boring the usual small hole does not produce a core of sufficient diameter to give the strength needed to prevent it from breaking to pieces. The sample of the formation thus obtained is not as satisfactory as that which is produced by larger cores, which remain intact.

ADVANTAGES OVER DIAMOND DRILLS

The first cost of the shot-drilling machine is no more than that of a diamond bit. Hence less installation cost. The cost for shot and the wear on bits per foot drilled is about one-half of the cost for wear on diamonds. With shot tools the number of feet cut per day is about the same as with diamonds.

Diamond bits often get caught and a stone is torn out of its setting, requiring much labor in the effort to recover them. Occasionally the drill rods will become filled with a foreign substance preventing the water from passing through them, and before the operator is aware the bit has been grinding in a dry hole and by frictional heat fused into an unrecognizable mass and the diamonds gone. This same thing has happened in drilling with shot tools, but the loss of a shot bit is only a small item.

How the Shot Cuts the Rock

A groove is cut on the inside of the bit which serves as a passage way between the rock core and the wall of the bit, down which the shot can freely travel. At the bottom of the bit an opening is cut for a water way. The quantity of shot fed to the bit should be enough to cover the bottom of the annular passage it is cutting.

The actual cutting is performed by breaking of the shot, which being of chilled steel embed themselves in the softer material of which the bit is composed. This action produces hundreds of minute pockets, or cavities, into which the small particles of shot are constantly caught, each time presenting a new facet, which mills away the rock. This action continues until the shot becomes so small that the flow of water forces them out of the bore hole above the drilling tool, at which point the water pressure is diminished and the shot fall back and settle in the sludge. When working properly the cutting edge of the bit will assume a half-round form, which keeps some of the shot off the bottom of the hole and thus produces sufficient space for clearance, both inside and outside the bit.

Peripheral Speed of Bit

The small drills up to 5 in. in diameter revolve at approximately 350 r.p.m. The speed of the larger machines is not so great. For instance, in drilling a 10-in. hole, 2000 ft. deep, an approximate speed of 175 r.p.m. was maintained. In boring a 29-in. hole the bit revolved at the rate of 125 r.p.m. With a higher peripheral speed it is possible to drill large diameters at a flatter angle, as the shot by centrifugal force and friction are carried up to the top of the bit.

Types of Drills

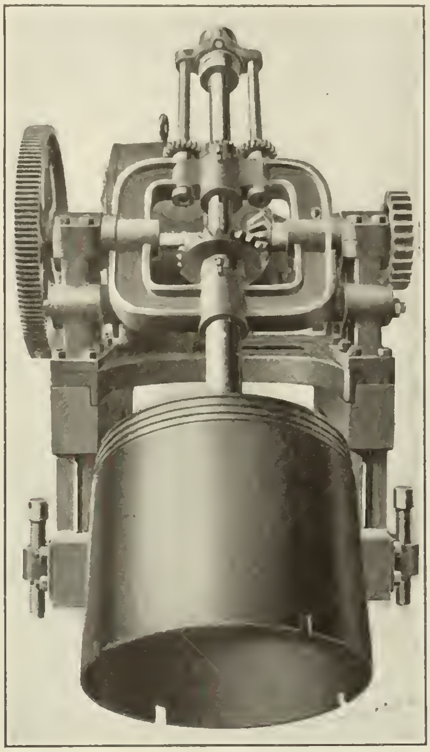
Three standard sizes of core drills are made. Special drills are also constructed for certain classes of work. The Class A drill, operated by steam power, is a direct-connected machine. Both the drill tools and the hoist may be operated together if it is necessary to do so, or they may be operated independently of one another, which is the usual practice. It is used largely by railroad companies, contractors, and miners for all conceivable purposes when the depth to be drilled does not exceed 500 ft. Classes B and C are enlargements of the Class A machine and intended for boring holes of larger diameters and to greater depths.

Mine Ventilation

The ventilation of coal mines may be improved by bore holes from the surface into the mine workings, as well as into the so called "riders" overlying the coal seams. This would allow the accumulated explosive gas in the mine to find its way to the surface. At each opening could be installed an electrically driven fan, which would force air into the workings, or exhaust air from the mine. Large bore holes could be used also as passages for pipe and cables, and would in many cases shorten the distance to which such lines must be carried.

Drill Holes Valuable in Rescue Work

There would be less difficulty in reaching and extinguishing mine fires, which under present conditions are often inaccessible. But few have thus far given any consideration to it as a device, by the aid of which present conditions may be improved and life within our mines protected. The accompanying illustrations show what can be accomplished in the way of drilling holes sufficiently large to admit a man. The size of these holes would be ample for the installation of permanent ladders, which would serve as exits from the workings in case of accident, and as such they would be of the greatest assistance in rescue work.



A 30-inch Terry Core Drill

Drilling through Concrete and Steel

Work recently performed by the War Department with a Terry core drill has established the practicability of drilling bore holes 30 in. or more in diameter, vertically or at an angle, and to any reasonable depth. The drill used was of the class D type and the material bored through was a trap-rock concrete embankment. Some of the drilling was done in places where the bore holes penetrated concrete reinforced by steel beams, and elsewhere iron drain pipes intersected the line of the bore hole. In the illustrations are shown parts of some of the core removed from a hole drilled at an angle of 55 deg. from the vertical. In one of these cores there is embedded a section of an 8-in. I-beam, and in another an iron pipe 2 in. in diameter. Both the steel beam and iron pipe were severed without any appreciable reduction in the speed of cutting.

Wear on Shot Bits

The wear on the bit was ¼ in. per ft. cut and 10 lb. of shot were used in drilling the same distance. Numerous seams and openings caused by imperfect setting of the cement, as well as severed pipes large enough to drain in a few minutes the water from an ordinary bore hole, did not hinder the work. The detritus or sludge is sufficient to close all save large seams or crevices and through which the heavy tools under a high momentum advance rapidly.

Bit Cost per Foot

In cutting a total of 14 ft. the wear on the bit was reported by the Government engineers at $5.25. The consumption of oil, waste, grease and shot for drilling is reported at a cost of $2. In a similar hole only 6-ft. in length, a wear on the bit valued at $6 was reported, and the consumption of shot, oil, waste, etc., valued at $1. L. L. Ryan, superintendent of the Manhattan Drilling Company states that in drilling through gneiss and quartz at the Stella mine, with a 20-in. shot bit, the wear on the bit in drilling 100 ft. was 12 in. A 20-in. shot bit is 24 in. long, of which length 18 in. are available for cutting. The cost of such a bit is $30 or $1.55 for each wearing inch. The cost therefore for wear on bit in drilling 100 ft. of rock was $19.80, or 19.8c. per foot.

Drilling Cost

The cost of any drilling operation is governed by the size of the hole, the nature of the rock, and the expertness of the operator. One railroad company drilled 50 three-inch holes, the average depth of which was 50 ft., for a total cost of $1.15 per ft. The cost of a 6-in. hole drilled in hard rock in New York, including all charges was $3.20 per ft. Generally speaking the cost for the average run of drilling for different purposes of one sort or another varies from 75c. to $3.50 per foot.

A 2000-ft. 10-in. artesian well was drilled in New York with the class C machine. The formation was granite and gneiss and the average progress per shift was 9 ft. The actual cost for drilling this hole was $5.50 per ft. including all labor, fuel supply, and replacement charges. The cost for labor per day was $11, which was high, owing to the fact that the work was done in New York City.

COLLIERY·NOTES

The strike of coal miners at Frank, Alberta, Canada, has been settled. The Canadian Consolidated Coal Company's mines, where the strike occurred, had been inoperative for six weeks.

During the year 1909 approximately 700,000 men were employed in the coal mines of the United States. Of this total number of miners, about 180,000 were employed in the anthracite region of Pennsylvania.

From 1885 to 1909 the production of anthracite coal increased 80 per cent., while that of bituminous coal increased 450 per cent. In other words, bituminous coal made up 65 per cent. of the total mineral fuel consumed 25 years ago, while now the percentage is 85 per cent.

The battery used with an electric mine lamp should give at least 18 hours' service without any appreciable falling off in the brilliancy of the lamp. As to the switch, it should be mounted deep in a block of hard rubber, and opened and closed by a thumb screw, screwing into the block, thus eliminating any possibility of the air penetrating into the switch.

By a unanimous vote, the joint scale committee of the Iowa Coal operators and miners has put its stamp of approval on the plan outlined by a special sub-committee, for the creation of a commission for the improvement of living conditions among the miners. The commission will be composed of 10 men and will have the coöperation of each coal company and each local union in the State.

The Mineral Mining Company of Shamokin has constructed three concrete hospitals in its Cameron mine. Each hospital is 15 ft. in length, 12 ft. wide and 8 ft. high. They have sheet-iron doors, electric light and are painted white inside. The furnishings consist of wash basins, tables, chairs, cots and medical supplies. Hydrants are placed in the rooms and plenty of fresh water is available.

The work of recovering the bodies of the victims of the last explosion (about a year ago) in the Leiter mines at Zeigler, Ill., began May 17, under the direction of engineers attached to the State mine-rescue station at Champaign, Ill. The members of the rescue party were provided with oxygen helmets, and encountered little difficulty in entering the mine. One decapitated body has been found.

Recently compiled statistics place the coal output of the State of Coahuila, Mexico, for the year 1909, at about 920,000 tons. From this coal output, approximately 150,000 tons of coke were produced. Because of the many installations of modern mining machinery recently put in, it is estimated that this year's coal output will reach a total of 1,200,000 tons, and the coke output will exceed 250,000 tons.

The Canadian Northern Railway will be extended 150 miles to the Brazeau coalfield, a new bituminous coal-bearing area in Alberta, Canada, in the foothills of the Rocky mountains west of Edmonton. British and German capital has been obtained, and 10,000 acres of coal land purchased. The amount provided for purchase and development of coal lands is stated at $10,000,000. Both development and railway building are to be energetically proceeded with.

Several coal companies operating in Allegheny county, Penn., have decided to enter into the manufacture of coke. This change of policy on the part of the Allegheny Coal Company, the Superior Coal and Coke Company, and other adjacent operators, is of special interest because these companies mine in the Freeport seam. The Freeport coal in this district has not been considered a coking coal until the present extensive tests have shown that with proper washing the coal will produce a fair quality of coke.

Natural coke from the Barranca coalfields of the Southern Pacific Railroad, in Mexico, will be tried at the Toledo customs smelter of the Yaqui River Mining and Smelting Company, soon to be blown in. The smelter is near the present terminus of the Yaqui river extension of the Southern Pacific Railroad. The coalfields are being opened by a branch line connecting with the Yaqui river line. The natural coke deposits are extensive, and if the coke proves satisfactory in smelting, there will be a big demand for it from Sonora plants.

The Carbon coalfields, Montana, are producing their normal tonnage. The mines of the Northwestern Improvement Company at Red Lodge are producing about 80,000 tons per month under the direction of Supt. C. C. Anderson. In the Bear Creek district the Bear Creek, the Montana Coal and Iron, the Washoe, the Smokeless and Sootless, and the International companies are all producing. The Northern Pacific has recently bought a right-of-way into the district and the Montana, Wyoming & Southern Cross has been handling business there for some time.

The cost of labor should be distinguished from the rate of wages. The cost of labor may be high, though the rate of wages is low, and a high rate of wages may be followed by a low cost of labor. It is often the case that a high rate of wages causes irregular and lessened employment, and a man's actual earnings may be less than they would have been with a lower rate of wages. In the coal mines of Belgium and France, where the rate of wages is lower, the cost of labor is higher than in Great Britain and the United States. This is due to the fact that the cost of labor depends on the production per man, as well as on the rate of wages. It is also true that in some mines and in certain districts, there are greater natural difficulties.

Recent experiments carried on in England with reference to spontaneous combustion of coal proved that the temperature of coal freshly stored rises in two or three days from 70 to 85 deg. F. and thereafter continues between 85 and 100 deg. F. This rise in temperature is accelerated by the presence of water, which brings oxygen in solution. Dry coal should not be deposited upon any large quantity of damp coal. Wet coal should be spread in layers 8 in. thick and allowed to dry 24 hours before being covered with a new layer. Sulphur compounds do not play an important part in the spontaneous ignition. If ventilation is attempted, it should be mechanical and very energetic, in order to produce a refrigeration which will counterbalance the oxidizing effect of the air.

As to the cost of equipping a plant for the production of coal, one English engineer making a broad estimate, says, that the amount of money required to sink a couple of shafts to an average depth, and to equip a colliery in an uptodate manner for an output of 1000 tons a day —or about 300,000 tons a year—would probably be about $750,000, or $2.50 a ton of yearly output. He further adds that the larger the output, the less will be the proportionate expenditure. Allowing 3 per cent. for the redemption of capital—or a period of about 33 years for redeeming it—3 per cent. on $2.50 is 7½c. Consequently, in the cost of producing coal, therefore, the charge per ton for the repayment of the capital invested, without allowing any interest for the use of the capital, may be placed at about 7½c. a ton of gross output.

The high price of mules is giving the Pennsylvania anthracite-mining companies unusual trouble. It is practically impossible to obtain the animals in the East, and one of the largest companies has recently sent agents through the West, to make a tour in search of good strong mules. Despite the introduction of mechanical haulage underground, there will always be certain gangways and entries in mines where it will never be economical to employ mechanical power. In the last nine years the price of mules has advanced more than 100 per cent. In 1901, a first-class mule could be bought for $145; in 1907 the price had risen to $210, and it is now about $300. Only exceptionally strong animals are wanted, and these are well housed and are cared for by experienced men working under the direction of the company veterinary. It costs about 40 per cent. more to feed the mules at the present time than it did in 1901.

The Kansas State Coal Mine

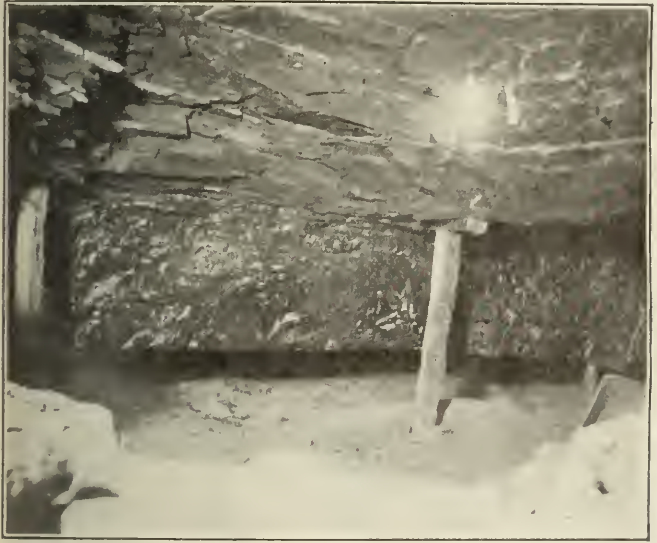
Convicts at Penitentiary Are Employed to Mine Coal for State Institutions. Safety and Sanitation More Sought Than Commercial Success

BY C. M. YOUNG[*]

The State of Kansas owns a coal mine which is operated in connection with the State penitentiary at Lansing. While the point of greatest interest is probably the fact that the mine is worked by convict labor, there are some things of interest about the mine itself, and a short description of the mine and the method of operating it will make the conditions of labor more readily understood.

The mine is situated near the penitentiary at Lansing, in Leavenworth county. It has railroad connections with the Union Pacific, Atchison, Topeka & Santa Fe, and Missouri Pacific.

The coal is found at a depth of 720 ft. in the Cherokee shales of the Lower Carboniferous. It is called a 22-in. seam, but varies in thickness from 19 to 27 in. In all questions at law concerning the amount of coal within a certain area, the bed is assumed to produce 70,000 bu. per acre.



SHOWING THE LONGWALL FACE UNDERCUT AND READY TO BE WEDGED DOWN

PARTY OF STUDENTS FROM UNIVERSITY OF KANSAS VISITING THE STATE MINE

Below the coal, is from 2½ to 3 ft. of clay, which makes a convenient mining. In the State mine about 14 in. of this clay is mined, though in other mines in the same district somewhat less clay is taken out. Below the clay is 3 ft. of limestone.

Above the coal is 45 ft. of shale, which forms an excellent top. Above the shale is a thin layer of limestone and above this is a bed of coal about 10 in. thick. This latter coal is interesting principally as being the probable source of the gas which is found in small quantities in the mine. A little water also finds its way into the mine through fissures in the roof, but the quantity of water is small and it gives very little trouble.

THE COAL HAS HIGH ASH CONTENT

The coal is not of high quality, having a large amount of ash and a considerable amount of sulphur. An average analysis of this coal is as follows:

ANALYSIS OF COAL.

	Per Cent.
Moisture	8.58
Volatile matter	33.62
Fixed carbon	44.5
Ash	13.28

The ash is so high that it gives considerable trouble on the grates and an attempt is to be made at the State University to wash the coal. For the purpose of determining the advisability of installing a washing plant, and also to give students an opportunity to study coal-washing methods and apparatus, a washer of rather small capacity will soon be installed in the laboratory of the mining department. The work done with this equipment will not be confined to the washing of the so called Leavenworth coal, but experiments will be made with all of the other coals of the State which give promise of being benefited by washing.

The mine is reached by means of a shaft 9x16 ft. in size, having three compartments, two used for hoisting and one for pipe and wire. Another shaft about 200 ft. from the main shaft serves as an upcast airway and an escape shaft. The main shaft is equipped with a Litchfield first-motion hoist with a 12-ft. drum and cylinders 24x48 in. The rope is 1½ in. At each trip, two cars holding 1000 lb. each are raised. The engine is rated at 500 h.p. and steam is raised at 60 lb. pressure.

The mine is worked on the longwall system, as indeed might be considered necessary. With a depth of over 700 ft. it would be very difficult to operate the room-and-pillar system, even if there were any advantage in doing so; in this case the advantage is all with the longwall method. The coal is only 22 in. thick and there is plenty of material for filling. If the longwall method could not be used, the possibility of profitable operation would be doubtful.

THE MAIN OBJECT IS NOT COMMERCIAL SUCCESS

In fact, very little attempt is made to make the mine a commercial success. This does not mean that the mine is poorly managed, but that more attention is paid to cleanliness, sanitation, safety and convenience than to cheapness of operation. The State employs the labor of convicts and furnishes the coal to the various State institutions free, each institution merely paying the freight on the coal consumed. Operating under these conditions, with no necessity for the most rigid economy, the penetentiary authorities are able to make the conditions underground much less unpleasant than they would otherwise be. Other mines in the immediate vicinity have been operated continuously for a long time by private capital and have apparently been able to show a profit. But an attempt to operate the State mine with as close attention to economy would undoubtedly result in so great an increase in the hardships of the miners that it would not be considered wise to require the labor of convicts.

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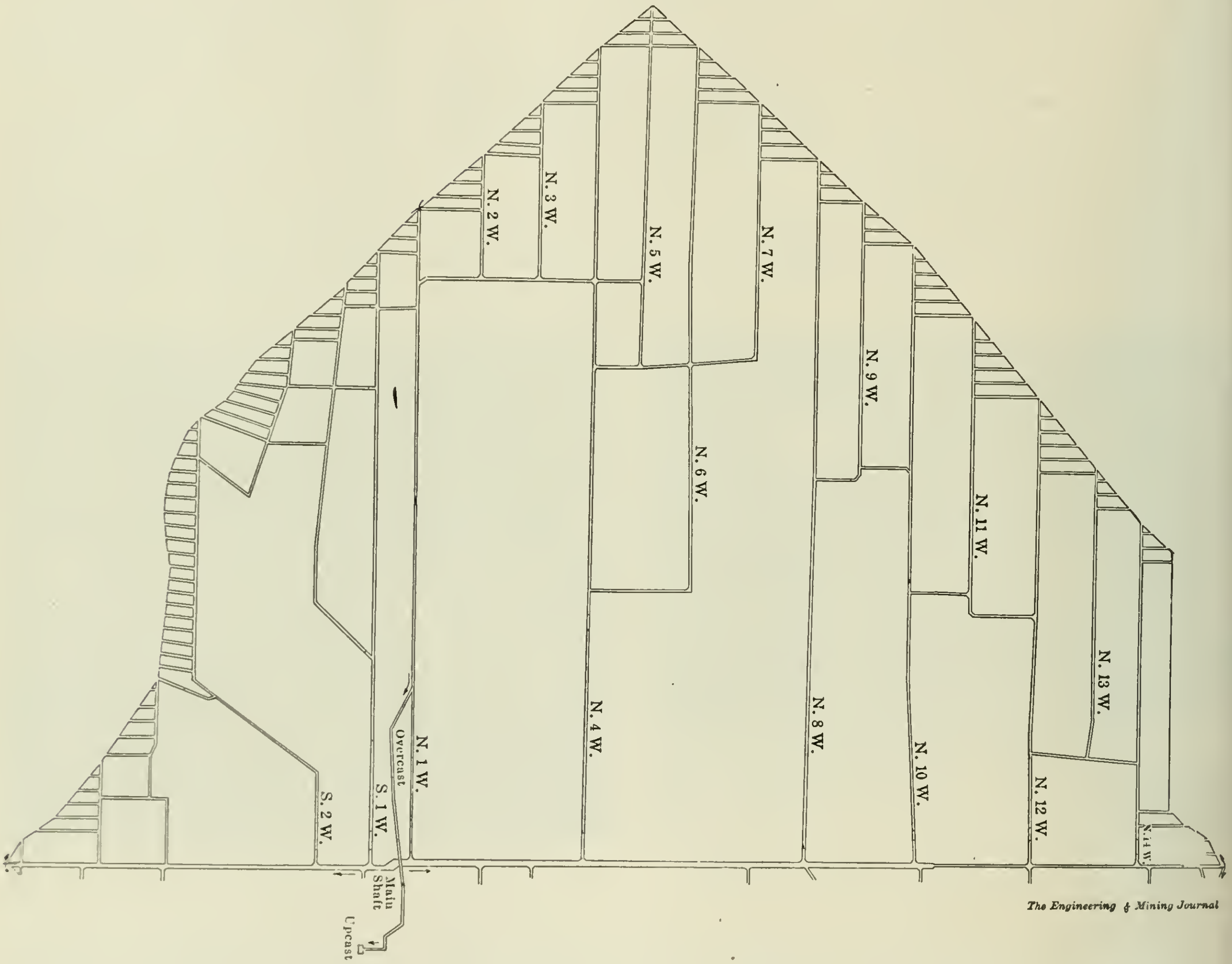
[*] Associate professor of mining engineering, University of Kansas, Lawrence, Kan.



The Engineering & Mining Journal

General Plan Showing System of Longwall Development in the Kansas State Mine

The main roads run due north and south from the shaft and at right angles to these, spaced 200 ft. apart, are the entries. These are kept open for only a short distance from the face, with the exception of such as are necessary for haulage and ventilation. The so called roads are run at right angles with the entries and are spaced 50 ft. apart. The working face is kept at an angle of 45 deg. with the roads and entries and therefore takes the form of a square whose diagonals are the main roads. As the seam is nearly level and the coal has no important cleat, this shape can be adopted without disadvantage and it gives the advantage of perfect regularity of working face and roads.

Explosives Are Used Only in Breaking Roof

The coal is undercut by hand and generally parts easily from the roof. In some places, however, a dark-colored, impure limestone occurs immediately above the coal and as the coal does not part easily from this, wedging is necessary. This limestone has the local name of "sulphur rock." The coal is passed along the face to a road-head where it is loaded onto cars and hauled to the shaft. As the entries are 200 ft. apart, it is evident that the maximum length of a road is 200 ft. Explosives are used only in breaking down roof. A considerable amount of dynamite is stored in a powder room near the bottom of the shaft and this is very carefully guarded. About 600 acres have been mined. The working face is now about three miles long, but not all of this is being worked. The east road extends about one mile from the shaft and the ordinary rate of advance is about 200 ft. per year. It is planned to extend the mine considerably farther to the east, where the State owns something more than 1000 acres of coal underlying an island in the Missouri river.

As the roads are spaced 50 ft. apart and are run due north and south and the working face is at an angle of 45 deg. with the roads, it is evident that the distance between roads along the face is a little more than 70 ft. This space is called a room and is commonly worked by two men, each miner thus having a space of about 35 ft. to work. This makes probably the most convenient arrangement as it leaves roads sufficiently close together for convenience in getting out the coal without having them so close as to interfere with packing the waste. Somewhat more waste is produced than is necessary for filling and this is hoisted and used for grading on the surface.

Haulage Is Done by Mules

Roof is brushed on the main roads only and tramming from the rooms is done by men. The haulage is done entirely by mules which remain in the mine as long as they are serviceable, being hoisted only in case of sickness or when the mine is shut down. The mules are in excellent condition and apparently fare much better than the ordinary mine mule. The stalls are clean and well ventilated. Near the stable is a roll hole, a large room with the bottom covered deep with sawdust, in which two mules at a time can roll. Each mule hauls a trip of 10 cars weighing about 500 lb. each and holding 1000 lb. There is a slight grade toward the shaft.

The main entries are brushed to a hight of about 7 ft. and are lighted by electricity for some distance from the shaft. As the timbers are whitewashed, these entries present a pleasing appearance of cleanliness.

The small shaft previously mentioned as an escape shaft, is used for working a shale mine. This shale lies with its bottom 120 ft. below the surface. It is 23 ft. thick, but only about 8 ft. is taken out. This mine is operated on the room-and-pillar system with rooms 18 to 20 ft. wide. The pillars were formerly 20 ft. wide, but this width proved insufficient and they are now made 40 ft. wide.

The clay is hoisted to the surface through the ventilating shaft which is an upcast. This shaft is closed by a door which is raised by the ascending cage. As not very much clay is taken out, this opening of the shaft does not seriously interfere with ventilation. This shaft is connected with the fan by a tunnel about 200 ft. long. This permits the fan to be located near the main shaft. This would be unimportant in most mines, but it is important in a mine worked by convict labor, as this is.

The clay is made into brick and the brick, like the coal, is used by State institutions.

No Coal is Sold

As before stated, no coal is sold, but all is used at State institutions and in winter months the mine finds difficulty in supplying the demand. This fact is due to lack of labor and not to difficulty in getting coal from the mine. Until recently, the State prisoners of Oklahoma were kept at this prison and the large number of prisoners made it possible to produce a considerable amount of coal. The mine now produces about 2000 tons per week and there is used at the penetentiary about 2500 tons per month.

The fan was made at the prison. It has 4-ft. straight wooden blades, is 18 ft. in diameter and runs at 70 r.p.m. It is run as an exhaust fan, taking air through the tunnel from the shale-mine shaft.

The point of greatest interest about the mine is the fact that it is worked by convict labor. This fact makes the conditions of operation considerably different from those of a free mine. The men are taken from the cell house to the dining room for breakfast in the morning, then they are conducted by guards to the shaft. The shaft is within the prison walls, though the waste dump is not. The latter is, of course, within the prison fence. The men are sent down the shaft and conducted to their working places. Here they work until noon, when they eat a dinner sent down to them. This meal is good in quality and abundant in quantity. It consists of a soup, meat, potatoes, bread and butter. It is sent down in large boxes and cans. The men eat in small groups in places not far from their working places. Benches placed along the wall of the entry serve as seats. Each man has a board about one foot long and two feet wide which he holds on his knees. He places his lamp on one corner of the board and is served with what food he desires. At the end of the meal the boards are scraped clean and left at the benches until the next noon meal. After this dinner the men work until about three o'clock. They then go to the shaft and are hoisted to the surface. Here they go to the wash room where they cleanse themselves and then amuse themselves in any harmless way until supper time. This play time is greatly appreciated by the men, who spend the time in playing ball and similar amusements. This is the program of the men employed in the mine for five days of the week. On Saturdays they quit work at noon and on Sundays no work is done.

Each Man Must Produce a Specified Tonnage

Each miner is required to mine a certain amount of coal each day. If he works alone in a room, his task is 9 tons per week. If two men are in a room they mine 15 tons, and three men in a room mine 21 tons. This requirement is not severe. The amount required is supposed to be that which an untrained man can produce. In other words, the men are not treated as experienced miners, but as inexperienced men. When they come to the prison, most of them are, in fact, untrained. Each new man is placed for two weeks with an experienced man and is supposed to learn his work in this time. During these two weeks his task is only half that of the experienced men, or 4½ tons per week.

As might be expected, the men are not equal in intelligence and ability to the free miner. Most of them are sent to the prison for minor crimes, such as theft, and those of the prisoners who seem better fitted for other work are not required to work in the mine. Nor is anyone employed in the mine whose health and strength are not equal to the work.

The task of 9 tons per week is not difficult to accomplish. In the free mines of the same district, in which the conditions of mining are the same, the miners produce from two to three times the amount required at the prison. It is recognized both that the men may not be the equals of the free miners and that the work should not be made so severe as to be considered a daily punishment. The conditions of mining are such that any able-bodied man can easily mine the required amount of coal. He has the privilege of doing his work in less than 5½ days if he wishes. Many of the men do this and spend the remainder of their time in reading or in simple idleness. They are not required to do more work, but are required to go into the mine. As the ventilation is good, this is not a great hardship. It is probable, however, that the time might be better spent in school work or in some other employment.

The Working Face Is Kept Straight

One reason for the requirement of a definite task lies in the fact that the mine is worked on the longwall system. It is necessary that the working face be kept approximately straight. If the face at one portion of the mine is not advanced as rapidly as that on both sides of it, the coal left behind is partly crushed by the pressure of the roof and is so pressed into the underlying clay that mining becomes difficult. At the same time the roof is prevented from descending properly over the coal at the sides of this lagging portion of the face, and the coal is thus deprived of the proper pressure and is not broken down as it should be. It therefore becomes necessary to carry the face forward at approximately the same rate at all neighboring points. In a free mine this is accomplished voluntarily by the miners who find it to their advantage to work the mine properly. But in a mine worked by convict labor it becomes necessary to impose a definite task.

A night school is conducted at which the men can make good some of the deficiencies of their education. To most of them this is a real benefit, as they are largely men who have had little training in school. Some few of the prisoners are men of good education and some of them are fitted for work requiring training and intelligence. Such men are given work fitted to their ability as far as possible. For example, the surveying and mapping of the mine, together with a considerable amount of the planning of small structures about the prison, is done by the prisoners.

The Propriety of Employing Convict Labor in Mines

Whether a State should employ its prisoners in any way in which profit to the State can be derived from their work is a question which I make no pretense of answering. If it is answered in the affirmative, as most, if not all States are now answering it, the question still remains whether the State should employ them in mining. This industry has associated with it some danger. In some mines this is great, but in such a mine as that at Lansing it is very small. Almost no gas is found. That which is found is carefully removed before men are allowed to enter workings where it occurred.

The longwall method of mining makes it easy to supply a sufficient amount of air and the mine is certainly well ventilated. The roof is good and gives almost no trouble. It seems hardly possible that any mine could have conditions less dangerous than this. In fact, it would be difficult to find any employment more free from danger. I do not pretend to answer the abstract question of the desirability or propriety of employing convict labor for the advantage of the State, but I believe that it can be said that the miners of this State mine are subjected to very little, if any greater hardship than the prisoners working on the surface and their lot is certainly very much easier than that of the prisoners of some States who are farmed out to contractors.

The Production and Use of Coke

BY W. HARTMAN *

Though the use of coke for heating purposes has been rapidly increasing during the last few years, it has, however, not attained that degree which has been reached in Europe. This may be due largely to our greater production of anthracite, but the fact remains that there is hardly a more useful fuel for house-heating purposes than coke.

All fuel is of organic, i.e., vegetable origin. The original plants were either ligneous, shrub-like or moss, and consisted partly of pure carbon and partly of combinations of carbon, hydrogen and oxygen. The transformation of these plants into the mined fuel of today consisted solely in the loss of these combinations.

In the course of time these products turned into lignite, then into bituminous coal and later anthracite. Therefore anthracite represents the most advanced form of coal in the transformation of vegetable matter.

The output of anthracite is not sufficient to cover the market and the places where it is found are limited. On account of this realtive scarcity, it is rather expensive. For this reason, an effort was made to produce anthracite artificially by driving out the volatile constituents from a less carbonaceous fuel. This object is reached by the use of a direct fire, as in the manufacture of charcoal for instance, or by shutting off the air in retorts heated from the outside (dry distillation). A good coke, therefore, often surpasses the natural anthracite in purity of carbon, which explains why coke is especially adapted as a fuel, smokeless and sootless.

CAPACITY FOR COKING INCREASES WITH AGE

For the production of a technically useful coke, only such grades of coal can be used which do not crumble in retorts, but form a homogeneous mass, baked together Anthracite and lignite when ignited neither bake nor melt, but some coals formed during an age between these two products are cokable. It has been found that the capacity for baking increases with the age. It is present in the so called gas coals and reaches its highest effect in those qualities containing about 25 per cent. volatile matter. All grades of coal above this line, being of greater age, generally show a decrease in coking qualities until they disappear entirely in anthracite.

SUITABLE COALS

Depending upon the purpose for which a coke is intended, various qualities of coal will be used. When the manufacture of illuminating gas is the object desired, a young coal rich in gases is selected. To recover the volatile matter, such as illuminating gas, tar and ammonia, this coal is carbureted in a retort by dry distillation, gaining at the same time, gas coke as the most valuable byproduct; figuring on the weight of raw material used, this process yields a coke output up to 60 per cent., according to the percentage of water and ash contained in the raw material.

GAS AND COKE PRODUCTION

The retorts used in the production of illuminating gas consist of single tubes of an oval cross-section. They are heated from the outside by generator gas. Special gas producers are necessary to generate the gas required for heating the retorts. Depending upon the construction of the ovens, the retorts, of which a larger or smaller number can be used, are arranged either horizontally, slantingly or vertically. In newer plants the retorts are fed mechanically, but all devices allow a loose filling of the retorts.

If the operator's main object is solely the production of coke, then an older coal has to be selected which is richer in carbon and correspondingly poorer in gas, but, of course, still of a baking character. When such a coal is brought into the ovens, the main product is coke, and the byproducts are coke-oven gas, benzole, tuluol, etc. The average coke production rises up to 80 per cent., varying more or less according to the water and ash contents of the raw material.

In producing coke through the distillation of coal, the form of the retorts has changed; we now have retorts in the form of chambers built of masonry, the walls of which are tunneled by heating channels. The necessary heat is produced by the gases obtained from the distillation itself; for this purpose, mostly those gases are used that are richer in hydrogen, and which are produced toward the end of the coking process. The volatile products of distillation, especially the so called coke-oven gases of the first coking period, are caught and are used as power for gas engines, etc. The feeding of the retorts with raw material, when coke is being manufactured, differs from the illuminating-gas process. When the production of coke is the main object sought, the coal that is charged must be as fine and pure as possible; this condition is reached by washing and crushing, which treatment also gives the coke an even, hard structure. The raw material should be jammed tightly into the ovens.

QUALITIES OF THE DIFFERENT COKES

As before mentioned, it is necessary to use a special heating material in the production of illuminating gas. For this reason, the coking process is continued to a certain degree only. Because of this difference in the time of burning, and as a result of different methods of charging the oven, the structure of the two qualities of coke is entirely different. Gas coke has a looser structure, that is, greater porosity, a lower weight and less strength of body.

When coke is burned on an ordinary grate, the oxygen of the air unites with the carbon of the fuel to form carbonic oxide (CO_2). In this way heat is produced. It is evident, therefore, that the more surface the coke offers to the air, the quicker will the oxygen be used up, and carbonic oxide be formed. It is necessary, therefore, to use much care in determining the hight of fire-bed that will give the most perfect combustion. When the hight of fire bed is properly determined, both qualities of coke are equally well adapted for getting complete combustion. It must be understood, however, that when a coke is to carry a heavy weight,

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*[illegible] Liberty street, New York

as is the case when coke is used in the blast furnace, the coke must be very strong, and for this reason the ordinary mine coke is best adapted. This same quality of coke, because of its higher temperature of combustion, is especially adapted for melting purposes. It may be mentioned in this connection that in Germany recently a new process has been discovered through which the smaller sizes of gas coke are briquetted and have shown good results in cupolas.

Rules to Determine the Quality of Coke

In order to ascertain the quality of a coke, the following suggestions may be helpful: A high ash content is indicated (1) by extraordinarily heavy weight; (2) the edges of the pores have a metallic brilliancy; (3) a dark, sandy appearance without porosity.

A high percentage of volatile matter is indicated by (1) small brown-black spots in a fragment originating from uncoked coal; (2) a dull sound when dropped on a hard object; (3) deep black interior to the pores and a tar-like luster to their edges; (4) a black appearance without brilliancy; (5) big lumps without structure and easily crumbling.

A high percentage of water can be determined by (1) examining with a magnifying glass to see whether or not the pores are filled with water; (2) by simply clasping an oblong piece of coke in the hand; if the coke is wet, a cool feeling will result. A moisture content up to 5 per cent. of water is hard to detect, as the pores absorb it entirely.

No matter by which process coke originates, its heat value, as well as its temperature of combustion, is naturally impeded by high ash and water content. As already explained, the gas works extend their coking only so far as the profit on illuminating gas and byproducts covers the expense resulting from the use of a special fuel for heating the retorts. In consequence, the gas coke is usually less coked and can, therefore, produce more gas. For this reason gas coke has a longer flame than the ordinary mine coke, and consequently is preferable where a long flame is necessary. On the other hand, mine coke possesses a greater heating value and a higher temperature of combustion.

It is evident, therefore, that the question of whether to use mine or gas coke depends almost entirely on the construction of the plant and the difference in the price between these two grades of coke.

Where Gas Coke Should Be Used

Where the boilers installed at a plant have no contact heating surface and are constructed with the fire-box underneath, or protruding, a coke with a long flame should be used. When such boilers are heated with a short-flame fuel, the temperature of combustion is developed on the grate bar and, therefore, is expended on the masonry without favorably affecting the boiler. Under such circumstances, only gas coke should be considered.

When the boilers at a plant have a contact heating surface, and the fire-box consists of water-cooled hollow bodies connected with the boiler and adding to the production of steam, instead of having a masonry fire-box, fine coke is undoubtedly the best fuel to use. In such a boiler, the coke having the higher temperature of combustion acts with the greatest efficiency. Naturally, in this connection, it should be remembered that the degree of usage of a combustion chamber constantly changes; during mild weather, and especially during the night time, the conveyance of air to the fire is restricted to a minimum. In such a boiler the consumption of gas coke is considerably greater than of mine coke. It is certainly true that when the unjust antipathy against coke, resulting from ignorance, has been overcome, its greatest enemy will become its best friend. Coke is smokeless, dustless, and gives but little breakage. It can be stored away in the summer time without deteriorating and can even be exposed to rain without any very bad after effects.

Coal Mining in Alabama

BY HENRY M. PAYNE *

There is no coalfield in the United States which presents a more interesting field for the student of mining than the State of Alabama. Coal mining is carried on in 12 counties of the State, and in seven of these 12, coke ovens are also operated.

Alabama's Annual Production

For the last four years, the annual output of coal in Alabama has ranged from 11,000,000 to 15,000,000 tons, and the production of coke has been approximately 3,000,000 tons per year.

Jefferson county leads all other counties in the number of operations (81 out of 215); coke ovens in operation (7496 out of 9823); total output (50 per cent. of whole); men employed (9039 out of 18,783); and has 29 out of the 58 gaseous mines in the State.

Of the total 215 operations in the State, only nine have shafts, while 96 have drifts and 110 have slopes.

The Seams Vary from 2 to 10 Feet in Thickness

On account of the great difference in the thickness and pitch of the seams, the price paid for mining varies greatly, the minimum paid being 35c. per ton, and the maximum, $1.10. The thinnest seam operated is the Montevallo seam, at Straven, which in some places is only 1 ft. 8 in. thick; the thickest seams are the Blocton No. 1, at Blocton, and the Mary Lee, at Porter, which are each about 10 ft. thick The average number of days worked in the whole State last year was 200. The mines in Marion county led the list with an average of 248 days, while Blout county only averaged 144 days.

The State as a whole is not organized, and some of the mines use convict labor, the principal advantage from this policy being a continuous output, rather than any reduction in the cost of production.

Because of the coking of about one-third of the total output of the State, in many districts the coal is loaded on a mine-run basis; but in all the other districts, careful attention is paid to the production of lump coal through improved methods of mining and the avoidance of the shattering effects of explosives.

Sentiment Now Favors Safety Measures

A serious change in sentiment has recently taken place in Alabama, and the majority of operators are urging the abolition of "shooting on the solid," and the use of black powder. On the other hand, there is a movement toward the introduction of undercutting machines, permissible explosives in connection with electric shot-firing devices, and also of the hydraulic mining cartridge with which several mines have been recently equipped.

The late Mulga and Palos explosions have emphasized the value of such rescue equipment as the hospital car of the Tennessee Coal, Iron and Railroad Company, and the Draeger oxygen apparatus with which nearly all the prominent companies are equipped. At all the larger

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*Consulting mining engineer, Morgantown, W. Va.

mines, a first-aid corps is maintained, and in addition to the regular mine inspection by the State, a company inspector is usually employed.

The reports of the inspectors and experts at the Mulga mine, indicate the absolute necessity for continuous examination of all working places, a more extended use of the safety lamp, and the constant removal of all dust as fast as it accumulates, in any mine where gas has ever been discovered, or where the location is such that it may be expected.

The greatest damage to this mine was at the foot of the main shaft, and fortunately the escape shaft was so slightly injured as to be almost immediately available.

The power plants and general equipment of all the mines in the State are above the average, and the local conditions are such that almost every method of mining, timbering, haulage and ventilation may be seen in practical use. One of the longest slopes in the State, and worthy of special mention is at the Blocton mine of the Tennessee Coal, Iron and Railroad Company. This haulway is perfect in alinement and grade for its entire length, and is a model of entry timbering and roadway maintenance.

Verdict in the Cherry Mine Disaster

The coroner's jury which began last November to investigate the cause of the Cherry mine disaster, which resulted in the death of 265 miners in the St. Paul mine, has reached an agreement, and 250 separate verdicts have been returned. The jury says the mining laws were broken with the knowledge and consent of the mine inspectors.

The verdicts were in three sets, one set fixing the cause of the death of the 12 men in the rescue party who perished on the cage in the mine shaft; another set for the 187 men who were suffocated in the second seam; the third set is for the 51 men who were trapped in the third seam and died of exposure and suffocation. The verdict of the coroner's jury vindicates John Cowley, the engineer who was in charge of the cage. The verdict blames "a confusion of signals" for the tragedy.

The following verdict was brought in for each of the 187 men who lost their lives in the second seam:

"We find that they came to their death by suffocation and that the fire was caused by a load of baled hay coming in contact with an oil torch. And we further find that there was great delay in notifying the men of their danger."

The verdict giving the cause of the death of the men in the third seam says:

"We find that they came to their death by exposure and suffocation. We further find that the mining laws of the State of Illinois in relation to means of escape were violated with the full knowledge and consent of the mine inspectors for district No. 2."

Atmospheric Pressure and Mine Explosions

By W. Hartman *

Each time a mine catastrophe occurs the question is raised: "Are there no visible signs which indicate or at least predict such a disaster, and thus enable the mine authorities to take steps in time toward its prevention?" Certain observations caused many engineers to believe that mine-gas explosions were more or less connected with variations in outside atmospheric pressure.

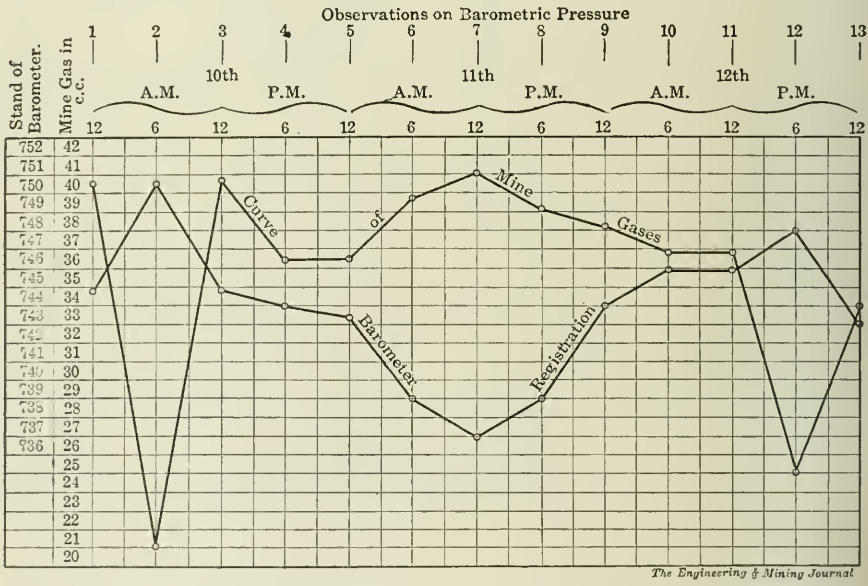

Fig. 1. Showing Relation Between Variations in Atmospheric Pressure, and Outflow of Gas in Mines

This question was of tremendous importance and the utmost care was taken when gathering the information. To get data which could be relied upon, it was, of course, necessary to stretch these observations over several years. For this purpose uniform schedules were issued, fitting into indicators which automatically registered every day the varying conditions prevailing in the air shaft of a mine.

One of the sheets illustrating the results obtained by this method is shown in Fig. 1.

Observations on Atmospheric Pressure and Outflow of Gas in Mines

This observation was taken in the suction channel of the fan, and it must be considered that the variation in atmospheric pressure was partly due to the number of revolutions of the fan. To render the varying pressure more conspicuous, the revolutions of the fan had been increased, which action, however, does not affect the general result.

Along with these observations went others, determining carefully the stand of the barometer at the time of various explosions in mines. When these reports were compared at the end of a few years, it was shown for a certainty that a connection between the atmospheric pressure and the frequency of gas explosions could not be established. At the time of some accidents, it seemed as if there was a link between these two factors. But this coincidence was so uncertain and so small in comparison to the bulk of the observations, that it is safe to say that explosions occur independently from the oscillations of atmospherical pressure. The barometer, being high or low, explosions were equally distributed. And this outcome was to be foreseen for it is only natural that explosions should occur independently.

Causes of Methane Accumulations and Its Ignition

Methane (CH_4) is the trouble maker in most gaseous mines, but it is hard to understand how a little of this gas can be of such importance in a well ventilated mine.

Even the gathering of dangerous quantities of gas must generally be credited to some mishap; for instance, breaking down of the fan or as a result of the caving in of old workings, rather than to atmospherical conditions. There is another matter which is still harder to solve; the connection between a variation in atmospheric pressure, and an ignition of gas. The firing of a body of gas may be due to any one of many unhappy circumstances, or to the inexperience of a miner. However, this only shows more plainly that the cause of such ignition is generally independent of atmospheric changes.

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*With Whitney & Kemmerer, 143 Liberty street, New York.

Safety Precautions in Alabama Coal Mines

In Addition to First Aid Corps and Emergency Car, the Electric Shot Firing System and Mechanical Means for Getting Coal Are Being Adopted

BY E. H. COXE*

The Tennesee Coal, Iron and Railroad Company has taken a leading part in the State of Alabama in adopting measures for the safety and benefit of its employees. Particularly in its coal mines, where the most hazardous work is carried on, has the Tennessee company specially pushed the establishment of safety precautions.

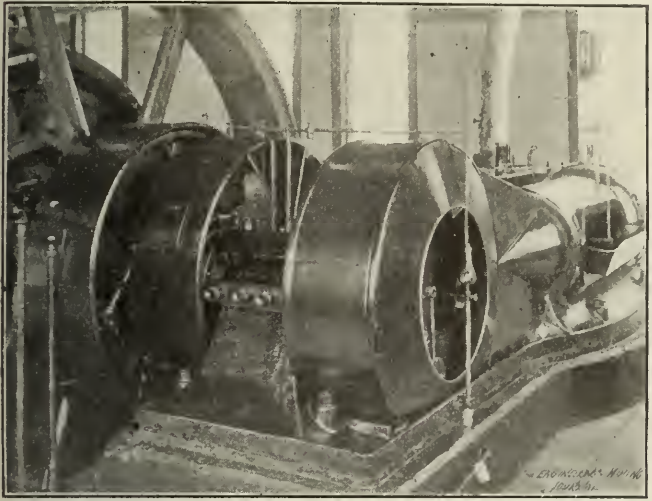

FIG. 1. SHOWING HOW THE CRANK PIN ON THE ENGINES ARE GUARDED

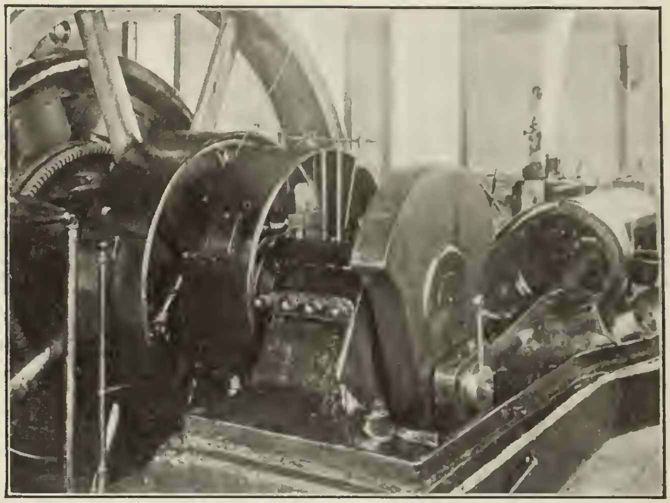

FIG. 2. SHOWING THE ENGINE WITH CRANK-PIN GUARD REMOVED

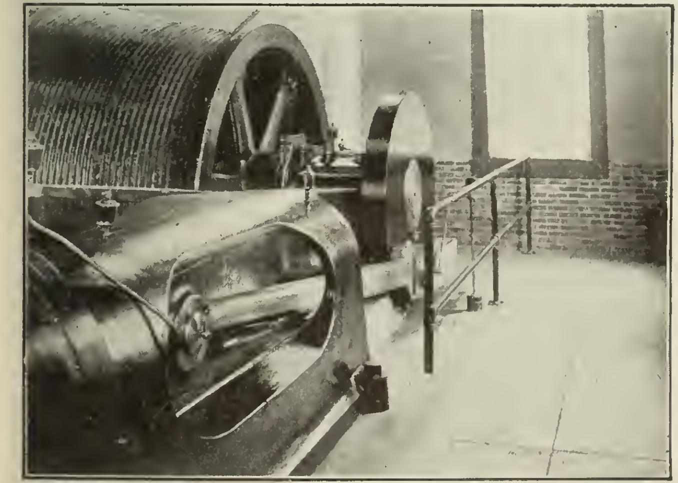

FIG. 3. SHOWING HOW SOME OF THE ENGINES ARE GUARDED WITH RAILINGS

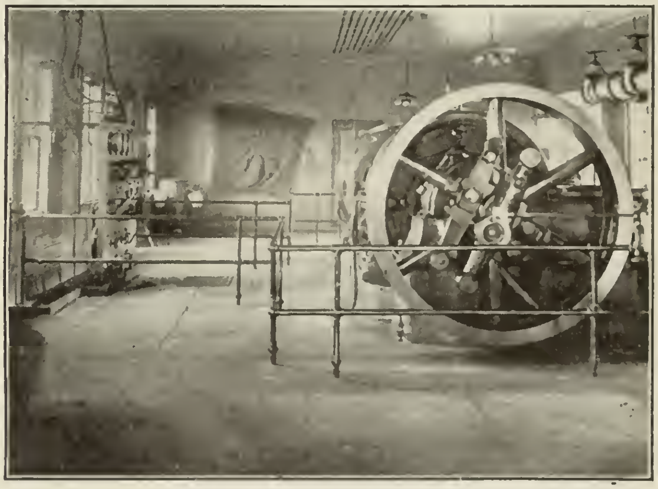

FIG. 4. THE DYNAMOS AND ELECTRIC SWITCH PARTS ARE ALSO GUARDED WITH RAILINGS

TENNESSEE COMPANY'S SAFETY MEASURES

All machinery operated by this company, both on the surface and in the mines, is guarded in every possible manner to prevent employees from coming in contact with any moving parts. Figs. 1 and 2 show how the crankpins on some of the engines are guarded; Fig. 1 showing the engine with the guard on, and Fig. 2 with the guard removed. Figs. 3 and 4 show how some of the engines, dynamos and electric-switch parts are guarded with railings. All engines operated by the company are protected in one of the two ways mentioned above.

All gear wheels on pumps or other machinery, both in and out of the mines, are shielded to prevent employees getting their limbs or clothing caught in the wheels, while oiling or working about the same. All sprocket wheels and sprocket chains are properly protected where it is possible to do so. Where set screws are required on revolving shafts or pulleys, they are either countersunk, or hollow set screws are used; the heads of these screws are made flush with the face of the revolving piece so that the operator's clothing cannot become caught.

All platforms or stairs are supplied with hand rails, and where there is any opportunity for objects to fall on persons working or passing beneath, footboards are placed around such platforms so that small objects cannot be knocked off.

In order that none of the above mentioned precautions may be neglected by any of the operating force, a separate department known as the safety department is maintained and the head of this department, or competent inspectors in his employ, make frequent periodical inspections of all the safety appliances at all of the works, submitting reports of their inspections to the general manager and also to the head of the department inspected. Inside of the mines every possible precaution is taken to prevent explosions of any description.

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*General superintendent of coal mines, Tennessee Coal, Iron and Railroad Company, Birmingham, Ala.

Coal Dust Is Sprinkled

At some of the coal mines steam is introduced into the air at the intake and inside of the mines, sprays of the American Moistening Company type are installed at sufficient intervals to keep all coal dust thoroughly wetted down. Fig. 5 is a flash-light photograph of one of sprays in operation in one of the company's coal mines. Hundreds of these sprays are in use all the time. In addition to this, where the results therefrom are not entirely satisfactory, they are supplemented by sprinkling with a hose. In the machine mines, the machine cuttings are loaded out before any shots are fired.

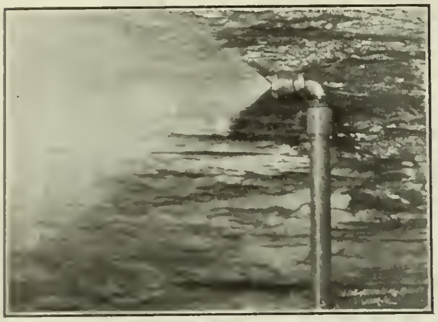


Fig. 5. Showing One of the Sprays in Operation Underground

Safety explosives are used in all mines where it is possible to shoot the coal with them, the explosives used being bituminite, manufactured by the Jefferson Powder Company, and carbonite and monabel, manufactured by the du Pont Powder Company, the two former being used for coal and the latter for rock. Dynamite is not allowed in any of the coal mines of this company under any circumstances whatever and rigid rules have been adopted to prevent this.

The use of coal dust, or coal in any form for tamping is strictly prohibited and a supply of clay for tamping purposes is kept in the mines at all times and the miners required to use the same. Where a place is dry and dusty it is required to be sprinkled before being shot.

Will Install Either Electric Shot-firing or Hydraulic Mining Cartridges

In one of the coal mines, known as No. 5 Pratt mine, in addition to the use of bituminite and the mining of all the coal in the clear, an electric shot-firing system was installed about a year ago, whereby all the shots in the mine are fired by electricity from the outside after everyone has come out, and there is absolutely no one underground when these shots are fired. This system was described in a paper read before a meeting of superintendents, mine foremen, assistant mine foremen, gas men, etc., held at East Lake Park, Alabama, July 17, 1909, under the auspices of the Alabama Coal Operators' Association, which paper was published in this Journal on Aug. 28, 1909. In connection with this system an absolute check is had on all men going in and out of the mines. The system has proved entirely successful and is now being installed in this company's No. 8 Pratt mine, and will be installed in other mines unless the hydraulic mining cartridge, which is now being experimented with by this company, proves successful, in which case this latter machine will be installed instead.

Special Inspections

In all coal mines of the company generating gas, a sufficient number of gas men are employed to examine all working faces at least once, and sometimes twice daily, and where gas is discovered, to see that same is properly cleared before an employee is allowed to enter that place. In addition to this, a sufficient number of inspectors are employed to examine every working place at least twice a week with particular reference to proper timbering; where a place is not properly timbered, the occupant thereof is not given any cars to load until he makes his working place safe.

All the doors in the mines are so hung as to be self-closing, so that no employee can carelessly leave a door open and thus disturb the ventilation, and these doors are required to be kept in that condition.

In addition to the State mine inspector, this company employs a competent inspector of coal mines, whose duty it is to examine all the inside workings of the mines and report to the general superintendent and division superintendent the conditions existing therein, with special reference to the safety of the employees.

Improved Construction

The old mines are being gone over with an idea of duplicating the driving mechanism of the ventilating fans, and of fireproofing the fan houses and engine buildings and the air shafts leading thereto. The fans are being set to one side of the shaft with fireproof conduits conducting the air from the shaft to the fan, and the shafts themselves are being made fireproof and equipped at the top with self-closing explosion doors, so that in case there should be an explosion, the doors would simply be blown open and would close themselves, doing no damage to the ventilating apparatus itself.

The last mine opened by this company, known as No. 12 Pratt mine, is substantially built, all the buildings being of fireproof construction. Fig. 6 is a photograph of the steel tipple at this mine. At another mine, known as No. 13 Pratt mine, now being opened, not only the buildings will be fireproof, but the shafts themselves will be concrete lined with steel guides and brick arches for a considerable distance from the bottom of the shafts, so that there will be absolutely no wood at all used in or about the shaft. There will also be at this mine a slope manway concrete lined so that egress from the mine will not be dependent upon any machinery.

First Aid Corps

For a month during the summer of 1909, Dr. M. J. Shields, at that time first-aid organizer for a number of anthracite coal companies in Pennsylvania, now national organizer for the American Red Cross Society, was employed by this company organizing first-aid corps at all their mines. Since that time this work has been carried on at all the company's mines under the direction of the local physicians and superintendents. Figs. 7, 8 and 9 show some of the different first-aid corps at practice work around the mines. Fig. 10 shows two of the first-aid men practicing artificial respiration in the mine. This work has resulted in great benefit to the men, three lives having been saved by inducing artificial respiration upon victims of electric shock from 500-volt current, and, in addition to this, all the doctors report that victims of injury are coming to them in much better condition since the first-aid corps have been trained and on these

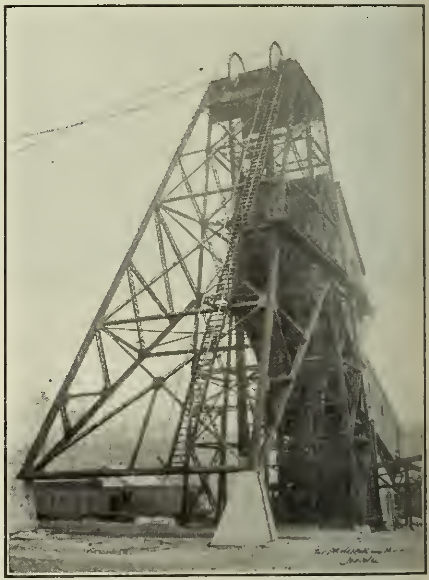


Fig. 6. The Headframe and Steel Tipple at No. 12 Pratt Mine

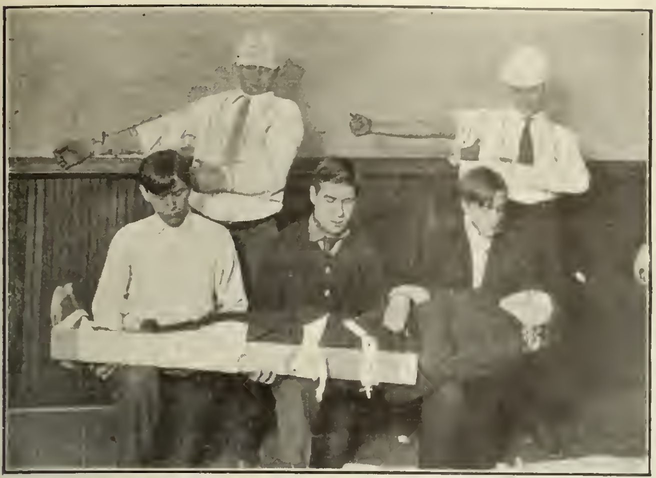


FIG. 7. FIRST-AID CORPS AT PRACTICE WORK AROUND THE MINES

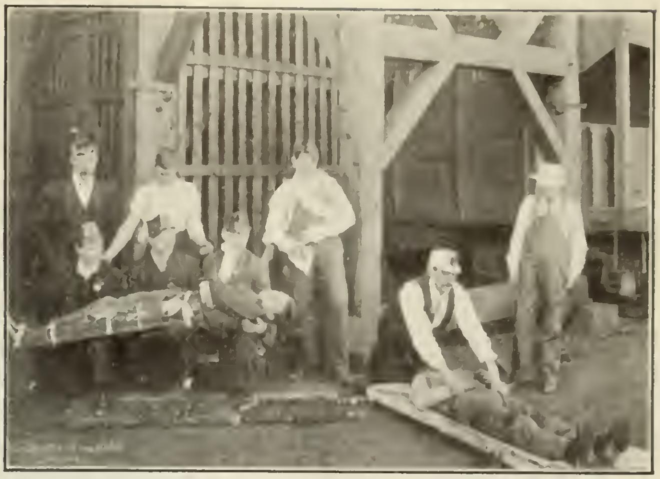


FIG. 8. FIRST-AID CORPS ARE ORGANIZED AT ALL THE COMPANY'S MINES

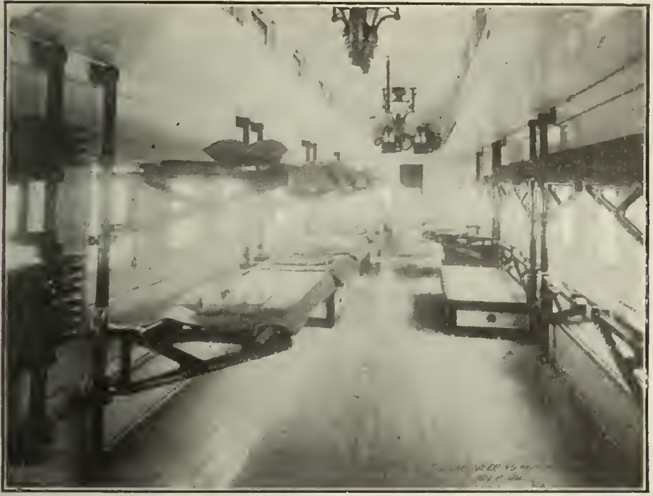


FIG. 11. THE INTERIOR OF ONE END OF THE EMERGENCY-HOSPITAL CAR

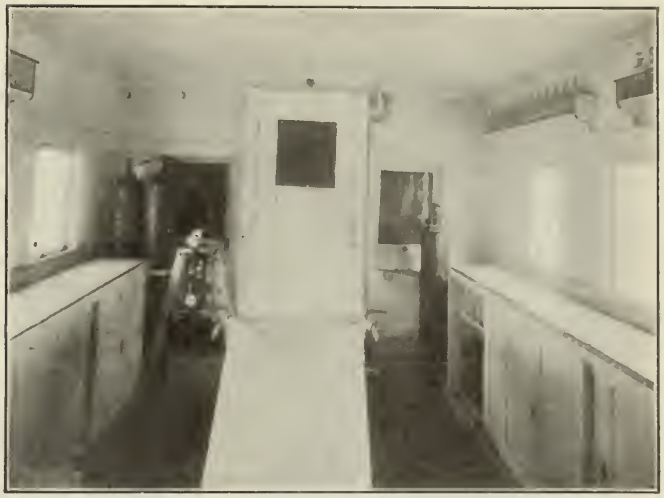


FIG. 12. SHOWING ONE VIEW OF OPERATING ROOM IN THE HOSPITAL CAR

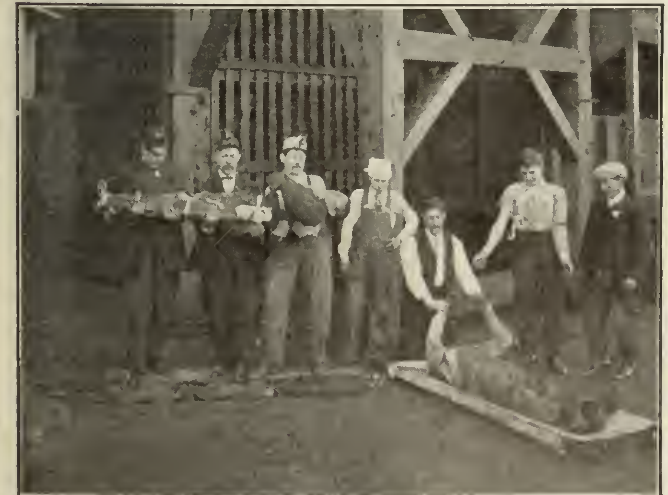


FIG. 9. THE FIRST-AID WORK IS CARRIED ON UNDER THE DIRECTION OF THE LOCAL PHYSICIAN

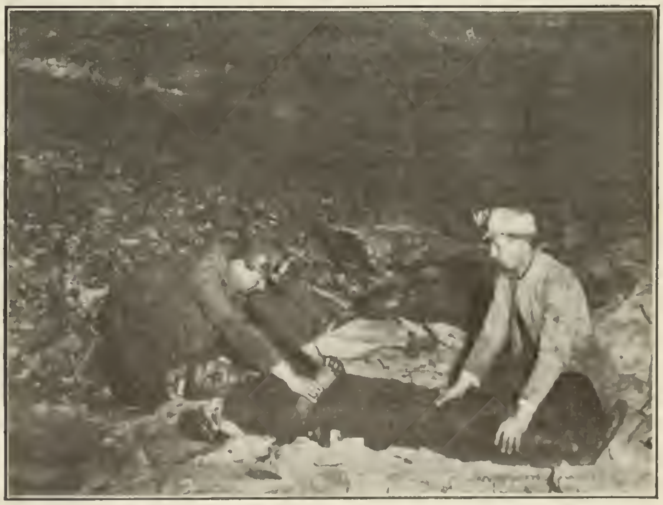


FIG. 10. SHOWING TWO FIRST-AID MEN PRACTICING ARTIFICIAL RESPIRATION IN THE MINE

men recovery is frequently much more rapid.

A Hospital Emergency Car

This company has also equipped a hospital emergency car. This car is furnished with six sets of Draeger rescue apparatus, together with necessary electric storage-battery lamps, oxygen tanks for recharging oxygen resuscitating devices, and two pulmotors, which is the latest oxygen resuscitating device gotten out by the Draeger company. The car is also equipped with an operating table and necessary bandages, medicines, oils and sterilized water, stretchers, air pillows, blankets, etc., for caring for and transporting injured men in case of a serious mine disaster. Fig. 11 shows the interior of one end of the car, showing the arrangement of the brackets for holding stretchers when occupied, with boxes containing the resuscitating apparatus and supplies underneath. Fig. 12 shows one view of the operating room in the car, showing the operating table and the oxygen tanks and pump. Fig. 13 shows another view of the operating room, showing the operating table with hot water and sterilizing arrangements. Arrangements have been made with all connecting lines on which the company is operating coal mines for the prompt handling of this car in case of any mine disaster at any time, either day or night. At the time of the recent mine explosions at Mulga and Palos, Alabama, although these mines did not belong to this company, the car was offered and promptly rushed to the mine in each case. Fig. 14 shows rescue men, equipped with the Draeger apparatus, doing practice work in the mines.

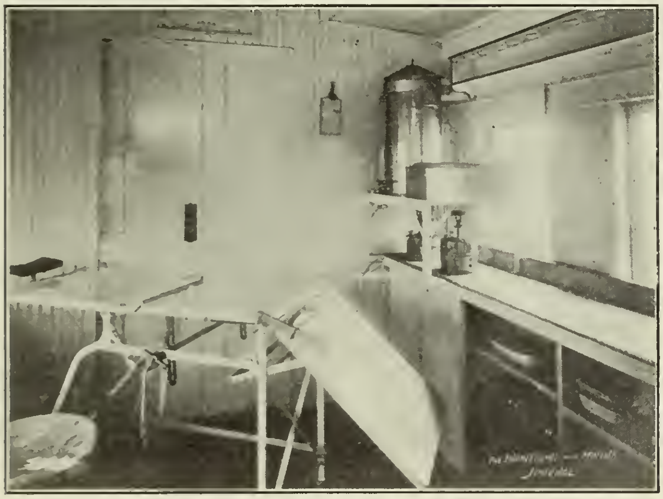


Fig. 13. The Operating Table with Hot-water and Sterilizing Arrangements in Hospital Car

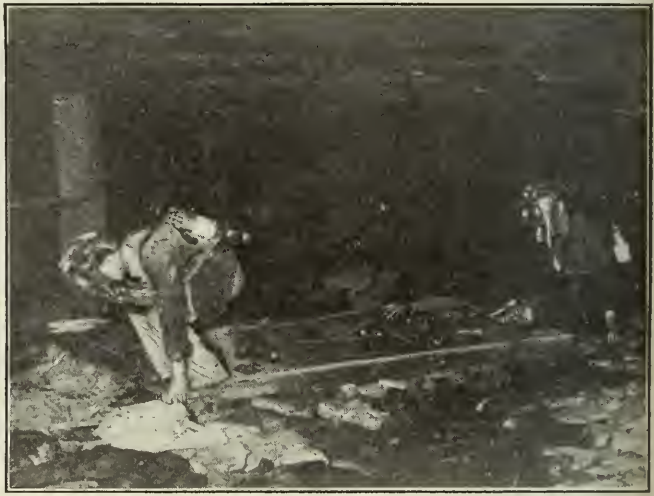


Fig. 14. Rescue Men Equipped with Draeger Apparatus Doing Practice Work in the Mines

At those mining divisions located some distance from the emergency car, four additional sets of the rescue apparatus, with necessary supplies and electric storage-battery lamps, and a pulmotor are being purchased for practice use and for use in case of emergency before the car could arrive.

This car is kept on a convenient sidetrack connected with one of the electric plants of the company, so that the storage batteries for the lamps are kept charged at all times, and the car is in charge of a competent man, so that all the apparatus and supplies are at all times in proper condition for immediate use.

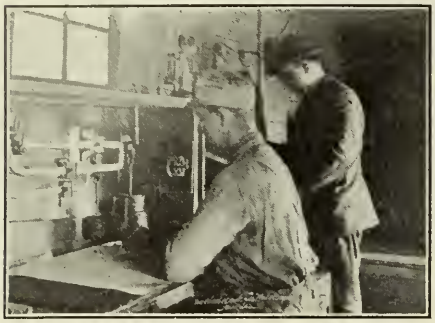


Fig. 15. Showing Company Weighman and Miners' Check Weighman at Work in Weigh Office on One of the Tipples

On all the mining divisions, hospitals are arranged for, and are in charge of the local company physicians; medical treatment is covered by the regular monthly assessment.

A Check Weighman is Appointed

In order that there can be no question of the fair and proper weighing of the coal, the miners at each mine, except the very smallest operations, are required to meet each six months and elect a check weighman from among the employees; it is the duty of this weighman to stay in the weigh house with the company weighman and see that the coal is fairly and properly weighed. Furthermore, the empty mine cars are weighed once each month, and as many miners as desire are invited to witness this weighing.

Free Lectures are Given

In addition to all of the above, the company has just employed a lecturer to give free lectures at convenient points on the different coal-mining divisions to the employees on questions of mining, dealing particularly with safety provisions, avoidance of accidents, proper handling of explosives, the causes of mine explosions, and proper methods to be adopted for preventing same.

A number of colored missionaries are employed by the company to conduct and promote reading classes among the colored employees and to endeavor to improve their general welfare, particularly their moral character and method of living.

Improvement of Homes

The Tennessee company is also engaged in putting fences around all of their employees' dwellings, so that they may not only have vegetable gardens, but keep their premises in neater and cleaner conditions; and, in order to promote the vegetable garden idea, prizes for the best, second best and third best vegetable garden, for both white and colored employees, have been offered, and seeds furnished by the company at cost, as set forth in the following notice:

"To Employees
Tennessee Coal, Iron and Railroad
Company:

"As an incentive to cultivate truck gardens on the yards surrounding the homes of the employees of the mining departments, it has been decided to offer six prizes at each division, three prizes for the white employees, and three for the colored employees, offering for inspection the best garden of the season. The first prize of $25 will be awarded in each case for the best garden. For the second est garden, $15 will be awarded, and or the third best, $10.

"These awards will be made only to hose employees occupying company ouses.

"The awards will be made upon the ecommendation of O. L. Ayers, chief griculturist of this company, and a comnittee consisting of the chief clerks.

"There will be four inspections, occuring in May, June, July and August. The rizes will be awarded after the last inpection.

"The right is reserved to withhold the ward in case there is not sufficient cometition or in case the character of the ardens is such that they are not entitled o consideration.

"The commissaries will supply seed for se in this competition at cost.

"Salaried employees are not eligible.

"Frank H. Crockard,

"Vice-president and general manager."

It is surprising to see the interest taken y the employees in this work and the egetable gardens now surrounding the mployees' dwellings. This has also had he effect of making the employees take pride in their surroundings and keep heir homes and yards in a much cleaner nd more sanitary condition.

Ignition of Coal Dust by Single Electric Flashes

Dr. W. M. Thornton and E. Bowden, of the Armstrong college, Newcastle-on-Tyne, are jointly responsible for a paper bearing the above title which was considered at the April meeting of the North of England Institute of Mining and Mechanical Engineers. Taking the point of view of the electrical engineer, the paper constitutes an examination of the properties of coal dust under electrification, and an investigation of the conditions under which a cloud of dust can be ignited by single electric flashes. The authors experimented with a mixture of three typical dusts from different seams, and by mixing these dusts they claim that the uncertainty of depending upon any one dust has been averaged. They did not sieve the dust before use, and it contained 10 per cent. of ash chiefly calcareous.

Coal in bulk, or dust, is not a conductor of electricity, but it is mentioned that if a paste made of coal dust and water is placed between terminals 1 in. apart on a marble base, and electrified either by direct or alternating pressure at 480 volts, a remarkable change takes place. Sparks pass through the substance of the paste, and eventually a large flash strikes across, short circuiting the terminals. The result is probably due to the establishment of a line of carbonized particles of the dust short-circuiting the terminals, but while venturing this suggestion the authors say the cause has not yet been determined.

The Results of Actual Tests

Trials were made to examine the effect of changing the percentage of volatile matter in mixtures placed between terminals ¾ in. apart at 480 volts direct current with the following results:

Mixtures.	Effect
(a) Mixture of coal dust and pentane.......	No effect.
(b) Mixture of coal dust and methylated spirits............	Slight sparking.
(c) Dry powdered shale..	No effect.
(d) Wet powdered shale. .	Steamed and sparked slightly.
(e) Powdered coke; loosely sprinkled.......	No effect.
(f) Powdered coke, pressed together.......	Sparked, flamed and flashed over.
(g) Wet coke dust......	Steamed, but did not spark or flash.
(h) Powdered arc-lamp carbon............	Sparked and flashed over.
(i) Powdered carbon brushes............	Sparked and flashed over.
(j) Damp, wet or very wet sand.........	Steamed, and dried but did not flash.

To produce a coal-dust explosion experimentally, the cloud of dust must not be too thin or too dense. In the former case a local ignition is extinguished by the cooling action of the air, in the latter by the products of combustion. The space also in which ignition occurs must not be too confined. Electric flashes can be produced by the mechanical breaking of the circuit or by the fusing of a wire, but the latter is not very likely to occur in a dangerous place in coal mining. Concentrating attention upon flashes produced by the quick breaking of circuits under different conditions of voltage and current, the object of the authors was to find the smallest current which would fire dust and if possible that which always caused ignition. As a result they show that the increase in percentage of ignitions is proportional to the increase in current. It is not proportional to the power of the flash, but to the product of this and the voltage. For a given voltage it has a definite relation to the current; so that the risk of ignition is proportional to the volume of the flash.

Commutators Must be Kept Clean

The necessity for keeping commutators clean, especially the small gap between live copper and the frame, is emphasized, while distributing boxes should be dust and flame tight and in compartments so arranged that the main terminals cannot be short circuited by a flash. The use of cartridge fuzes where possible is recommended, the authors say that once used, these latter should not be replaced by bare wire or by running wire through an empty tube.

The conclusion is arrived at that momentary arcs produced by break of cables or conductors can ignite dust, but the current required to do so is very much greater when the voltage is low, and at moderate voltages is greater for alternating than for direct current. This suggests to the authors that the arrangement most satisfactory from the point of view of safety, both for flashes and for shocks, is high-tension transmission to a substation or transformer house. Probably with cables well enough armored to prevent any external flash, and quite low-tension local transmission for power and lighting. Series lighting with incandescent lamps is not recommended.

When Carefully Used Electricity Is Not Dangerous

In concluding their paper, Messrs. Thornton and Bowden say that although it has been shown that a cloud of coal dust can be ignited by small single flashes, and the degree of probability has been found for most cases likely to occur in practice, it does not follow that the use of electricity in collieries is dangerous. Electricity is no more dangerous than the supply for domestic use of highly poisonous and explosive coal gas. An efficient leakage-indicator is equally necessary for both. No indicator will prevent risk from sudden breakage of either pipes or cables, but in the electrical case there is the advantage that the main supply can, if desired, be cut off by a small leakage of current.

The risk that any user of electricity is willing to take must be based on his own view of the chance that conditions favorable to ignition may not occur at his plant. To a great extent this is a question of suitable design and of revision of obsolete designs. It is equally one of efficient supervision by skilled men, and of regular attention to the machinery and transmission system.

The authors do not profess that their paper covers the whole ground, not that the results can be regarded as absolute, for although they have been made with standard dusts for the North of England, lower percentage of ignition would probably be obtained with anthracite and higher with brown coal.

Coal Output of Missouri for 1909

The output of coal for Missouri during 1909 shows an increase of 386,787 tons over 1908. Macon county, which, for a number of years ranked first in the production of coal, shows a decrease of 34,224 tons for 1909. Lafayette county, the second largest coal producing county in the State, reports an increase of 152,020 tons, while Adair county, which in 1908 was practically on a par with Lafayette county, produced 114,814 tons less in 1909 than in 1908.

Beside the big increase in production reported by Lafayette county, other counties showing substantial gains in production are: Barton, Clay, Henry, Howard, Linn, Montgomery, Platte, Ray and Sullivan. The selling price of the coal at the mines will probably show a slight increase over the price received in 1908.

Lessons from Coal Dust Explosions

Summary of Conclusions of British Mine Inspectors on the Explosion at Darran Colliery in the Cardiff Inspection District, October 29, 1909

RESCUERS USELESSLY SACRIFICED

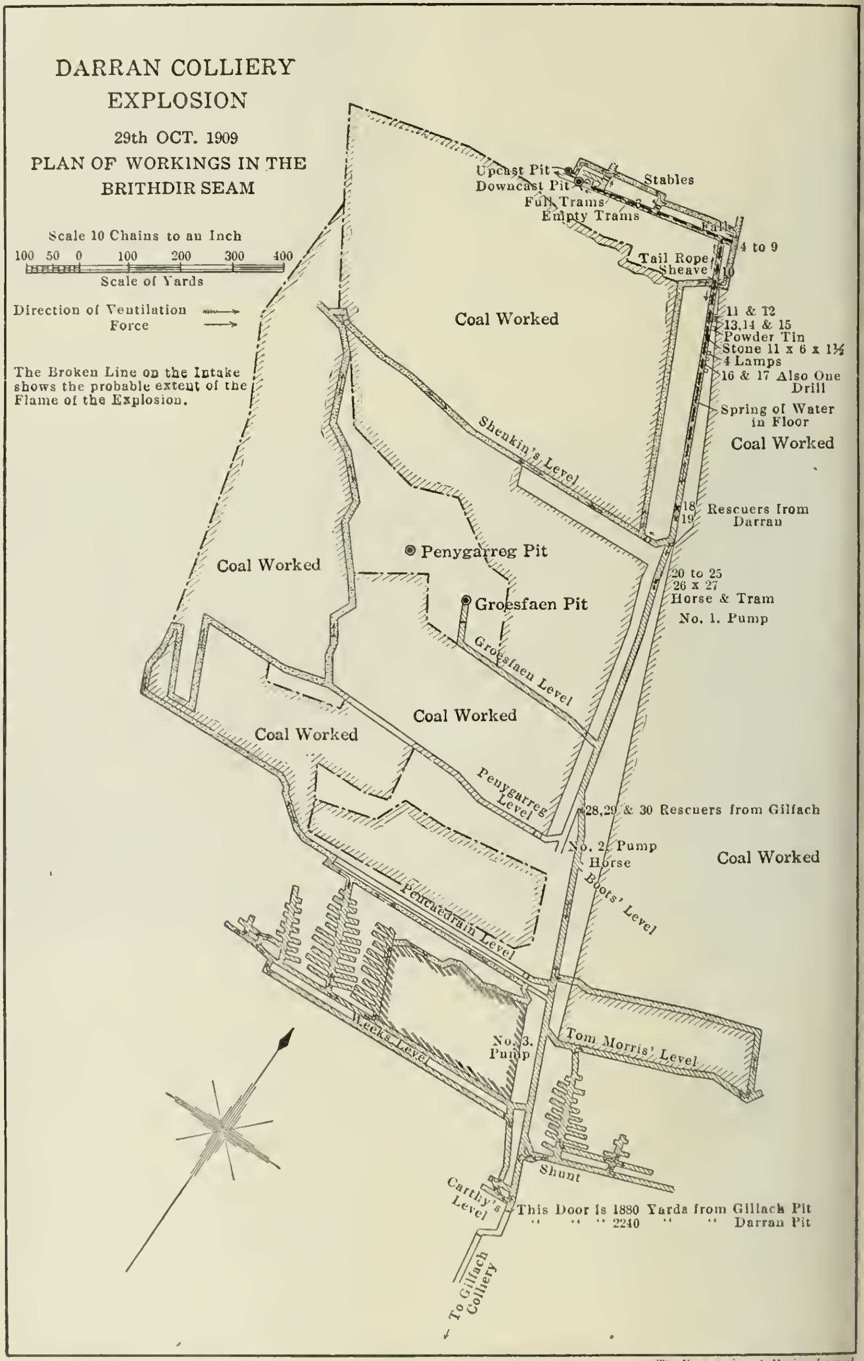
The report on the Darran explosion has been prepared by W. N. Atkinson, and Fred A. Gray, inspectors of mines in the South Wales coal-mining district.

The Darran colliery, situated at Deri, in the Bargoed Rhymney valley, has a working staff of 272 men and a coal output averaging 400 tons per day. The shafts, of which there are two, are about 17 yd. apart and go down 111 yd. to the Brithdir or No. 2 Rhondda seam. There is also an underground connection with two other shafts belonging to the Rhymney Iron Company, Ltd., which is the owner. One of the latter shafts is at Gilfach colliery, to the south of Darran, and 24 of the men working at Darran at the time of the explosion escaped from Gilfach; however, further efforts to rescue others from this shaft were unsuccessful, and indeed resulted in the loss of three of the explorers. Notwithstanding the loss of these three lives, the inspectors indicate that the explosion furnishes an instance where the connection of the workings of two collieries enabled a number of men to escape who would otherwise probably have lost their lives.

The Brithdir seam is about 3 ft. 10 in. thick with a good roof of strong shale or sandstone rock, the workings in operation being all to the dip and at a considerable distance from the shaft. These workings were reached by an engine plane, called the drift, driven in the seam for 1940 yd. from the pit level. The seam was worked by a modification of the room-and-pillar system. Levels were driven to the east and west from the engine plane at intervals of 220 to 300 yd., and headings were driven off the levels to the rise about 100 yd. apart. To the east and west of these rise headings, rooms were driven, and the pillars (about 10 yd. wide) were secured through a subsequent operation.

Firedamp Was Never Detected

The colliery was ventilated by a Schiele fan 6 ft. in diameter, fixed near the top of the upcast shaft and driven by a steam engine. It ran at 300 r.p.m., and produced about 20,000 cu.ft. of air per minute, with a water gage of 12 in. The mine produced a considerable quantity of water which was drained to three pumps worked by compressed air, and by them forced to the shaft, where it was raised by a pumping engine on the surface. Naked lights were used throughout the mine, and during the whole life of the colliery, firedamp had never been detected, while none was observed after the explosion. Blackdamp was found in old workings and unventilated places.



The Engineering & Mining Journal

Plan of Darran Colliery, Showing Direction of Air Current, Indications of Force and Positions of Bodies

Attached to the report, which, of course, has been submitted to the secretary of State for the Home Department, is a plan (see accompanying figure), showing the shafts, roads and workings, the direction of the air current and o indications of force, and the positions (denoted by numbers) in which the bodies were found. The plan also shows the road leading to Gilfach colliery.

The inspectors say that the major portion of the roads and workings were we r damp, but portions of the main intake and haulage road were dry and dusty, and t was on this road the explosion occurred. n the vicinity of the downcast shaft the oad was wet and from the shaft to the op of the drift, the floor was partly wet nd partly dry and dusty. The main drift was dry and moderately dusty for about 00 yd. from the top, and from that point he floor was wet for a considerable distance; the roof and sides gradually became damp also. The return airways and workings generally were damp and free rom coal dust.

Coal Is Dropped from Cars

On the dry portion of a haulage road, he coal dust was produced from dust and oal which was blown and fell from the ars. The ordinary cars in South Wales lrop much coal and dust all the way from he face to the shaft. Comparatively speaking, however, no part of the road was excessively dusty nor was the dust of a particularly fine and dry nature. The following is an analysis of the coal producing the dust:

ANALYSIS OF COAL.

olatile hydrocarbons	21.64
'ixed carbon	70.13
Sulphur	2.01
Ash	4.92
Moisture	1.30

The rescue operations are surveyed in detail by the inspectors, which they say add another to the many previous examples of the great danger of advancing nto air contaminated with afterdamp. The five would-be rescuers who lost their lives were not afforded the protection of breathing appliances, a manager, an undermanager, two firemen and a contractor sacrificing themselves in consequence. The report says that such hasty procedure not only endangers the lives of the explorers, but may delay and derange the course of properly conducted rescue operations.

The Danger of Carbon Monoxide

It should be remembered that carbon monoxide may be present in dangerous proportion without affecting lights, and that inexperienced persons are therefore liable to run into danger. As pointed out by Doctor Haldane, the eminent British authority, the only practicable indicator of this gas is a small animal such as a mouse or canary, the suggestion seeming to be that one should be taken down by persons responsible for exploration and rescue operation after explosions and fires.

Besides, the effect of carbon monoxide is cumulative, and if the rescuers advance until only slightly affected, the difficulty in retracing their steps to pure air is often very great; in some cases disablement comes on suddenly. The inspectors are emphatic in their declaration that in the Darran explosion, when it was seen that the men at the top of the drift were killed and the air bridge destroyed, no further advance should have been made until the ventilation was restored.

Explosion Caused by Misplaced Short

Regarding the cause of the explosion, a fall had occurred on the main drift, and a fireman seems to have fired four charges of powder on the stone to break it up, thus firing the dust. This stone, which had fallen from the roof was found on the main drift about 200 yd. below the turn. It was irregular in shape, but 11 ft. 6 in. on the longest side by 6 ft. 6 in. at the widest part, and about 2 ft. thick on one side tapering to thinner edges on the other side and ends. The positions of the men above and below this fall of stone, and of the tools near the stone, were consistent with the firing of a shot, and in the absence of any other probable means of ignition, the inspectors think there is no reasonable doubt that the explosion was caused by the firing of an explosive on the fallen stone.

They say that apprehension of the dangers of coal dust has not become general among miners. The fireman no doubt knew that it was contrary to rules to fire explosives except in a shot hole, but it is probable he did not realize that the result might be a disastrous explosion. The practice of breaking falling stones by explosives, even when in shot holes, is a dangerous proceeding when dry coal dust is present, and in such cases should never be undertaken without copious watering.

Moral Revolution in Anthracite Mining

BY P. M. GREER

There may be a moral as well as a mechanical revolution in mining, and of the two it is probable the moral revolution will be more important in the end than the mechanical. When I came to the anthracite regions 10 or 12 years ago, the moral conditions throughout the entire field were about as bad as they could be. I could walk into any street in the vicinity of the breakers in the city of Scranton, Penn., and discover without trouble that every fourth house in the place was a "speakeasy," an unlicensed bar for the sale of intoxicating drink to miners.

These places were entirely patronized by miners, and so long as a man was working he obtained credit for as much drink as he was able to consume. The result of this open and flagrant traffic in drink seven days in the week was that the mortality at the mines increased by leaps and bounds. Scarcely a day passed in which any particular mine did not pay its tribute to the "speakeasy" in the death of a miner or his laborer, usually a man in the prime of life, and frequently with a family dependent upon him.

But this was not all; while death claimed its toll, disabling accidents, accidents that did not end fatally, became so common that they were scarcely noticed. The homes of the miners also were quite unsightly. If a miner built his home, that too often was as far as his thrift extended. He took no pride in his homestead or its surroundings. To live in a "shack" seemed to be the climax of his ambition and of his esthetic susceptibilities. I am not discriminating between the foreigner and the English-speaking miner. One was nearly as bad as the other. There were conspicuous exceptions as there always are, but these only accentuated general conditions.

Conditions Were Painted Black

During the period of the great strike in 1902, the anthracite regions were invaded by hordes of special artists, photographers and writers who depicted the social condition of the anthracite miners "at home" as black as pen and ink could make them. I am aware, of course, that they exaggerated, that they selected the particular and salient features that suited the exigencies of the magazines or newspapers that they represented; but allowing for this, I do not think they consciously exaggerated things as they stood, for they had absolutely no need to do so.

Now all this is changed, changed from top to bottom. I think that I am correct in saying that there is not a "speakeasy" in the city of Scranton. Certainly, if there is, it is not patronized by the miner. There are any number of licensed saloons, more or less reputable, but as far as I can discover, except where foreigners mostly congregate, their patronage is general, not particular.

The average miner within the past decade of years is morally metamorphosed and he not only shows it himself, but it is demonstrated even more fully and happily in his environment. He pays as he goes along. He is not in debt to the "company store" or the "speakeasy" proprietor. He is master of his own destiny in this as in so many other respects which consequentially follow from it. He has his bank account. He does not put his vote up to auction for any man. He is now a good citizen. He has a genuine appreciation of the marketable as well as the social value of morality and individual character. He despises a grafter as much as a professional reformer pretends to do.

The Foreign Miner Has Also Improved

While in some respects the foreign miner has not kept pace with the English-speaking miner in this moral revolution, he is by no means unaffected by it. He is receiving the full benefit of the abolition of the "speakeasy." Although he drinks far too much as it is, he is drinking less than he used to do. His children are the peers of any of any nationality in the country in intelligence, vivacity and receptivity. The reaction of the child's culture is apparent on the parent to an astonishing degree. The children have set their faces against many of the proclivities of the parents, and the alderman's court and its deeply demoralizing concomitants are becoming happily a thing of the past, or at least to a considerable extent. These statements are not theoretical generalizations; they are observable facts.

The moral pulsations of a revolution in any manifestation of human life are, when all is said and done, its reality. But in the mining field, this moral revolution of which I speak has had its tangible economic effects. In the first place, a sober, self-respecting miner is altogether a different economic factor than when he is the reverse. He accomplishes more work; he does it better, and in the mines and out of them, he is infinitely less a danger to himself and a menace to his fellows. Although fatalities in the anthracite mines are still much larger than they should be, it is an unquestionable fact that the loss of life per thousand tons, or whatever the unit of measurement taken, has sensibly decreased during the past 10 or 12 years. I refer, of course, to preventable accidents, the accidents which many designate the "will of God" for want of a more scientific system of terminology.

Fatalities Are Result of Ignorance and Carelessness

Accidents in mines, or at least in our mines, that are preventable, arise from ignorance, carelessness and any predisposing cause that produces these factors. No drunken miner would, at present, be permitted to enter a mine under any circumstances if the fact were known to the mine foreman or any other official responsible for allowing him on the cage. It is unquestionably a fact that in days gone by, after the monthly pay day, thousands of miners were carried to the foot of the shaft who were no more in a condition to enter a mine than they were to enter paradise, and their one anxiety when they got underground was to fire their shots and get out again to obtain an "eye opener."

Now miners in this condition invariably neglected the most elementary precautions, such as securing the roof and rendering their chambers safe. At present, the gradual diminution of drunkenness among miners is bringing to the front a class of men in the mines who are realizing their responsibility as workmen and acting on their appreciation of the fact. This is a matter of first-rate importance to the operator from an economic standpoint. A fall of roof in a chamber handicaps the place to a considerable extent. It generally takes days to place the room in a fit position for a man to enter again.

There is an unfortunate tendency among mining men only to look at the broad effects, technical, scientific or commercial, of particular incidents or policies when discussing industrial problems in public. But, after all, as in other walks of life or work, it is the small and relatively unimportant details that tell most surely by their cumulative effects in the end.

I attribute a good deal of the moral revolution that has been effected in the mining communities in the anthracite regions to the disappearance of the "company store." It was an unmitigated curse, worse in my judgment than either the "speakeasy" or the licensed saloon. During the time that the "company store" was an existing institution in the mining regions, the average miner, who was of a spendthrift, happy-go-lucky disposition, was from one payday to another actually a pauper. He knew that he could obtain the essential provisions for himself and his family from the "company store," that he had to get them there or starve, and for the rest, what did it matter? He had no incentive to save, for the bill of the company store practically ate up his pay, and any ready cash that he handled went for the most part to "pay his grog bills."

The Breaker Boy

The breaker boy has participated in this moral revolution as largely, if not more so, than his father. He no longer enters the breaker at the age of eight or nine, and works there until he graduates as a mule driver and later a full-fledged miner. The commonwealth has taken him under its wing. He cannot enter a breaker to work until he is 14, or enter a mine until he is 16. The mine inspector sees to it that before he enters one or the other that he is not only able to read and write, but able to do so with facility. We shall have no more young men, who began life as boys in the mines, having to confess when the occasion required that they could neither read nor write. The breaker boy is having his chance in the progress of this moral revolution and he is availing himself of it to the limit of his opportunity.

This moral revolution that we see going on around the anthracite mines is not of equal intensity all through, but is in progress everywhere. Moreover, it has only begun. The inertia has given way to a movement actual and potential. It needs direction and should receive more of it than it has done in the past from the official operator.

Anthracite Breaker Fires

Special Correspondence

During the last twelve months, an unusually large number of anthracite breakers and washeries have been destroyed by fire. The financial losses involved in the destruction of this property must have amounted to millions of dollars, while the loss in wages to the miners thrown out of employment amounted to an equally large sum.

The question arises, how far were these fires inevitable in the accepted sense of that term; how far were they due to sheer carelessness, and how far were they attributable to incendiarism? A certain number of breaker fires were and will be, unavoidable, so long as breakers are an integral part of mining machinery. It may also be assumed tha a few, a very few, were attributable to incendiarism. But by far the larger number of the fires that have occurred in breakers were entirely preventable.

A breaker is a complicated structure It contains a large amount of valuable machinery. It is lighted invariably by electricity. It is built of wood. Many of the breakers were erected years ago They are saturated with oil and coal dust Boys or young men are hastily employed in them. The watchmen are not as they should be, selected for any special aptitude that they possess as wakeful and watchful guardians. Boiler houses, engine houses, blacksmith shops, clerical offices and powder shanties are frequently in the immediate proximity of the breakers. Al these factors are a menace to the life o the breaker, and one or the other of them eventually bring about its destruction by fire.

The Breaker Should Be Isolated

It is necessary, of course, that the breaker should be in the immediate vicin ity of the shaft. Is it necessary, however that the other buildings should be so close to it that for all practical purpose they are associated with it as if on one foundation? There is no question bu that it is better to have the breake building isolated, so that if any of th neighboring buildings catch fire, the de struction of one would not endanger o involve the destruction of the breaker.

CONCRETE TOO EXPENSIVE

Although lumber is not yet as expensive as other building materials, the time is coming, if it has not already arrived, when a modification in the design and building material of breakers must be adopted. It seems at least that the more vulnerable portions of a breaker could be sheathed with sheet iron or lined with brick. This is never done. The materials used in the newest and most elaborately equipped breakers is still unprotected lumber in the body of the building. There have been some suggestions made by mining engineers that breakers should be built of concrete, however, unless new and extensive coal seams are discovered the expense of concrete breakers will be almost prohibitive.

At any rate, to secure breakers from periodical destruction by fire should not be beyond the elementary resources of architecture and mining engineering. Every breaker burned involves a loss to the mine proprietor of from one-half to three-fourths its value, as well as the value of the machinery which it contains. Insurance companies are very chary in issuing polices on breakers, and they cannot be blamed for this precaution. The average life of a breaker probably does not exceed 10 years. The insurance risk taken, therefore, is out of all proportion to the value of the property on which the policy is issued.

Partially lining the more exposed points in a breaker, that is, those places most exposed to sparks or the carelessness of those employed in them, with sheet-iron or brick or fireproof varnish, would largely minimize those risks without involving any great expense.

At the present time, a concrete breaker is in course of construction for the Lackawanna company at Taylor, near Scranton, Penn. This is an experiment. When the breaker is finished, it will be the only one of the kind in the anthracite region, although the mine shafts are now invariably lined with concrete and have proved satisfactory. The Lackawanna can afford the experiment; few other operators can.

A New Type of English Safety Mine Lamp

In view of the number of explosions in coal mines, Consul Benjamin F. Chase, of Leeds, England, has investigated a British safety lamp for miners, which cannot be relighted except under conditions which make it free from dangers. The consul witnessed practical demonstrations of the lamp, and describes it:

The body of the lamp is cast from brass and the globe-holding ring is made in the same way. The safety gauze, which is of the regulation gauze or perforated copper, is shielded from accident by a steel hood. The lamp is so constructed that the absence of any material part prevents its locking, and it is therefore unlikely that it would be lighted and delivered to the miner unless it is in proper condition, i.e., has the gauze in place. The lock is composed of two pieces of iron with a coil spring connecting and can only be released by using an electro-magnet much more powerful than an ordinary hand magnet.

By the testing process through which each lamp is put, any defects which take away the safety are exposed. The lamps are tested by a machine which produces a mixture of gas and if there is any defect in the gauze which would produce an explosion it is disclosed. This appliance is also simple of operation and is made for use at the mine. The oil-filling machine works semi-automatically.

The lamp can be lighted instantly on the machine which goes with a complete outfit, and a relighting machine for use underground is so arranged that it cannot be operated until all danger of contact with outside gases is removed.

A MAGNETIC LOCK IS PROVIDED

The lamp has the general appearance of other safety lamps, but has some special features, to wit, a magnetic lock which cannot be opened without the use of an electro-magnet so that men cannot open it in the mines and it does not require lead locks or keys; a wick tube which makes the process of examining the wick or rewicking simple and easy; an electric lighting pin, which makes it easy to light the lamp, after being put together on one of the lighting machines which are for installation at the mines; also a simple device for snuffing the wick. It also has a spring valve on the oil bowl which makes filling an easy process. With these conveniences the lamp, when cleaned and put away, needs no attention until the man is ready to go to his work, when it can be instantly lighted and is secure.

UNLOCKING AND LIGHTING DEVICES

The unlocking machine is composed of an electro-magnet, which is put in contact with the bolt at the base of the lock and presses it until contact is made with the lock bolt and the lock is released, and by a turn the globe and gauzes are removed.

The lamp-lighting machine for use in the office or lamp room is so arranged that by placing the lamp on a plate provided for it and depressing the same, a current is formed and the lamp is lighted ready for use. A relighter for use in the mine is so constructed that before the contact can come the receptacle is closed and flame tight.

This relighter can be operated by the men underground with perfect safety. It is composed of a lamp chamber over the generator and coil chambers. The lamp is placed in position, the door closed, and the body of the chamber has to be revolved to a point which takes away all danger of gas connection before the electric current will act.

While many of these lamps are in use in England and other parts of the world, no attempt has yet been made to introduce them into America. The makers claim that no disaster from gas explosion has ever occurred in a mine fitted up and using their appliances, and an examination of the process of manufacturing and the safety appliances in use in connection with these lamps would cause one to believe that this claim is well founded.

The important feature of these lamps is the fact that when lighted and locked, which is the work of an instant, the miner has no means of exposure to danger by thoughtlessness or inquisitiveness, and no companion can furnish a key by which the lamp can be unlocked. They seem to be made with the object of perfect safety and to meet that requirement.

DEMONSTRATIONS TO BE MADE IN A NUMBER OF GASEOUS MINES

In addition to the foregoing, the Bureau of Manufactures has a letter from Ackroyd & Best requesting that the firm be placed in communication with owners of mines in the United States, and especially of "gassy" mines, with a view to making practical demonstrations of their safety lamps. It is proposed by the firm to send several sets of the devices in charge of their representatives.

Mining authorities of Pennsylvania and West Virginia have been notified of the desire of Ackroyd & Best, and it is probable arrangements will be made to have the lamps tested in May. The United States Geological Survey is engaged in a special investigation of safety devices for mines, and Director Smith will include the Ackroyd & Best lamps in this inquiry. Consul Chase furnished the Bureau of Manufactures with several of the safety lamps and appliances, and also a number of photographs, which have been turned over to the Geological Survey.

Modern Method of Plumbing a Shaft

Details of System Employed in Anthracite Field, where Steel Wires Are Preferred to Copper, and the Plummets Immersed in an Oil Bath

BY JOHN P. DAVIS

When an outside survey is to be connected with an inside mine survey, it should be connected to all the corners of the boundary lines of the property and should also be closéd within a reasonable limit. The stations used in plumbing a shaft are usually located within a few hundred feet of the shaft and are generally put in with car axles or iron pins, 1 to 2 in. in diameter.

Fig. 1 shows the plan of a typical method of plumbing used in the anthracite coalfield of Pennsylvania. The set-up is made on station *x*, which is from 10 to 25 ft. from the shaft, according to local conditions. The letter *s* indicates a spad placed obliquely on the near side of the shaft so that when the wire is hung, it may be sighted under the spad from the set-up at *x*. Then by raising the objective glass of the telescope, a spad *s* is put in in the same straight line, and station *x s* is produced. These spads are usually placed as far apart as practicable so as to get a maximum distance between the two wires. Then sights to *A* and *B* are repeated so as to secure as great accuracy of the azimuth as is possible. Measure the distances *X A* and *A B* at least twice, each time by a different party to eliminate the personal equation. Then coördinate values for the points *A* and *B* are determined, and the azimuth of the plane formed by them is known.

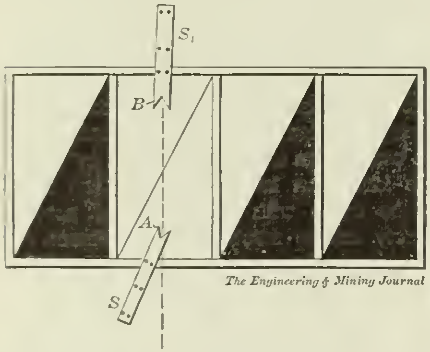


FIG. 1. PLAN SHOWING TYPICAL METHOD OF PLUMBING

THE PARTY GOES UNDERGROUND

Now the cage is slowly lowered with the party which consists of at least four men, while a man at each spad on the surface holds the reel end of the wire. Occasionally the wires are hung on the spads to see that they hang without interference.

Heretofore copper wires were used for this purpose, but on account of its elastic nature and low tensile strength, steel wires are used for shafts over 400 ft. deep.

Fig. 2 shows a section of the shaft and the general arrangements of the plumbing apparatus. The plummets shown on Fig. 3 are attached to the end of the wires. They are immersed in a liquid, either water or oil, the latter preferred on account of its viscosity. The plummet is made of cast iron, 7½ in. diameter at the bottom and 6½ in. at the top, and 12 in. high. The wibs are ¼ in. thick and 2½ in. wide. The spiders are ¼ in. thick and 9½ in. high. Its weight is about 18 lb. Fig. 4 shows an ordinary light sawhorse, 3½ ft. high and 3 ft. long at the top. On one side of it a foot rule is attached, as shown in the sketch. The use of the sawhorse will be described later. Fig. 5 is a spad upon which the wire is hung on the surface. It is usually made of ¼-in. iron plate, about 3 ft. long and 3 to 4 in. wide, and is provided with 6 holes for nails.

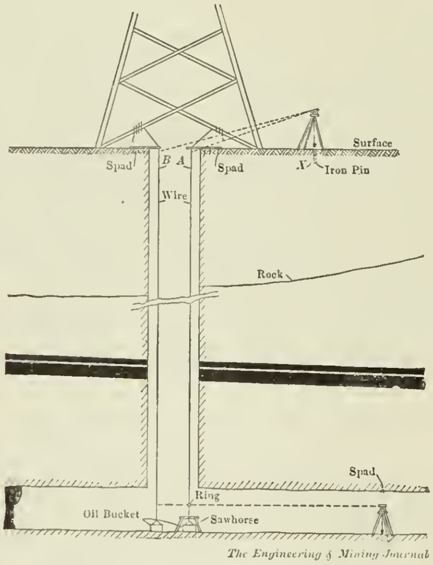


FIG. 2. SECTION OF SHAFT AND ARRANGEMENT OF PLUMBING APPARATUS

SETTING THE PLUMMET

The plummets are attached to the wires *A* and *B* and placed in the buckets, as shown at the bottom of the sketch, Fig. 2. At the end of the wire *A*, a ring is attached and the plummet is fastened to this ring by means of a string. The use of this ring will be described later.

The next move is to adjust the plummet and bucket carefully so that the former is free to swing in the latter. Now place the bucket directly under the moving plummet. When the latter begins to swing back and forth, steady it with the hand. In the meantime set the transit about 50 ft. from the wire in the plane of the wires *A* and *B*. Now place the sawhorse within ¼ in. of the wire and note the swing on the foot rule and bisect the swing about as follows:

Left.	Center.	Right.
3¼ in.		7⅜ in.
3⅛ "		7¼ "
3⅛ "		7⅛ "
3 "		7 "
2⅞ "		6⅞ "
	4⅞ in.	

From the above observations the final resting place of the "bob" is 4⅞ in. Now bring the wire slowly and carefully to 4⅞ in. and let it hang and swing. If it remains stationary, we have accomplished our desire. If it swings again, it is due to the vibration of the wire. In the same way the plummet on the wire *B* is adjusted. Now sight to wire *A* and then focus to wire *B*. If the set-up is not in the plane of the wire, then note the angle between the two wires, say, the wire *B* is 30 min. left of the wire *A*. Since the set-up is about 50 ft. from the wire, the transit will have to be moved to the right 0.44 ft. Make a point on the floor at the transit and measure off 0.44 ft. to the right at right angles to the plane of the wires and set the transit up on the new point.

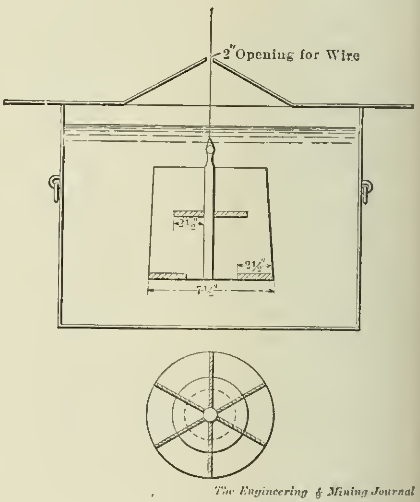
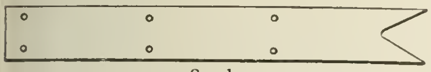


FIG. 3. SHOWING DETAILS OF PLUMMET ATTACHED TO END OF WIRE

ADJUSTING THE TRANSITS

Adjust the transit and sight to wires *A* and *B* as before. The instrument is then nearly in the plane of the wires. Now move the head of the transit to the right and left until it is in the line of the wires. When a sight to the wire *A* is taken, it will be noted that *B* cannot be seen. This indicates that the wire *B* is just behind *A*, so the sight will have to be taken through the ring, as shown in Fig. 2. After securing the observations on the wires, the distance between the two wires is measured to check up the measurement taken at the surface and also from the set-up to the wire *A*. Now cut at least two stations in the roof, each at least 50 ft. apart, and sights and measurements are taken as usual.



Spad
Fig. 5

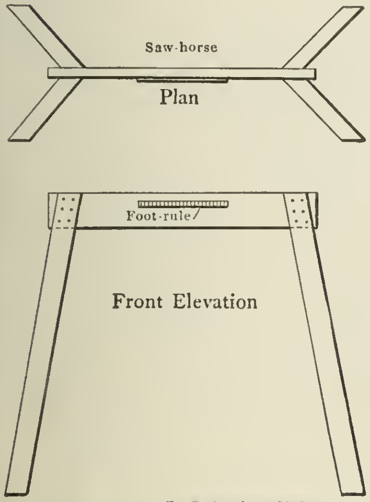


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Fig. 4. Sketch Showing Ordinary Light Sawhorse

After these observations are noted, drill a hole about 1½ in. deep over the transit, then drive a plug into it. The plug is centered by an ordinary spad and hang the plumb-bob in the spad so that it hangs directly over the center of the transit. Now move the transit to station 1 and backsight on the spad and foresight on station 2. In the same way the instrument is set up at station 2, and backsight is taken on station 1 with foresight on the spad. Stations 1, 2 and the spad form a triangle, and the sum of the interior angles of the triangle equals 180 deg. The plumbing of the shaft is completed and the plumbing apparatus should be disconnected.

Carrying the Elevations Underground

Now measure the depth of the shaft from the top of the rail outside to the top of the rail inside. If the depth of the shaft thus obtained is 395.75 ft., also assuming that the bottom elevation at the set-up under the spad is 1 ft. higher than the rail at the foot of the shaft, and further that the roof distance from the rail to the spad is 6.25 ft., then the elevation of the spad is 111.50 ft., if the elevation of the outside rail at the shaft is 500 ft. The elevations of station 1, 2, etc., can be calculated as usual. The inside surveys are then extended from these stations.

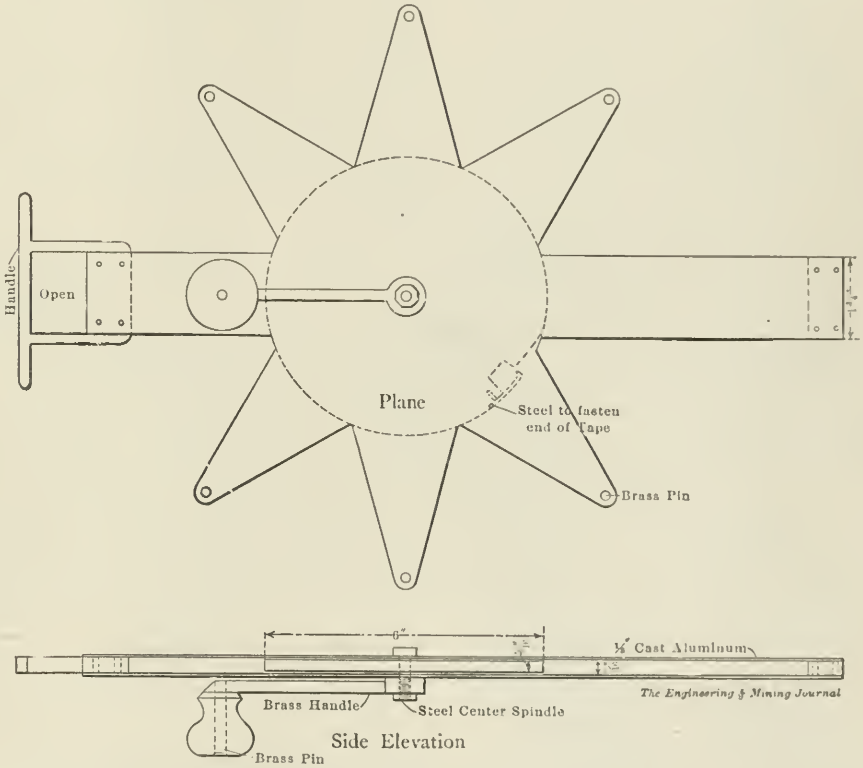
Only One Wire Is Required in Second Plumbing

Since the azimuth and coördinate values of the wires are known, the coördinate values of the spad stations 1 and 2 can be calculated as usual. This concludes the first plumbing. When the underground workings are connected with a second opening or an air shaft, another plumbing is necessary to check up the first one. In this case only one wire is required. So far as the general method is concerned the second plumbing is identically the same as the first one. The outside survey should be connected to the former plumbing.

The station upon which the instrument is set up should be within 50 ft. of the shaft; from this set-up it is advisable to sight to the wire which is hung on a spad as previously described and then measure the distance from the set-up to the wire. Next, calculate the coördinate values of the wire. In the same way determine the coördinate values of the same wire underground. If the outside and inside values do not check up, it is necessary to make two calculations to determine the course and distance between the last wire and the wire *A* of the former plumbing, one using the outside values and the other all the inside values. If there is more than 3 min. difference in the courses—outside and inside—the survey should be repeated.

A New Reel for Mine Surveying

The accompanying sketch illustrates an aluminum reel manufactured by the American Safety Lamp and Supply Company, Scranton, Penn., for use with steel tapes, such as are used in surveying in the anthracite mines of Pennsylvania. The advantage of this reel over many other forms, is that it is light, its weight is only 2½ to 3 lb. It is also compact, so that it is easily carried up a steep pitching place. It is designed in such a way, that the wear and tear and injury to the tape is reduced to a minimum. The side pieces of the reel are ⅛-in. cast aluminum and are riveted together by brass. The drum is also made of aluminum, being 6 in. in diameter and having a face 5/16 in. in width. On the circumference an arrangement for fastening the end of the tape is provided, with a steel strip and screw, as shown in the plan. The drum revolves about a spindle ¼ in. in diameter. The arm and handle of the drum are made of brass. This arrangement of the reel allows the tape to wind one wrap on top of the other. The reel holds a 300-ft. tape.



The Engineering & Mining Journal

Sketch of Aluminum Reel for Steel Tapes Used in Mine Surveying

Methods of Mining Lignite in Italy

The Principal Steel Works of Italy at Terni, Producing Armor Plates for the Italian Navy, Depends Almost Entirely on Lignite for Fuel

BY CHARLES R. KING*

The small amount of coal produced in Italy, although not thus detailed in the usual lists of the world's production of black coals, is practically all lignite. This lignite comprises vegetable fibers in all stages of fossilification—some even but slightly metamorphosed from their primitive structure. An examination of many truck loads of Italian lignite in transit from mines to consumers shows that it is often indistinguishable from pieces of old riven oak. When completely fossilized or mineralized, it may be properly called brown coal (*braunkohle*).

Generally speaking, the Italian lignite is of low calorific value, averaging 2500 cal. per kg., as compared with the *braunkohle* of Bohemia and Hungary, which has a general average of 3500 cal. per kg. It is, in fact, only suited for lean gas making in industrial establishments, or for firing stationary steam boilers. In Austria, Bohemia, Hungary and Saxony, its superior steam-raising power enables it to be used in locomotive boilers. In Bohemia it is used with great economy in the boilers of even the express locomotives hauling important international trains, and I have had several occasions of observing how well the furnace fires are fed with this Bohemian lignite exclusively and without any admixture with the poor black coal of Austria; the fire, when half burnt through, closely resembling one of cannel coke. It is, of course, rather soiling, the locomotive and cars being sprinkled with the yellow dust.

LIGNITE USED IN STEEL MANUFACTURE

The principal steel works of Italy, producing armor plates for the Italian navy, depends almost entirely upon lignite for fuel. as do those of Hungary also; the steel company mines its own lignite close to the works at Terni, in Umbria.

During visits to all the principal metallurgical works of Europe, I inspected the lignite mines near Terni. These mines cover an area of 10,000,000 sq.m., the coalfield being represented almost totally by one seam, varying from 4 to 9 m. in thickness (13 to 30 ft.), with an average of 6 m. (20 ft.). At a hight of about 8 m. above this seam is another occurring in places, but of only a few cm. thickness and unimportant in value for mining purposes. The estimated area of the ligniferous strata is 3,500,000 sq.m., and this multiplied by the thickness of 6 m. represents a volume of 21,000,000 cu.m. or metric tons. Allowance being made for walls and pillars to be left unmined for the support of water courses, roads, villages, and also for the considerable faults which have divided the seams into as many different parts, the actual cubic volume of lignite has been estimated by one authority to be only one-third of the total ligniferous area, that is 7,000,000 cu.m. or tons.

In actual working, the experience of 10 years' operation has, however, shown that every square meter of surface worked has yielded on an average about 4½ tons of lignite, from which it would appear that the coefficient of reduction for the greatest unknown factor, that is, the one due to structural faults, would be only three-quarters. The average production of the mines is 1,000,000 tons in 10 years.

The lignite is employed only for gas making and for the firing of forge furnaces at the Terni blast furnaces and steel works, because the whole of the motive power of that establishment is derived from the water falls of the Marmora, the energy being transmitted by means of electric current, compressed air, etc. The production of lignite is, therefore, limited to the requirements of the heating furnaces alone, and the total value of fossil coals used yearly is supplemented by the coke for the blast furnaces, this latter being the only fuel which has to be imported from abroad, since Italy has no coking coal.

REDUCING THE MOISTURE CONTENT

Freshly mined, the lignite from the Spoleto mines contains 35 per cent. of hygroscopic water and its calorific power is then about 2560 cal. per kg. weight, on an average. By dessication, this quantity of humidity may be reduced 20 per cent., but this process not only increases the proportion of small coal but it also drives off hydrocarbons of considerable thermic value, that is, the most volatile of them, so it has been found best, by long experience, to burn the lignite while still humid, particularly as the principal center of its consumption is not far distant from the mines.

The fixed carbon content of the lignite varies, according as the fuel is ligneous or peaty, between 35 per cent. and 31 per cent., and the volatile matters vary in content from 64 per cent. to 61 per cent.

The product of the Spoleto mines, near Terni, is subdivided into four classes, as follows:

1. Big lumps, as mined, selected in the place.
2. Nobs, obtained by screening all which remains from the first selection.
3. Smalls, the product of a second screening, composed of pieces of 1 in. to ¼ in. in size.
4. Slack or dust, remains of the second screening, containing the largest proportion of argillaceous matters, generally in the proportion of 50 per cent.

The two first qualities are used almost wholly for gasification at the steel works of Terni; the third quality is used for steam raising at the mines and also sold for the same purpose, baking bricks, etc. The fourth quality is bought by agriculturists for lightening heavy clay soils and to mix with stable manure of which it absorbs the ammoniacal gases, so forming a valuable fertilizer.

The seams worked comprise two varieties of lignite, the one of a peaty nature, of a deep chocolate hue, opaque, and with a schistic structure, very often containing ligneous elements visible in the brown mass as stripes of yellow hue more or less intense; density, 1.24. The other variety consists of arborescent plants, of which the structure and color are still retained, often revealing the family to which they belonged mostly coniferæ; average density, 1.20.

METHOD OF DEVELOPMENT

The method of working the lignite beds is shown by the accompanying illustrations, for which I am indebted to the steel-works director. The system employed is longwall, that is, the seams are completely worked out and abandoned to goaf at once. The plan of the work is shown in Fig. 7. Here on each side of the main (inclined) shaft *A A*, see Figs. 1 and 7, a number of roads *b b* are headed off in the seam, each one distant 16 m. (53 ft.) from the other, measured along the inclination, and all laid with tracks running toward the inclined shaft *A A*. This shaft is equipped with tracks and a balanced-cable haulage system by means of which the trucks loaded with lignite are raised to the principal levels —as shown in Fig. 19—which in turn communicate with the main shaft of the pit. The seam being set out with roads and cross roads, or gates, as shown in Fig. 7, the attack is then made at the limit of the district or panel *c c*, which is a gate, termed in Italian *galleriozzo*—presumably a combine of "gallery" and *pozzo*, a pit—which ascends from the upper haulage road *b b*.

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*Engineer, Staple Hill Park, near Bristol, England.

This gate, of reduced section, is commenced at 2 m. distance from the end of the panel and is, as shown by the dimensioned plan, Fig. 7, 16 m. or 53 ft. in length, and terminates at its highest point in the old goaf or abandoned levels, at which point understoping is commenced in the *place, a,* which is 4 m. or a little over 13 ft. square; in consequence of its shape this *place* is termed in Italian *camera,* or chamber, and upon the roof of this chamber, understoping is then begun.

The length of the gate or *galleriozzo* is subdivided into 4 *places* or *camera*, that is 4 × 4 = 16, as illustrated in Fig. 9. The *camera a* is excavated to the full depth of the lignite seam and *goafed,* followed up by the *camera a* in the same manner. While one gang is mining out the band from *a* down to *a″*, see Fig. 9, another gang is driving a second and parallel *galleriozzo*, 4 m. distant from the first; this latter gang proceeds to understope the *places b b′* by the time that the first gang is nearly down on the tributary road *b*.

Under normal conditions of working, stoping proceeds in 4 *places*, or *camera*, simultaneously, and on both sides of the inclined shaft *B A* in Fig. 8, as indicated by the varying lengths of the gates shown below the goaf. By subdividing the main level into as many secondary levels as are required, the necessary number of working places may be laid out for any predetermined rate of production.

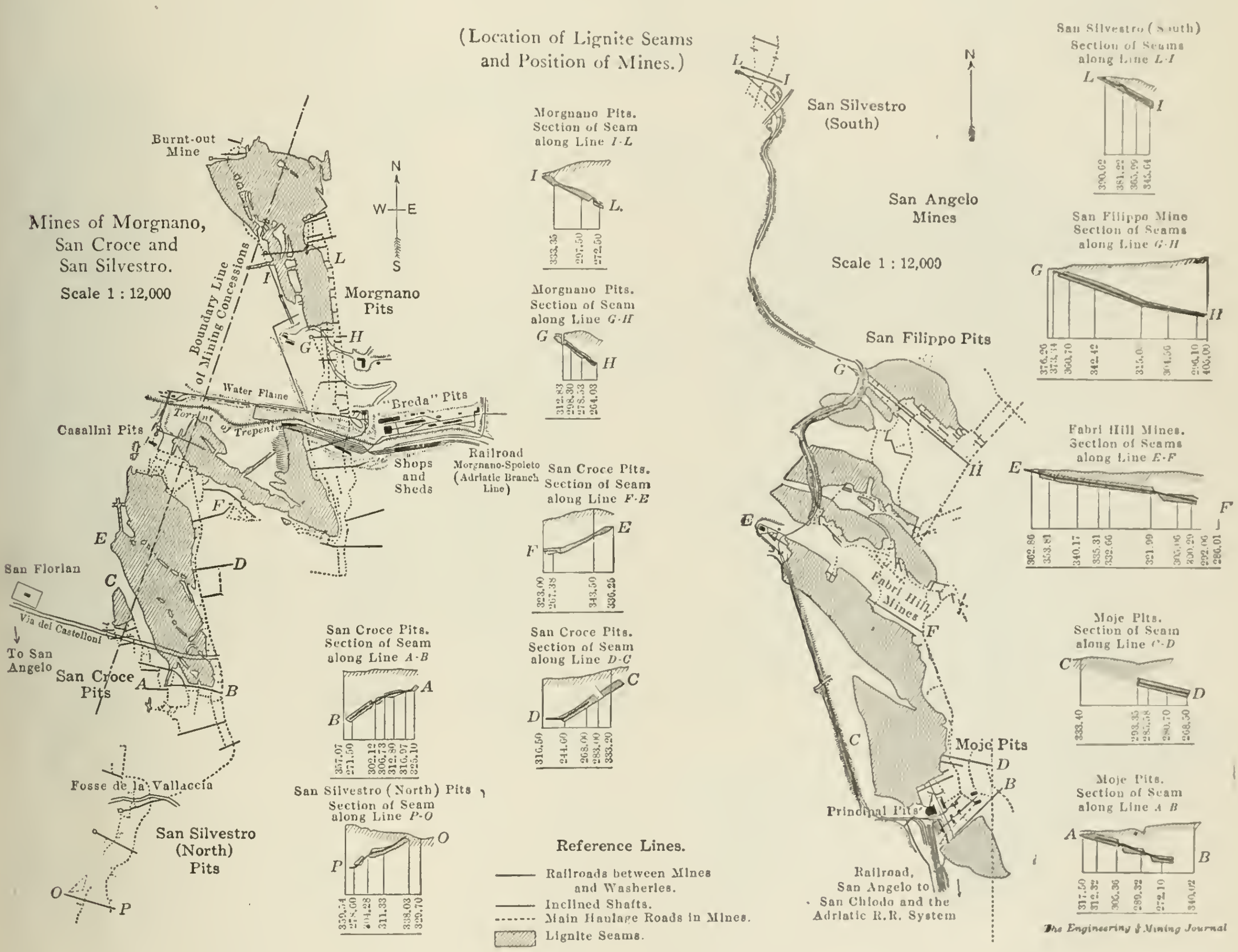
A vertical section of the plan, Fig. 8, at *B A*, is given in Fig. 10, showing the inclined road *A B* provided with a balanced wire-rope haulage system and with short landing roads; these landings are provided at the end of each level road, for the switching of loaded trucks which are to be raised, and of empty ones coming down as balance. The working is controlled by compressed-air winches of about 12 h.p. These level crossings are avoided, or become unnecessary, when the special form of hoisting truck, or truck-carrier shown in Fig. 19, is employed.

The Method of Understoping

The actual process of understoping the lignite seams will be understood by reference to the groups of Figs. 11 to 18, showing the details of operation in plan and section side by side. The collapse of the roof fills the goafed or worked part as fast as the back of the level is reached.

The seam to be stoped is represented in plan, Fig. 11, comprised within the area *a b c d*, the work commencing by means of a hand level about 5 ft. 3 in. high from the thill, or floor, and having as working faces the roof and two walls in the lignite, as shown developed in Fig. 13. From the two other walls the goafed material which rolls into the *camera* consists of blocks of marl which gradually form a talus of about 45 deg. Gradually the scarp advances, reducing by about 5 ft. the level floor of the *place* and extending along the gate or *galleriozzo* to a distance of 8 feet.

At this stage the miner prepares to


(Location of Lignite Seams and Position of Mines.)
Mines of Morgnano, San Croce and San Silvestro.
Scale 1 : 12,000
Burnt-out Mine
N
W
E
S
Boundary Line of Mining Concessions
L
I
Morgnano Pits
G
H
Water Flame
Torrent Trepente
"Breda" Pits
Casalini Pits
Shops and Sheds
Railroad Morgnano-Spoleto (Adriatic Branch Line)
F
E
D
C
San Florian
Via del Castelloni
To San Angelo
San Croce Pits
A
B
Fosse de la Vallaccia
San Silvestro (North) Pits
O
P
Morgnano Pits. Section of Seam along Line I-L
I
L.
333.35
297.50
272.50
Morgnano Pits. Section of Seam along Line G-H
G
H
312.83
298.30
278.53
264.03
San Croce Pits. Section of Seam along Line F-E
F
E
323.00
267.38
343.50
336.25
San Croce Pits. Section of Seam along Line D-C
D
C
316.50
244.60
268.00
283.00
333.20
San Croce Pits. Section of Seam along Line A-B
B
A
257.07
271.50
302.12
306.13
312.80
316.97
325.10
San Silvestro (North) Pits Section of Seam along Line P-O
P
O
311.33
338.03
329.70
Reference Lines.
Railroads between Mines and Washeries.
Inclined Shafts.
Main Haulage Roads in Mines.
Lignite Seams.
L
I
San Silvestro (South)
N
San Angelo Mines
Scale 1 : 12,000
San Filippo Pits
G
H
E
Fabri Hill Mines
F
C
Moje Pits
D
B
Principal Pits
Railroad, San Angelo to San Chiodo and the Adriatic R.R. System
San Silvestro (South) Section of Seams along Line L-I
L
I
390.02
381.27
363.09
343.64
San Filippo Mine Section of Seams along Line G-H
G
H
376.26
373.74
360.70
342.42
301.56
296.10
405.00
Fabri Hill Mines. Section of Seams along Line E-F
E
F
362.86
353.81
340.17
335.31
332.66
321.99
300.29
292.06
286.01
Moje Pits. Section of Seam along Line C-D
C
D
333.40
298.35
280.70
268.50
Moje Pits. Section of Seam along Line A B
A
B
317.50
312.37
305.36
289.32
272.10
340.02
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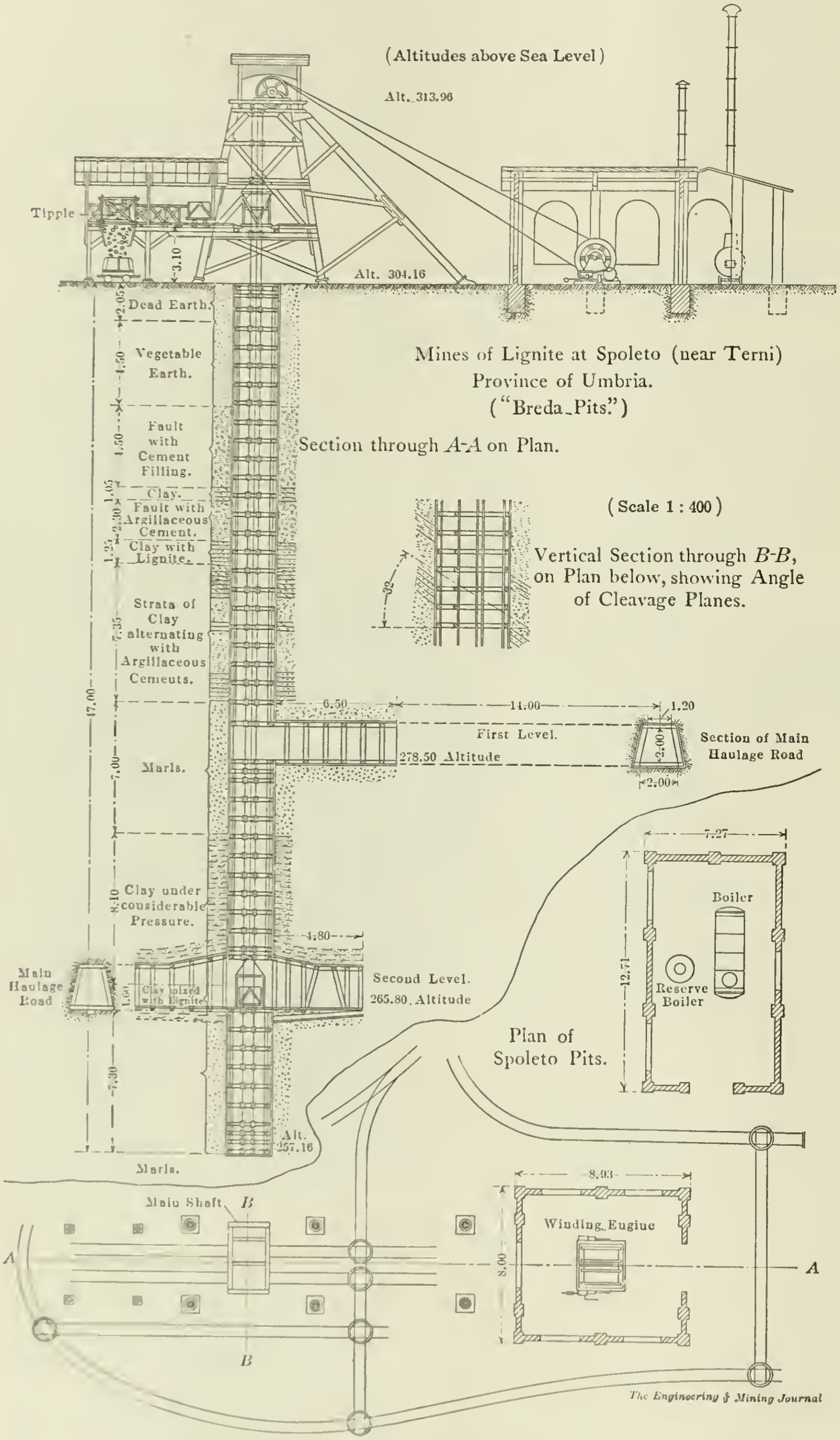
Example of Lignite Mining Layout Near Spoleto, Italy stope, or sump, about 30 in. from the back of the seam by means of a kirvel, or undercut channel, in the mass which is to be brought down, usually by means of a shot. This channel is hewn out by means of a pick having an ax at one end and a gouge at the other, termed a *malimpeggio* ("bad to worse"). When the sump is brought down, and the lignite product removed, the miner uses his pick to glide the spoil or gob into the goafed *camera* or *place*. In this way the floor is covered to a depth of about 30 in., upon which raised level the miner has again brought the roof to within a distance of 5 ft. 3 in. from his footing.


(Altitudes above Sea Level)
Alt. 313.96
Tipple
3.10
Alt. 304.16
Dead Earth
2.05
Vegetable Earth.
4.50
Fault with Cement Filling.
4.50
Clay.
1.05
Fault with Argillaceous Cement.
2.30
Clay with Lignite.
1.25
Strata of Clay alternating with Argillaceous Cements.
7.35
47.00
Mines of Lignite at Spoleto (near Terni) Province of Umbria. ("Breda Pits.")
Section through A-A on Plan.
(Scale 1 : 400)
Vertical Section through B-B, on Plan below, showing Angle of Cleavage Planes.
6.50
14.00
1.20
First Level.
278.50 Altitude
Section of Main Haulage Road
2.00
2.00
Marls.
7.00
Clay under considerable Pressure.
8.10
4.80
Main Haulage Road
Clay mixed with Lignite
1.60
Second Level.
265.80 Altitude
7.30
Alt. 257.16
Marls.
7.27
Boiler
Reserve Boiler
12.71
Plan of Spoleto Pits.
Main Shaft
B
A
B
8.93
Winding Engine
8.00
A
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SECTION THROUGH SHAFT AND ENGINE HOUSE
(Figures represent meters)

To prevent this filling, and the successive fillings which raise the floor level, from invading the cross gate or *galleriozzo*, the miner bars the entrance to the latter by means of timbers placed one above the other in measure as the level rises during successive operations of stoping (see plans through *PQ*, Figs. 11 to 17). However, as the working passage or gate would eventually become obstructed by these timbers, without possibility of the miner getting out or in again, he hews out of the lignite, and near the barrage, a small shaft, or preferably a manhole half-round in section and serving as a passage. By this method, in successively stoping the roof and raising the floor level, the back of the seam is reached at hights of 20 and 23 ft. from the thill. Some care is necessary in bringing down the last 3 ft. thickness of the seam, but the miner has always a safe retreat in his manhole, where there is no danger during collapse of the roof or walls.

In some of the pits, as at San Angelo, the *places* or *camera* are always made, as described, 4 m. in length and width; but at other pits, Morgnano for instance, it is necessary, on account of the nature of the deposits, to make them of only 3 m. (10 ft.) rectangular section. In the latter case the gates or *galleriozzo* cave in rapidly, and under the effect of heavy pressure, the walls and roof of the *places* are always fissured and subject to movement, often presenting to the view great masses of lignite strata broken and jumbled, necessitating considerable outlay for propping and lagging, or entirely lining with steel girders, but entailing scarcely any expense for explosives.

There are, however, comparatively few accidents to deplore in spite of the instability of the strata cut through by the various access galleries, and this for the reason that the swelling of the clay enveloping the seams is slow in action, giving always a certain indication of its movement, in due time, and never subject to sudden collapse as in the case of friable strata.

THERE IS NO SYSTEM OF MECHANICAL VENTILATION

During stoping operations in the places or "chambers," the air arrives through the haulageways by diffusion, there being no regularly installed system of forced or mechanical ventilation; however, as the "gates" have only to carry the air a short distance to the working places, the air is sufficiently respirable.

A regular system of forced ventilation has not been found necessary in these lignite mines, since lignite does not, like coal, continually throw off inflammable gases requiring to be diluted with an abundance of air forced in from the outside.

At the Spoleto mines the ventilation of the levels and secondary galleries is effected by natural draft through shafts having orifices situated at different altitudes and sufficing to circulate the air.

At Morgnano there are two shafts, the mouth of one being on the hill of Morgnano at an altitude of 375.8 m. above sea level, and the other on the hill of San Croce at 350.5 m. altitude. The lowest outlets of the two shafts respectively are, 298.7 m. at Morgnano, and 312 m. at San Croce. These differences of level of 77 m. at Morgnano and 38.4 m. at San Croce suffice to create the necessary flow of the air in the different pits named. At the mines of St. Angelo, the draft is induced by means of an air-return shaft in the pit of San Fillipo, which is situated at the highest level of all the pits, with its mouth and 50 m. higher than the pits of Moje, which have the lowest level of the group.

This natural air current is due to the difference in weight of the air at different temperatures. For instance, in summer, when the outside air is warmest, it centers, as a rule, at the highest elevation, traverses the shafts and levels, and escapes at the lowest level. When the air is coldest outside (as in winter or at night) the current is inverted and the air usually enters at the lowest level. These inversions of current occur not only with change of season, but with the diurnal changes.

NATURAL VENTILATION

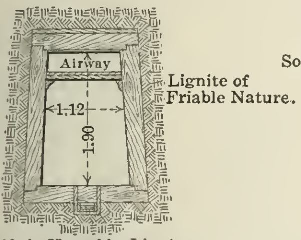
In Italy, as in fact in all neighboring regions, including the French Riviera, the daily temperature variations touch the extremes of cold and heat, and these variations are marked, at certain hours of the day, by a change in the direction of the underground currents coursing through the lignite mines of Spoleto. The change is preceded by a calm, or standstill, of the natural air currents in the mines, and this state is also normal for whole days whenever the seasons themselves are changing and when the outside air is balmy without the characteristic "continental" transitions from the heat of midday to the extreme cold of midnight—"English" weather, in fact.

At such periods the equability of the atmosphere results in an outside temperature approaching the mean temperature of the "levels" in the mines; and this equilibrium of the temperatures suspends the natural movement of the air through the galleries and shafts. The general supposition that heated air always rises into the cold air above it is frequently mistaken under different barometric and meteorological conditions; cold air will, in fact, descend to warmer and lower levels with as much facility as cold air will rise into warmer air prevailing above. Thus, when the outside air is clear and dry, at freezing temperature, and a trap in the roof of a warm chamber is opened, the outer cold air descends and repels the warm air in a strong, continuous wind; if the weather then changes to rain and the temperature runs up to 46 deg. F. while leaving the inside temperature unaltered at 40 deg. F., then the current through the trap becomes inverted and the cold, inside air flows freely outward in ascending into the warmer and moist air above. This natural phenomenon of cold air thus rushing toward air of a higher temperature, whether the latter is at higher or lower levels, is sometimes available for the application in the natural ventilation of underground passages.

When the natural air currents are insufficient, it has been customary at certain Spoleto mines, notably at the San Croce pits, which are shallowest, to start fires near the base of the air shaft, thus warming the ambient into which the colder air, lower down, will more freely rise, so inducing an upward current. Resort is also sometimes made to fans, but the conditions are not, or were not at the time of my visit, considered to be such as would justify the installation of regular ventilating plants.

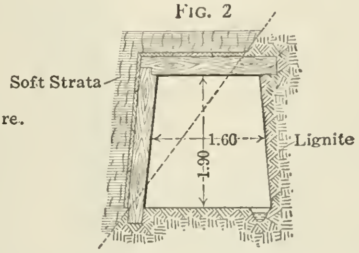
Compressed air is often used for winches on the inclined planes in the

FIG. 1



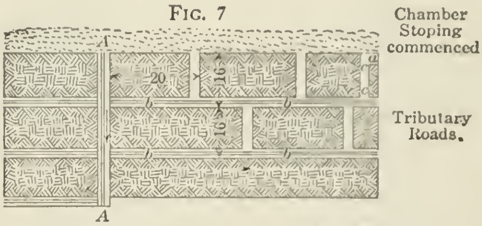
Drift in Unstable Lignite.
Exploration Drift, All-timbered, with Drain Channel and Air Return-way.

FIG. 2



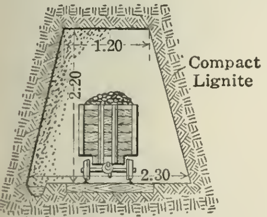
Tributary Road.
Half Timbering in Soft Strata on one side only, and omitted in Compact Lignite on other side.

FIG. 7



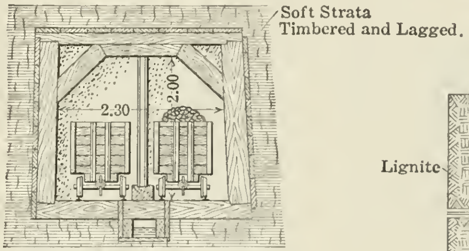
Plan of Panel with Tributary Roads and Cross Gates, preparatory to Stoping.

FIG. 3



Section adopted in Firm Lignite Seam, No Timbering necessary here.

FIG. 4



Section of Main Road built for Double Haulage Road,
Heavy Timbering supported on center by I-Section Beams in Unstable Soils.

FIG. 8

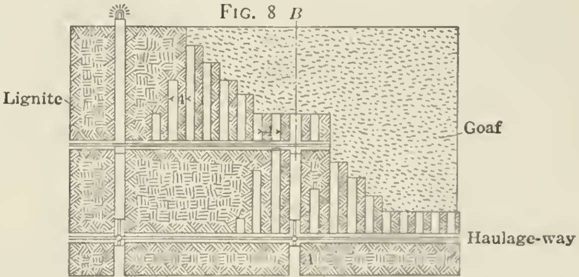
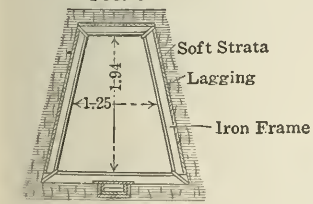


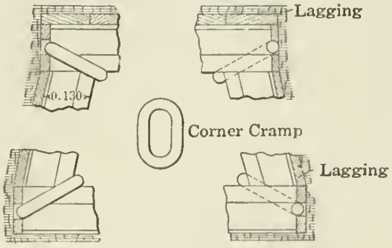
Fig. 8. Plan of Stoping Operations.
(Figures Indicate Meters)

FIG. 5



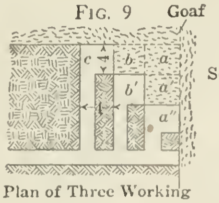
Iron Framing for considerable pressures.

FIG. 6



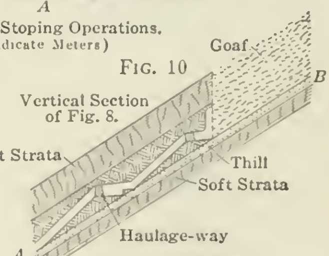
Details of Corner Cramps & Iron Frames in Fig. 5.

FIG. 9



Plan of Three Working Chambers at End of Panel.

FIG. 10



Vertical Section through *A-B* Fig. 8.

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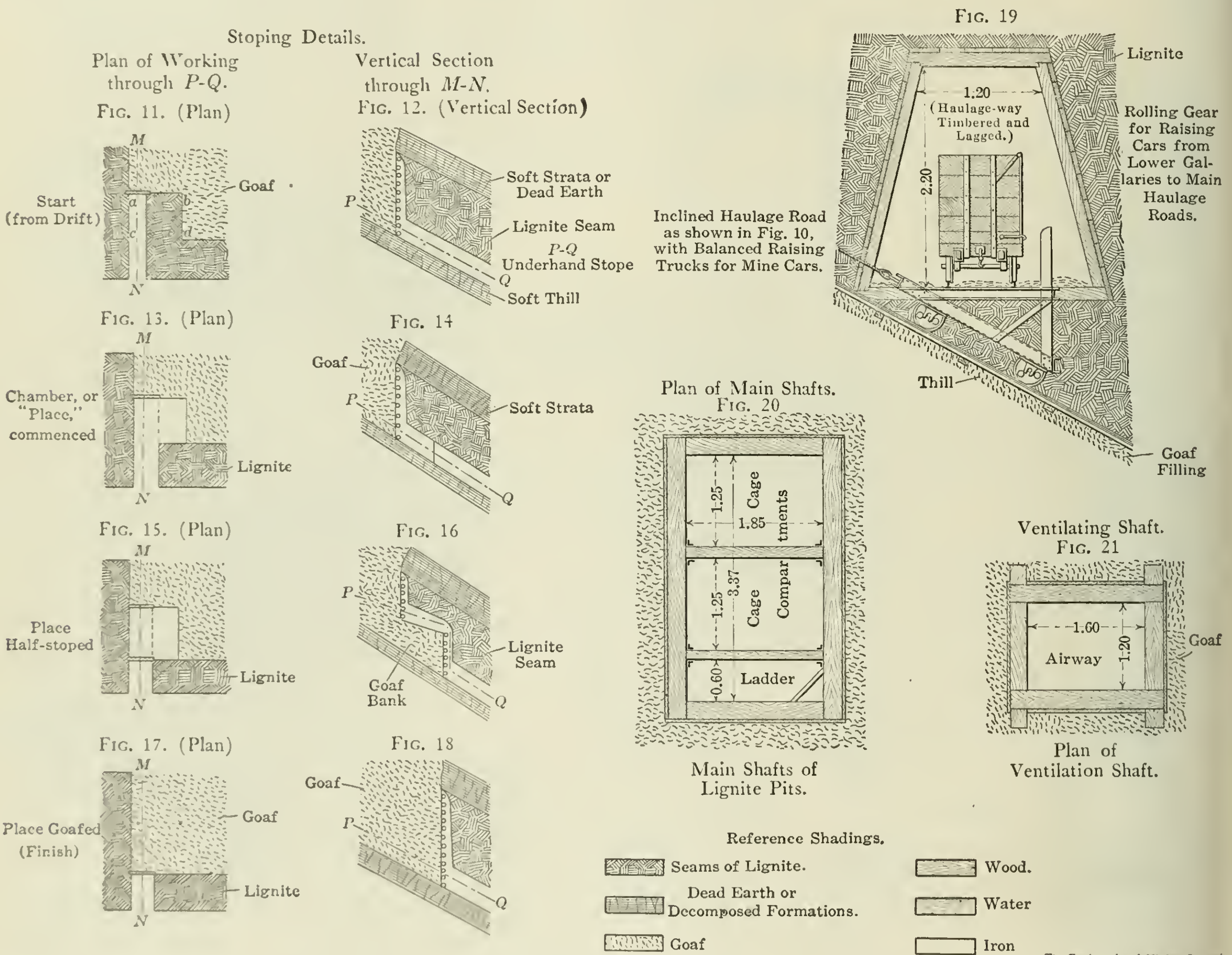
DETAILS OF TIMBERING AND PLAN SHOWING METHOD OF DEVELOPMENT
(All figures represent meters)

mines and for other tools, and is also employed in some cases to ventilate the workings; it is utilized in the long exploring drifts of the San Angelo mines where there is no natural air current.

The methods of coal getting previously described are found to be suited to thick seams whose inclination does not exceed 35 deg. and where the lignite is of a light brown color, entirely free from any firedamp.



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Stoping Methods Shown in Detail, and Balanced Truck for Raising Cars up Incline

Mine Fires Frequently Occur

Mine fires are of frequent occurrence, probably by reason of the amount of slack unavoidably lost in the goaf during stoping, and it is rare to work a thickness of above 2 or 3 m. without starting a fire, which can never be extinguished but will usually go on smoldering for years once it has taken firm hold. These fires occasion no other inconvenience than the loss of the lignite which had not been won, provided the works have been well laid out, so as to limit their effects. There is no danger of fire whenever, for any reason, a mine is laid out with numerous levels, sublevels, headingways, gates, cross gates and other drifts. It is only where the lignite walls are actually broken by stoping operations, that is, no longer intact and swept by the air currents, that combustion is generated; as a consequence, fires are usually limited to the portions already partly worked.

No instance occurs of a fire in unbroken walls having contact with the air. Where a pit, partly worked, has to be abandoned for a time, it is usual to take all precautions against fire in the stopings by excluding the air. If, nevertheless, a fire breaks out and spreads, the practice is to cut out, or isolate, the burning zone by building up earthen walls, from thill to roof, in all galleries approaching the locality of the fire, which district thenceforth becomes lost for further cropping.

In the lignite mines of Spoleto, the fires never give rise to very serious consequences because, to begin with, the longwall system is employed and the lignite is completely stoped from thill to roof, and this goafed area is never entered again; secondly, because the stoping always proceeds at the extreme limits or periphery of a panel or district, that is, on the fringe of the goaf field, so that fires are readily shut off, and the locked-in combustion gases are forced to expend themselves in creeping through the interstices of the goaf instead of seeking an outlet through the dirt walls built up and barring them from the other parts of the mine.

But Little Water Has to Be Handled

Drainage of the lignite mines of Spoleto is light, for the inflows are small, the greatest volume being due to rain water filtered through the goaf and variable in quantity according to the season of the year. If the season is wet, the inflows are in proportion; if dry, the inflows gradually cease. The proportion of water entering by percolation is not in ratio to the areas goafed, for the reason that the goaf gradually consolidates under the effect of pressure and filtrations, and the interstices then disappear, giving no longer free passage to surface waters. The water is removed from the mines by pumping into cisterns which, in turn, are raised to the surface by means of the usual hoist gear and cages.

The mines of Spoleto, near the town of Spoleto, are divided into two principal divisions, one named Morgnano, with pits at Morgnano, San Croce and San Silvestro, and another named San Angelo, with pits at Silvestro South, San Fillipo, Fabri and Moje. The mined and screened lignite is transported from the lignite fields over an ordinary-gage railroad, 15 km. in length, connecting the two collieries with the station of Morgnano, which is on a branch from Spoleto. The great steel works of Terni lie between Orte and Spoleto and take the largest consignments of lignite.

HANDLING THE OUTPUT

The main shafts of the mines are rectangular, being 66 ft. one way by 6 ft. the other; they are divided into two hoisting compartments and one division for pit ladders, signal tackle, etc.; see Fig. 20. The shafts at the various pits have winding engines of from 50 to 70 h.p. and Cornish-type steam boilers. The arrangements differ at the different pits. Fig. 1 shows the general disposition of the plant at the Breda pits. The cars are hoisted to the landing stage, about 10 ft. above the mouth of the pit, run onto the tumbler and there tipped into two hoppers—one for large lignite and one for smalls. From here, the trucks are despatched to the washeries situated at a lower level on the side of the hill. The center of the winding drum to center of the shaft is, in this example, about 18 meters.

The shaft cages weigh 1760 lb. and are guided by four steel rails of about 18 lb. to the yard; the mine cars weigh about 100 lb. and hold approximately 1300 lb. The outside or surface cars have a capacity of 2600 lb. All are of the well known Koeppel (Berlin) type.

The Moje pit—not illustrated—is run with a 70-h.p. winding engine and here the cars are hoisted to a top stage landing upon a platform carried by the connecting span or bridge of the headframes, 10 ft. above the shaft's mouth, and there dumped by a tumbler into a trommel run by a 12-h.p. motor. The cages weigh about 1300 lb.; the cable pulley, at a hight of about 33 ft. above the pit, is 40 in. diameter, and the winding drums are 80 in. diameter. The weight of the mine cars when loaded, is 1300 pounds.

The various pits of the different mines are situated at a higher elevation than the washeries and the car sidings, and to utilize the force of gravity of the descending trains, there is a complete system of automotor planes and counterplanes controlled by double-drum winches fitted with powerful brakes by means of which one train, with 10 to 15 Koeppel cars, is hauled in a direction opposed to that of another proceeding on the adjoining track.

The declivity and its length are variable. As an example of one surface line, connecting the pits together and to the cleaning sheds, the San Angelo mines may be mentioned. Between the pits of San Fillipo and the Fabri hill, the grade is 2.4 per cent. to 2.6 per cent. in a length of 1600 ft., after which there is a drop of 130 ft. in a distance of only 1300 ft., which is worked by means of the automotor planes referred to under the control of a powerful double-drum braking attachment. The system is planned to permit of a number of switching operations being performed on different inclined planes and without resort to other motive power than gravity.

At the first level on the hillside are situated the screening or washing plants, and from which the cars of small lignite then descend (and past which the cars with large lignite descend direct from the mines) to a lower level where the whole lignite product of the mines is passed over the weigh-bridges, previous to proceeding a quarter mile farther on to the large broad-gage trucks or coal cars of the Italian railroads. The gage of the mine railways is 23½ inches.

At the washery, the small lignite from the mines is passed through bumping screens fixed to stagings 6½ ft. high, and from which the products descend through chutes into the cars below, the large sizes into cars outside the staging and the small sizes into cars beneath the staging itself. The system of ordinary tracks and inclined tracks with automotor haulage, braking apparatus, turn-tables, etc., for the special needs of the mines and washeries comprises about 10 km. of line, as compared with the 11 km. of underground lines in the mines themselves, for the operation of which there are, in all, about 700 cars.

NOT MUCH MACHINERY REQUIRED

The nature of the fuel and conditions under which the exploitation is effected do not call for much important machinery. The product is principally for one consumer—the steel works of Terni—and the situation is in Italy where labor is cheap and the question of time is also of comparatively small importance. But considering Italy's dearth of mineral treasures, its lignite mines are of considerable interest and are perhaps not yet appraised at their full potential value.

The State railway, which is one of the largest coal consumers, is experimenting with oil fuel as a means of reducing the heavy toll which it pays to England and Germany for black coal. Even America has been tried for Italy's coal supplies. An Italian railway official at Venice told me recently how near America once came to being one of the greatest coal suppliers to Italy. An American multi-millionaire, whose name is universal, was combining business with pleasure in a sojourn at Venice, which would have been the future discharge port for American coal. The prices to be paid were always expressed in "L." and the millionaire thought there was really a good field for harvesting. At some point in the negotiations he learned that the sign "L." stood for "lira" and not the English libra "£"—or only one twenty-fifth the value of the latter. At this stage the millionaire became inarticulate and the proposed contract was nevermore heard of.

The problem of fuel remains still a most important one for Italy, for the fabulous tales of Italy's wealth of "white coal," i.e., water power, appear to be as far from practical realization as 10 years ago. The Steel Works of Terni are run almost wholly by water power, but coal and coke are still urgently necessary for their furnaces.

The Palos Explosion

The explosion in the mine of the Palos Coal and Coke Company, May 5, caused the death of 83 men. Every man in the mine at the time of the explosion perished. The State mine inspectors have decided that the explosion was caused by a pocket of gas being ignited by a naked lamp. Dust played a part in carrying the fatal explosion through the mine. It has also been decided that gas caused the explosion in the Mulga mine of the Birmingham Coal and Iron Company, April 20. As a result of this latter explosion, 40 miners were killed.

The coal-mining industry in Alabama has been greatly stirred by these two recent explosions, and as a consequence, the Alabama Coal Operators' Association will name a committee to figure on some new mining laws to be sought from the next legislature. Extraordinary care is being taken in the inspections of mines throughout Alabama at the present time, and sprinkling of all dust is being carried on in many places. Considerable difficulty is being experienced in persuading the colored miners to continue working in the gaseous mines.

Explosion Caused by Defective Ventilation

In the report of his investigation of the explosion in one of the mines of the Youghiogheny & Ohio Coal Company, near Amsterdam, O., State Mine Inspector Harrison says that defective ventilation caused the disaster. The Youghiogheny explosion was the most disastrous mining accident that has occurred in Ohio in recent years. Inspector Harrison says: "Indications show that one of the machine runners went into the left entry for some purpose which can only be surmised, and that he came in contact with and ignited a body of gas which had accumulated from defective ventilation." Mr. Harrison further says that "the opening of a door, thus deflecting the current of air from that portion of the mine where the explosion occurred, caused the gas to accumulate."

Sinking the Woodward No. 3 Shaft

Unusual Methods Were Required to Sink through Gravel and Quicksand Saturated with Water, and Make a Water-tight Connection with Rock

BY R. V. NORRIS*

The Woodward Colliery of the Delaware, Lackawanna & Western Railroad Company, located in the Wyoming valley near Wilkes-Barre, Penn., is the largest colliery of this company, and its record production of 908,168 tons in 1907 is probably the largest of any anthracite colliery to date.

The total coal area tributary to this colliery is a little over 1000 acres, of which about 300 acres is on the slope of the Kingston mountain, and the balance on the Susquehanna river flats and under the bed of the river. All this flat area is covered by a heavy wash, ranging from 60 to over 200 ft. in depth, and is subject to overflow during floods.

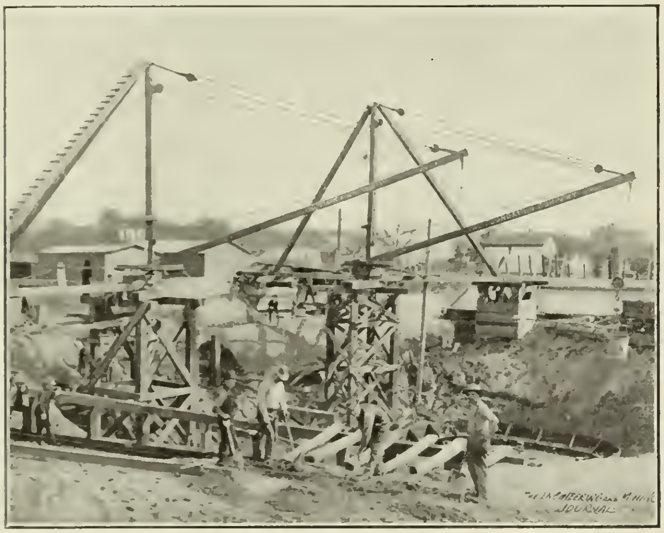

FIG. 1. SHOWING DERRICKS USED TO COMPLETE THE STEEP SLOPING SIDES OF THE EXCAVATION

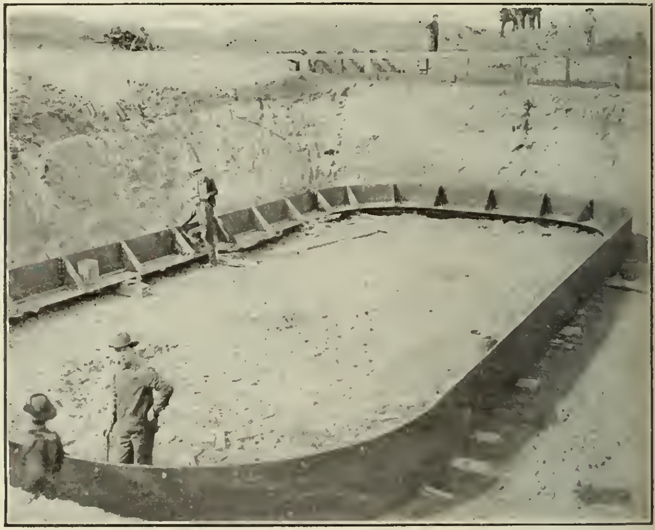

FIG. 2. ON OCT. 14, WORK WAS STARTED PUTTING THE CUTTING EDGE IN PLACE

The coal is hoisted through two shafts and a slope, all on the high land, and in 1907 the workings had extended in the Baltimore bed about 4000 ft. southerly toward the Susquehanna river from the nearest shaft, where further advance was interfered with on account of the difficulties of ventilation. The colliery is essentially a gaseous one, and even the four fans in operation were insufficient to keep the faces clear of gas at all times.

It was decided in the spring of 1907 to sink another shaft, to provide adequate ventilation for the southerly portion of the property, and to work upper beds which could not be safely reached from the old shafts on account of the great depth of wash close to the hillside, but which by their dip to the southward, and by the decreasing depth of cover in that direction were workable in the southerly portion of the property.

The final location of the new shaft, known as the Woodward No. 3 was made about 1000 ft. southerly from the face of the workings, at a point where borings had shown the depth of wash to be a minimum.

UNUSUAL METHODS REQUIRED IN SINKING

As the surface on the flats is but a few feet above the river, and the wash of clay, gravel and quicksand is fully saturated with a water level varying with the rise and fall of the Susquehanna river, it was at once recognized that unusual methods would be required in sinking to make a water-tight connection with the rock.

The only previous shafts which have been successfully sunk through this heavy wash, are at the Mt. Lookout Colliery of Simpson & Watkins, now the Temple Iron Company, where after many failures, wooden caissons sunk with compressed air were finally successful, but at very great cost, and the Pettebone colliery of the Delaware, Lackawanna & Western Railroad Company, where timber cribs were sunk open in ground partly drained by heavy pumping, and from which the ground water was largely cut off by trenches packed with clay.

As a preliminary to selecting a method for sinking the Woodward No. 2 shaft, five test holes were bored, one in the center and one 25 ft. beyond each proposed corner of the shaft. These were drive pipes to rock, and in each a diamond drill hole was continued into solid measures. The holes, as shown on the shaft drawing, showed the wash to vary from 68 to 72 ft. in depth, and to consist of sand and gravel, with over 30 ft. of blue clay in the bottom. While the records of the holes indicated that the clay was continuous to the rock it was recognized that there was a possibility of some sand at the bottom of the holes having been missed by the pipes plugging with clay while driving. This actually proved to be the case, but had but little effect on the work.

The size of the shaft inside the concrete was fixed at 14 ft. x 48 ft. 10 in., as shown on the drawing, Fig. 3, and to stiffen the caisson, concrete cross walls were provided between the hoisting and pumping compartments, as well as between the pumpway and airway. The latter wall is to be extended to the bottom of the shaft to permanently separate the airway from the hoistways by a fire and explosion-proof brattice, which is necessary in view of the expected use of the shaft for some time at least as both an intake and outlet airway.

DECIDED TO SINK A REINFORCED CONCRETE CAISSON TO ROCK

After full consideration of the many methods proposed, the proposal of "The Foundation Company of New York," to

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*Consulting engineer, Wilkes-Barre, Penn.

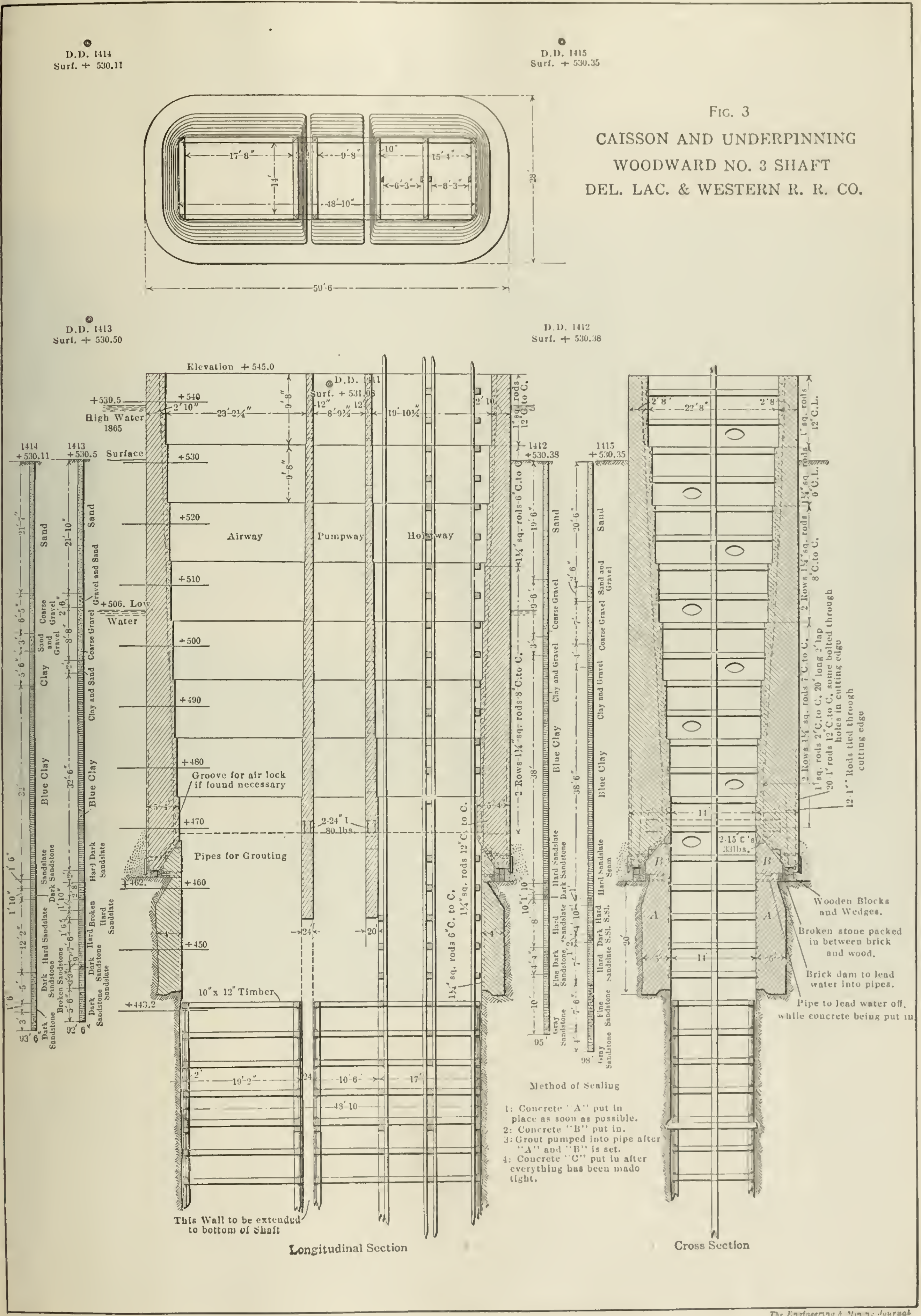

FIG. 3

CAISSON AND UNDERPINNING WOODWARD NO. 3 SHAFT DEL. LAC. & WESTERN R. R. CO.

Method of Sealing

1: Concrete "A" put in place as soon as possible.
2: Concrete "B" put in.
3: Grout pumped into pipe after "A" and "B" is set.
4: Concrete "C" put in after everything has been made tight.

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sink a reinforced-concrete caisson to rock and to continue the reinforced-concrete lining in rock to firm strata was accepted. The specifications required the caisson itself and its connection with the rock to be practically impervious to water, to show no pronounced leakage, and no seepage exceeding 25 gal. per minute. It may be stated here that the measured seepage on the finished work was but one and one-half gallons per minute, and that the shaft is now practically dry as far as surface water is concerned.

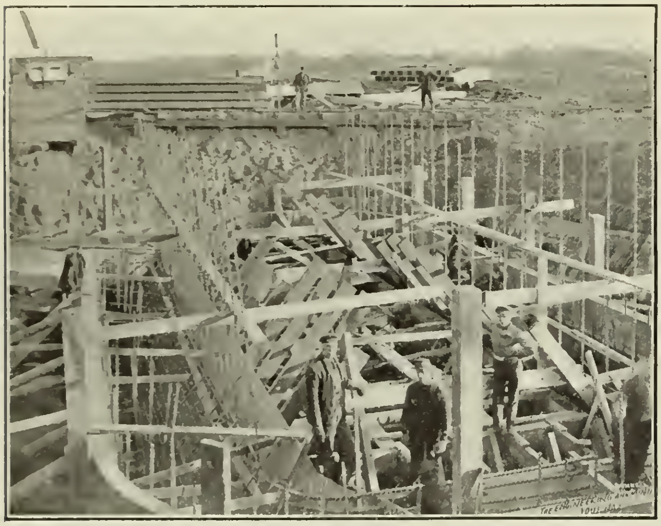


Fig. 4. Lower Forms and Reinforced Rods of Beveled Cutting Edge

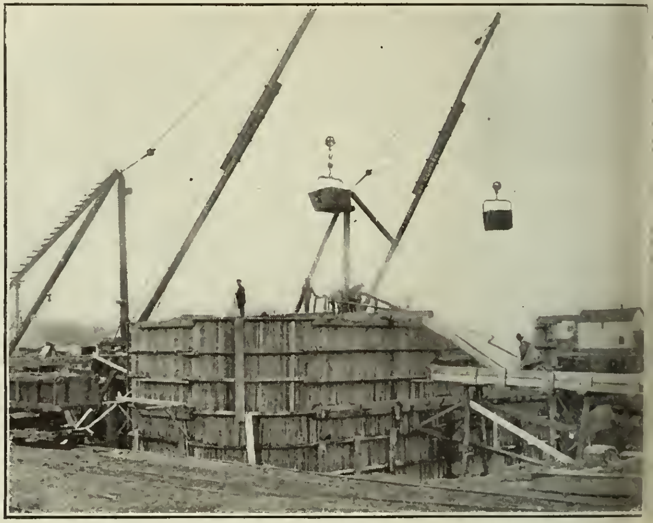


Fig. 5. Showing Caisson During Process of Sinking

Estimate of Ground Pressure

The location on the "flats" of the Susquehanna river involved extending the walling to above the flood level, the record flood of 1865 reached an elevation of —539.5, as compared with a surface elevation at the shaft of +530, and low water in the river of +506. Considering that at a flood of +540, the river is nearly two miles broad, it was believed that 5 ft. above the flood record would be absolutely safe, and the top of the concrete was fixed at an elevation of +545.

In calculating the strength of the caisson required, the assumption was made that the wash might be or become fully saturated, and it was specified that "the reinforced concrete walling be proportioned to stand fluid pressure of saturated clay weighing 130 lb. per cubic foot to elevation +530, and water pressure only from +530 to +545, allowing 16,000 lb. per square inch safe load on reinforcing steel, and 750 lb. per square inch on concrete in compression, no allowance to be made for strength of concrete in tension."

To further strengthen the caisson, the corners were rounded, but even with this and with the two cross walls, the bottom of the caisson was 7 ft. thick on the sides, and 5 ft. on the ends, reinforced as shown on the drawing. Besides the circumferential reinforcement required to resist the pressure, vertical reinforcing rods were freely used to insure the solidity of the caisson during sinking.

The operation of sinking was started Sept. 13, 1907, by excavating an open pit about 15 ft. deep to a point just above the then level of the ground water. This level fluctuates with the rise and fall of the Susquehanna river, and at the time of starting, the river was within a foot of low water. The pit was largely excavated by horse scrapers and the spoil placed as an embankment around the shaft as a partial protection against floods. During the process of excavation the derricks were erected and the final steep sloping of the sides of the excavation accomplished by the use of these (Fig. 1).

On Oct. 14, the pit was completed and work was started putting the cutting edge in place (Fig. 2). This was built of steel plates and angles securely bolted together and carefully leveled up, this work was completed Oct. 17, when the lower forms, already built outside the pit, were lowered into place and concreting started Oct. 21.

The Beveled Portion Was Heavily Reinforced

The lower part of the caisson rested on the steel cutting edge and was beveled inside for the lower 7 ft., in to the full thickness of the caisson walls. This beveled portion was very heavily reinforced (Fig. 4), 78 of the inner and 32 of the outer vertical rods passed through and were secured to the bottom plate of the shoe; to further strengthen the cutting edge 78 extra 1-in. round rods, 6 ft. long, were riveted in countersunk holes in the vertical member of the cutting edge, and laid parallel to the beveled inner surface of the bottom of the caisson.

Besides the beveled form which was built outside of the pit and lowered into place, two sets of inner and outer forms were built of 3-in. surfaced plank, strengthened by angle iron. These were used for the entire caisson by removing the lower set of forms and placing them on top of the other set as the concreting progressed; the step enlargement of the interior was accomplished by the use of distance pieces as required. The forms, besides being rigidly built, were thoroughly braced and tied during the progress of the work, so that there was no trouble at any time from their springing or moving.

As well to save concrete as to allow for possible inaccuracy in vertical sinking the walls were reduced in thickness by steps on the inside as the caisson was built, the side and end walls being thus reduced from 7 ft. and 5 ft. respectively, to 2 ft. 8 in. and 2 ft. 10 in. thick, and the two partition walls from 20 and 24 in. to 12 inches.

Further, the two partition walls each rest on two 24-in. 80-lb. I-beams, anchored top and bottom to 15-in. channels in the side walls. The wall between th hoistway and pumpway only extends t the bottom of the caisson, but the wa between the airway and the pumpwa will be extended to the bottom of th shaft, to entirely separate the upcast ai way from the hoist and pumpways whic will be used as a downcast.

Great Care Was Necessary in Excavating

In building the caisson, pockets we left to take the timbers necessary to su port the guides for the cage in the hois way, and similar pockets in the airw for the possible future construction platforms, should any work be requir on the separating wall between this a the pumpway. To save space, the gui next the pumpway was bolted directly the concrete separating wall, which w pierced at intervals to permit access the pumpway from the cage.

By Oct. 26 the wall of the caisson h

reached a hight of about 20 ft. when sinking was started by excavating from the shaft and allowing the caisson to settle. The concrete being built up as the settlement progressed; with the very large size of the shaft it was inevitable that the ends would not be constantly in ground of the same bearing capacity, and great care was necessary in excavating to keep the caisson plumb and level during sinking. Levels in both directions were constantly used and any tendency to tip was corrected by more rapid excavations in portions of the shaft, and to some extent by hastening the deposit of concrete on the high end or side (see Fig. 5).

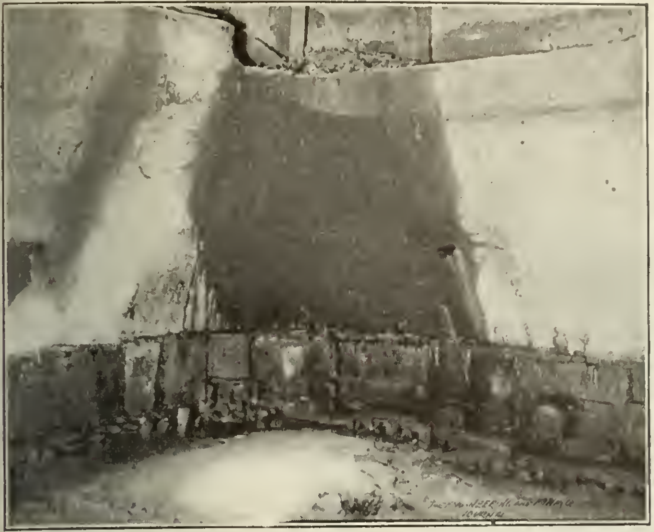


Fig. 6. Wedging at Northwesterly Corner of Shaft

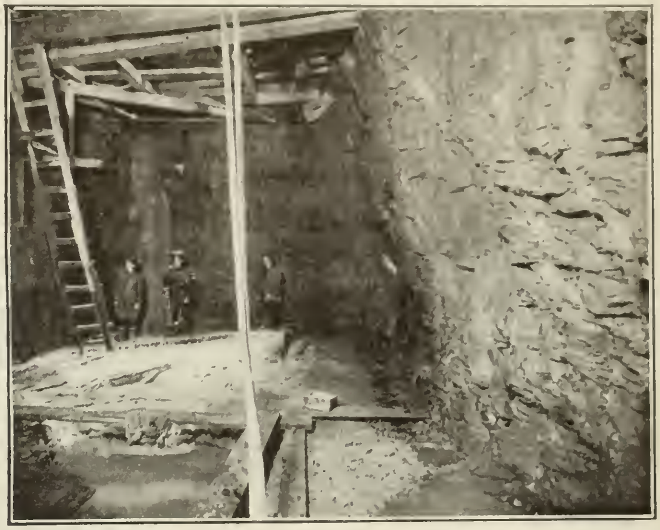


Fig. 7. Excavation in Rock Before Underpinning, Showing Channeling Under Caisson

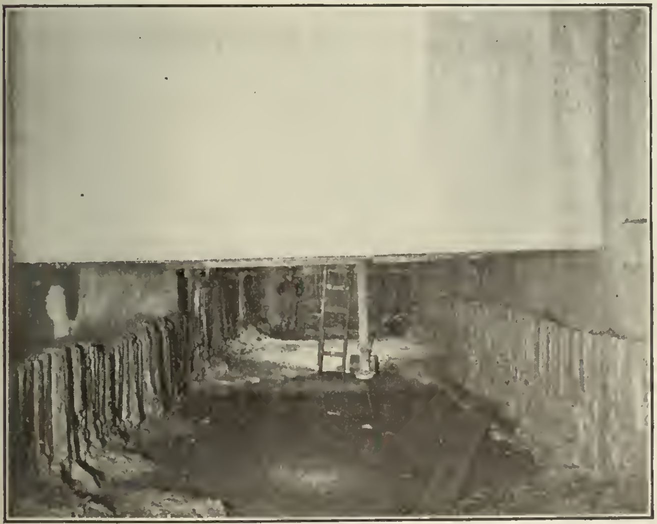


Fig. 8. Bottom of Shaft Showing Completed Underpinning and Channeling

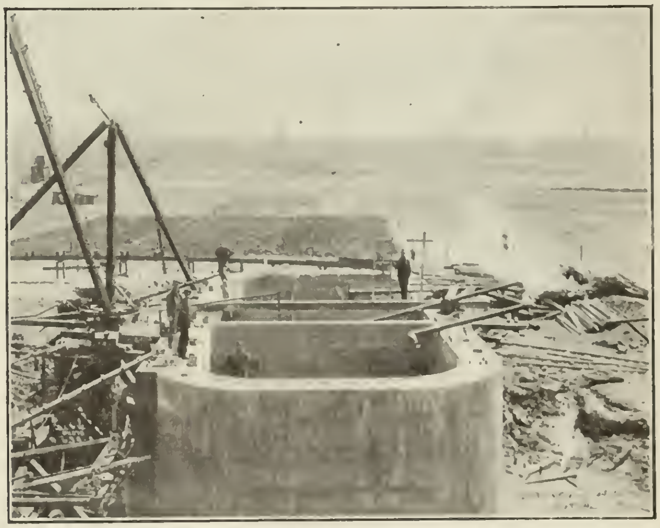


Fig. 9. Top of Completed Shaft, Showing Farm Lands, Susquehanna River, and Wilkes-Barre, Penn., In Background

The work was pushed day and night until on Dec. 5, 66 days after starting, the westerly corner of the caisson sunk practically plumb, landed on rock at a depth of about 68 ft. below the surface, or 83 ft. below the final top of walling.

The excavation, as shown by the bore holes on drawing, Fig. 3, which average 20 ft. 10 in. sand, 12 ft. 2 in. gravel, 36 ft. 7 in. clay to rock, started from the surface in sand, and as it will be remembered that the pit was excavated to within 1 ft. of the ground water level, pumping was necessary almost from the start, the quantity of water handled increased gradually up to 1200 gal. per minute until the clay was penetrated for a short distance when this settled around the caisson and practically cut off the inflow of water. This clay reached in places to the rock, but in patches was underlaid by about 18 in. of peaty gravel.

Water from River Forced Its Way Hrough

It was known from the borings that the surface of the rock was not level and it had been planned to sink the caisson a minimum of 5 ft. into the soft surface rock, secure by grouting through pipes which were built into the beveled portion of the caisson, and then sink to firm rock, about 20 ft., and underpin with a reinforced concrete wall. One corner of the caisson having reached rock, work was at once started to excavate in this as planned; meanwhile a number of 12x12-in. blocks were placed under the opposite end; which was still about 3 ft. above the rock surface; unfortunately, at this juncture, the Susquehanna river rose in an 18-ft. flood, and the additional pressure of the water, probably aggravated by the light blasting which was being done, broke the clay seal, and on Dec. 12, water in large quantities forced its way under the cutting edge and through the peaty gravel in the bottom of the shaft, so that by 10 a.m. on that date, the pumps with a proved capacity of over 1200 gal. per minute, were unable to cope with the inflow, and the shaft was flooded to the flood level of the river.

It was hoped that with the recession of the fllood, the clay would again settle around the shaft, and with this in view, no work was done for about 10 days, when the flood having subsided, and further pumps having been procured, an attempt was made to unwater the caisson, which was successful down to a point about 10 ft above the cutting edge, when the water broke in and drowned the pumps, and again refilled the shaft.

This water carried so much sand and clay that it caused very great difficulties with the pump packing and valves, and as the shaft is surrounded by valuable truck gardens (Fig. 9), the water could not be discharged at random, and a box trough 2½ ft. wide and 8 in. high was built from the shaft, nearly a quarter of a mile to a pond hole near the river, where the water could be discharged.

THE WATER WAS FINALLY SUBDUED

By the addition of more and more pumps, and finally with the added help of a Jeansville 1000-gal. electrically driven centrifugal, the water was on Jan. 17 lowered so that men working over their waists in the icy water could wedge off the space between the caisson and the rock. This rock occupied the time from Jan. 17 to Feb. 1, 1908. The method finally successfully adopted consisted in building small semicircular dams of cement bags filled with clay, taking in about 10 ft. of the periphery of the shaft, the space thus separated was given special pumping attention and the opening between the cutting edge and the rock closed with 12x12-in. yellow-pine timbers, and tightened with white-pine wedges; 4- and 6-in. pipes were left at short intervals and by allowing these to flow, the water pressure was decreased while sealing was in progress. Fig. 6 shows clearly one corner of the shaft just after sealing was completed.

The pumping plant eventually accumulated, all of which was in use in the final sealing, comprised: Worthington duplex pumps, one 22x10x18 in.; one 10x6x10 in.; one 16x9x12 in.; Knowles single pumps, one 16x10x24 in.; two 14x8x12 in.; one 18x14x20 in.; one 14x6x12 in., all steam operated; also one 1000-gal. Jeansville centrifugal pump electrically operated.

From the size of the shaft it is apparent that practically all available space was taken up with this huge pumping plant, and had the inflow been but little larger it would have been necessary to use compressed air to make possible the joint at the rock.

In the original plans this contingency was considered, and grooves were left in the caisson above the beveled portion, so arranged that a deck of double 12x12-in. timbers calked and made airtight, could have been readily installed, to which deck air locks would be secured and the work finished under compressed air if necessary. The timber for this deck was kept actually on the ground, and its use was being seriously considered when final success in wedging off the water was achieved.

During this long fight with the water, lasting from Dec. 12 to Feb. 1, the caisson had settled out of plumb a maximum of 1 47/100 ft. endwise, and 1 17/100 ft. sidewise. Owing to the precaution of making the inside tapered, it was practicable to timber the hoistways vertical, as originally planned, and the only inconvenience resulting was the necessity of leveling up the top. This leveling was done with a bevel form, a maximum of 21 in. high at the level of the bottom of the last step next the top; the caisson at this time had only been completed to this step, and it was necessary, therefore, to build counterforts to support a portion of the head frame and do some cutting in the timber hitches which were left as the concrete was built and which were thrown out of line by the settling.

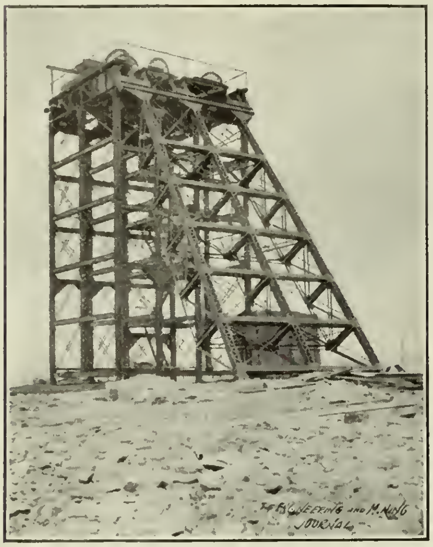


FIG. 10. STEEL HEADFRAME WOODWARD NO. 3 SHAFT

SINKING TO ROCK BY CHANNELING A GROOVE

The wedging completed, so that the inflow of water could be easily handled, sinking to firm rock was started by channeling a groove 5 ft. deep all around the bottom of the shaft as close as possible to the wedging, and removing the first 5 ft. of rock by careful blasting. While the channeling was in progress, about 100 barrels of cement grout was pumped by 80-lb. air pressure through the pipes left in the tapered portion of the casing, in the expectation that this would settle around the outside of the wedging and assist in cutting off the water. This grout did much good in reducing the flow to about the equivalent of a flow through a 2-in. pipe, and undoubtedly greatly reinforced the wedging.

After removing the first 5 ft., the balance of the rock excavation was completed, using two shaft bars and four compressed-air rock drills in the usual manner, but with great care, working in 5-ft. benches, using light charges until on April 18 firm, solid sandstone was reached at an elevation of +443.2 ft., 101 ft. 10 in. below the top of the caisson and about 87 ft. below the surface (see Fig. 7). On this a further channeled groove, 5 ft. deep, of the desired inside size of the shaft was cut; the bench was left approximately 4 ft. wide. The cut, as shown on the drawing, was used to form a base for the underpinning with a strong toe to assist in holding the walls.

During the sinking, the beveled bottom of the caisson had been roughened by chipping, and a notch cut out all around, exposing the reinforcing rods to assist in making a firm connection between the underpinning wall and the caisson.

The wall averaging a little over 4 ft. thick, and heavily reinforced as shown, was then built up to the level of the bottom of the wedging. A number of seams admitting water had been encountered in sinking, and these were trapped by wooden boxes, and the water from them conducted by pipes through the wall; after the wall had fully hardened these were treated by forcing in grout under heavy air pressure, the pipes closed and the wall openings to them concreted.

In closing the main joint with the original caisson, a few inches of broken stone was packed against the wedging and retained by a thin brick wall; into this stone pipes were left at frequent intervals, passing out into the shaft. The concrete was brought up in three operations; first, the main wall *A*, Fig. 3; second, the connecting section *B*, which was allowed to harden, and lastly, the stone-filled space was grouted solidly, through the pipes left in for this purpose. The triangular section *C* was left open for the purpose of calking off all possible flow along the joint, when this was finally made tight, the space *C* was filled and all the pipe ends (which were in recesses in the concrete) were covered over, making a clean and watertight connection. This connection was finally completed May 14, 1908, and the shaft turned over to the rock-sinking contractors, who were paid an extra price for the first 50 ft. below the concrete for extraordinarily careful sinking, and the use of shallow holes and light charges.

ESTIMATE OF QUANTITIES HANDLED

The quantities handled by the Foundation Company under their contract, were: Earth, open pit, 3900 cu.yd.; earth in caisson, 3049; rock, 1049; concrete in caisson, 2229; concrete in underpinning, 619 cu. yd.; reinforcing steel in caisson, 250,045 lb.; reinforcing steel in underpinning, 29,560 lb., or a little over 10¼ miles of 1¼-in. and 1-in. twisted rods; earth backfill, 2300 cubic yards.

The shaft has now been sunk to the bottom of the Baltimore bed at an elevation of 255.6 ft. This point is 800.6 ft. below the top of the caisson. A steel headframe has been erected, and inside connection with the Woodward colliery workings has been established. The caisson work has remained tight, despite a severe test, when, during the sinking, a gas explosion took place in the shaft, of such severity that I felt the shock in Wilkes-Barre, nearly a mile away. This explosion wrecked a large amount of timbering, raised the temporary headframe, destroyed the temporary ventilating fans, but had absolutely no effect on the caisson or underpinning or on their connection with the rock. The gas was fired on the surface during a cessation of work, so that beyond severe, but not fatal burns to the man whose carelessness and disobedience of orders caused the explosion, the damage was only to property.

The work on the part of the contractors was under the superintendence of Alexander Allaire, with the supervision and advice of L. L. Brown, general superintendent, and D. E. Moran, vice-president and chief engineer of the company. For the railroad company, I had the benefit of the advice and assistance of R. A. Phillips, general superintendent, H. G. Davis, superintendent fourth district, and A. C. LaMonte, chief engineer of the coal department.

The balance of the sinking of the shaft to the Baltimore bed was contracted to John Pugh & Sons, of Kingston, Penn. The work was entirely satisfactory, and while accomplished under great difficulties, was completed inside the estimated cost, and considering the size of the opening, at very much lower cost than any previous shaft sunk in the region through the heavy wash of the Susquehanna valley.

New Explosives Placed on Permissible List

The following explosives are announced as acceptable for use in coal mines:

Ætna coal powder, D, Ætna Powder Company, Chicago, Ill.

Coal special No. 3-B and Coal Special No. 3-C, Keystone Powder Company, Emporium, Penn.

Eureka No. 2-L. F., Tunnelite No. 6-L. F., and Tunnelite No. 8-L. F., G. R. McAbee Powder and Oil Company, Pittsburg, Penn.

Titanite No. 3-P, Waclark Titanite Explosive Company, Corry, Penn.

Trojan coal powder A, Trojan Powder Company, Allentown, Penn.

Detonite special, Detonite Company, Cincinnati, Ohio.

Monobel No. 2, Monobel No. 3, Carbonite No. 4, and Hecla No. 2, E. I. du Pont de Nemours Powder Company, Wilmington, Del.

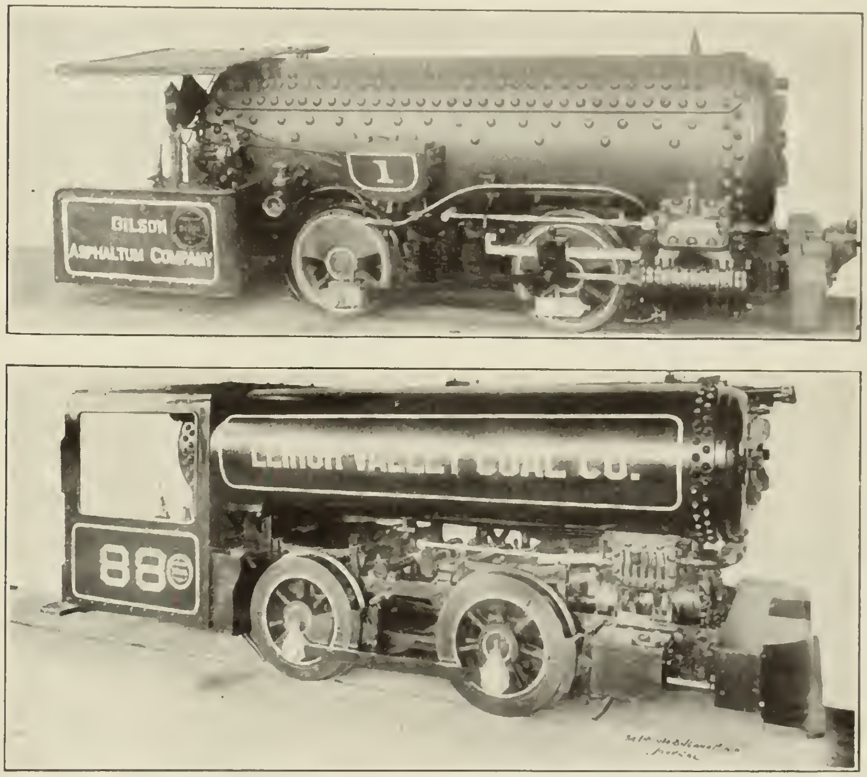
Kanite A, W. H. Blumenstein Chemical Works, Pottsville, Penn.

New Compressed Air Locomotive

The accompanying illustrations represent two compressed-air locomotives recently built by the Baldwin Locomotive Works. Both these engines are of the four-coupled type, but they differ considerably in constructive details.

Lehigh Locomotive for Mining Service

The locomotive for the Lehigh Valley Coal Company is built with a width limit of 5 ft. 6 in. and a hight limit of 5 ft. 7 in. The length over the bumpers is 14 ft. The frames are of forged iron and have a slab section ahead of the leading driving pedestals. This construction provides a ready means for supporting the cylinders, which are placed between the frames and securely bolted to them. The cylinders are set on an incline of 1 in 10, so that the main rods will clear the leading axle. The driving axle is, of course, cranked, and is a steel forging, made in one piece.



Two New Compressed Air Engines

The air tanks are two in number, with a combined capacity of 95 cu.ft. Air is stored at an initial pressure of 800 lb. per sq.in., and after being reduced to 140 lb. is passed into an auxiliary reservoir. From this reservoir the supply for the cylinders is drawn. Safety valves are mounted on both the main and auxiliary reservoirs.

This locomotive is in mining service. The leading dimensions are: Gage, 4 ft.; cylinders, 8x12 in.; driving wheels, diameter, 28 in.; wheel base, 4 ft.; weight, 18,000, lb.; tractive force, 3260 lb. The equipment includes air brakes, also four sand boxes with spouts to all the wheels.

A More Compact Type

The locomotive for the Gilson Asphaltum Company, of Mack, Colo., is also in mine service. The atmosphere in this mine is charged with gilsonite dust which is very explosive; hence compressed-air haulage has been adopted in order to eliminate fire risks. This locomotive is considerably lighter and more compact than the one for the Lehigh Valley Coal Company.

The air supply is stored in a single tank of 39-cu.ft. capacity. The initial pressure is 800 lb. per sq. in., and the working pressure 140 pounds. The cylinders are placed outside the frames, in a horizontal position. The frames are of plate steel and are supported on coiled springs. The air tank rests directly on the frames, the points of support being over the springs.

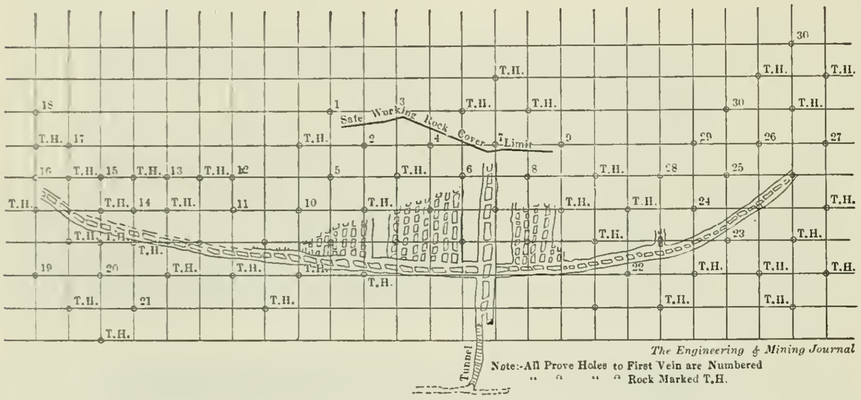
This engine is provided with a sand box on each side, and sand can be blown under either the front or back wheels by means of air sanders. Air-brake equipment is also provided, with shoes on all the wheels. The auxiliary air tank is placed on the left side and is fitted with a safety valve, as is also the main tank. The principal dimensions are: Gage, 2 ft.; cylinders, 5½x10 in.; driving wheels, diameter, 20 in.; wheel base, 3 ft. 6 in.; weight, 8650 lb.; tractive force, 1800 pounds.

A Safe Working Rock Cover Limit

Anthracite Companies Use Great Care in Calculating the Depth and Strength of Overlying Strata, so as to Prevent Cave-ins and Protect Life

BY FRANK LYNDE

To work a shallow seam of anthracite coal, it is necessary to prove the thickness of the strata overlying the seam by means of test holes, in order to secure the maximum safety for the workmen, as well as to protect the property from a serious cave-in. Most of the seams found in the Northern anthracite fields are far below the elevation of rivers and streams.



The Engineering & Mining Journal

Fig. 1. Showing Typical Working of a Surface Seam in Northern Anthracite Field

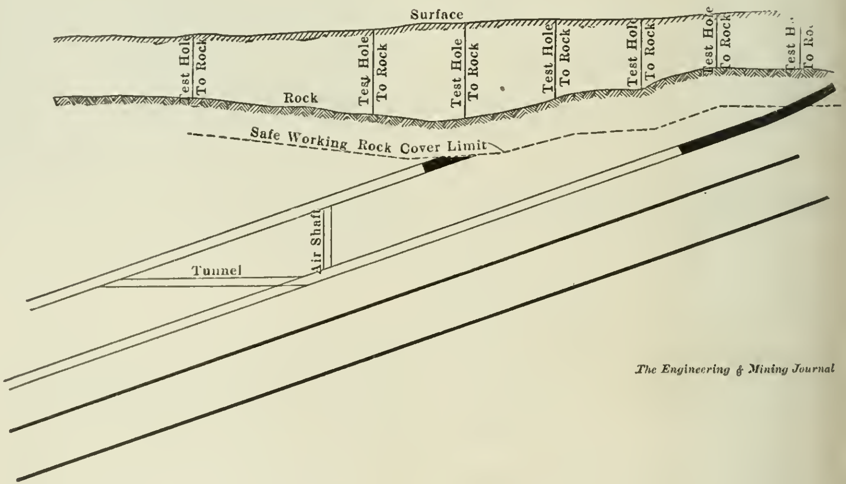
Fig. 1 shows the typical working of a surface seam in the Northern anthracite field. In developing such a bed, the area is usually divided into a number of squares, whose sides vary from 100 to 400 ft., depending upon the following conditions:

1. Character of the rock overlying the seam.
2. Depth of wash over the rock which varies from 10 to 150 feet.
3. Thickness of safe working rock-cover limit, which varies from 20 to 100 feet.

At each or every other corner of the square, a prove hole is put down, which may be to the rock or to the first seam, depending upon the character of the information required. In some instances, the companies put most of the holes to the rock and very few to the seam; others prefer to drill every other hole to the vein, while still other operators advocate putting the majority of the holes to the first seam.

The Holes Should Be Sunk to the Seams

When the holes are put down to the rock, we get very little information as to the nature and condition of the strata above the seam. On the other hand, putting the majority of the holes down to the first seam is very expensive, and economical mining will not permit such extensive provings; however, when the workings in the mines are approaching a body of water, such as a river, lake, pond, etc., it is always well to put down the provings to the seam at each corner of the squares and cement the holes. The squares in this case should be as small as possible.



The Engineering & Mining Journal

Fig. 2. A Section of Workings, and Series of Provings, Only Put Down to the Rock

The sides of the squares should be roughly proportional to the thickness of the safe working rock-cover limit. This proportion depends upon the hardness and condition of the rock overlying the seam. For a medium hardness of rock with wash less than 75 ft. thick, the relation between the thickness of a safe working rock cover and the sides of the squares, in practice, is as follows: For 20-ft. rock cover, the side of the squares should be 100 ft.; for 40 ft. rock cover, side of the squares 200 ft.; for 60 ft. rock cover, 300 ft. squares, and for 80 ft. rock cover, 400 ft. squares, etc. In other works, the sides of the squares should equal five times the thickness of the safe working rock-cover limit.

In case of a soft rock, such as "soapstone," "fireclay," and other rocks, which disintegrate readily when exposed to the atmosphere, the side of the squares may be taken as three times the thickness of the safe working rock-cover limit, the least thickness of which should be 50 ft. The width of the workings should not exceed 40 per cent. of the chamber centers. This is done not only to avoid cave-ins, but also it lessens timbering as well.

Determining a Rock-cover Limit Graphically

It is an easy matter to determine a given thickness of safe working rock-cover limit graphically, when the bore-hole data are available. Fig. 3 shows a method by which a safe working limit is usually established. In this sketch the location of the bore holes and sections of two consecutive holes are plotted. Each hole is numbered with its surface, rock and seam elevations. The line connecting any two holes is taken as a datum line for the section. From the datum line, which is taken as plus 400, measure off the elevations of surface at the two holes and connect them by a straight line. In the same way the two rock elevations and the elevations of the seam are connected. Then measure a de-ired thickness of the safe working rock-over limit from the elevation of the ock; when this line cuts the roof of the eam, as at *A* between the bore holes 8 nd 9, it is the point where it has just he desired thickness of the rock and eyond which it is not safe to work.

Then continue by projecting point *A* ipon its datum line, as at *B*. In the ame way, point *C* between the bore holes ' and 8 is established. Project *C* to *D* nd connect *B* and *D*, *D* and *F*, etc. The egular lines connecting these points fix nd establish the safe working rock-cover limit. Fig. 2 shows a section of workings and series of provings, which are only put down to the rock; in this case the safe working limit cannot be determined beforehand. But frequent surveys of the workings must be made as the faces advance, so as to get the elevation of each face. Then the actual thickness of the rock over any given face is the difference between the rock elevation and the elevation of the roof and the face of the workings. The dotted line on Fig. 2 shows 50 ft. safe working rock-cover limit.

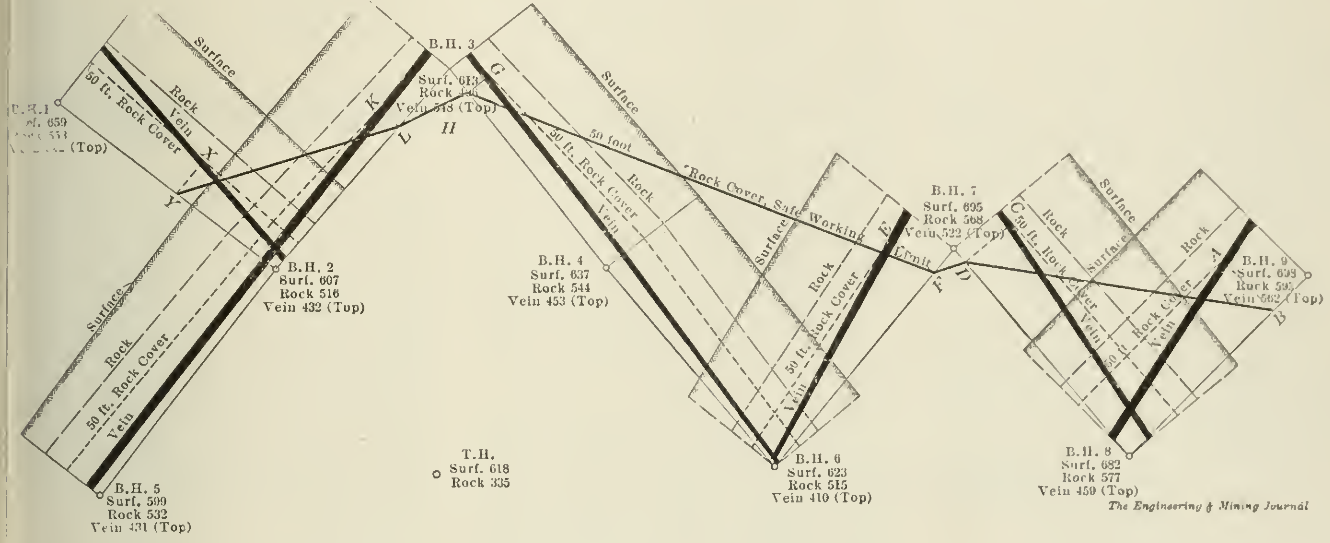


FIG. 3. SKETCH SHOWING METHOD BY WHICH A SAFE WORKING LIMIT IS USUALLY ESTABLISHED

Mine Ventilation

By Oskar Nagel*

The system of ventilation best suited for a certain mine depends upon local conditions. With a large surplus of power, mechanical ventilators or fans will be used to advantage; where high-pressure water is inexpensive, water-spray ventilators are convenient, while the air-jet ventilator will be the proper apparatus wherever compressed air is obtained at low cost. The operation of the water-spray and air-jet types is based upon the sucking force of a jet.

Ernst Koerting, who has devoted a life time to the development of jet apparatus and its various applications, has succeeded in constructing a successful mine ventilator which is widely used in European collieries. Fig. 1 shows a Koerting water-spray ventilator in which *W* is the water inlet; *E*, the air inlet; *A*, the air discharge, and *U*, the water overflow. The motive power in this apparatus is a water spray produced by water being forced through a nozzle under pressure. The water issues from the nozzle in the form of a cone and strikes against the inner walls of the apparatus. The efficiency of the apparatus is as high as 50 per cent., which is greater than that obtained from fans. The air is cooled in its passage through the cone of spray, and at the same time is moistened and washed. These features of the apparatus are of considerable value. As an example of the cooling effect of the water-spray ventilators, I may mention that in the case of an apparatus supplied for an underground engine room the temperature of the room was reduced from 96 deg. F. to 76 deg. F., the temperature of the water being 63 deg. Reliability, simplicity and low first cost are some of the advantageous features of this type.

The compressed-air jet ventilator is shown in Fig. 2. In this type the quantity of air to be delivered is easily regulated, a feature which will be appreciated by coal operators. The air ventilators can be arranged either to blow the air forward or to exhaust it. The efficiency is the same in both cases.

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*Consulting chemical engineer, New York, N. Y.

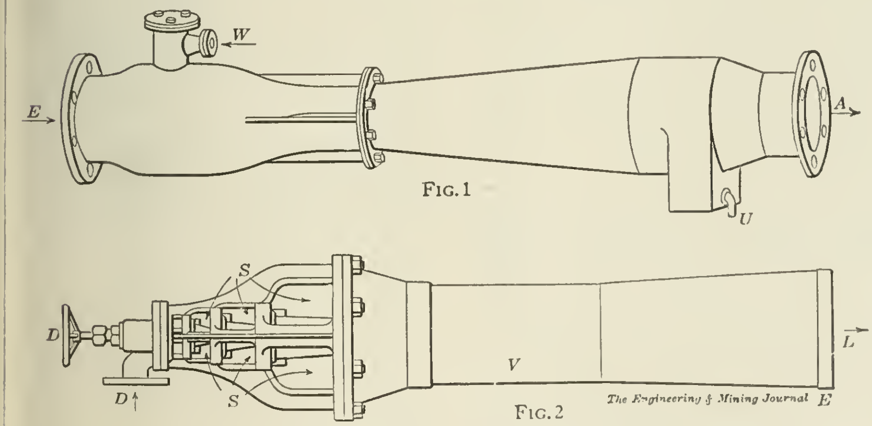

FIG. 1

FIG. 2

APPARATUS FOR WATER-JET AND AIR-JET VENTILATION

Texas, the only State which has been an iron manufacturer, has gone out of the business and leased its property. This consisted of a blast furnace and pipe foundry at Rusk, several small iron-ore mines, and about 45 miles of railroad connecting the furnace with the mines and extending to Palestine. The furnace and foundry were built to give employment to the convicts in the prison at Rusk, but they have never paid, showing a large deficit yearly. Now the furnace needs repairs, and it has been decided to lease it to private parties.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

W. E. Reppy, of Carthage, Mo., has gone to Cobalt, Ont., to examine some mines.

Max Wardall, of Seattle, Wash., has been appointed receiver of the Clallam Coal Company.

Theodore Gross, resident manager of the Hirsch Syndicate, Ltd., has returned to New York, from London.

Alfred James, of London, has been visiting and inspecting mines at Real del Monte and Pachuca, Mexico.

John Knox, Jr., assistant superintendent of the Calumet & Hecla, is recovering from an operation for appendicitis.

H. Kenyon Burch, mechanical engineer for the Miami Copper Company, has just returned from a 900-mile automobile trip through Arizona and the northern part of Mexico.

Myron K. Rodgers, of Seattle, Wash., has been spending two months in Mexico, examining and reporting on mines near Guadalaja, at Etzatlan, and in the Ameca district.

Algernon Del Mar has established an office in the Union Trust building, Los Angeles, Cal. His specialty is stamp milling and cyanide treatment of gold and silver ores.

W. C. B. Allen is geologist for the Kansas City Southern Railway Company, with headquarters at Kansas City, Mo. He has done much exploration work along the line of that road.

John M. Nicol is now representative in Mexico for the Hammond Iron Works and the Hendryx Cyanide Company, in place of Francis E. Pratt, resigned. His office is in the City of Mexico.

George E. Farish, of Denver, Colo., sailed from Seattle, Wash., May 21, to examine some placer properties in southern Alaska. His address will be, until Aug. 1, care Postmaster, Juneau, Alaska.

Dr. G. B. Waterhouse, of Buffalo, N. Y., has been appointed metallurgist to the Lackawanna Steel Company, in place of H. Cook, resigned. Dr. Waterhouse has conducted some experimental work in metallography and other special lines for the company in the past few years.

William K. Field has been elected president of the Pittsburg Coal Company, in place of M. H. Taylor, who becomes chairman of the board of directors. Mr. Field was at one time president of the New Pittsburg Coal Company, of Ohio, but for several years past has been president of the Sunday Creek Coal Company.

Maximillian Herrmann, professor of the Royal College of Mines, Hungary; Francis Vnutsko and Francis Bohm, mining engineers connected with the Hungarian Government, are now in this country studying the natural gasfields. They constitute a commission appointed by the government for that purpose, in consequence of the recent discovery of natural gas in Transylvania.

Dr. R. B. Owens, until recently electrical engineer with the Southern Power Company, at Charlotte, N. C., has accepted the appointment of secretary of the Franklin Institute, Philadelphia, made at a recent meeting of the board of managers. He is a graduate of Johns Hopkins University, and has been instructor at the University of Nebraska and at McGill University besides engaging in practical work.

A committee has been appointed to arrange for the centennial celebration at Pachuca, Mexico, in September, which includes the following representatives of the mining interests: C. W. Van Law, general manager Real del Monte; Hugh Rose, general manager Santa Gertrudis; H. A. Barker, Blaisdel Reduction Company; Frederick P. Jaggi, Consolidated Smelting and Refining Company; Francisco H. Rule, La Blanca Mining Company.

J. Obalski and E. Dulieux, under the firm name of Obalski & Dulieux, have opened offices as mining engineers in the Quebec Bank building, No. 11 Place d'Armes, Montreal. Mr. Obalski was for many years head of the Bureau of Mines, of the Province of Quebec, and is widely known in Canada from his long experience in the mining industry and his extensive explorations of the northern territory. Mr. Dulieux is at present in charge of the mining department at Laval University, and is a graduate of the High School of Mines in Paris.

OBITUARY

Franklin C. Robinson died at Brunswick, Me., May 25, aged 58 years. He had been professor of chemistry and mineralogy in Bowdoin College for over 30 years. He was well known for his various chemical investigations and was a vice-president of the American Chemical Society.

August Rische died in Denver, Colo., May 13. He was well known formerly as a miner and prospector in Colorado. Together with George Hook, who is now in Germany, he discovered and located the famous Little Pittsburg mine at Leadville, on a grubstake furnished by the late H. A. W. Tabor. He made a large profit from his share in the mine, which he afterward sold. He had lived in Denver ever since, but lost much of his money in unfortunate investments.

Warner Arms died at Youngstown, O., May 18, aged 58 years. He was known for years as president of the Falcon Iron and Nail Company, Niles, Ohio, which was established in 1867. In 1886 the Falcon Tin Plate and Sheet Company at Niles was taken over, its principal product being Russia iron sheets. The company in 1892 built a mill to roll black plates, and in March, 1895, it produced tin and terne plates. This latter plant was taken over by the American Tin Plate Company; later, on the organization of the American Sheet Steel Company, the latter took over the original sheet mill plant of the Falcon company. Mr. Arms was third vice-president of the American Tin Plate Company, and later was made first vice-president. He retired from sheet and tin-plate manufacture in 1903.

SOCIETIES *and* TECHNICAL SCHOOLS

University of Kansas—The present Geology and Mining building, which was completed last year, is three stories high, 60x110 ft., with an annex for mining and ore-dressing laboratories, 40x80 ft. The first floor of the building provides two offices, one private laboratory for advanced quantitative work, one large general blowpipe laboratory for mineralogy, one classroom; a drafting room, a fireproof vault for preserving drawings, manuscripts, etc., a museum room for storing mining machinery, and other lesser rooms. The annex provides laboratory facilities.

West Virginia Coal Mining Institute—The summer meeting will be held at Bluefield, W. Va., June 7-9. The program includes a visit to the mines of the United States Coal and Coke Company, with an address by E. O'Toole, general superintendent of those mines. Papers to be presented are as follows:

1. "Mine Water Softening and Purification for Coal Mine Operations," J. C. W. Greth, Pittsburg.
2. "Safety Chambers in Mines," George S. Rice, Pittsburg.
3. "Coal Mine Equipment," W. S. Mayers, Fairmont, W. Va.
4. "Relation of the Deep Waterways of the Mississippi to the Waterways of West Virginia," Col. John Luther Vance, Columbus, Ohio.
5. "Allotment of Cars for Coal Mines," J. W. Heron, Huntington, W. Va.
6. "Languages, a Factor of Safety and Profit in Relation to Coal Mines," Charlton Dixon, Lowmoor, Va., and Dr. Peter Roberts.
7. "Geology of the Bluefield Region and the Pocahontas Coal Series," Dr. I. C. White, Morgantown, W. Va.

In addition, A. C. Morse, Elmira, N. Y., will give a demonstration of methods of extinguishing fires in coal mines. Mayor Charles Lynch, Medical Corps, U. S. A., will be present with a fully equipped hospital car and apparatus for first aid to the injured.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

May 30—The strike in the Kate Hardy mine at Forest, Sierra county, where good ore was found close to the surface, has induced a number of owners of adjoining properties to work the surface dirt. In the districts of Alleghany, Forest, Scott's flat and vicinity, 300 men are now working for wages in addition to the number who are working for themselves. Mines long idle are being developed. The Phœnix quartz mine at Sierra City is being put in shape again and a 3-mile flume is being rebuilt to bring in water. At Gibsonville, three recently incorporated companies are planning mills. At Forest the gravel channel has, after six years' work, been intersected in the Rio Antigua mine at the end of the mile-long tunnel. It is thought that this is the old Bald Mountain channel, which yielded largely when worked years ago. At Sierra City, where the Swastika mine, formerly the Chipps, has a 12-stamp mill, ten stamps are being added by superintendent L. H. Holly. The reopening of the Irelan mines at Minnesota, Alleghany district, is at last well under way, and important development work is going on in the Dreadnaught, Gold King, Sierra Wonder, Sherman, Balsam Flat, Kenton and other mines.

Plumas, the adjoining county, is also experiencing a distinct revival, largely owing to the advent of the Western Pacific railway. Steps are being taken to build a wagon road from Mohawk valley to the Gold Lake section of Sierra county, and this road, when completed, will make the business of the Downieville and Sierra sections dependent on eastern Plumas county. Passenger traffic on the Western Pacific has not yet been started, but soon will be. In the vicinity of Genesee, extensive developments are being made on the copper belt. A small furnace is being put up on the Engel claim in that section, and the Walker Mining Company will soon commence production on a large scale and ship its ores. For several years more or less work has been done on the copper claims in Plumas county, and now that the new railroad is operating, there is a chance to ship the ores for treatment at smelteries elsewhere.

The Keystone Dredging Company, operating in Butte county, has increased its capital from $250,000 to $2,500,000.

The Otter Bar Placer Company was incorporated at Stockton, capital, $15,000, to do mining in Calaveras and Tuolumne counties. William Hendsch is director.

Denver

May 29—Apparently the Silverton mines will become heavy producers of zinc ores. Ten carloads of zinc concentrates from the Aspen mine were shipped during May. Another carload was shipped from the Silver Lake, and the Silver Ledge mine, on Mineral creek will soon be a large zinc producer.

The Oak Creek coal mines, in the Yampa coalfield, on the Moffat road, 195 miles from Denver, are outputting about 800 tons per day, a great deal of which is being shipped to Missouri River points. At the same time, if it were not for the lack of cars during the cold season on the Missouri River roads, there would be a market for 5000 tons per diem for the above points from the mines of the Oak Hills, Juniper and Routt County companies in the Oak Creek district.

The Roosevelt deep drainage tunnel in the Cripple Creek district, from the results of which so much is expected, is within 1000 ft. of the El Paso shaft, on Beacon hill, and as several rich strikes have lately been made in that section, more than usual interest attaches to the work. The principal discoveries of rich ore have been made in the Prince Albert and Black Belle properties, on the south slope, by the Union Leasing Company. These mines are developed at 600 ft. by the Iland tunnel, which has been driven 1650 ft. Raymond S. Husted is the manager. The ore encountered in the tunnel is at the contact of the big phonolite dike which has its course through Beacon hill and the granite, and is 4 ft. in width. On the same hill, Dr. Buckmaster and associates, leasing on the Home, of the Commonwealth company, have opened an oreshoot at the 300 level. At the Mable M. shaft, of the Gold Dollar company, under lease to Albert Campbell, a shoot of ore 4 ft. in width has been opened at the fourth level, and an initial shipment has returned over 2 oz. gold per ton. Macdonald & Co., leasing in the Gold Dollar tunnel, is shipping ore that runs from $15 to $30 per ton. So that Beacon hill is at present the center of interest in the Cripple Creek mines.

The Beacon Hill orebodies are found at the contact between the granite of the hill and what has been called a dike, but is, more properly speaking, according to the U. S. Geological Survey, "an eruptive plug filling an elliptical conduit in the Pike's Peak granite." But there are minor dikes in the hill which are apparently offshoots from the main mass or plug, and along these are also found rich orebodies, notably one of these, which is known as "the El Paso dike."

Much interest centers in the new Portland mill on Battle mountain, and its success will mean much to the district. The Portland has three 6-ft. chilian mills, one of which is now running, and the other two will start up as soon as the adjustments and changes incidental to the starting of a new plant are made. The process in use consists of first concentrating out the sulpho-tellurides, and then cyaniding the tailings, with the adding in this case of an additional salt, which designates it as "the Portland process." The mill is operating on mine ore. F. B. Crowe is the metallurgist, Mr. Taylor, general manager.

Adjoining Beacon hill is Raven hill, and there the Elkton mine, the gross production of which is now close to $10,000,000, is to be benefited greatly by the completion of the Roosevelt tunnel, which is expected to drain the workings at a depth of 1600 ft., or 700 ft. below the lowest level. This mine has paid to date $2,554,460 in dividends.

Butte

May 29—The annual meeting of stockholders of the Anaconda Copper Mining Company was held in Anaconda on May 18 and the following directors elected: B. B. Thayer, William Rockefeller, John D. Ryan, H. H. Rogers, F. P. Addicks, Urban H. Broughton and George H. Church. A detailed report was also made by the president, giving the conditions existing at the different mines of the company. At the Anaconda mine the gases have seriously interfered with operations. From September, 1908, to May, 1909, the gases rendered the shaft useless but at that time abated sufficiently to allow repairs, which were made down to the 800-ft. level and some ore hoisted from that depth. The shaft will shortly be repaired from the 1200-ft. level to the 800-ft. level, after which, since the shaft below that point is in good repair, hoisting will be resumed. The Neversweat has hoisted considerable of the Anaconda ore. At the St. Lawrence shipments are being made from the 700-ft. level. The Mountain Consolidated shaft was sunk an additional 160 ft. At the High Ore in April, 1909, a crosscut on the 1400-ft. level encountered an orebody of considerable size and high value, the existence of which had been unsuspected. The same orebody has since been found on the 1200-, 1600- and 1800-ft. levels and a crosscut is now being run to it on the

2200-ft. level. From the 2800-ft. level a crosscut has been driven to a point underneath the Anaconda shaft to which a raise will be run, thus making the latter shaft 2800 ft. deep. At the Diamond, the shaft has been sunk to the 2956-ft. mark. The Belmont shaft, down 1400 ft., will be sunk an additional 600 ft. Connections have been made with the Anaconda 1400-, 1600- and 1800-ft. levels. At the Right Bower the shaft is 534 ft. deep and some exploration work has been done but it is thought that greater depth must be attained before higher values are encountered. The report states that the hopeless conflict of extralateral rights in the Butte mines made necessary the consolidation of the several companies.

Salt Lake City

May 26—Active work has been started on the new Snake Creek drainage tunnel, which is being driven to develop the southern part of the Park City district. A concrete compressor house has been built, and a Sullivan two-stage compressor with a capacity of 680 cu.ft. of free air per minute has been installed. This is belt driven by a 100-h.p. General Electric motor, power being furnished by the Snake Creek Power Company. The current is reduced from 6600 to 440 volts at the transformers, which are just outside of the compressor building. Two 3¼-in. drills are being worked abreast in the 6½x9-ft. tunnel, and the face is advanced about 12 ft. per day. The contract calls for 370 ft. per month. The tunnel, which was started by hand, is now in a distance of over 200 ft. At present 26 men are employed on three shifts. This force will be increased.

The taking of testimony in chief of the plaintiff in the case of the Silver King Consolidated vs. the Silver King Coalition was concluded May 25. On May 27, testimony in rebuttal began. The hearing has already occupied about six months.

Goldfield

May 26—The jury in the case of L. H. Dresser, charged with "high grading" in the Consolidated mill where he formerly worked on the concentrating tables, has been dismissed for failure to reach a verdict. The vote stood seven for acquittal and five for conviction. The defendant was arrested as he was coming off night shift at the mill. It is alleged that in his pockets were found several pounds of concentrates valued at $200. A second trial will follow within a couple of months, although it is common talk in Goldfield that a jury cannot be secured that will convict a man of robbing the Consolidated.

It is expected that by June 15, the Consolidated mill will again be in operation at its full capacity. The rubber conveyer belt which was made to order in the East is on the ground and will be put in place as soon as the steel work is completed. Foundations for the new storehouse are in, and the railway spur to the new site is completed.

Scranton, Penn.

May 29—Over 10,000 miners in the collieries of the Pennsylvania Coal Company between Old Forge and Wilkes-Barre went on strike last week, alleging grievances to which they said they were subjected contrary to the award of the Anthracite Commission. The men did not come out in a body, nor were they called out by the officers of the miners' union, to which, as a matter of fact, the majority of them did not belong. The strike was started by 300 men in a mine at Old Forge, followed next day by the same number of men coming out at Pittston, and these two isolated strikes were followed by others until the whole number of men were idle.

The 12 grievances are formulated. The men say that at the collieries at which the coal is weighed, the cars were run so fast on the scales, seven a minute, that the weighmaster could not obtain an accurate weight and that he seldom or never conscientiously tried to do so. They also said that the dockage was excessive; that they were paid less than at other mines for rock work and yardage. They also complained of tardiness in the delivery of cars and mining props, and other matters of the kind.

When the men began going out on strike, the officers of the union of the First district got to work and enrolled a large number of the men in their organization. The majority of the men working for the Pennsylvania company are foreigners, and at Midvale there was some rioting, one of the rioters being shot by a State trooper, that force having been called out to protect property in the neighborhood of the mine where the rioting occurred.

On May 26, Capt. W. A. May, general manager of the Pennsylvania Coal Company, and W. W. Inglis, general superintendent, representing the Erie railroad, to which the Pennsylvania company belongs, W. L. Connell, president of the Conciliation Board, and Pres. Benjamin McEnaney and Secretary John T. Dempsey, representing the striking miners as officials of the miners' union, met at Scranton to reach a settlement, or at least a method of adjusting the difficulties. It was announced that the company was willing to submit all the grievances the men allege to the Conciliation Board and that they would adhere loyally to the decision of the board, whatever it may be, after the men had returned to work. On the other hand, President McEnaney said that he would call a convention of the miners, and try to persuade them to accept this solution.

On May 27 there was a mass meeting of the miners of the company held at Pittston, at which President W. L. Connell, of the Conciliation board, and President McEnanney, of the miners' union, attended. They advised the men to return to work and to place their grievances before the Conciliation Board. The strikers then retired and took a vote on the reference of the matters in dispute to the Conciliation Board. After a few minutes' deliberation, they decided by a unanimous vote that they would not return to work until the grievances of which they complained were redressed. There is every possibility now that all the miners employed by the company, some 20,000 men, will be on strike within the next few days.

A committee representing the strikers of the several collieries of the Pennsylvania Coal Company had an interview, May 28, with Capt. W. A. May, general manager of the company. After some discussion on the points in dispute, the committee declared that the 10,000 men whom they represented would not return to work until all the grievances of which they complain were redressed.

The company has collieries at Forest City, Mayfield and Dunmore; none of the men at these mines have struck yet. The employees of the Consolidated mine of the Hillside Coal Company at North Avoca went on strike May 29, alleging the same grievances as the men at the other collieries.

Cobalt

May 30—Last year there were 105,416 tons of coal used under the boilers, but now the amount used in this district is almost negligible. The Mines Power Company has repaired the generators at Matabitchowan, and the entire system is working satisfactorily. The pressure of the air is remarkably constant at 105 lb. and is practically free from moisture. The plant of the Hydraulic company is also giving satisfaction. There are now 13 concentrators in the district, all operating by electricity, and this number will shortly be augmented. A Pittsburg syndicate will erect a custom mill near Kerr lake, and the Hudson Bay company has also decided to build a concentrator. It is stated that the Crown Reserve is also planning one.

Mexico

May 29—In northern Mexico the zinc ore situation is unchanged. The European buyers decline to take any ore except on long contract. The Calera company, of Chihuahua, is shipping to the United States, as are also the Chihuahua and Potosi mines of the Sta. Eulalia district of Chihuahua, both of which have long contracts at good prices.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

A New York company under the direction of A. J. Scheur, has secured the right-of-way for a railroad to be known as the Alaska Short Line, to run from Illimna to the Kuskokwim, touching the Innoko and Haiditarod countries.

Joseph Houston and associates have given a bond on 2500 acres of placer along the Alaska Northern railroad at mile 24 to Victoria investors represented by T. Ford Hopkins.

Arctic—This company will start operations at Teller, May 20. Ten acres of gravel will be run through the boxes the first thing. Max Hirschberg is manager.

Chena—This company has been incorporated at Chena for the purpose of building a 10-stamp mill for custom work.

Reliance—These mines will be equipped with the first 20-stamp unit of a 200-stamp mill.

Eagle River—This company expects to make the properties formerly owned by the Nowell company, Berner Bay, produce within the year. Bert Thane has charge.

Alaska Treadwell—The crushing for the month ended April 15 was 19,315 tons, yielding $55,712. The net operating profit was $19,818; yield per ton, $3.01.

Alaska United—The total yield for month ended April 15 was $73,944. The ore in the Ready Bullion averaged $2.40 per ton and in the "700," $2.

Lost River Tin—The company is making preparations for working the property 28 miles north of Teller. H. F. Peterson, of Seattle, is manager. About 1100 ft. of development has been done, and a number of veins of tin have been opened up.

Beatson Bonanza—This copper mine on Latouche island has been sold to the Guggenheim interests. It is reported that a smeltery may be built in connection with the deal.

Alabama

Joseph H. Hoadley, president of the Alabama Consolidated Coal and Iron Company, has disposed of a majority of his holdings to Scranton, Penn., coal men and a new president will be elected soon. The Baltimore interests on the board of directors tendered their resignations last week. It is given out that the new interests will make heavy expenditures looking to development of the properties of the company, which consist of coal and ore lands, blast furnaces and coke ovens.

In all probability the United States Steel Corporation will make a contract for the use of natural gas at its plants in and around Ensley, Ala., provided the pipe-line is constructed from the Fayette, Ala., gasfields. The pipe-line is now under consideration. The four wells flowing gas are now showing a strong pressure.

The Southern Iron and Steel Company will probably operate the plant of the Weller Rolling Mills Company at Alabama City, near Gadsden. The creditors of the bankrupt Weller concern expressed fears that the use of the plant by the Southern company might cause a deterioration in the value of the plant, but this has been arranged and the plant will likely be operated shortly.

Arizona

GILA COUNTY

Ray Consolidated—Formal notice of the proposal to exchange Gila copper shares for Ray Consolidated on the basis of three shares of the former for one of the latter has been issued.

Miami—All the interior work in the orebody at the Miami mine above the 420-ft. haulage level is completed, and the putting up of the raises which will be used as chutes in mining is far enough advanced so that production could be commenced at once if necessary. On the second haulage level, 570 ft. from the surface, the main drift which will eventually connect shaft No. 4 with the orebody 700 ft. distant has been driven 40 ft. from the station. This level will be designed and equipped in exactly the same manner as the haulage level above. The construction of the concentrator, power house and new hoisting plant is being carried forward rapidly, so that all should be in readiness for production by the end of this year. About 950 ft. of drifting and raising is being done weekly.

Arizona Commercial—On the seventh level a crosscut is being driven northward to open the Old Dominion fault. The installation of a 1000-gal. pump on the seventh level is now completed, preparatory to resuming shaft sinking.

Live Oak—The third churn drill struck chalcocite 300 ft. from the surface and has since passed continuously through sulphide ore for 55 ft. Drift No. 208, driven eastward on the second level, has passed through ore of similar character for 161 ft. As the third drill hole is 700 ft. west of the shaft, the ore belt is shown to extend 861 ft. in an east and west line, with an average vertical thickness of from 150 to 200 ft. M. E. McCarthy is manager.

GRAHAM COUNTY

Detroit—The company has been absolved from liability for damages from the floods of 1906 by a decision of the Pima county court.

PINAL COUNTY

Mammoth—This gold property in the Superstition mountain district on the Maricopa county border, east of Mesa, has been acquired by George U. Young, who will install ten stamps and make tests for cyanidation while continuing development.

California

AMADOR COUNTY

Kennedy—The orebody on the 3300-ft. level is as large as it was on the level above. The ore extracted keeps the 100-stamp mill busy. The shaft will be sunk to the 3400-ft. level making it the deepest in the State.

Levaggi—This mine, Plymouth, has been placed under bond to Eastern men who are putting up a 10-stamp mill and starting to sink.

South Eureka—A new retort building has been erected and other improvements made.

NEVADA COUNTY

Cassidy—L. H. Armstrong and associates have raised the money to start up this Grass Valley mine.

Double Diamond—This property near Moores Flat, D. Edwards manager, will resume.

Excelsior—The mines, Meadow Lake district, will be started under management of Charles Chambers.

Ancho—This mine at Graniteville, George Mainhart, manager, has been reopened.

Canada Hill—This mine has been unwatered and new compressors and drills have been ordered.

PLACER COUNTY

Good Friday—Nevada county men have organized to work this mine at Ophir, and have obtained control also of the Green, Hilltop and Enterprise mines in the same district.

PLUMAS COUNTY

Bushman—This mine, near Quincy, has been bonded.

Gold Leaf—E. Arundel Smith has secured for English capital a bond on this group near Quincy and will begin work. The Gobert mill has been leased.

San Benito County

Aurora—This quicksilver property will have the new furnaces running in about three months.

Black Warrior—C. Davis and F. O. Richardson have paid the first installment on the bond on this property, which joins the Standard on the north and has a vein on the same contact. Men are at work developing.

Sierra County

Swastika—This mine near Sierra City, will add 10 stamps, doubling the mill.

Kate Hardy—A strike has been made in this mine near Forest. Power drills and a mill will be installed. William Beggs, of San Jose, is one of the owners.

Trinity County

Trinity—This new company at Carville is erecting a 40-stamp cyanide mill and installing a 500-h.p. hydroëlectric plant. D. W. Shanks, of Chihuahua, is manager.

Colorado

Clear Creek County

Lucania—Jesse J. May has started on a contract to advance the tunnel 500 ft. and expects to have the work completed by Aug. 1. Another similar contract will then be let by John McCall, manager. The first 500 ft. will reach the Specie Payment vein.

Gunnison County

United Colorado—The 200-ton mill at Dorchester is operating.

Leadville—Lake County

Brattleboro—One of the best gold strikes made in the district is on the Valley property of this company, in South Evans gulch. It is under lease to the Luema mining Company, Warren F. Page, manager.

Matchless—This mine on Fryer hill, owned by the Tabor estate, and under lease to T. M. Raney, is outputting 40 tons per diem of iron-silver ore from 365 ft., the silver contents increasing with depth.

San Juan District

Camp Bird—The April output was $166,765, and the net profit, $121,355.

Teller County—Cripple Creek

Isabella—In May, the company's Bull Hill mine shipped 24 cars from the Lee shaft, which yielded 1 oz. gold per ton. The Empire shaft, under lease to the Western Investment Company, has shipped 12 cars, which it is said, ran $34 to $40 per ton; and from the Maloney shaft, on the Orphan Belle, 55 tons of $25 ore have been shipped by Lessee Dailey.

Eclipse—Work has been resumed on this mine, in Eclipse gulch, west of Battle and Squaw mountains. This was one of the first producers in Cripple Creek, and 900 ft. of drifts and shafts were done on it in the early day. It was credited with a production of $50,000. An electric hoist has been installed, and the lessees are unwatering.

City View—A shoot of ore 50 ft. in length and yielding from 1 to 2 oz. gold per ton, has been opened by Frederick Schaeffer, lessee, on the City View basalt dike, Gold hill.

Requa-Savage—Two carloads of ore from this Beacon Hill mine were shipped recently, estimated to carry 1 oz. gold per ton.

Ajax—Leasers are sending out from 1200 to 1500 tons per month of $20 average grade, the ore coming from all parts of the mine from surface to the 1300-ft. level.

Granite—Several hundred tons per month are being produced by this property, the average grade being a little over $20 per ton.

Vindicctor—Four to six carloads per month are being shipped by John Sharpe, leasing on the dump of this mine, and it is said the returns are better than those obtained from some of the mine ore.

Stratton Estate—The American Eagle mine of this concern, under lease to the Colorado Mines Investment Company, Paul Hines, superintendent, during April produced 350 tons of ore averaging $50 per ton. Sublessees shipped carload lots of very much higher grade than the above, some of it yielding as high as $1000 per ton. Todd & Co., sublessees, have made a strike of 18 in. of ore carrying free gold, which is being sacked underground.

Idaho

Coeur d'Alene District

Mineral Point—This mine, which is especially rich in silver, has resumed prospecting by diamond drill and will work actively.

Rex—Regular shipments will begin July 15 by which time the second compressor and hoist will be in place.

Trail Gulch—This gold-quartz property, located in 1884, has been purchased for $70,000 by W. J. Peck and William Lotze, of New Haven, Conn., and by F. W. Isham, of Spokane, and $36,000 paid. The property was owned by A. B. Ward, of Delta. It was formerly owned by Charles Sweeny, of New York.

Bunker Hill & Sullivan—The tailing mill with a capacity of 1000 tons daily, is operating satisfactorily and is adding greatly to the output.

Iron Mountain Tunnel Company—This company has completed the 1650-ft. tunnel and is operating under direction of Robert C. Davis. Preparations are being made to commence zinc shipments from above the 1600 level, and to recover the silver-lead ore developed.

Indiana

Gibson County

Ayrshire Coal Company—This company has leased a large tract south of Oakland City, and will open a new mine. The mine is on the Evansville & Indianapolis railroad. Pittsburg men are also making coal tests south of Oakland City, with a view of developing their leases.

Greene County

Sullivan Coal Company—This company, operating a large mine at Dugger, has filed a petition with the Indiana Railroad Commission, asking that the Indianapolis Southern railroad be compelled to establish a 60c. rate on coal to points in the gas belt. The petition alleges that a 60c. rate is enjoyed by competitors on other lines, but that the Indianapolis charges 75c. to the complaining company.

Sullivan County

Consolidated Indiana Coal Company—This company is drilling at Keller. The drill has reached No. 5 vein and other holes have been started.

Vigo County

Every mine in the Terre Haute district is in operation on full time, to meet the demand for coal in the northwestern market. The railroads are taxed to supply cars. The price of steam coal at the mines closed at $1.75 a ton, against $1.25 earlier.

Michigan

Copper

Keweenaw—The shaft on the Kearsarge lode is 200 ft. and the lode being exposed is nearly 40 ft. wide, with about 25 ft. of it uniformly charged with copper. A drill in line with the shaft cut the formation at 1400 ft. and the core showed the formation to be about 28 ft. wide and proved the continuity of the mineralization.

Phœnix—At this property, the drill has penetrated the ashbed lode, showing it about 65 ft. wide, with copper.

La Salle—No 1 Tecumseh shaft is down to the 22d level, with the openings from the 14th to 17th levels inclusive revealing stamp rock. Shipments of 350 tons of rock are being made daily to the stamp mills, most of it from the stock pile.

Contact Copper Company—This company has been organized to acquire the Elm River property and the tract of land comprising about 800 acres in sections 13 and 12, now held under option by the Elm River Company. Among the incorporators are Harry F. Ray and Stever R. Dow, of Boston, and John G. Stone of Houghton. It is planned to begin drilling on section 13 at once.

Ahmeek—The first head in the new stamp mill is ready and will be followed within a few days by the second. In the near future this property will be taking care of its own rock.

Oneco—The company has discontinued its No. 7 hole after penetrating the Oneco lode and has moved it to No. 9 hole, which, together with No. 8, will go down vertical to expose the mineralization underlying the southeastern portion of the tract.

Twin Lakes—The company has discontinued driving its sand pipe for the first hole on section 23. This pipe was started at an angle of 45 deg. and was put down 485 ft. when boulders were encountered. Another attempt to get this pipe down was started at the same point vertically. The second hole will be started on section 27, going down vertical.

New Arcadian—Surface trenching has been started on the trend of the lode exposed in the No. 4 hole of the New Baltic company.

Iron

Munro Mining Company—This company, controlled by the Buffalo & Susquehanna interests, is developing an iron deposit between Crystal Falls and Iron River. The company has an exploration under way on the Schiebler tract on the Western Marquette range.

Swallow & Hopkins—This firm is interested in an option on the Gustafson land on the western Marquette range, north of the Chicago mine.

Cleveland Cliffs—The company has awarded contracts for a power house at the Smith mine and a crusher and ore-sampling house at the Austin mine, both in the Swanzey district of the Marquette range. The steel for a shaft house is on the ground at the Barnes property. This mine will be one of the largest on the range. The shaft is being put down rapidly.

Montana

Butte District

Anaconda—Stockholders of the Alice Mining Company have voted to accept the merger agreement. The exchange gives the Alice shareholders 30,000 shares of Anaconda, or at the ratio of 15 shares of Alice for one of Anaconda. A court petition has been filed by six Parrot stockholders, who oppose the Anaconda merger, and ask to have their stock appraised.

Butte & Superior—The rumor that all work on the new concentrator had been stopped and that President Wolvin and Manager Atwater had been called to New York is apparently without foundation in so far as suspension of work is concerned. About 350 tons of ore are being shipped daily to the Basin concentrator and between 150 and 300 tons are being shipped each week direct to the Bartlesville plant of the American Metals Company.

East Butte—President Gross states that development is being confined exclusively to the Pittsmont mine from which 2086 tons are hoisted weekly, which average 5 per cent. in copper. An additional blast furnace will soon be started to treat ore from the Butte & Ballaklava mine which will be handled on a custom basis.

North Butte—George Bartlett states that the management during the last three years has evidently devoted most of its energies to getting out ore and that the development has not kept progress with the actual mining. This, however, will be remedied. Mr. Bartlett was unable to obtain any confirmation of the rumor that a diamond-drill hole was being run from the 2800-ft. level of the Diamond mine into the North Butte property. The shaft, he states will be sunk from the 2200-ft. level, its present depth, to the 2600-ft. level.

Jefferson County

Cascade and Eastern Star—W. J. Stephens, owner of the Hidden Treasure, has purchased from W. H. H. Dickinson the properties for $40,000. The claims contain a continuation of the copper vein in the Hidden Treasure.

London-Corbin—The gallows frame has been completed and a hoist will be installed. The shaft, down 60 ft., will be sunk 300 ft. before any other development is done.

Corbin-Pennsylvania — The company has been incorporated with a capital of $500,000. H. E. Emmerson is president, W. D. Gibson, and H. N. Brooks, secretary and treasurer. The property consists of six claims adjoining the Boston & Alta. On the Flambeau claim a shaft is down 120 ft., and on the Alta mine Extension claim there is a 150-ft. shaft.

Montana-Corbin—Two cars of ore have been shipped. One car from the 150-ft. level averaged 8.97 per cent. copper and one from the 400-ft. level averaged 12.6 per cent. copper.

Missoula County

Copper Hill Mining Company—The company has been organized by Morton Webster, A. T. Ryan, P. L. Eberhardt, Howard K. Welch and James Howarth to operate seven claims, several miles west of Quartz. A crosscut tunnel is in 500 ft. A second tunnel will be driven giving a depth of 1000 feet.

Nevada

Churchill County

Nevada Hills—The reduction plant of the recently consolidated Nevada Hills-Fairview Eagle is nearing completion. As soon as the power company can supply electricity, the property will be operated at full capacity.

Esmeralda County

The purchase of the Rawhide water system by Los Angeles capital means the erection of another custom mill in the Rawhide camp.

Florence—Interest centers in progress at northern extremity of the property in territory formerly in the Reilly lease, which produced nearly $1,000,000 in 90 days. The old lease workings will be tapped on the 350-ft. level, where rich ore is in sight.

Combination Fraction—The orebody exposed on the 500-ft. level, in virgin ground northeast of the main shaft, is being sought on levels below and above. The Fraction will start milling June 1.

Merger—High-grade ore from the shoot recently exposed on the Ford lease is being sacked and shipped.

Goldfield Annex—Sinking has commenced from the 800-ft. level.

Humboldt County

There has been a new camp established in Lowery cañon, above National.

Work has begun on the mines of the Dike district, in the Pine Forest mountains.

Much work is being done at the Red Buttes copper camp Jackson Mountain region, about 60 miles northwest of Winnemucca.

The placer mines near American cañon, Humboldt range, are being worked again as are also the placers 18 miles south of Winnemucca.

Nevada Sulphur Company—The company has commenced operations on the property in the oil region 60 miles west of Winnemucca.

Equity—W. H. Hammond with Boston interests is developing this property at Mountain City.

Imlay—Robert Kirk, superintendent, reports the mill has been running steadily several months, treating 46 tons daily of $7 gold-silver ore. Sinking to the 250 level in ore is in progress.

Ohio—This group of three claims with five adjoining claims, has been purchased by a Milwaukee syndicate for $200,000. An additional $100,000 will be invested in a mill for treating the ore exposed in the mine and on the dumps.

Seven Troughs—The company is having tests made on the mine tailings, with a view to installing a cyanide plant.

Nye County

Tonopah shipments for week are: Tonopah, 3150 tons; Belmont, 1400; Montana-Tonopah, 971; MacNamara, 175; West End, 200; Tonopah Extension, 800; Midway, 50; total, 6746 tons.

Midway—Work will be resumed immediately on the 1035-ft. level, the deepest in the mine.

Montana-Tonopah—The April report is the best for a year. 4303 tons were mined and milled, with an average extraction above 91 per cent.

Tonopah-Belmont—The Belmont shaft, which encountered ore at 1160 ft., is now 20 ft. deeper with the bottom still full of high-grade milling ore. The new vein promises to prove equal to the main Belmont vein from which it appears to be entirely distinct.

Tonopah—The mill during week ended May 15, treated 3400 tons, averaging $21. Bullion shipments included 76 bars of bullion and 40 tons of concentrates, total $86,000.

Bullfrog-Mohawk—A plunger pump, with a 20-h.p. gasolene engine, capable of 2500 gal per hour, is being installed preparatory to sinking.

Montgomery Mountain—The company, owning a large acreage adjoining the Montgomery-Shoshone, has been incorporated with a capital of $1,500,000 by Utah operators.

Rex—The Rex mill at Gold Circle is running smoothly at maximum capacity.

New Mexico

Following its recent action in withdrawing from entry the newly discovered oilfield near Alamogordo, the general land office has withdrawn a tract 24 miles square, including all of the newly discovered oil and gas field of Eddy county, in the vicinity of Dayton. Nearly all of the artesian district of the county is included. Development of the Dayton oil district has just started on a large scale.

SIERRA COUNTY

Lake Valley—The company is planning to place the smeltery in repair and treat the low-grade silicious ores on the dumps and in the stopes. The sulphide ores of Las Animas district, 25 miles north, afford a flux.

Good Luck—This company, operating the Dude mine eight miles south of Lake Valley, has opened up low-grade silver ore and lead. The shaft is down 300 ft. with drifts of 355 ft. on the 200-ft. level, and 190 ft. on the 300-ft. level.

Log Cabin—An examination is being made cf these properties, Tierra Blanca.

Oklahoma

The Quapaw Gas Company may not be able to furnish gas for the Oklahoma mining camps owing to an Oklahoma law that prevents a company which receives gas out of the State from selling it in the State. The mains are laid and the gas is being piped to Missouri.

Queen City-Joplin—This mine will resume, the deeper mines in the camp having controlled the water.

Oregon

JOSEPHINE COUNTY

Brantner—This group has been purchased by Moy Jin Munn, a wealthy Chinaman, of San Francisco, who will operate the mines on a larger scale.

SUMPTER COUNTY

North Pole and E. & E.—Alexander Baring, of London, is at Baker City on a deal which involves the consolidation of these properties.

South Dakota

The Lundberg, Dorr & Wilson mill, at Plumas, will resume soon.

Gold Mountain—This new company will sink a shaft 600 ft. to the quartzite and crosscut. The property is three miles east of Deadwood. John R. Russel is secretary.

Utah

The local United States land office has received notice that a part of the lands which were included in temporary petroleum withdrawals have been restored to entry. The restoration is made upon the recommendation of the director of the United States Geological Survey on the ground that the lands are more valuable for agricultural uses than as oil lands. A small part of this land lying south of the 37th parallel north latitude is governed by the Salt Lake meridian, Arizona. The land restored is for the most part in Washington county.

BOX ELDER COUNTY

Black Warrior—This property in the Lucin district was recently taken under bond and lease by J. B. Simpson and Frank Williams.

EMERY COUNTY

Castle Valley Coal Company—The railroad to the mine is completed, and track is being laid on the tramway between the mine and tipple. Several thousand feet of development have been done. From 50 to 100 tons of coal are being mined daily, and preparations are being made to increase this to 500 tons.

JUAB COUNTY

May Day—Leasers are mining from the 1000-ft. level. The ore was developed by the company on the 1000-ft. level, and was looked for on the 1100, but missed owing to the flat dip. A lease was granted to some of the employees. The company is shipping enough ore to meet expenses, and in addition to pay off some indebtedness.

Yankee Consolidated—Arrangements have been made with the Knight companies to furnish electric power and air for this mine.

Murray Hill—At this property north of the Yankee Consolidated, joining the Godiva claims on the northeast, a double-compartment shaft has been sunk 70 ft. Development will be continued in search of the Colorado orechannel.

Iron Blossom—Work is being done on the 600-, 700- and 1100-ft. levels. Copper ore has been developed on both the 700- and 1100-ft. levels, and a car is shipped every two weeks. On the 600 level, work is being done on the gold vein, which carried about $15 in gold and 30 oz. of silver. This orebody is reported to be headed southwest for the Governor property which is also owned by the Knights, and is about 200 ft. from the Governor north claim lines. In the north workings, No. 3 shaft, silver-lead ore is being mined from the stope on the 500-ft. level. Most of the shipments are from this part of the mine.

Carisa—Two feet of lead ore has been opened on the 500-ft. level, and development is being carried on.

Eagle & Blue Bell—The 200-ft. shaft has been retimbered for 50 ft., and is being put in shape for sinking. Timbering will be continued to the bottom. The new hoisting plant is expected in July.

Sioux Consolidated—The last 34 cars of ore brought $11,829.

Lower Mammoth—Development on the 2000-ft. level has not opened large orebodies, though some ore has been encountered. The drift is being driven south for the contact. The leasers are shipping ore from old workings between the 1100 and 1200 levels. What appeared to be a wall on the 1100 was broken through, and exposed ore.

TOOELE COUNTY

Cliff—Ore is being hauled from the mine at Ophir to the railroad at St. John by a traction engine. The cost for hauling is stated to be 42c. per ton, as compared to $1.50 for hauling by teams. Regular shipments are being made.

Washington

OKANOGAN COUNTY

Q. S.—This mine will be developed by A. M. Dewey, of Spokane, and the improvements will include an electric power plant.

SNOHOMISH COUNTY

Eclipse—The Independent mill building and water-power equipment has been purchased.

STEVENS COUNTY

First Thought—Daily shipments are being made. The vein is over 30 ft. wide.

Canada

BRITISH COLUMBIA

Consolidated—The plant smelted 41,933 tons in April, which yielded gold, 10,419; silver, 187,976 oz.; copper, 489,923 lb.; lead, 3,653,182 lb.; total value, $447,735. The company will explore the

Sullivan lead-zinc mine near Marysville, with drills.

Canada Zinc Company—The electric zinc-smelting plant at Nelson will be used by the Dominion department of mines for experimenting with electro-thermic processes for the reduction of complex zinc-lead ores.

Queen Victoria—Work will be resumed at the mine, near Nelson, now under bond to the Consolidated company.

Granby—An extensive exploratory campaign with diamond drills has been inaugurated.

Ontario

The shipments from Cobalt for the week ended May 20, are: McKinley-Darragh, 201,408 pounds; Crown Reserve, 84,000; Nipissing, 120,400; Buffalo, 66,000; O'Brien, 64,100; Chambers-Ferland, 64,260; Trethewey, 63,700; Coniagas, 52,400; Silver Cliff, 51,500; Cobalt Central, 46,300; total, 814,068 pounds.

Temiskaming—The new mill is treating 100 tons of dump and mine ore. Magnificent ore is being found on the 400-ft. level, and the shaft is being sunk to 500 ft., to open it.

Hudson Bay—This company has taken a working option on the O'Gorman & Sweet properties in Gowganda, and has started work.

King Edward—This company is shipping on an average of a car of concentrates per month, and producing between 12,000 and 14,000 oz. The output is from the Watts. The company operates a small concentrator and the production is from the milling ore.

Leroy Lake Syndicate—In drifting in this property, Gowganda, at the 110-ft. level, five good veins have been encountered—one 12 in. wide, the other ranging from 2 to 5 in. The ore runs between 1000 and 2000 oz. silver per ton and there is good milling rock in the wall.

Buffalo—The production for the past fiscal year was approximately 1,500,000 ounces. In April, the mill recovered 117,004 oz. from mill rock of an average assay of 48.66 oz. Labor costs were $4711 and power cost $973.

Brydge—A new high-grade vein has been discovered on the 200-ft. level of this Peterson Lake lease.

Crown Reserve—Another high-grade vein about 4 in. wide has been opened up south of the Carson vein on the 100-ft. level.

Miller Lake-O'Brien—A small high-grade shipment has been made by boat from this property at Gowganda.

Provincial—The second high-grade vein in the shaft near the Savage property was opened up at 120 feet.

Orizaba—This property, Barr township, Montreal river, has a shaft down 100 ft. and will be sunk to 125 ft. At 13 ft., an assay showed 139 oz. silver and $12 gold, but the vein dipped from the shaft at 40 ft. It will be sought by crosscutting at 125 ft. The vein has been traced for about 1½ miles.

Thompson—A vein 8 to 10 in. wide, with a good showing of silver has been found, and stripped for 300 ft. at this Gowganda mine.

Amalgamated Asbestos—One-half of the new mill at Black Lake is in operation with double shifts, treating 500 tons of rock per day, furnished from the Union and Southwark properties. Within a month the mill will be working to full capacity, handling 1000 tons of rock daily. The tramway connecting the Southwark quarries with the mill, which, with the sidings, contains a trackage of one mile, is in full operation. Five derricks with electric hoists, are operating on the Southwark, and six derricks in the other pits. The rock now being extracted is of good quality and the production of asbestos is up to the original estimates. About $300,000 has been expended on the mill, tramways, derricks and boarding houses, and 200 men are employed.

Moose Mountain Mining Company—This iron property developed by Charles S. Osborne, of Sault Ste. Marie, has let a contract for installing an electric plant, the power to be transmitted 31 miles. A 1000-ton mill is in operation. About 1,000,000 tons are reported developed. Lifting magnets will be employed in handling the ore.

Mexico

Baja California

Progreso—This mine at Triunfo, is installing a concentrator and a slime plant to treat the complex ore. Arthur C. Nahl is manager.

Chihuahua

Dolores—For the first quarter of 1910 the revenue amounted to $279,634; expenses, $181,679; profits, $97,954. On the new Bohemian vein where the shaft has reached 193 ft., stoping has been begun. From present indications this new vein may prove as valuable as the Alma or main vein. The new workings are developing favorably. In the No. 3 shoot, the ore from the winze, 88 ft. below the tunnel, averaged $100. The third level north drift driven to cut No. 3 shoot is showing $30 to $40 ore.

Durango

Corralejo—This company in the El Oro district is shipping. About 800 ft. of work has been done and a 10-stamp mill is in commission. The company's Monte Cristo gold mine has been acquired by a new company organized in France by Felix Kahn, and is being developed. N. C. Thompson is in charge of the Corralejo.

Sinaloa

Choix Consolidated—The company will open two groups near the Orient railroad. E. A. Thomas, Los Angeles, is president.

Sonora

Calumet & Sonora—The additions, making this company's mill capable of treating 110 tons daily, have been completed.

Santa Fe Consolidated—Stock has been put on the market for funds for a mill.

San Antonio—This silver-lead property in the Arizpe district, is prosecuting development under S. B. Gregory.

Altar Placer—This concern is launched by Douglas, Ariz., people to acquire holdings in the Altar district and operate with dry-washing machines.

North Tigre—Much tunnel work has been outlined. The company has funds to meet requirements.

Rosales—This mine, which yielded shipping ore in 1907, is being reopened, and a 200-ft. shaft will be sunk.

Black Mountain—This company, which has worked the Cerro Prieto mines, west of Magdalena, has closed down indefinitely, with the exception of some final work at the main shaft. Nearly all the miners and millmen have left.

Greene-Cananea—Owing to the increased supply of first-grade ore from the Sierra de Cobre mine, the production at some of the smaller mines has been curtailed, converter lining only being drawn from the America.

Waldorf—Recent work on a 7-ft. fissure has disclosed gold and tellurium in promising quantities.

Sonora Copper Smelting Company—The erection of the smelting plant at Noria has begun. The ore will be conveyed from the tunnel 3200 ft. by an aërial tramway.

Veta Tierra—These placers, near Llano, have been purchased by George D. Stonestreet, and the erection of machinery is under way.

South America

Bolivia

Phuyo-Phuyo—Maurice E. Rosewater of the firm of Rosewater & Rist, New York, owners of this mine at Pelechuco, has bought the whole section of Phuyo-Phuyo. There are extensive Inca and Spanish workings there. Some of the ditches are eight and 10 miles long. The purchase includes five lakes, with ample water rights and two hydraulic mines in Suchez and Phuyo-Phuyo. Hydraulic power is available. The gold found is coarse.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, June 1—The coal trade in the East is in fair condition and shows little change. Car shortage and delays in transportation are making some trouble for operators. The demand for coal is good, but Eastern buyers run chiefly to the lower-priced kinds, and trade is best in those sorts.

The anthracite market is quiet and steady as usual, with no considerable changes to be reported.

In the West, there are still troubles over the mining rate in Illinois and the Southwest. An important change has taken place in southern Illinois, where the operators last week met and decided to break away from the State association and form a new association of their own. They also decided to grant the miners the advance asked in the wage rate. The terms offered have been accepted, and many of the mines are starting up this week. The break with the State association is based on its refusal to continue the differential between southern and northern Illinois. The district covered by this partial settlement is that which trades chiefly with the St. Louis market.

In the Southwest, there has been no approach to a settlement with the striking miners. It is reported that the operators are preparing to give up all negotiations and to open their mines on the open-shop plan. They believe that in that case many miners will return to work.

Meantime, the mines in Indiana, Ohio and the Pittsburg district, which have resumed work, report a very good business.

Coal Rates to the Lakes and Tidewater—Going rates from various districts to the Lake ports and to tidewater are as follows. in cents per ton:

Pittsburg District:	Commercial.	Cargo.	Bunker.
Buffalo	125 00		
Lake Erie ports	190 00	88 00	98 00
Chicago	190 00		
Detroit	110 00		
Philadelphia	185 00		
New York	220 00		
Eastern Ohio			
Lake Erie ports	90 00	85 00	85 00
Detroit	115 00		
Chicago	165 00		
West Virginia			
Fairmont to Lake		97 75	107 75
Fairmont to Chicago	190 00		
Fairmont to Tidewater	180 00		
Pocahontas & New River to Lake		97 00	107 00
Pocahontas to Chicago	190 00		
Pocahontas to Tidewater	140 00		

The rates from Handley and Thurmond, the central basing points for the Pocahontas and New River regions, to tidewater at Norfolk and Newport News work out, respectively, to 0.373c. and 0.387c. per ton-mile.

Coal Freight Rates—The Illinois Railroad and Warehouse Commission has made an order suspending for 60 days, or until Aug. 1, the proposed increase in freight rates on Illinois railroads.

Coal Traffic Notes

Coal tonnage of the Norfolk & Western railway, 10 months of fiscal year, from July 1 to April 30, short tons:

Field:	Commercial.	Company.	Total.
Pocahontas	7,974,141	1,012,732	8,986,873
Tug River	1,229,350	177,449	1,406,799
Thacker	1,223,601	569,244	1,792,845
Kenova	545,072	151,422	696,494
Clinch Valley	555,830	44,856	600,686
Total	11,527,994	1,955,703	13,483,697

As compared with the corresponding period in 1908-9 there was an increase of 3,191,051 tons, or 31 per cent.

New York

Anthracite

June 1—Trade is about as usual. There was some extra business done in anticipation of the rise in prices, but not enough to disturb the trade.

Today 10c. per ton comes off the regular summer discounts. Schedule prices for domestic sizes are now $4.45 for broken and $4.70 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, $3@3.25; buckwheat, $2.20@2.50; No. 2 buckwheat or rice, $1.65@2; barley, $1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

Bituminous

The seaboard bituminous trade shows some improvement, but orders still come in quite irregularly. A considerable business is being done, but it is not as well distributed as it might be. New England territory is waking up a little, but it is there that the variations are most apparent. Some dealers are inclined to charge West Virginia with this uncertainty. New York harbor trade is apparently better.

Prices continue about the same. Good Miller vein steam coal can be had at $2.65@2.70, f.o.b. New York harbor; and there is a range of 20c. below this and 25c. above for coals of lower or better quality. Gas coal is in good demand, but prices are low. Buyers still show a marked preference for the lower-priced coals.

Car supply is still below par, and there are many complaints from mines on this account. Transportation is a little better, but there is occasionally delay in getting coal through on time. As usual, there is considerable difference in the supply and movement on different roads.

In the coastwise-vessel market the call for boats is quite up to the supply—perhaps a little above it. The rate of 70c. from New York to points around Cape Cod holds, and vessel owners seem to be pretty firm in asking at least that figure.

Birmingham

May 31—There is a better demand for coal in the South. Alabama coal operators have received some healthy contracts by reason of the strike in the Middle West, several railroads making contracts for their needs for the next few weeks. The mines at Mulga, property of the Birmingham Coal and Iron Company, in which an explosion occurred April 20, will resume operations this week, the last inspection having been made by the State mine inspector. It will be several weeks yet before the mines at Palos, in which an explosion occurred on May 5. can resume. The official report of the chief mine inspector was issued last week. A close inspection is being made of every mine in the State and operators are receiving instructions to watch the dust accumulations. The railroads are furnishing all assistance possible in handling the increased production of coal in Alabama. So far there has been no delay in the moving of coal.

Coke is not so strong. The production is being kept up right along and whatever is not being used immediately is being stacked for future use.

Chicago

May 30—Under the pressure of continued consumption on a large scale and no resumption of mining in Illinois, the large users of coal are beginning to place large orders for their fuel supply with sales agents of coal from other States. Their storage piles are giving out. Indiana coals especially profit from the situation, but prices are so high that many manufacturers are striving to burn as little fuel as possible; others even contemplate shutting down wholly or in part, saying they cannot meet competition if compelled to buy at current prices. Under reports of labor agreements being reached, prices fluctuate considerably. Smokeless, the other principal source of supply now, is more constant, holding its customary users and making increased sales slowly because of its higher price. Yet smokeless is firm and probably will weaken considerably as soon as fresh supplies are in the market from Illinois. Buying by small concerns increases steadily.

Lump from Indiana, and the little Illinois coal available, bring $2.65@2.75; run-of-mine from the same source sells for $2.40@2.60, and screenings are in demand at $2.50@2.75. Smokeless holds firmly to $3.55 for lump and $3.15 for run-of-mine, list prices. Hocking finds large sale at $3.15. No coal is in too large supply and none seems likely to be under a continuance of present general conditions. The anthracite market is quiet, showing hardly any increased demand in the closing days of May.

Cleveland

May 30—The market is gradually working back to its usual basis, as Ohio mines are getting down to steady work. Lake shipments are larger, and there is, in consequence, a better supply of slack on the markets.

For Middle district quotations are, f.o.b. Cleveland, $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.60 for slack; No. 8 district, $2.20 for 1¼-in., $2 for ¾-in. $1.90 for run-of-mine and $1.75@1.85 for slack; Youghiogheny, $2.60 for lump, $2.30 for run-of-mine and $2.05 for slack; Pocahontas, $2.85 for lump and $2.45 for run-of-mine.

Indianapolis

May 30—The Indiana Manufacturers' and Shippers' Association is seeking to solve the problem presented by the rising price of coal and the demand upon the part of the carriers for increased rates. A petition has been filed with the Railroad Commission against 23 railroads to prevent them from increasing their coal rates June 1. The petitioners maintain that the rates now in existence are fair both to the shipper and to the carriers, and that the proposed increase would work a hardship. A hearing on the petition will be had by the commission June 10.

The movement of coal to this city from Indiana mines is considerably larger than usual for this time of year, and the situation would be satisfactory to the operators, dealers and consumers, but for the uncertainty of prices.

The national executive board of the United Mine Workers, in session at headquarters in this city, has approved the features of the proposed insurance bill in Congress.

Pittsburg

May 31—The coal market presents no new features. The car supply is good, Lake shipments are heavy, local demand is fair, and prices are maintained: mine-run and nut, $1.20@1.25; ¾-in., $1.30@1.35; domestic, 1½-in., $1.50; slack, 80@85c. per ton.

Connellsville Coke—Several good contracts for furnace coke have been placed in the past fortnight, and the tone of the market shows a material improvement, on the theory that most of the cheap coke has found a market, while the feeling in pig iron is undoubtedly better, and it is found that some furnaces are going to run next quarter when it was expected they would be idle.

The Cambria Steel Company has bought 6000 tons of furnace coke monthly, seven months, June to December, inclusive, at $1.70 and has made a contract with the Tower Connellsville Coke Company, through Matthew Addy & Co., the coke company's selling agents for the East, for 15,000 to 20,000 tons of furnace coke for two years beginning Jan. 1, next, with an option on a third year, at a flat price, not stated. Not counting this last contract, there have been made in about a fortnight contracts aggregating 55,000 tons of coke monthly, chiefly at flat prices, $1.70@1.85. Corrigan, McKinney & Co., who inquired for 25,000 tons monthly for second half, suggesting that they expected to do $1.55, did not obtain prices approaching their idea, and are holding off. Occasional lots of prompt furnace coke have been sold at $1.60, and possibly at 5c. less, but such figures cannot be done regularly.

We quote standard grades of Connellsville coke: Prompt furnace, $1.65@1.70; contract furnace, $1.80@1.90; prompt foundry, $2.15@2.25; contract foundry, $2.25@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville regions in the week ended May 21, at 393,185 tons, a drop of 3000 tons; shipments at 3945 cars to Pittsburg, 6381 cars to points west, and 1034 cars to points east, a total of 11,360 cars.

St. Louis

May 30—The strike as far as this district is concerned is at an end. This was brought about by two unexpected incidents. The decision on the part of miners to allow any independent mine to work until signing the scale was, of course, taken advantage of immediately by a number of smaller independent mines and on May 24 at least a dozen of these mines started operations. The operators of the Fifth and Ninth districts realized from this the miners had practically gained their point. They immediately called a meeting at St. Louis. Prior to this time the operators of those districts had felt that the Illinois Operator's Association was not working entirely for their interests and consequently on May 25 they decided to secede from the Illinois Association in a body and form a separate organization of their own to be known as the Operators of the Fifth and Ninth districts of Illinois. These operators then decided to sign the scale and go to work. Most of these mines started on May 26. The Fifth and Ninth districts of Illinois represent all the mines within a radius of 40 miles of St. Louis, known as the Standard district. There are about 75 mines in this district and they represent a total of over 30,000 tons per day, about one-third of the tonnage of the State.

The operators in those districts were aggrieved at the refusal of the Illinois Operators' Association to countenance any abolition of the differential which exists in favor of Southern Illinois. The rest of Illinois—the Carterville and northern districts—are still out. Prices, of course, are not as high as they were last week, though they remain firm at $1.75 per ton at mines for mine-run coal and it looks very much as if this figure will hold until the rest of the State signs up and goes to work. All the coal that is being produced is being snapped up.

The anthracite market continues to be good and all coal which is coming forward is being readily absorbed.

Current prices are as follows for the St. Louis market.

	Mine.	St. Louis.
Kentucky mine-run	..	$2 40
Indiana mine-run	..	2 35
Kentucky lump		2 60
Indiana lump		2 55
Illinois, Standard:		
Mine-run	$1 75	2 27
2-in. lump	2 00	2 50
2-in. screenings	1 60	2 12
Pocahontas and New River:		
Lump or egg	1 50	4 00
Mine-run	1 10	3 65
Pennsylvania Anthracite:		
Nut, stove or egg		6 55
Grate		6 30
Arkansas Anthracite:		
Egg or grate	3 35	5 35
Coke:		
Connellsville foundry		5 10
Gas house		4 50
Smithing		4 15

Prices for Kentucky and Indiana coals are on track, East St. Louis.

FOREIGN·COAL·TRADE

Russian Coal Production—Coal production in Russia for the full year is reported as below, in metric tons:

District:	1908.	1909.	Changes.
Donetz	17,982,000	17,499,000	D. 482,000
Poland	5,555,000	5,605,000	I. 50,000
Ural	771,000	689,000	D. 72,000
Moscow	315,000	249,000	D. 66,000
Caucasus	52,000	41,000	D. 11,000
Total	21,675,000	21,083,000	D. 592,000

The total decrease last year, as compared with 1908, was 2.4 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on May 20: Best Welsh steam, $4.02; seconds, $3.81; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.16; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, June 1—The iron and steel markets continue to improve; there is rather more buying of material and generally a better tone, and a feeling that the waiting condition is approaching an end.

In pig iron there have been some good orders for foundry iron placed in the East, with others under negotiation. It is understood that most of these are taking the lowest prices recently quoted. It seems to be evident that buyers have made up their minds that prices have reached the lowest probable level, and that little or nothing is to be gained by further holding back. In the Central West a similar condition exists, but there the demand is chiefly for basic pig, though some bessemer iron is also called for by buyers.

In finished material something of the same condition exists. Structural contracts are coming forward in considerable quantity, both in Eastern and Western territory. There has also been a fair business coming forward in bars and plates, while sheets and tinplates are being well sold; the market indications, in fact, are more encouraging than have been reported for a number of weeks past.

A report comes from Pittsburg that the Steel Corporation is planning to place warehouses in a number of distributing centers, with a view to selling iron and steel products directly to consumers, and thus eliminating, as far as possible, the iron brokers and jobbers who now handle most part of the small trade. Such a change, however, will take some time, as it is always a slow and difficult matter to change established trade custom, and the iron brokers and jobbers are numerous and influential. It is doubtful, moreover, whether the independent companies will be ready to unite with the Steel Corporation in such a movement.

Baltimore

May 30—Imports for the week included 1378 tons ferromanganese from Liverpool; 4460 tons cupreous pyrites from Huelva, Spain; 14,900 tons iron ore from Cuba.

Birmingham

May 31—The iron trade in Southern territory continues to improve, and it is expected that before another fortnight passes there will be considerable activity. The price of iron has taken on additional strength, though $12 per ton, No. 2 foundry, appears to be the common figure in this section. Some few orders have been placed here for iron to be delivered during the last half of the year but there remains much of the probable make to be covered. The curtailment in production is being kept up. So far no further reduction is announced here.

The demand for basic iron continues a little active, taking up about all of that class of metal that is being manufactured. Charcoal iron is holding a high price.

Steel products are in good demand. The Southern Iron and Steel Company has all of its new plant at Alabama City in operation now.

Brass foundries are busy making tuyeres, jackets and other appurtenances for furnaces undergoing repairs. The cast-iron pipe plates are still busy. Foundries and machine shops appear to be enjoying a better patronage.

Chicago

May 31—The pig-iron market shows a maintenance of the stronger tendencies of last week, with melters more and more inclined to contract for their last-half needs. Most of the business now done, however, consists of sales for third-quarter requirements. Some inquiry on business running into 1911 has developed no willingness of furnaces to make low prices so far ahead. Nearly all foundries are now figuring on last-half requirements and watching the market closely. It is safe to say they are prepared to contract liberally for pig iron the moment the upward tendency is shown to have started in earnest. Meantime they buy 30 to 90 days ahead, in small lots. Neither Southern nor Northern agents display anxiety to sell, and both predict a rising market. Prices continue practically as last week—$12 Birmingham, or $16.35 Chicago, on most of the Southern No. 2 contracted for, with perhaps some sold as low as $11.50 Birmingham; and $16.50@17 on Northern No. 2. The melt of pig iron continues large. General conditions in iron and steel products are good. Some apprehension is manifested in manufacturing lines over the lack of coal from Illinois mines, and some sales are held back by this, but not many. Sales of coke are large at $5 for the best Connellsville.

Cleveland

May 30—A sale of 80,000 tons of ore to an eastern furnace interest is reported. Otherwise the ore market is quiet.

Pig Iron—Some good sales of foundry iron are reported; also a number of inquiries for basic pig, but no sales. Quotations current are $17.15 for bessemer; $16@16.25 for No. 2 foundry; $16.10@16.35 for No. 2 Southern; $15.50@15.75 for forge; all Cleveland delivery.

Finished Material—Quite a number of structural contracts are coming in; also some orders for trolley rails. Bars are active; quotations are 1.45c., Pittsburg base for steel, and 1.50@1.55c., Cleveland for iron bars.

Philadelphia

June 1—The fact that so many of the consumers of pig iron in this territory are fairly well supplied in hand or under contract for delivery accounts for the fact that there is very little disturbance and scarcely any change in selling prices. The only sign of weakness is shown in a few offerings of Southern pig at about 25c. less than recent prices. Basic has weakened according to quotations given, but this has not resulted in any sales of consequence. All of the Eastern mills are short of forge. The past week has developed an encouraging amount of business which calls for basic material and steel billets. Foundrymen are buying very little material, even though as low as $16.50 has been named for Northern and $16 has been shaded for Southern. Good gray forge is held at $16 for Northern and $15 is shaded for Southern.

Steel Billets—Some new work into which steel billets enter has started inquiry for supplies and the quotations received show a weakness in prices.

Bars—The bar-iron trade has dropped off; few orders have reached this territory from the large consumers. The ordinary retail trade is more active than it has been. There is inquiry at present for best refined iron in small lots.

Sheets—The sheet mills during the past week have gathered a fresh batch of orders mostly for small lots and chiefly for quickest possible delivery. Retail distribution has been quite active.

Pipes and Tubes—Reports indicate consumption at a maximum with requirements among larger consumers pretty well covered by contract. The purchases of the smaller interests continue at about the same rate and there has been no change in quotations.

Plates—Reports from all plate mills show a vigorous tone to the market with new requirements coming along at a rate which means strong prices throughout the summer. Small lots for immediate delivery still command premiums.

Structural Material—The amount of business in this market has been light. A few railroad requirements which were expected to shape up in June have been again postponed.

Scrap—The scrap market is inactive and only trifling local sales are spoken of. Dealers are not quite as quick in contracting for future supplies. There is very little inquiry and prices point downward.

Pittsburg

May 31—Additional agricultural-implement steel-bar tonnage has been placed, and the great bulk of this business, probably 75 or 80 per cent., is now under contract either for six months or the 12 months beginning July 1. The business was all taken at the regular price of 1.45c., Pittsburg. This is the only trade which is good in the West, the railroads being poor buyers. Locally the signs for heavy consumption at the moment are not particularly good. One of the large steel-car interests is reported as nearly caught up on its orders, and the current rate of car buying would not carry more than one-half or two-thirds the rate of production it has been having since the first of the year.

The tone of the market is undoubtedly better in coke and pig iron, but apparently altogether because prices close to cost of production have been reached. In finished steel the tone is less satisfactory, and as prices have declined but little there is room, and prospect as well, for some considerable declines.

Pig Iron—At the recession in prices noted in last report there is a stronger belief that the bottom has been reached, as with foundry and basic at $15, Valley, it is held that furnaces which buy their coke and ore are losing money. Of late the lowest prices have been made by ore interests which have a net profit even if losing at the blast furnaces. It is hardly to be expected, however, that consumption will be limited to the iron which ore interests can make. The Babcock & Wilcox Company inquires for 5000 tons for second-half delivery to Barberton, O., prices to be in by next Monday. The Westinghouse Air Brake Company inquires for 1000 tons each of No. 2 foundry and gray forge, for third quarter, but is expected to take 5000 or 10,000 tons. We quote bessemer at $16; basic and No. 2 foundry at $15@15.25, malleable at $15.25@15.50 and forge at $14.50@14.75, at Valley furnaces, freight to Pittsburg being 90c. per ton.

Ferromanganese—The market is quiet and not very steady at $40.50, Baltimore, freight to Pittsburg being $1.95. It is possible this figure could be shaded. On forward delivery 50c. more is asked, but consumers are buying only from hand to mouth.

Steel—Bessemer steel is somewhat easier, while open-hearth continues scarce. It is significant that the basic pig iron made last year was 61½ per cent. of the basic open-hearth steel production, against 52 to 53 per cent. in recent years and 40 per cent. in 1901. This illustrates how the scrap outcome has become insufficient to support the rapidly growing production of open-hearth steel, requiring the use of more pig iron, and increasing the cost of production, as compared with pig-iron prices or the cost of making bessemer steel. We continue to quote: Bessemer billets, $25.50@26; sheet bars, $26.50@27; open-hearth billets, $28@28.50; sheet bars, $29@29.50, all f.o.b. Pittsburg or Youngstown mill.

Sheets—There has been only a moderate turnover, and prices are no firmer, concessions of $2 or $3 per ton being made by a few mills on attractive business. Regular prices are 2.40c. on black, 3.50c. on galvanized, $1.70 on painted corrugated and $3 on galvanized corrugated. Blue annealed sheets continue scarce, bringing 1.85@1.90c. for delivery in the next few weeks, against the regular figure of 1.75c., for indefinite delivery.

Sault Ste. Marie Canal

The total freight carried through the Sault Ste. Marie canals in April was: East-bound 1,325,379; west-bound, 633,534; total, 1,958,913 tons. No comparison can be made with last year, as there was hardly any business in April. The traffic this year was all through the Canadian canal, as the locks on the American side were out of commission. The number of vessel passages was 768, giving an average cargo of 2551 tons.

The mineral freights reported were 937,049 tons iron ore; 539,923 tons coal; 26,683 tons pig and manufactured iron; 5447 tons copper; 46,676 bbl. salt.

The extreme draft for the Poe (American) lock this year is announced at 18 ft., as against 18 ft. 8 in. for the Canadina lock.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports pig-iron production in April at 1,202,117 tons, or 48,067 tons less than in March. For the four months ended April 30, the make was, in metric tons:

	1909.	1910.	Changes.
Foundry iron	744,765	900,065	I. 155,300
Forgo iron........	232,838	223,087	D. 9,751
Steel pig..........	359,572	417,253	I. 57,681
Bessemer pig.....	143,575	165,421	I. 21,846
Thomas(basic)pig	2,610,851	3,015,400	I. 404,549
Total............	4,091,601	4,721,226	I. 629,625

The total increase was 15.1 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

British Steel Production—Steel production in Great Britain for the full years given was as follows, in long tons:

	1908.	1909.	Changes.
Open-hearth........	3,817,103	4,148,408	I. 331,305
Bessemer...........	1,478,539	1,733,220	I. 254,681
Total..............	5,295,642	5,881,628	I. 585,986

The increase in 1909 over 1908 was 11.1 per cent.; but there was a decrease, as compared with 1907, of 641,120 tons, or 9.8 per cent.

British Iron Trade—Exports and imports of iron and steel and of manufactures thereof, in Great Britain, four months ended April 30, are valued by the Board of Trade returns as follows:

	Exports.	Imports.	Excess.
Iron and steel	£14,020,765	£ 2,878,395	Ex. £11,142,370
Machinery ...	9,105,864	1,466,855	Ex. 7,639,009
New ships....	2,995,993	....	Ex. 2,995,993
Total..... ..	£26,122,622	£ 4,345,250	Ex. £21,777,372
Total, 1908..	23,648,841	4,047,369	Ex. 19,601,472

Increase in total exports, £2,473,781, or 10.4 per cent.; increase in imports, £297,881, or 7.4 per cent. The quantities of iron and steel were, in long tons:

	1909.	1910.	Changes.
Exports..............	1,292,671	1,534,618	I. 241,947
Imports..............	374,595	434,667	I. 60,072

Exports of scrap iron and steel, not included above, were 53,081 tons in 1909, and 73,119 in 1910; imports were 4433 tons in 1909, and 16,277 this year.

METAL·MARKETS

New York, June 1—The metal markets show no marked changes for the week. In some quarters there is an improvement in demand, but there have been no considerable changes in prices.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
April 1910..	$36,283,625	$ 2,100,918	Exp. $34,182,707
" 1909..	6,337,994	3,345,861	" 2,992,133
Year 1910..	47,199,706	11,669,276	" 35,530,430
" 1909..	44,316,626	15,504,136	" 28,812,490
Silver:			
April 1910..	4,696,534	3,840,495	Exp. 856,039
" 1909..	4,952,251	4,222,147	" 730,104
Year 1910..	18,336,081	15,238,634	" 3,097,447
" 1909..	19,426,181	14,675,365	" 4,750,816

Exports from the port of New York, week ended May 28: Gld, $19,800; silver, $799,590, chiefly to London. Imports: Gold, $43,618; silver, $14,798, from the West Indies, Mexico and South America.

Gold production of Russia in 1909, based on official figures, was $37,455,032; an increase of $6,510,471, or 21 per vent., over the previous year.

Gold and silver movement in Great Britain, four months ended April 30:

	Imports.	Exports.	Excess.
Gold	£17,744,630	£15,814,595	Imp. £1,930,035
Gold, 1909...	20,878,859	14,472,579	Imp. 6,406,280
Silver	4,695,856	3,664,236	Imp. 1,031,620
Silver, 1909.	4,202,576	4,287,747	Exp. 85,171

Of the imports this year, £2,443,007 gold and £2,823,296 silver came from the United States.

Exports of silver from London to the East from Jan. 1 to May 18, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.........	£1,938,300	£2,632,840	I. £ 694,540
China.........	1,075,100	1,113,500	I. 38,400
Straits........	82,800	......	D. 82,800
Total......	£3,096,200	£3,746,340	I. £ 650,140

India Council bills in London brought an average of 15.94d. per rupee.

Gold—The price of gold on the open market in London has been unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. The Bank of England is still taking gold. In New York no gold was sent to Europe, but about $1,250,000 was taken by Canadian banks.

Platinum—Business is steady and prices are unchanged. Dealers ask $30 per oz. for refined platinum and $35.50@36 per oz. for hard metal—platinum-iridium alloy.

Production of platinum in Russia in 1909 is officially reported at 322 poods, or 169,501 oz. crude metal, 83 per cent.; equal to 142,686 oz. pure platinum.

SILVER AND STERLING EXCHANGE

May-June.	26	27	28	30	31	1
New York....	53¾	53¾	53⅝	....	53½	53½
London	24¾	24¾	24$\frac{11}{16}$	24$\frac{11}{16}$	24⅝	24⅝
Sterling Ex..	4.8750	4.8735	4.8740	....	4.8730	4.8725

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The market has reacted slightly this week, but closes firm at 24⅝d. in London. China banks have been buyers at the decline.

Copper, Tin, Lead and Zinc

May-June.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
26	12⅞ @13	12½ @12¾	56⅜	33¼	4.30 @4.35	4.17½ @4.20	5.12½ @5.15
27	12⅞ @13	12½ @12¾	56¾	33⅛	4.30 @4.35	4.17½ @4.20	5.10 @5.12½
28	12⅞ @13	12½ @12¾	....	33	4.30 @4.35	4.17½ @4.20	5.10 @5.12½
30	......	......	56⅞	...	......	......	......
31	12⅞ @13	12⅝ @12¾	56⅞	33⅛	4.30 @4.35	4.17½ @4.20	5 07½ @5.10
1	12⅞ @13	12⅝ @12¾	56⅞	32⅞	4.30 @4.35	4.17½ @4.20	5.05 @5.07½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—In spite of the holiday break in the week the sales of copper have amounted to upward of 10,000,000 lb., but in view of the quantity that must be marketed daily on the average, the volume of business can be classed only as moderate. Both the European and American buyers have figured in the market. Domestic manufacturers have pursued the hand-to-mouth policy that has characterized them for some time past. It is noteworthy that most of the business has been for prompt shipment. All orders have been the subject of keen competition. Lake copper has been freely offered at 13c. and transactions have been effected at that price. Electrolytic has been freely offered at 12⅞c., delivered, 30 days, corresponding to a little less than 12.75c. net cash, New York, but this price has been shaded in order to consummate business. At the close, Lake copper is quoted at 12⅞@13c., electrolytic copper in cakes, wirebars and ingots at 12⅝@12¾c. Casting copper is quoted nominally at 12¼@12½ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been advanced ¼c., and is now 14¼c. base, carload lots at mill.

The London speculative market has been somewhat firmer. The liquidation on the part of tired holders which has been taking place for some time past was not in evidence this week, and the market showed some resiliency. The close is cabled at £56 17s. 6d. for spot, and £57 15s. for three months.

Refined and manufactured sorts we quote: English tough, £59; best selected, £60@60 10s.; strong sheets, £68@69 per ton.

Exports of copper from New York for the week were 7545 long tons. Our special correspondent gives the exports from Baltimore at 1177 tons.

Copper in May—May began with electrolytic copper on the basis of about 12.30c. During the first week in the month there were free sellers at that price, but with the change in sentiment that then became manifest, European buyers came into the market and fairly large sales were made at an advance. The latter did not go far, but during the remainder of the month, the market held its gain with moderate business, and closed at about 12.70 cent

Tin—The London market ruled fairly steady for the past week. Shipments to the United States were larger than anticipated, and this fact helped to maintain quotations in the face of generally expected unfavorable statistics for the month of May. When the latter became public and showed an increase of 2500 tons, the market turned weak, and closes at £149 2s. 6d. for spot, and £150 7s. 6d. for three months.

The domestic market ruled very dull and transactions were confined to retail business. The close is weak at about 32⅞ cents.

Lead—The market is fairly active and firm at last prices, 4.17½@4.20c., St. Louis, and 4.30@4.35c. New York.

The London market for Spanish lead is cabled at £12 10s., and for English at £12 12s. 6d. per ton.

Spelter—The market is quiet. Manufacturers in some lines are not believed to be well covered, but as their orders are not coming in plentifully, and as the metal is freely offered, they are buying only in a small way. Prices have declined somewhat, and at the close are 5.05@5.07½c. St. Louis, and 5.20@5.22½c. New York.

New York quotations for spelter on May 26 were 5.27½@5.30c.; May 27 and 28, 5.25@5.27½c.; May 31, 5.22½@5.25c.; June 1, 5.20@5.22½ cents.

The London market for good ordinaries is £22 7s. 6d., and for specials £22 12s. 6d. per ton.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, four months ended April 30, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports,	Excess.	
Copper, long tons	45,004	23,552	Imp.	21,452
Copper, 1909....	39,126	24,802	Imp.	14,324
Tin, long tons....	14,195	14,245	Exp.	50
Tin, 1909........	13,018	13,289	Exp.	271
Lead, long tons..	70,370	16,538	Imp.	54,832
Lead, 1909......	73,461	14,712	Imp.	58,749
Spelter, l'g tons..	42,083	2,967	Imp.	39,116
Spelter, 1909....	36,492	2,082	Imp.	34,410
Quicksilver, lb...	1,724,654	301,602	Imp.	1,423,052
Quicksilver, '09	1,282,063	356,226	Imp.	925,837
Ores:				
Tin ore and con.	8,704	....	Imp.	8,704
Tin ore, 1909...	7,445	....	Imp.	7,445
Pyrites..........	272,028	....	Imp.	272,028
Pyrites, 1909...	275,084	....	Imp.	285,084

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1910, the United States furnished in all 88 tons copper matte, 15,596 tons fine copper, and 8090 tons lead. This lead was chiefly Mexican, refined in this country.

Spanish Metal Exports

Exports of metal and mineral from Spain, three months ended March 31, reported by *Revista Minera*, in metric tons:

Metals.	1909.	1910.	Changes.	
Pig and manuf. iron	5,569	5,798	I.	229
Copper...............	3,808	4,860	I.	1,052
Copper precipitate..	3,977	3,923	D.	54
Lead.................	34,846	42,633	I.	7,787
Zinc.................	778	250	D.	528
Quicksilver..........	422	420	D.	2
Minerals.				
Iron ore.............	1,740,868	2,200,267	I.	459,399
Manganese ore.....	1,650	446	D.	1,204
Copper ore..........	276,490	251,711	D.	24,779
Lead ore............	805	963	I.	158
Zinc ore.............	30,347	36,586	I.	6,239
Pyrites, iron........	275,058	336,854	I.	61,796
Salt..................	138,439	113,682	D.	24,757

Imports of phosphates, 25,128 tons in 1909, and 31,438 in 1910; nitrate of soda 15,771 tons in 1909, and 18,402 this year.

Other Metals

Aluminum—There is little change in the reports. Business continues on a good scale, sales being large, with good inquiries coming in. We quote now 23¾c. per lb. for No. 1 ingots in large lots, New York. The market abroad is reported in improving condition.

Antimony—The market remains dull, and in the absence of large business prices are nominally unchanged. Quotations are 8⅜@8½c. for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—Business is fair, and prices are unchanged. New York quotations are $47 per flask of 75 lb. for large orders; $48@49 for jobbing lots. San Francisco, $46@46.50 for domestic orders and $2 less for export. The London price is £8 15s. per flask, with £8 13s. 9d. quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio.

Zinc and Lead Ore Markets

Joplin, Mo., May 28—The highest price paid for zinc-sulphide ore was $46 per ton; the highest base price was $43.50 and the lowest in carload lots was $41 per ton of 60 per cent. zinc. Zinc silicate sold on a base of $22@24 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $37.42. The high price for lead ore continues at $48 per ton, with deductions of $1 per ton for grades under 80 per cent. lead. The average price, all grades of lead, was $47.94 per ton of 2000 pounds.

Striking miners are a new element in the local situation, having resulted in closing down a half dozen mines, in addition to the number closed down on account of the low price of ore. The strike relates to the sliding scale of wages to be regulated by the rise and fall in ore prices. The miners contend they have not been given a square deal. Several mining companies have prevented a strike in their mines by meeting the contention of the men.

SHIPMENTS, WEEK ENDED MAY 28.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	3,165,830	695,370	$80,004
Joplin	1,571,520	120,920	36,690
Galena	1,100.290	67,710	23,635
Oronogo	1,128,190	2,430	23,613
Miami	1,241,170	245,240	18,295
Duenweg	871,110	23,000	17,508
Alba-Neck	795,170	......	17,506
Jackson	302,900	209,140	11,076
Granby	772,570	12,850	10,050
Sarcoxie	270,450	......	4,950
Carl Junction	224,900	2,350	4,888
Carthage	191,670	......	4,120
Badger	193,560	......	4,043
Spurgeon	184,870	49,400	3,178
Aurora	164,250	......	2,812
Stott City	119,580	......	2,391
Quapaw	79,240	14,630	1,761
Saginaw	35,270	4,770	461
Totals	12,411,540	1,447,810	$266,981
Five months	241,554,600	35,463,020	$5,804,180

Zinc value, the week, $232,264; 5 months, $4,872,884
Lead value, the week, 34,717; 5 months, 931,296

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., May 28—The highest price paid for zinc ore was $43.50 per ton; the base price, 60 per cent. zinc, was $42@43.50 per ton. No sales or shipments of lead ore were reported.

SHIPMENTS, WEEK ENDED MAY 28.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	455,680	....	545,200
Galena	451,500	....	....
Highland	323,400	....	....
Cuba City	177,780	....	110,110
Dubuque	84,000	....	....
Linden	....	....	124,520
Total	492,360	....	779,830
Year to date	34,279,911	2,651,689	7,206,720

In addition to the above there was shipped during the week to the separating plants, 2,505,423 lb. zinc concentrates.

CHEMICALS

New York, June 1—The general market is steady, but not specially active, so far as new business is concerned.

Copper Sulphate—No change is reported. On an average business, prices remain at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller orders.

Nitrate of Soda—Business is good for the season and contract deliveries are steady. Quotations continue at 2.15c. per lb. for spot lots; a shade higher is reported for future deliveries, 2.07½@2.12½c. per lb. being asked.

Arsenic—Sales are still light, but prices are unchanged, $2.37½@2.45 per 100 lb. being quoted for white arsenic.

MINING·STOCKS $

New York, June 1—Dullness has characterized the general stock markets, and the trading has been mainly professional and anything but exciting. This condition was rather intensified by a double holiday, the Exchange having adjourned from Friday over to Tuesday. The market could not be called strong, but fluctuations were small.

At the close today there was a burst of activity, but it was accomplished by a bad and general break in all stocks, prices declining heavily.

On the Curb also, matters were quiet for the most part. The copper stocks were traded in only on a small scale, with one or two exceptions, and there were only small changes in quotations. Cobalt stocks were the most active section of the market and were inclined to be stronger than most of the others. The market closed generally dull and weak.

Boston, May 31—There is little to attract attention in the copper-share market. Now and then some specialty is made prominent by a period of activity but there has been no sustained movement in any direction. The market appears to be in a strong technical position, but is waiting developments.

Butte Balaklava has continued to attract attention, although today it broke $1.50 from its high price. Isle Royale has been one of the mainstays of the market, yet it broke $3 to $21 today. Superior & Boston has attracted attention with a strong market price, due to favorable diamond-drill explorations.

Nipissing has held strong with a high at $12. Some inquiry for Yukon is noted on the Curb, as operations in that dis-

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	February.	March.	April.
Arizona, Ltd.	2,658,000	2,886,000	2,340,000
Balaklala	989,102	1,263,733	1,109,311
Boleo (Mexico)	2,331,832	2,148,383	2,777,800
Copper Queen	8,927,203	10,809,488	9,920,000
Calumet & Ariz.	2,024,000	2,820,000	2,400,000
Cananea (Mexico)	3,586,000	3,700,000	4,262,000
Detroit	1,486,400	1,698,975	1,930,000
Imperial	750,000	825,000	800,000
Nevada Con. (Est.)	5,115,723	5,339,466	5,500,000
Old Dominion	2,035,000	2,674,000	2,325,000
Shannon	1,526,000	1,468,000	1,288,000
Superior & Pitts.	1,864,000	2,370,000	2,130,000
Utah Copper Co.	5,913,465	7,853,288	7,902,643
Butte District	13,758,620	24,000,000	25,000,000
Lake Superior	18,250,000	19,250,000	16,250,000
Total production	71,099,622	89,366,867	86,934,754
Imports, bars, etc.	14,093,381	20,178,202	21,180,396
Imp. in ore & matte	6,063,764	6,181,476	12,527,371
Total	91,256,767	115,726,545	120,642,521

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
V, 1909	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31,332,403

	VISIBLE STOCKS.		
	United States.	Europe.	Total.
VI, 1909	169,848,141	127,352,960	297,201,101
VII	151,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,981,159	246,870,400	388,854,559
VI	....	239,142,400	....

Figures are in pounds of fine copper. U. S production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

trict are now on a full scale. The Contact Copper Company, to take over the Elm River, has been incorporated under Michigan laws. Likely the basis for exchange will be share for share, but this has got to be decided upon yet.

A 50-cent assessment on Rhode Island Copper shares excited comment for a spell, inasmuch as all but a few thousand shares have been turned in for exchange into Franklin mining stock. The Algomah Mining Company has been organized by Boston and Houghton, Mich., parties to take over and develop the old property, situated south of the Lake mine. There are 100,000 shares, par $25, of which 30,000 shares will be retained in the treasury while 60,000 shares go in payment for the property. The balance is to be offered at par for public subscription.

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	May 31	June 21	$0.10
Beck Tunnel, Utah	June 14	....	0.01
Black Jack, Utah	....	....	0.01
Blue Bell, Idaho	Mar. 14	June 1	0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Bullion, Nev	May 8	June 6	0.05
Caledonia, Nev	June 17	July 8	0.10
Con. Imperial, Nev	Apr. 19	May 12	0.01
Con. Virginia, Nev.	May 9	June 3	0.20
Crown Point, Nev	June 26	July 20	0.10
Hancock Con., Mich	Au.Oct.	....	3.00
Hector, Idaho	Mar. 28	May 26	0.00¼
Helvetia, Ariz	....	....	0.50
Mangus Dev., Mich	May 7	....	2.50
Mexican, Nev	May 17	June 9	0.15
Ojibway, Mich	Oct.	....	1.00
Ophir, Nev	Apr. 22	May 16	0.25
Rhode Island Copper, Mich.	....	......	0.50
Savage, Nev	May 2	May 27	0.10
Sierra Nevada, Nev	June 21	July 12	0.10
Union, Nev	June 9	July 1	0.10
Utan Con. of Tintic, Utah	May 15	....	0.01
Yellow Jacket, Nev	June 9	July 11	0.15

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	.....
November	50.703	......	23.351	.....
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56	12.733	12.931	13.091	57.363	57.238
May	12.893	12.550	13.238	12.885	59.338	56.313
June	13.214	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.298	......	13.647	......	59.906	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32.403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	33.125	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	.....
August	5.729	......	5.579	......	22.125	.....
September	5.796	......	5.646	......	22.906	.....
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.50	15.02	16.23	15.08	16.18
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS June 1

Name of Comp.	Bid.
Listed:	
Acacia	.06½
Cripple Cr'k Con.	.03
C. K. & N.	.15½
Doctor Jack Pot.	.10
Elkton Con.	.79¾
El Paso	.89½
Fannie Rawlins	.05½
Findlay	.08
Gold Dollar	.11
Gold Sovereign	.03⅞
Isabella	.18½
Mary McKinney	.59
Pharmacist	.02⅞
Portland	1.17
Vindicator	.94⅞
Work	.04½
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.08

SALT LAKE June 1

Name of Comp.	Clg.
Carisa	‡.50
Colorado Mining.	.65
Columbus Con.	.82
Daly Judge	3.95
Grand Central	1.25
Iron Blossom	.95
Little Bell	1.25
Little Chief	‡.45
Lower Mammoth.	.48
Mason Valley	7.00
Maj. Mines	‡2.32½
May Day	.05½
Nevada Hills	.83
New York	.13
Prince Con	.73
Red Warrior	‡6.00
Silver King Coal'n	2.47½
Sioux Con.	.25
Uncle Sam	.35½
Victoria	‡1.07½

SAN FRANCISCO. June 1.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Atlanta	.12
Belcher	.65
Best & Belcher	.25
Caledonia	.45
Challenge Con.	‡.24
Chollar	.12
Confidence	.70
Con. Cal. & Va.	.96
Crown Point	.60
Exchequer	‡.21
Gould & Curry	.18
Hale & Norcross	.32
Mexican	1.05
Ophir	.97
Overman	.85
Potosi	‡.27
Savage	.23
Sierra Nevada	.19
Union	.19
Yellow Jacket	.70

Name of Comp.	Clg.
MISC. NEVADA	
Belmont	3.62½
Daisy	.06
Jim Butler	.25
MacNamara	.25
Midway	.25
North Star	.04
West End Con.	.44
Atlanta	.12
Booth	.13
C.O.D. Con.	.08
Columbia Mt.	‡.06
Comb. Frac.	.51
Great Bend	.02
Jumbo Extension	.20
Oro	.06
Red Hill	.03
Sandstorm	.03
Silver Pick	.07
St. Ives	.15
Tramps Con.	.04

N. Y. EXCH. June 1

Name of Comp.	Clg.
Amalgamated	68⅞
Am. Agri. Chem.	‡46
Am.Sm.&Ref.,com	75⅞
Am. Sm. & Ref., pf.	104
Anaconda	41½
Bethlehem Steel	27⅞
Col. & Hock. C. & I.	6⅛
Colo. Fuel & Iron.	36¼
Du Pont P'd'r, pf.	87½
Federal M. & S.	‡41
Great Nor., ore ctf.	62
Nat'nalLead,com.	75
National Lead, pf.	107½
Nev. Consol.	20⅜
Pittsburg Coal	19¾
RepublicI&S,com.	33
Republic I & S, pf.	‡98
SlossSheffi'd,com.	71½
Sloss Sheffield, pf.	‡117½
Tennessee Copper	26
Utah Copper	45¼
U. S. Steel, com.	79⅞
U. S. Steel, pf.	117
Va. Car. Chem.	59⅝

N. Y. CURB June 1

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	18
Braden Copper	4¼
B. C. Copper	5⅞
Buffalo Mines	‡2½
Butte Coalition	20½
Caledonia	1¼
Chino	12⅜
Cobalt Central	.07
Cobalt Prov.	59
Con. Ariz. Sm.	2
Cumberland Ely	9
Davis-Daly	1¾
Dominion Cop.	‡7
Ely Con.	.56¼
El Rayo	3¾
Florence	2.22
Gila Copper	6⅜
Giroux	7⅝
Gold Hill	‡⅞
Goldfield Con.	8½
Greene Cananea	8
Guanajuato	‡1⅜
Guggen. Exp.	190
Kerr Lake	.09
La Rose	4⅜
McKinley-Dar-Sa.	.93
Miami Copper	21¾
Mines Co. of Am.	61
Mont. Shoshone	‡⅞
Mont.-Tonopah	‡.70
Nev. Utah M. & S.	1
Newhouse M. & S.	3½
Nipissing Mines	11⅛
Ohio Copper	2½
Pacific Sm. & M.	⅜
Ray Central	2 13/16
Silver Queen	.35
Standard Oil	625
Stewart	11/16
Tonopah	8½
Tonopah Ex.	‡.90
Tri-Bullion	11/16
W. Va. Wyo. Cop.	‡2 1/16
Yukon Gold	4 3/16

LONDON June 1

Name of Com	Clg.		
Dolores.	£1	10s	0d
Stratton'sInd.	0	3	3
Camp Bird	1	8	6
Esperanza	2	13	9
Tomboy	0	19	3
El Oro	1	6	9
Oroville	0	9	6
Mexico Mines	8	8	9

BOSTON EXCH. June 1

Name of Comp.	Clg.
Adventure	6
Allouez	43
Am. Zinc	25¼
Arcadian	5
Arizona Com.	16
Atlantic	7
Boston Con.	‡17
Butte & Balak	16⅝
Calumet & Ariz.	63¼
Calumet & Hecla.	575
Centennial	18
Con. Mercur	.10
Copper Range	66½
Daly-West	8
East Butte	8½
Franklin	12½
Granby	40
Hancock	18
Helvetia	3
Indiana	17
Isle Royale	21
Keweenaw	4
Lake	51
La Salle	12¼
Mass	7
Michigan	5
Mohawk	52
Nevada	20½
North Butte	32
North Lake	11
Ojibway	7½
Old Dominion	36
Osceola	136
Parrot	15
Quincy	78
Shannon	11⅛
Superior	45⅛
Superior & Bost.	11
Superior & Pitts.	12
Tamarack	52½
Trinity	5⅞
U. S. Smg. & Ref.	42
U.S.Sm. & Re., pd.	50
Utah Apex	3
Utah Con.	23
Victoria	3½
Winona	7¾
Wolverine	118
Wyandotte	1¾

BOSTON CURB June 1

Name of Comp.	Clg.
Ahmeek	170
Bingham Mines	3
Boston Ely	2⅛
Boswyocolo	.08
Cactus	3
Calaveras	5¾
Champion	.06⅛
Chemung	9
Chief Cons.	1⅛
Cons. Ariz.	2
Corbin	.08
Crown Reserve	3⅛
First Nat. Cop.	3¾
Indiana	21⅝
Inspiration	7⅛
Mackinaw	.09
Majestic	.60
Nat'l Mine	.31
Nevada-Douglas	2⅝
New Baltic	6¼
Oneco	3⅛
Raven Copper	.44
Ray Con.	18⅜
Rhode Island Coal	7¾
San Antonio	‡7⅝
Shattuck-Ariz.	‡29⅛
South Lake	5⅛
Superior & Globe.	.35
Trethewey	1⅜
Tuolumne Copper	‡3⅜
Vulture	9⅜
Yuma	.55

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SAMPLING AND ASSAYING

12,722—BALANCE—The Mathematics of the Balance. T. S. Minney. (Pac. Miner, Apr., 1910; 1½ pp., illus.) 20c.

12,723—BRASS—The Analysis of Brass. Albert J Hall. (Metal Ind., May, 1910; 1⅓ pp., illus.) 20c.

12,724—CUPELS—Cement vs. Bone-Ash Cupels. J. W. Merritt. (Min. and Sci. Press, May 7, 1910; 1 p., illus.) 20c.

12,725—CUPELS — Notes on Assaying (Pac. Miner, Apr., 1910; 1¼ pp.) 20c.

12,726—DRYING FLASKS—Apparatus for Drying Flasks, Etc. Charles Baskerville and Reston Stevenson. (Journ. Am. Chem. Soc., May, 1910; 2½ pp., illus.) 80c.

12,727—ELECTROANALYSIS—The Mercury Cathode in Electroanalysis. (Journ. Am. Chem. Soc., May, 1910; 4½ pp., illus.) 80c.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Carbons, good drill quality	carat	$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd.	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05¾@.06
Emery, in kegs: Turkish flour	"	.01¾@.02
Grains	"	.03½@.04
Naxos flour	"	.01¾@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
Peekskill flour, f.o.b. Easton, Pa	"	.01¼@.01¾
Grains, in kegs	"	.02¾@.03
Garnet, per quality	sh. ton.	25.00@35.00
Pumice Stone, Am. Powd.	100 lb.	1.60@2.00
Italian, powdered	per lb	.01⅜@.01¾
Lump, per quality	"	.03½@.30
Rottenstone, ground	"	.02@.04
Lump, per quality	"	.05@.20
Rogue, per quality	"	.05@ 30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.02⅜
Boric	"	.07
Hydrofluoric, 30%	"	.02¾@ 03¼
" 48%	"	.06
" 52%	"	.06½
" 60%	"	.10
Hydrochloric acid, 20°	per 100 lb.	1.25@1.50
Nitric acid, 36° to 40°	per lb.	.03⅞@.04½
Sulphuric acid, 50°, bulk	per ton.	$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.10
66°, bulk, ton		18.00
Oxalic	per lb.	.07⅛@.07¾
ALCOHOL—Grain 95%	gal.	2.52@2.55
Denatured	"	.42
Refined wood, 95@97%	"	.52@.57
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.04½@.05
ALUMINUM—Sulphate, com'l.	lb.	1.50@2.00
AMMONIA—24 deg. lb.	"	.04½@.05½
" 26 deg. lb	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.28
Carbonate	"	.08@.08⅜
Muriate grain	"	.05½@.06¼
Lump	"	.09¼@.09½
Sulphate, 100 lb.	"	2.75@3.00
Sulpho-cyanide com.	"	.25
" " chem. pure	"	.35
ANTIMONY—needle, lump	lb.	.04⅛@.04¼
Oxide	"	.07¾@.08
ARSENIC—white	"	.02⅜@.02½
Red, Outside brands	"	.07
Saxony	"	.07½@.08
ASPHALTUM—		
Barbadoes	per ton.	80.00@100.00
West Indies	"	20.00@60.00
Egyptian	lb.	.13@.18
Gilsonite, Utah ordinary	per ton.	32.00@40.00
Trinidad	"	20.00@25.00
California	per ton.	25.00@30.00
BARIUM—		
Carb. Lump 80@90%	lg. ton.	26.00@35.00
Precipitated, 96@98%	"	34.00@36.00
Powdered, natural	lb.	.02@.02¼
Chloride com'l	ton.	33.00@35.00
Nitrate powdered, in casks	lb.	.05@.06½
Blanc Fixe, dry, bbl	per lb.	.02¾@.04
BARYTES—		
Am. Ground	sh. ton.	12.00@15.00
Floated	"	17.00@19.00
Foreign floated	"	20.00@23.00
BLEACHING POWDER—35% 100 lb		1.20@1.25
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		3.90@4.25
BONE ASH	lb.	.02¾@.04
BORAX, sacks	"	.03¾@.05
CALCIUM—Acetate, gray, 100 lb.		1.75@2.00
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. N. Y.	"	11.00@14.10
CEMENT—Slag cement	bbl.	.75@1.25
Portland, Am. 500 lb	"	1.50@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb	"	.85
In sacks	"	.65
CHROME ORE—		
New Caledonia 50% ex ship N. Y.	per lg. ton.	14.00@16.00
Bricks, f.o.b. Pittsburg, per M		175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	ton	8.00@9.00
Foreign	"	11.50@18.00
COBALT—Oxide	lb.	.80@.85

COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.80
In bags	"	.60@.75
CRYOLITE (carload)	lb.	.06¼@.07
FELDSPAR—Ground	sh. ton.	6.00@14.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Special extra	"	30.00@35.00
FIRE CLAY—F.o.b. St. Louis.		
St. Louis, extra quality	per ton.	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. Pittsburg:		
Lump	ton.	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock.	"	8.50
FULLER'S EARTH—Lump	100 lb.	.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.02@.04.
Dust	"	.02¼@.05
Chip	"	.04@.08
Lump	"	.05½@.12
Large lump	"	.08¼@.10½
GYPSUM—		
Fertilizer	sh. ton.	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01¾@.02¼
German	"	.02¼@.02⅝
LEAD—Acetate (sugar of) brown.	lb.	.07¾@.08
Nitrate, com'l.	"	.09@.10
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	7.50@8.50
Calcined, powdered	sh. ton.	26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	.90@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01¼
75@85% binoxide	"	.01¼@.01½
85@90% binoxide	"	.01½@.04
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	16.00@32.50
MARBLE—Flour	sh. ton.	7.00@9.00
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.10¼@.11
Sulphate, double	"	.05⅞@.08
NITRATE OF SODA—		
100 lb. 95%		2.07½@2.15
95% for 1910		2.07½@2.15
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.06¼@.06¾
English glassmakers'	"	.08¼@.09¼
Lithophone	"	.03½@.07
Metallic, brown	sh. ton	16.50@30.00
Red	"	14.00@18.00
Ocher, Am. common	"	10.00@15.00
Best	"	12.00@15.00
Dutch, washed	lb.	.02¾@.03
French, washed	"	.01¼@.02
Paris green, pure, bulk	"	.17¼@.20½
Red lead, American	"	.06¾@.07
Foreign	"	.08¼@.09¼
Turpentine, spirits bbl.,	per gal.	.62½@.63
White lead, Am., dry	lb.	.06@.06½
American, in oil	"	.07@.07¼
Foreign, in oil	"	.09@.09¾
Zinc white, Am. extra dry	"	.05¼@.06¼
French, proc's, red seal, dry	"	.07½@.08
French, process, green seal, dry	"	.10@.10¼
PHOSPHATES—Acid		55@60c. per unit
*Fla., hard rock 77%		7.00@7.50
land pebble 68%		3.75@4.00
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@4.00

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb.	$.07½
Powdered or granulated	"	.08
Bichromate, Am.	"	.07⅜@.08
Scotch	"	.10¾
Bromide	"	.20
Carbonate (80@85%)	"	.03½@.04¼
Caustic, ordinary	"	.05¼
Elect. (90% KOH)	"	.06@.06¼
Chloride (muriate), 100 lb		1.90
Chlorate, powdered	"	.08½@.09½
Crystals	"	.09@.09¾
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.19
Kainite, long ton, bulk, 8.50; bags,		9.25
Permanganate	lb.	.09¼@.10¼
Prussiate, yellow	"	.13@.13¾
Red	"	.29@.32
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. R. R.	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10¾@11c.
Imported, non-arsenical, furnace size, ex-ship, per unit		.12½
Imported, arsenical, furnace size, ex-ship, per unit		.12
Imported fines, arsenical, ex-ship, per unit		.09@.09½
Imported fines, non-arsenical, ex-ship, per unit		10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.13
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals	"	5.00@5.75
SILICA—		
Ground quartz, ord'ry	lg. ton	7.00@15.00
Silex, ground	"	7.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.33¼@.36¾
SODIUM—Acetate	lb	.04½@.05
"Alkali," per 100 lb., 58/48		.90@.95
Bicarb. soda, per 100 lb		1.00@1.30
Soda, caustic, per 100 lb., 78/60		1.72½@1.85
Soda, caustic, powdered		02[illegible]@.03
Salt cake, per 100 lb., bulk		[illegible]
Salt cake, bbl		55[illegible] 5
Soda, monohydrate, per lb.		@ 5
Bichromate	lb.	@ 6¼
Bromide	"	.20
Chlorate, com'l.	"	@.09½
Cyanide, 120-130% KCN, per 100		
Carloads (30,000 lb.)	lb.	18c.
5-ton lots	"	18½
Less than 5 tons	"	
Hyposulphite, Am.	"	1.30@
Phosphate	100 lb.	2.10
Prussiate	"	.0
Sal soda, f.o.b. N. Y.	"	
Foreign, f.o.b. N. Y.	"	
Silicate, com'l	"	
Sulphate, com'l (Glauber's salt)	100 lb.	
Sulphate, com'l, calcined		
STRONTIUM—Nitrate	lb.	8
SULPHUR—Louisiana (prime) to New York	lg. ton.	up
To Boston, Philadelphia or Baltimore	"	up
Roll	100 lb.	1 15
Flour	"	2 40
Flowers, sublimed	"	2 60
Powdered commercial, bags		55
Sicilian, extra qual., unmixed seconds, crude brimstone to New York	lg. ton.	00
TERRA ALBA—Fr.&Eng.	100 lb.	00
TALC—Domestic	sh. ton.	12.00 00
French	"	15.00 0
Italian, best	"	30.00 0
TIN—Bi-chloride, 50°	lb.	
Crystals	"	.2
Oxide, lb.	"	
URANIUM—Oxide	"	2
ZINC—Chloride sol., com. 20°	"	
Chloride, granular	"	
Dust	"	
Sulphate	"	

NOTE—These quotations are for wholesale lots in New York unless specified, and are generally subject to trade discounts. In the cases of so important minerals, such as phospl pyrites and sulphur, in which there established markets, the quotations a tially representative. But in the cases the minor mineral products, the represent what dealers ask of consume and what producers can realize in selling their output as a matter of private contract.

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PUBLISHED WEEKLY

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**Illustrated.*

The Economic Situation

The great event of the past week has been the action of the Government in enjoining the railways from increasing freight rates, which precipitated a sharp decline in the stock market and revived the feeling of pessimism, previously lulled. The railway policy had been inspired by the increased cost of operating, chiefly because of advance in wages. It was deduced naturally that if the railways could not offset this by higher charges, they could not buy so much material for improving their facilities, and diminished demand would follow down the line to crude iron, copper and other raw material. The compromise later effected between the President and some of the railways does not greatly alter this view.

Outside of Wall Street, the action of the administration is doubtless popular, but there is something to be urged in behalf of the railways. The latter owe a duty to the public, whose franchises they enjoy, but competitively they are in a different position from the manufacturers, and it is difficult to see how they can establish rates without some agreement among themselves. Respecting the railway rates that have ruled during recent years, there is much to be said on both sides. A scientific analysis would possibly disclose that upon certain kinds of freight, especially the classified freight, rates have been too high; while upon commodity rates they have probably been, in general, too low. There ought to be a legal method for reconciling the interests of the public and the railways in the adjustment of railway rates. This is in view in the bill now pending before Congress.

The recent move of the railways toward increased rates was based upon the greater cost of operation, resulting from a bad economic situation. The policy adopted by them, however, will not lead to any good end in the long run. The continuous increase in the cost of living is bound to have disastrous consequences, although the evil day may be postponed. Safety lies in the other direction, namely toward economy. The railways, along with many manufacturers, made a mistake when recently they advanced wages.

We begin now to see more clearly what has been the commercial trouble in this country during the first half of 1910. We have been suffering from the consequences of extravagance and speculation, the latter in land, stocks and commodities. The speculation in land turns out to have been much greater than was supposed, and nothing locks up capital so much as land speculation. These conditions produced a bad situation in our international trade and absorbed the money required to increase railway facilities and make other necessary improvements. We were, therefore, obliged to borrow from abroad upon onerous terms.

The remedies for the present situation are economy and liquidation. This has been the meaning of the liquidation that began last January in the stock market, and lately has been in evidence in the commodity markets. The corrective having been thus applied, our commerce has been coming down to a sounder basis. The Washington action of last week was instrumental in hastening liquidation, but was not a fundamental cause.

In the latest gloom of pessimism there have been forebodings of a crisis. This, however, is ultra-pessimistic. The conditions at present differ materially from those in 1907. A bad situation then was of worldwide existence. Europe could offer no help to us because it also was in trouble, but now Europe can help, at a price.

In looking toward the future, let it not be forgotten that this is a great country, whereof the annual savings amount to upward of five thousand million dollars, which is an immense recuperative ability. The outlook for the crops in 1910 is so far excellent, and after mid-summer it is to be expected that a great flood of wealth, scattering its effect over all industries, will begin to move eastward.

Iron Making in China

It has been long known to engineers and explorers that China possesses important deposits of iron ore and coal, and that with improved economic conditions and modern machinery the country might some day take an important position in the iron markets of the world. Until a few years ago, however, these resources were utilized only to a very limited extent and after very primitive methods. It is a matter of much importance, therefore, that a beginning has been made in the manufacture of iron and steel by approved modern methods, and on a large scale. It is also important that the work, though directed by Belgian and German engineers, has been financed by Chinese capital, wealthy Chinese merchants having recognized its value and having been willing to invest their money in the enterprise.

The article on another page, describing the iron and steel works at Hanyang, gives an account of a plant consisting of blast furnaces of the latest German type, with steel furnaces and rolling mills which turn out rails of excellent quality and other finished steel. The methods used are not different from European or American practice, except that more hand labor is employed than in our works, owing to the cheapness of labor. For that reason also the labor costs are extremely low through the whole process from the mining of the ore to the final outturn of the finished steel. The high quality of the ore and its abundant supply are also elements which will be of importance in future calculations.

Already this development may be said to have an effect upon our own iron trade apart from the fact that it is supplying Chinese railroad builders with material which they were formerly obliged to import. Last year 60,000 or 70,000 tons of basic pig iron were brought to New York, on a low freight rate, and sold here at a price which was said to return a good profit to the makers. A few months ago the Western Iron Corporation, of Seattle, made a contract with the Hanyang works for pig iron, the quantity running from 36,000 tons the first year up to a maximum of 200,000 tons in the 15 years covered by the agreement. This pig is to be used, with pig from Washington ores, in making steel at Irondale; and it is to be supplied at a cost much lower than that at which iron from the Eastern States can be delivered on the Pacific Coast. Moreover, the Western company will take 100,000 tons a year of the Hanyang ores for its blast furnaces. The shipment of iron to the United States from China is a new and surprising feature in the trade.

It is easy to believe that this is only the beginning of a great development. Based on the abundance of raw material and the supply of cheap labor, it may readily become of great interest to the ironmasters of Europe and America.

Regulating Production of Potash Salts

The law which passed the German Reichstag recently in relation to the potash-salts question, appears from advance notes of its contents so far received to be a peculiar piece of special legislation. It was passed by a combination of the high Agrarian, or extreme conservative, party and the Socialists, a rather unusual coalition. The Imperial government had already assumed the control of the potash-salts industry, and this bill establishes the rules for its conduct.

The old Kali-Syndikat, composed of the mine operators, including the Prussian government, which owns large mines, is set aside. All the mines are placed under the direct control of the Bundesrath, or Imperial Council, and that body will allot to each the quantity which it may produce, though later it may delegate the allotment to a committee. If any mine should produce more than its allotment, it must pay a tax of 16 marks—\$3.81—per 100 kg. on the excess, which is practically prohibitory. A special amendment, however, was made to this clause, providing that where the production is made to fill contracts now existing, the tax may be reduced to such an amount that the total price shall not be in excess of the price prevailing on June 30, 1910. This amendment was made at the instance of the foreign minister, and it is said that it was the result of representations made by the United States on behalf of the American holders of large contracts.

The operators of mines are closely held down, not only on production, but also on prices. The bill fixes prices which may be charged, the range for salts sold in Germany being 10 to 15 per cent. below the old syndicate prices. This is accompanied by a strict prohibition of the sale of any salts for export at lower prices than are charged for home consumption.

Further, the bill provides that operators must retain the present scale of wages paid to miners. If any mine should reduce wages without the consent of the Bundesrath, its allotment may be cut off. This clause seems to have been inserted to secure the Socialist vote. The only consolation the mine operators have, apparently, is that they are secured against competition; for the law provides that if any new mines are opened, they must wait five years at least before they can receive an allotment. The provisions of the law, of course, indicate that the mines will be under close government supervision, both as to operation and sales.

This seems to be the climax of governmental regulation of private industry. Our own trust magnates will look with envious eyes upon so perfect a system of throttling competition.

The curtailment of pig-iron production has been, after all, less than the current reports had it. The June report shows only 14 fewer furnaces in blast than on May 1; and the estimated make of iron in May was only 100,000 tons less than in April. The effect on the market was greater than the reality warranted.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Cactus Copper Company

We have received the following despatch from Gay & Sturgis, Houghton, Mich.:

In the editorial in the JOURNAL of June 4, entitled "Cactus Copper Company," several allusions are so obviously directed at our house that it is incumbent upon us to reply. Unfortunately for us, as we see it, the criticisms hit hardest where the people hit are innocent. The principal foundation for your criticisms is based on a forged telegram published Jan. 28, 1910, containing outlandish statements alleged to have come from our representatives who were then visiting the Cactus property. Consulting Engineer Pritchett denied these statements in a Globe newspaper, Feb. 1, and as we maintain our own weekly mining review in which our clients and others may find a correct version of our statements, we did not feel obligated to issue a denial of this spurious message. We ask the JOURNAL to satisfy itself concerning these facts, which can readily be done, and in its next issue to remove the stigma placed upon us by the editorial. Every statement we have made regarding Cactus has been obtained from authoritative sources and in each case has been tacitly endorsed by the entire management.

Early in 1909 the Cactus Copper Company was organized, and in December of the same year we underwrote $225,000 worth of this company's stock, which simply took over the assets of the Cactus Development Company and provided a sufficient sum for conducting the work recommended by the consulting engineer, C. W. Pritchett. The details of this were all laid before the stockholders in a circular letter. Hence there is no excuse for veiled allusions to corrupt financing. We hope the JOURNAL will take immediate steps to investigate thoroughly all statements we have ever made concerning this company and its property. We are confident it will then find that it has done us a great injustice; for while our name was not mentioned, the reading public will point us out as the object of attack.

We have received the following telegram this morning from Mr. Pritchett: "Denver, Colo., June 6-7, 1910. Your telegram of today received. While at the Cactus property recently, President Eaton instructed me to write full report on conditions and prospects there. Expect to have this completed by last of this week. Think report will cover the ground fully. C. W. Pritchett."

President Eaton has telegraphed to our Boston office the following statement: "Duluth, Minn., June 7, 1910, Gay & Sturgis, Boston, Mass.: The prospects of Cactus becoming a great mine were never brighter than today. Mr. Pritchett, our consulting engineer, has just left the property and has expressed himself as highly pleased with the outlook. The company has options on 42 claims adjoining the old group on the north. We now are owning and controlling about 1400 acres. Every statement made by Gay & Sturgis concerning the Cactus which has come to my notice has been conservative and well within the facts. W. A. Eaton, President."

The foregoing is respectfully submitted.

GAY & STURGIS.

Houghton, Mich., June 7, 1910.

[We made no charges against anyone respecting this company, but it is on record that specific statements as to the development of this mine have been circulated widely and these statements have not been confirmed by any published report of the company's engineer, although the company has been urged to make such a report, and has repeatedly promised to do so. Its failure to fulfil this promise was the point of our criticism.—ED.]

Consular Reports

The new federal mining department could expend some effort usefully in editing the consular reports. The issue of Jan. 3, 1910, contains a report by the consul-general at Winnipeg, on a gold process invented by George Thurber. He says, in part, "The ore * * * * is treated with a chemical solution, the formula of which is kept a secret pending the granting of a patent. * * * The process is claimed to be applicable to mines now working by merely substituting this process for the copper process (sic). According to the report of recent experiments, ore, which when submitted for assay to two of the best offices in Canada was reported by one as having no trace, and by the other as having only 70c., gave a test by this process of $14.50 to the ton."

Another report enthusiastically describes the placer mines of Bolivia as being a field for heavy dredges, but ends by admitting the impossibility of taking a modern dredge into the mountains over trails. A third report describes an automobile factory in France which covers 6000 acres and employes 1000 men—or six acres to the man. A large portion of the trade reports urge the American manufacturer to sell f.o.b. the customer's port or even on consignment, forgetting the enormous increase in capital which the latter course would require.

Such statements as the following constantly appear, and it is these which cause the reports to be held in less esteem than they deserve:

"A merchant in a European country will be glad to exhibit American pianos if sent him on consignment."

"A merchant in Bagdad will be glad to sell American agricultural machinery if delivered to him f.o.b. his city, and will pay for the machinery as he sells it."

"American machinery trade would be increased in China greatly if the manufacturer would conform, in his designs, to local customs." Apparently this last consul has no conception of the meaning of the words "standard designs" as employed in manufacturing. The low prices now quoted on American products are largely due to standard designs and prices would be much higher if designs were changed to suit every whim of the customer. Instead of the designs being suited to the customer, the customer must be educated to the point of accepting the American designs and admitting their superiority over his own crude, inexperienced ideas.

Another consul wants the names of American firms which manufacture apparatus for utilizing the energy of the sun's rays for generating and storing electricity. Someone is "playing horse" with the consul.

There is a vast amount of valuable information in the consular reports, but in each case, one must be sufficiently posted on the particular locality covered, to judge of the accuracy of the information given. A Mexico City consul recently described that city as offering a good opportunity for American tailors, giving as reasons, the high prices and poor fits of the tailors now there. I know that, while American ready-made clothing is somewhat higher than in the States, the local tailors can duplicate in fit and quality American made-to-order suits for half the New York cost.

MARK R. LAMB.

Milwaukee, Wis., May 24, 1910.

The New Bureau of Mines

Special Correspondence

The expenses of the Bureau of Mines, as planned for the coming fiscal year, are as follows: General expenses and salaries, $54,000; removing and equipping offices and laboratories, $14,700; contingent expenses, $7000; stationery, $3500; library, $1000; rent of buildings, $12,500; printing and binding, $29,000; total, $121,700. The law provides that the publications of the Bureau of Mines are to be published in such editions as recommended by the Secretary of the Interior, but not to exceed 10,000 copies for the first edition. Whenever the edition of any of the publications of the Bureau of Mines shall have become exhausted and the demand for it continues, there are to be published as many additional copies as the Secretary of the Interior may deem necessary.

Comptroller Tracewell of the Treasury Department has been consulted about the dividing of the appropriation for the printing and publishing of reports and for general administrative purposes between the Geological Survey and the Bureau of Mines.

The appropriations as above set forth have been accepted and have been incorporated into the sundry civil bill which has passed the House of Representatives. All the technological work and its appropriations have been transferred in that bill to the Bureau of Mines, and in addition the work of mine inspection in the Territories has been turned over to the new bureau. In the Senate an effort will be made to expand the work of the bureau still further and to give it more money.

Guanajuato Consolidated Mining and Milling Company

A detailed report of the Guanajuato Consolidated Mining and Milling Company for the year 1909 states that the fluctuations in the company's business were greater than during the preceding year. The net profits given by quarters, after deducting the cost of development and incidental expenses, are: $15,000; $43,000; $52,500, and fourth quarter $41,000. This falling-off in earnings continued during the first quarter of the current year, when the profits were reduced to $24,000.

The foregoing figures are net as regards the business in Mexico, but are subject to a charge for the New York office expenses, salaries, transfer agents, legal expenses and corporation taxes at the rate of $18,000 per year, and the annual interest on outstanding bonds amounting to $12,000. The fluctuations in the result of the operations at the mine were due more to changes in the value of the ore and other local conditions than to the fluctuations in the price of silver.

Development work during the year amounted to 4731 ft. About one-half of this was on the eighth level. Ore blocked out amounts to 188,500 tons. Total ore mined during the year, 116,518 tons; dry tons to mill after sorting, 86,580, averaging 12.955 oz. silver and 0.05417 oz. gold and valued at 15.68 pesos per ton. Total recovery, silver 95.04 and gold 96.26 per cent. Cost of mining, milling and cyaniding, $360,208, or $4.16 per dry ton milled, not including the interest and general office charges.

Joseph Smith Harris

Joseph Smith Harris, for many years a prominent figure in the anthracite industry, died suddenly at his home at Germantown, Penn., June 2, aged 74 years. He was born in Chester county, Penn., educated in the Philadelphia public schools, and served his apprenticeship as a civil engineer on the Pennsylvania Railroad. In 1854 he was appointed an assistant in the United States Coast Survey and continued in that capacity 10 years, serving in Kentucky and on the northwestern boundary; incidentally he was for a time in command of a steamer in Admiral Farragut's Mississippi squadron during the Civil War.

In 1864 he opened an office at Pottsville, Penn., as a civil and mining engineer, and soon made himself prominent in connection with the survey and planning of coal-mining operations. In 1870 he was appointed engineer of the Philadelphia & Reading Coal and Iron Company, holding that office seven years. From 1877 to 1880 he was superintendent and engineer of the Lehigh Coal and Navigation Company; after two years as general manager of the Central Railroad of New Jersey, he returned to the Lehigh company as president, and remained with it from 1882 to 1892. During that time he served also for three years, 1886-1889, as one of the receivers and afterward vice-president of the Central Railroad of New Jersey. In 1892 he was chosen vice-president of the Philadelphia & Reading; in the following year he was appointed by the court one of the receivers of that company. When the company was reorganized in 1896, he was chosen president of the Reading Company, the new holding company, and was also president of its two subsidiary corporations, the Philadelphia & Reading Railroad Company and the Philadelphia & Reading Coal and Iron Company. He held those positions for five years, and in 1901 finally retired from business. He spent his remaining years in the study of the history of his native State, which had always attracted him, though his busy life had left him little time for such work.

As engineer and afterward president of the Lehigh Coal and Navigation Company Mr. Harris thoroughly reformed the business and operations of the "Old Lehigh" on modern lines, doing away with the rather antiquated methods of mining which had come down from the earliest days of the anthracite industry. As receiver of the New Jersey Central and afterward of the Reading he carried those companies through the difficult period of bankruptcy. He was the only president in the long history of the Reading who was an engineer and not a lawyer or financier.

Mr. Harris married in 1865 Delia Lillian Brodhead, who survives him, with three daughters and a son. He was a member of the American Philosophical Society and the Pennsylvania Historical Society. From Franklin & Marshall College he received, in 1903, the degree of doctor of science. Mr. Harris was made in 1889 a trustee of the University of Pennsylvania. He was the author of several published works on the local and genealogical history of Pennsylvania.

Annual Report of Butte Coalition

The report of the Butte Coalition Mining Company for the year ended Dec. 31, 1909, includes a report by T. F. Cole, president of the company, under date of June 1, 1910, and a letter from A. C. Carson, general manager, telling of the development and operation of the company's mines from May 31, 1909 to March 31, 1910.

Properties Pass to Anaconda Company

The president, in his report, states that in March, 1909, the company purchased 3000 shares of the capital stock of the International Smelting and Refining Company at the par value of $100 per share. The mines operated during the year were those of the Red Metal Mining Company, the Alice Gold and Silver Mining Company's workings being practically idle during the entire year.

At the meeting of the stockholders of the Red Metal Mining Company, held in April, 1910, a proposal was made to sell and dispose of all the assets of the company to the Anaconda Copper Mining Company for 500,000 shares of the latter company's capital stock. The advisability of this sale was investigated by two members of the board of directors who were not in any way connected with the Anaconda company. One of these is a mining engineer in active practice. It was deemed advisable to accept the proposal and the transfer of the properties took place as of March 31, 1910. The present dividend rate of the new stock is equivalent to that of the Red Metal company, for which it was traded.

At a stockholders' meeting held at Salt Lake on March 27, 1910, the directors of the Alice Gold and Silver Mining Company also agreed to transfer their assets and property to the Anaconda Copper Mining Company for 30,000 shares of stock in the latter company. By these two trades the Anaconda company obtained complete control of all the properties and assets of the Red Metal Mining Company and the Alice Gold and Silver Mining Company.

MANAGER SUMMARIZES WORK DONE

The manager's report shows that during the period Jan. 1 to Dec. 31, 1909, the mines of the company produced 591,737 tons of ore, from which payment was received for 33,438,490 lb. copper, 594,626.11 oz. silver and 4059.514 oz. gold. The total development work done by the Red Metal company is stated as 19,186 lineal feet. During the period May 31, 1909 to March 31, 1910, 5297 ft. of development work was done in Rarus mine, 9405 ft. in the Minnie Healy, 4484 ft. in the Tramway mine.

In the Minnie Healy the production was raised in five months' time, after the completion of the Tramway shaft and surface plant, from 200 tons to 700 tons per day. At the end of the period covered in the report, the output was 1200 tons per day, and the output per man per day had reached 2.35 tons. This is claimed to be the highest figure for the company's operations. The Tramway mine is said to have been put on a paying basis during this year, the average grade of the ore in all veins being 130 lb. gross to the ton. The mining cost is stated to be high at the Tramway. During the year the Rarus shaft was sunk to the 2200-ft. level and the Tramway to the 2000 ft.; 750 men were employed in the mines.

BALANCE SHEET

The balance sheet of the Butte Coalition Mining Company, on Dec. 31, 1909, showed the assets of the company to be $15,257,239. The liabilities were at the same time stated to be 1,000,000 shares of capital stock authorized and issued, valued at $15,000,000; accounts payable, $110,504 to the Red Metal Mining Company, and miscellaneous sums amounting to $3121. The surplus was $393,613, made up of the 1909 balance of $80,486, and $313,126, net income for the year. There was paid in dividends, $250,000. The total income for the year was $342,156; expenses, $29,029. No figures are given from which any idea of the operating costs can be gained.

The auriferous area along the river Ili, about 70 versts to the south of Kiachta, is reputed to be the richest in Mongolia. A number of unusually large nuggets have been found in the river fords.

Report of United Copper Company

F. A. Heinze, president of the United Copper Company, has just made his annual report to the stockholders. He summarizes the holdings of the company, giving figures as to the intrinsic value of each. Data referring to the Ohio Copper Company are summarized elsewhere in this issue.

STEWART MINE

Through the Montana Ore Purchasing Company, the United company is quoted as controlling the Stewart Mining Company, capitalized at 1,250,000 shares of $1 par value each. The Montana Ore Purchasing Company owns 673,250 of the 1,013,262 shares issued by the Stewart company. The situation of the Stewart property is given as being in the immediate vicinity of the Bunker Hill & Sullivan mine and the Federal Mining and Smelting Company's property. The ore is a silver-lead one. The Stewart company has leased the Mammoth mill of the Federal company at a rental which will not exceed $1100 per month. The mill has a daily capacity of 500 tons, and working on dump ore from the mine is at present producing concentrates assaying 52 to 55 per cent. lead and 34 to 37 oz. silver, with 6:1 concentration. The property is estimated as having a value of $15,000,000, according to a report of an unnamed expert.

COAL HOLDINGS

The United company is stated to be a two-thirds owners of the capital stock of the New York & Pittsburg Coal Company, and through the Montana Ore Purchasing Company to hold a first mortgage of $600,000 on this property, comprising approximately 10,000 acres in Washington county, Penn., and underlaid by the "Pittsburg seam." The situation of the property is given as 32 miles from Pittsburg, in the immediate vicinity of the Pittsburg-Westmoreland Coal Company's property and of that of the Pittsburg-Buffalo company.

PROPERTY IN BUTTE AND VICINITY

The Lexington mine in Butte, according to Mr. Heinze, is also controlled by the United company, through the La France Copper Company. The property is developed by a three-compartment shaft to a depth of 1465 ft. It is estimated that 246,000 tons of ore, averaging $28.20 gross value per ton, are developed in the main Lexington orebody. The ore is refractory, but Mr. Heinze states that he has been assured by Beer, Sondheimer & Co., that a recovery of 60 per cent. of the gross value can be made with the milling facilities at present available to the company. According to the same authority, a 70 per cent. recovery should be made with the proper equipment. The ore is said to become more zinky in character with depth.

The Basin Reduction Company, another asset of the United company, has a mill with a capacity for copper ores of 1500 tons daily, a mill site, and valuable water rights, etc. This mill is at present doing custom concentrating work and is beginning the treatment of Lexington ore. The other mining holdings of the United Copper Company are 13 "Danielsville" claims, approximately 260 acres, situated in Deer Lodge county, and about 200 acres on the "porphyry dike," about seven miles south and west of Rimini, Mont. The former is a gold property, the latter a low-grade porphyry copper.

BRITISH COLUMBIA TIMBER LANDS

In British Columbia the United Copper Company holds an undivided one-half interest in 540,000 acres, situated in the southern part of British Columbia and in the vicinity of the Columbia & Western Railway, a section of the Canadian Pacific system. According to a report made by G. W. Mason, of Cœur d'Alene City, Idaho, these holdings are worth: Land, 539,010 acres, $2,546,375; timber, 636,000,000 ft., $1,411,500; total value, $3,957,875.

Mr. Heinze expresses the greatest confidence in the value of the holdings of the United Copper Company and states that litigation against the company, and later against himself, has made it impossible for the most economic and profitable operation of the subsidiary companies.

Ohio Copper Company

According to a report by F. A. Heinze, president of the United Copper Company, the mill of the Ohio Copper Company, at Lark, Utah, when completed will have a capacity of 3000 tons daily. At present one-half of the mill is finished and in operation. The cost of milling has been 38c. per ton. Figures so far obtained indicate that the cost of mining will be less than 50c. per ton. The freight on ore between mine and mill is 15c. per ton. Ore in sight is over 13,000,000 tons.

The cost of the mill up to March 31 was $1,273,215. It is estimated that $250,000 is required to complete the plant. According to these figures the cost of the plant will be about $1.50 per ton of annual capacity.

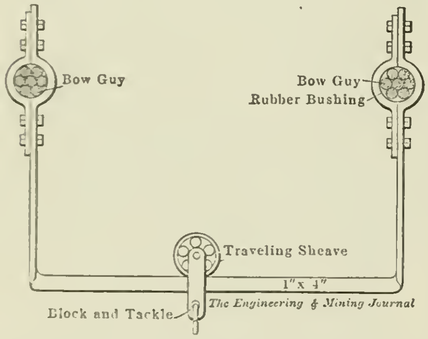
In May, the Goldfield Consolidated Company milled 19,800 tons of ore and, owing to the recent fire, only 70 stamps were dropped. This means that a stamp duty of 9.1 tons was attained. The tonnage put through the mill last month with 70 stamps dropping was greater than was ever crushed with 100 stamps before chilean mills were introduced between stamps and tube mills.

DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Tackle to Serve Bucket Line

A tackle to handle the heavy iron used on dredges to knock out pins in the bucket line is usually suspended from the bow gauntry guy rope. C. E. Himes, a dredgemaster on the Folsom, Cal., division of the Natomas company, has the block and tackle hung from a sheave traveling on a frame between the two bow-gauntry guys. The frame on which the sheave travels is made of one piece of 1x4-in. iron, bent as shown in the sketch and firmly bolted to the guy ropes. A piece of old stacker belt is used as a bushing where the iron is clamped about the guys. By having the block and tackle suspended from a traveling sheave, it is much easier to swing the heavy iron to knock out pins from either side of the bucket ladder. The sheave travels across the digging well.



TRAVELING TACKLE FOR DREDGE BUCKET LINE

Bull Jig Rougher in a Joplin Zinc Mill

By L. L. Wittich*

To abolish the necessity of regrinding much of the zinc ore that would be returned to the rolls after failing to pass through a ⅝-in. revolving screen, the Culpeper Mining Company, north of Carterville, Mo., has installed what is termed a bull-jig rougher, and claims the capacity of the mill is increased 100 tons per day, making its total capacity 500 tons.

This is the first instance of a rougher jig of different construction from the regular rougher being installed in the Joplin district. It is situated high in the building and handles only the coarse ore that passes through a ½-in. revolving screen. The regular rougher cares for the ore passing through the regulation ⅜-in. mesh. The operators claim the extra cost of running the bull jig is too insignificant to be considered.

The bull jig rougher is composed of two large cells, each 36 in. wide and 60 in. long. Four eccentrics, two for each cell, operate the jig beds. Were it not for the bull-jig rougher a large volume of chats, on failing to pass through the ⅜-in. screen would be returned to the rolls for regrinding. Of the concentrates, neither draw-off nor hutch product from either cell, go directly to the bins. A return of this mineral-bearing ore is made to the chat rolls where it is reground. Ore that passes through the ⅜-in. screen then goes to the regulation rougher, from the first cell of which the draw-off goes directly to the bins.

Tailings from both the regulation rougher jig and the cleaner, are drained over revolving screens, the water passing into settling tanks from which the slime feed is drawn for the tables.

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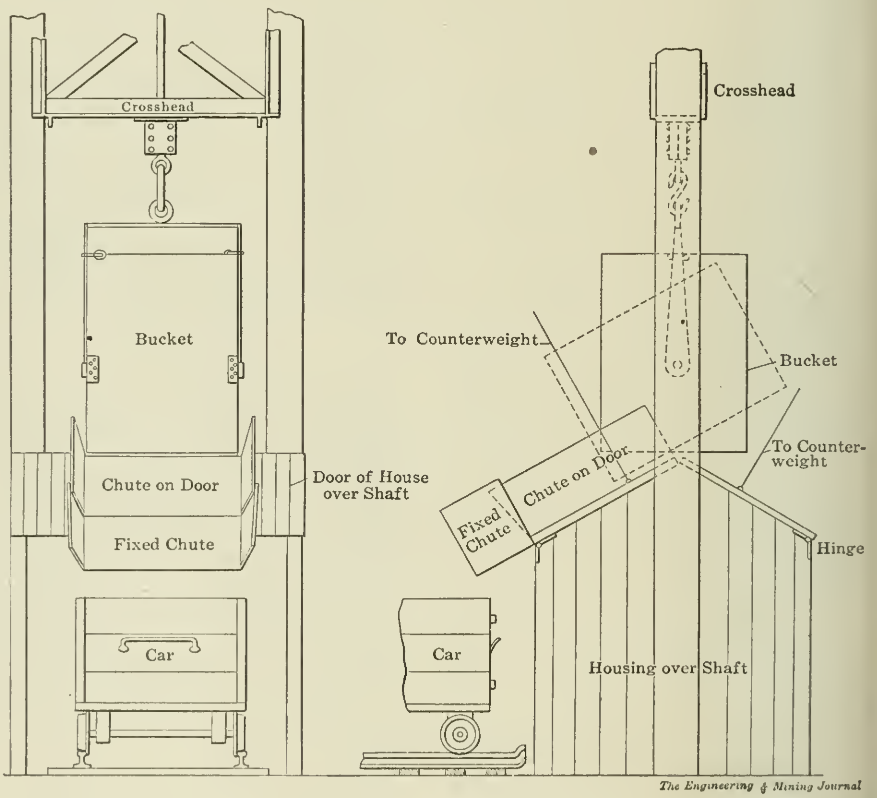
*Joplin, Mo.



SURFACE DUMPING ARRANGEMENT

Bucket and Chute for Shaft Sinking

By A. P. Rogers *

In sinking a shaft in South America a few years ago it was necessary to devise an arrangement for dumping the bucket which would be capable of rapid operation in the hands of the native labor. The usual plan of a rope with a hook on the end of it to attach to a ring in the bottom of the bucket for dumping purposes did not appeal to me; it is not a neat arrangement, and a careless topman or engineer might cause some large rock to drop out of the basket down the shaft.

The accompanying sketches illustrate my device in more or less detail, and can be readily changed to suit any local conditions. As the distance between the guide rails in each skipway was only 2 ft. 2 in., I had the body of the bucket made in a cylindrical form, 5 ft. high by 2 ft. diameter, and so hung on the bail that the center of gravity was slightly below the bearings when the bucket was empty. A heavy bottom to the bucket brought the center of gravity quite low for this purpose. Two lugs attached to the top of the bucket held it fixed in this position. When it was filled with a load of rock, however, the center of gravity was slightly raised and the moment the lugs were thrown it required little effort by the topman to dump the bucket. Several forms of bail were tried out, but the most satisfactory proved to be the one shown in the sketches, consisting of two side rods hung on a heavy, flat crossbar, through which the cable hook was attached.

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*Mining engineer, 25 Broad street, New York.

The crosshead used was made from channel irons as guide shoes, with diagonal braces. Two lighter channel irons were riveted to these for top and bottom plates. It made a rather heavy crosshead, but for continuous use over a long period of time it proved satisfactory and substantial. The weight was more of an advantage than otherwise, as it made the bucket ride smoothly.

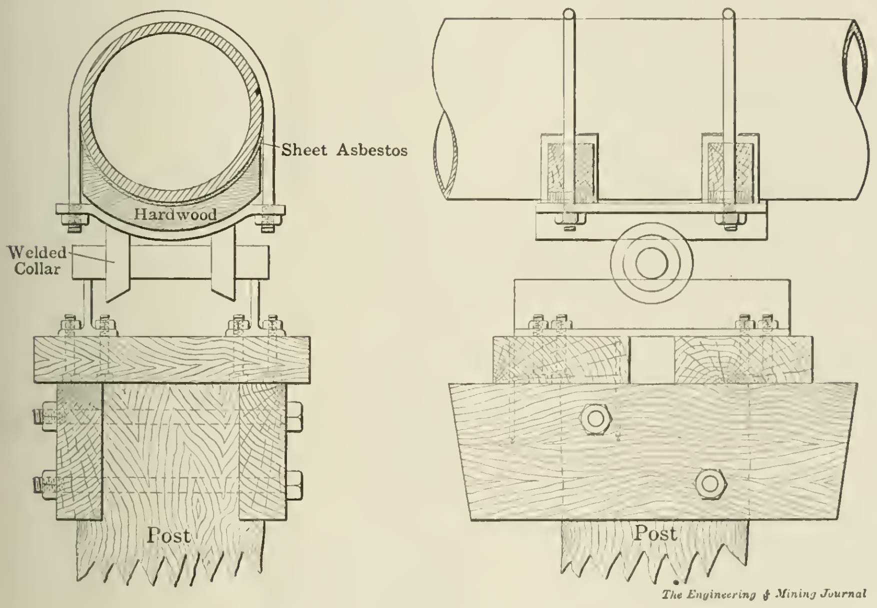
The housing over the top of the shaft was built up 5 ft. high and the trap doors were constructed from 2-in. plank. On top of the door, upon which the bucket was dumped, I bolted a sheet of ⅛-in. iron, with two sides bent up, forming a chute for the rock into the car. This iron made the door heavy, but with a counterweight it was perfectly easy to open and shut. The arrangement was used with perfect satisfaction for two years without accident and the topmen became expert in operating it rapidly.

The stamp duty at the Ready Bullion mill of the Alaska United Gold Mining Company, Douglas Island, Alaska, during the last fiscal year, was 5.37 tons per 24 hours.

Supporting Roller for Outdoor Steam Line

The sketches show a supporting roller for outdoor steam lines that are carried some distance on posts. This particular drawing shows a roller for a 7-in. steam line that is supported for a distance of 1200 ft. and contains five expansion joints. The roll allows for a movement of 6 in., which is taken up by the expansion joints and is ample for the greatest variation of temperatures.

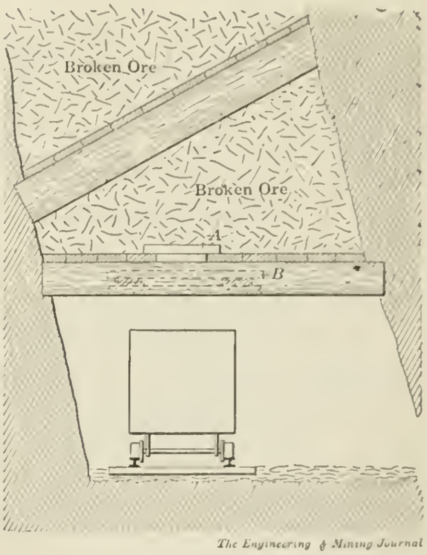
The posts of the steam line are set to grade and notches cut in each post parallel to the line. A plank 18 in. in length is bolted in place in the notches in order to support the two T-irons that form a track for the roller. The roller is 1½ in. in diameter, with two welded collars gaged, according to the size of the pipe in the line. Resting on the rollers is a bent plate held to the pipe by means of two U-bolts. There is a packing between the plate and pipe composed of 1¼ in. of hardwood and a sheet of ⅛-in. asbestos. This allows room above the roller for the steam-pipe covering.



Roller Support for Steam Line

A Modified "Chinaman"

The accompanying sketch shows a modification of the chute, described in the Journal of Sept. 4, 1909, known as the "chinaman," and recently put into use in the shrinkage stopes of the Copper King mine, at Clifton, Ariz., by L. W. Armstrong, superintendent. It was found that the "loose, sliding" boards covering the opening in the center of the platform would not slide easily, or at all, when covered with ore from the stope, making it extremely onerous to open the chute and to close it when the car was filled. The difficulty was overcome by nailing a cleat of 2-in. stuff to the inside of each of the stulls supporting the platform and fitting in 2x6's from stull to stull on either side of the opening above; these 2x6's support loose boards *B*, as shown in the sketch, which can be easily moved by hand or with a short, sharp-pointed bar. Two of the loose boards *A* on the platform are removed, leaving a permanent opening. It was found expedient to raise the platform about 3 ft. above the top of the car as it enabled the trammer to get at the chute door more easily, and also avoided the inconvenient reduction in the hight of the level at the "chinaman."



The Improved Chinaman

Underground Sorting Grizzly

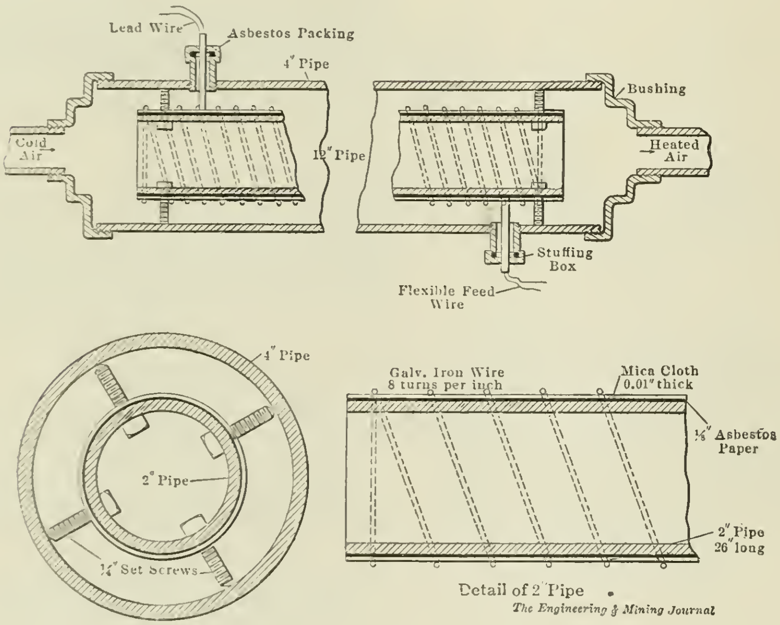
Ore is sorted in stopes to as great an extent as is possible in the Last Chance mine at Wardner, Idaho. In development work or raising, however, it is practically impossible to do any sorting when the ore is broken, so "automatic sorters" are placed at some convenient point in the chute, usually near the level below.

The sorter is merely a grizzly placed across the rock chute, with a small platform beside it. This platform is usually a few boards or a wooden door covering the top of the second compartment of the chute, two compartments being maintained down to the tramming level below. All fines from the heavy galena ore are considered as ore, so the continuation of the chute below the grizzly is the ore compartment. An opening is left beside the grizzly through which large pieces of ore can be dropped into the chute. Waste material is sorted out on the platform and grizzly, and dropped into the second compartment of the chute.

Electric Reheaters

At the Bully Hill copper mines in Shasta county, Cal., a novel type of reheater is used in connection with pumps operated by compressed air. The arrangement is an electrical resistance coil inclosed in a pipe through which the compressed air passes directly before being utilized. The arrangement was worked out by H. A. Sutliffe, electrician for the Bully Hill Copper Mining and Smelting Company, and has proved thoroughly satisfactory.

The reheater consists of two principal parts, i.e., an outer jacket and an inner length of pipe upon which is wound the resistance wire. The air line is bushed to the pipe jacket and through this jacket are tapped, as shown in the drawing, two ½-in. holes provided with insulated stuffing boxes through which the flexible, lead wire is connected to the resistance coil.



The Engineering & Mining Journal

ELECTRIC REHEATER USED AT BULLY HILL, CAL.

In the design shown the resistance coil is wound on a section of 2-in. pipe, 26 in. long, the jacket pipe being 4 in. in diameter. The central pipe is first wrapped with ¼-in. asbestos paper, and this in turn covered with mica cloth 0.01 in. thick. Over this is wrapped a helix of No. 14 galvanized-iron, telephone wire pitched eight turns to the inch. At points 1 in. from either end, the central pipe is tapped for set screws at four equally spaced points about its circumference. These set screws serve to keep the resistance coil from touching the outer pipe jacket. The wire coil is so wound as to not touch the set screws.

A reheater, as described, is designed for a 110-volt 40-amp. current and will use approximately 6 h.p., yet at the Bully Hill mine a saving of at least $6 per month has been effected, it is claimed, by each reheater installed. The reheaters are credited with raising the available air pressure 5 lb. With the electric reheater it is well to have the valve controlling the air engine, pump, etc., for which the air is being heated, connected with a pilot light, so that when the engine is shut off, attention will be called to that fact at once and the reheater will be disconnected. If this is not done there will be danger of burning out the reheaters as they soon become hot enough to destroy themselves if allowed to run after the air is cut off.

Heating Cyanide Solutions

In the Montana-Tonopah mill, Tonopah, Nev., heating the cyanide solutions during agitation is practised. Hendryx agitators are used and at first radiators were put in these. After a couple of months a scale formed over the steam pipes rendering their efficiency extremely low.

The practice finally adopted is to pass steam at about 30 lb. pressure into the solution through a 1-in. pipe terminating below the surface of the pulp. Solutions are now kept at 90 to 95 deg. F. (higher temperatures cause an increased cyanide consumption) and with a small consumption of steam, and no additional cyanide, the extraction has been bettered almost 5 per cent.

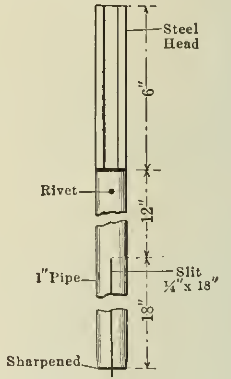
The Automobile in Mining

The automobile is doing much to solve the transportation problem in Mohave county, Arizona. A large auto-truck, put into use by the Dixie Queen mine recently, has been thoroughly tried out in the 25-mile haul between the mine and Chloride and has given fine service. Loads as high as four tons have been successfully hauled to the mine in less than half the time by teams. Six machines bought in Kingman several months ago have been in use constantly, and as many more have been ordered recently. A 60-h.p. automobile will be used for transportation to and from the railroad terminal at Chloride by the Dandy mine.

Sampling Lead Concentrates

The sampling of fine lead concentrates has long been a serious problem among producers. It is desirable to sample in the cars when shipment is made. The chief difficulties have been to reach the bottom of the car and bring up a representative sample.

The sampler in use by several companies in southeast Missouri accomplishes this in a satisfactory manner. It consists of a 1-in. pipe about 3 ft. long. It is split about ¼ in. wide, the split starting at the bottom and running up about 18 in. The bottom is sharpened, and a piece of drill steel is riveted in the upper end.



The Engineering & Mining Journal

SAMPLING TOOL

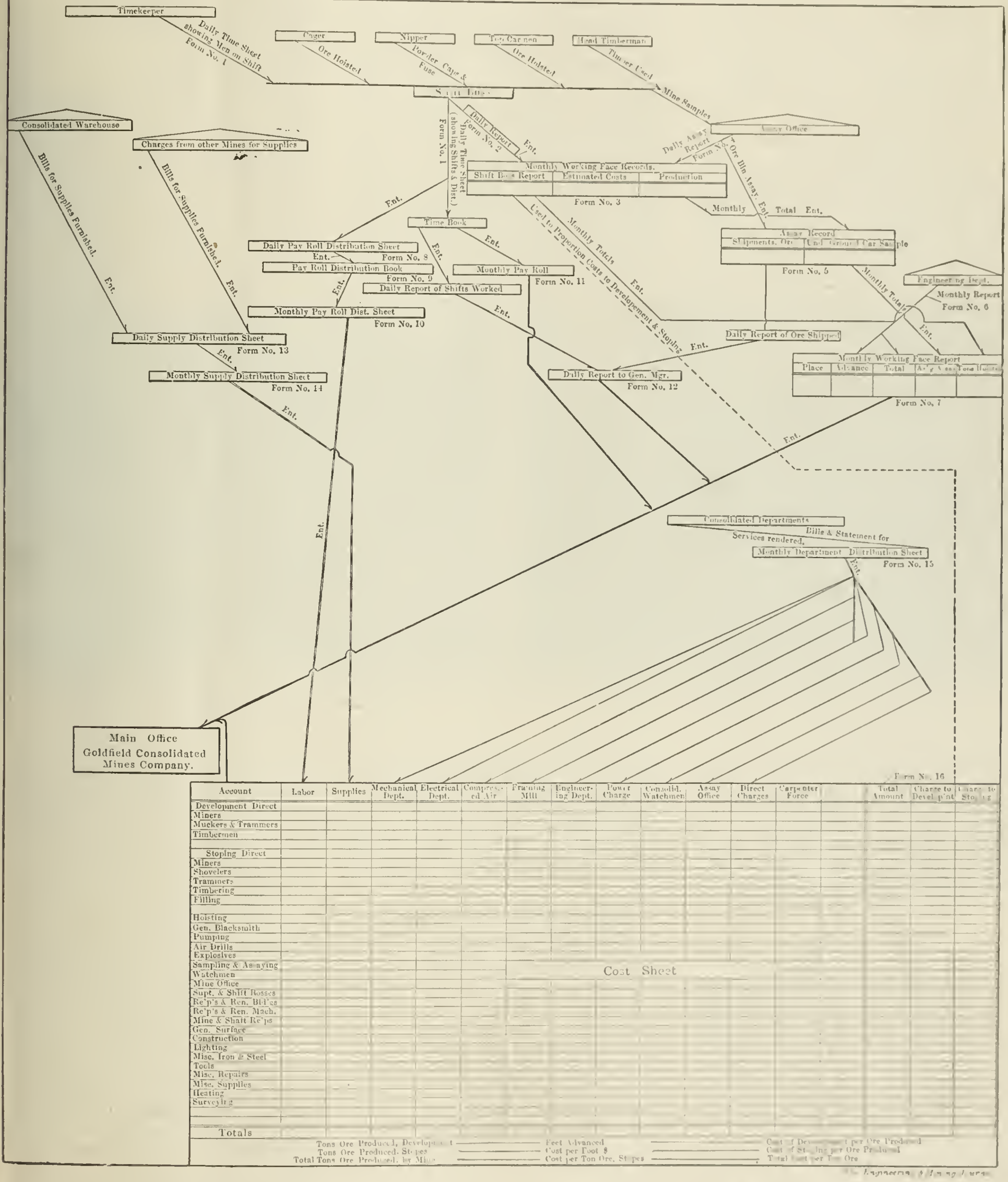
In sampling a car it is first marked off into 2-ft. squares. This gives from 48 to 64 holes to the car. The sampler is driven to the bottom of the car with a 6-lb. hammer, and then pulled out. The spring of the pipe holds the ore, which falls out when the pipe is tapped on the side. In vanner concentrates there is sometimes a suction which will pull out part of the sample. This may be avoided by loosening the pipe in the hole as much as possible and then removing it with a twisting motion. The samples are emptied on a sheet of iron and cut down by quartering in the usual manner. This method of sampling has proved satisfactory, checking within less than 1 per cent. with the smeltery samples which are taken every twentieth shovelful.

Satisfactory experiments with the concentration of fluorspar ore, using the Monell table, have been made at Jamestown, Boulder county, Colorado.

Flow Sheet of Reports

The accompanying diagram explains the new cost system which has been installed in the office of the Goldfield Consolidated Mines Company, under the direction of J. R. Finlay, general manager. The original drawing from which the illustration was made was contributed by Heath Steele.

The arrangement given here is a great improvement upon former methods and may be modified to suit any mine, large or small. A good system of bookkeeping, and a complete record of all of the mine work is indispensable at any mine. The scheme here illustrated is comprehensive, and the reports to the general manager are such that he can tell at a glance just what is being done by any department. In fact, a brief examination by anyone will enable him to readily grasp the basic idea of the system and should be of assistance at any property where a new cost and report system is in contemplation.



FLOW SHEET OF MINE REPORTS AS USED BY THE GOLDFIELD CONSOLIDATED MINES COMPANY

First Year of the Gowganda District, Ontario

Transportation Facilities Inadequate. First Power Plant Installed April 1909. Total Shipments Amount to 320 Tons, Valued at $400,000

BY G. M. COLVOCORESSES*

Gowganda has passed through its first year of development and mining work and in April, 1910, closed its first shipping season. It has not produced any startling results, but from a prospecting field it has become a mining camp and taken second place among the silver-producing districts of Ontario.

In April, 1909, the first power plants were being erected while the pioneer hand-steel work had been begun barely three months previous. No shipments of ore were possible until January, 1910, because in summer the camp was only accessible by 100 miles of canoe and river route. Since January, 13 car loads have been shipped, containing approximately 320 tons of cobalt-silver ore. The exact grade of these shipments is not generally known but I would estimate that in the aggregate they contained close to 800,000 oz. of silver valued at $400,000.

The First Air Drill in the Gowganda District, May 10, 1909

Lumber for Powerhouse made with Whipsaw and Broad-axe

History

The history of the camp is brief, dating from the summer of 1908 when prospectors following up the Montreal river found silver on the west shore of Gowganda lake, while at nearly the same time silver-bearing veins were found near Le Roy and Miller lakes, which are three miles east of Gowganda lake. Those sections are now included in the Gowganda district, which may be roughly bounded by a rectangle eight miles long, north and south, and six miles wide. There are also several promising localities outside of this district. The pioneer claims were all staked before September 1908, when the assessment work (largely stripping) was done by the original owners who early realized that Gowganda was not a poor man's camp and sought capital to assist them.

My first visit to Gowganda was in November 1908, just at the "freeze up," which, barring the "break up," is the nastiest time of the year. The canoe route was frozen up and the winter road was not yet cut through, so that our party walked the entire distance from the Temiskaming & Northern Ontario Railroad at Charlton to Gowganda (60 miles), and back again two weeks later. The conditions of the trail and the camp at that time were vividly described by H. E. West[1].

Development Work in 1908

Other than surface stripping no development work had been done, and except at Le Roy lake there was not a test pit 10 ft. deep in the whole district. With one exception the silver-bearing veins had been found in the diabase. They were all narrow, 2 to 2½ in. wide, and a few had been traced over 100 ft. in length; most of them were less than 50 ft. In these veins the oreshoots showed for a length of 6 to 25 ft., rich in native silver associated with calcite and cobalt minerals or with black mud; and thin leaf silver impregnating the wall rock for 3 or 4 in. on each side of the vein proper. Outside of the oreshoots the vein filling is mud, calcite and quartz, cobalt bloom and smaltite. There was nothing remarkable about the surface showings in themselves. They were well worth development on option, but for the properties to become profitable mines, it was necessary to suppose that the oreshoots would lengthen as they went down; that new oreshoots would be found and that their grade and width would not diminish for at least 80 or 100 ft. in depth. The remarkable things about the district were the large area over which the silver showings had been found in two months' prospecting, the number of veins showing some silver and the high grade of the oreshoots exposed.

High Price of Claims Due to Cobalt's Success

On many of the claims it certainly seemed as if investors would be taking a long chance to buy outright on the high prices that were being asked by the prospectors. Yet such chances were taken, and before the month of February the ownership or controlling interest in most of the properties showing silver had passed from the original owners at figures that varied from $50,000 to $500,000, all or a good part of which to be paid in cash.

I think that it was not so much the ore showings themselves which sold the properties as the shadow of Cobalt which hung over this new district, nearly 100 miles away, and which gave to the claims a prospective value that without Cobalt they never would have had. It will be remembered that Cobalt was at first looked at askance by many engineers and investors. The best prospects there were sold at the start for a few thousand dollars and have since made fortunes for their purchasers. In spite of some weak spots Cobalt has proved a wonderful camp and when silver is found in "New Ontario" the cry goes up that another Cobalt has been discovered. Some of the Gowganda prospects were sold to men who had made money in Cobalt, but more to men who had not made money in the early days of Cobalt and who have been kicking themselves ever since for missing that golden opportunity.

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*Superintendent, Millerett Silver Mining Company, Ltd., Gowganda, Ontario.

[1] Eng. and Min. Journ., May 1, 1909.

Winter Road Completed to Gowganda

Early in January, 1909, the winter road was cut through to Gowganda lake where a mushroom town sprang up with surprising rapidity and the real rush to the camp began.

Gates Mine, Near Miller Lake, December, 1909

Millerett Silver Mine, March, 1910

Work was started on the staked claims while several hundred prospectors and "claim stakers," (there is a big difference) snowshoed over the country for 20 miles in every direction and staked a large portion of it, often without having seen the rock formation which lay under 3 ft. of snow.

By February most of the properties that showed silver had begun underground developments. The new owners showed no lack of faith in their prospects. About 30 camps, to accommodate 20 to 80 men, were built. Hand-steel work was started at all of them while nine power plants, ranging in capacity from 20 to 170 h.p., were brought to the properties before the winter road broke up early in April.

Then operators then laid in provisions and supplies for 8 or 10 months' work and general stores were heavily stocked up at Gowganda. Throughout March 600 sleigh teams worked at high pressure between Charlton and Gowganda and 300 over the western road from the terminus of the Canadian Northern Railway at Sellwood.

Power Plants Installed

By the middle of June most of the power plants were in operation and air or steam drills took, in part, the place of hand steel, while prospecting, stripping, trenching, and sinking were being carried on vigorously throughout the entire district. At this time probably 40 tons of high-grade ore were bagged up in the camp, taken entirely from the silver shoots near the surface. Underground developments, however, have not been satisfactory. The deeper shafts, then down 50 to 60 ft., had lost the veins or lost the oreshoots (which often pitch considerably in the vein) and all through the summer of 1909 Gowganda presented a rather sad appearance. Most of the claims staked on the snow were found to be worthless. Comparatively few new finds had been made on the original claims. Only two of the mines were steadily producing ore in any quantity and most of the underground workings were out of ore altogether. It is not surprising that many of the people who visited the camp at this time went away with the impression that Gowganda possessed merely a scattering of little surface-ore pockets not good enough to be converted into mines.

Fortunately the owners of the properties were not so easily discouraged and in the autumn things changed for the better. Several good surface finds had been made and good ore had been struck at depths varying from 60 to 90 ft. On the first of December there were close to 200 tons of ore bagged, while several of the mines had developed small ore reserves sufficient at least to assure their working profitably throughout the winter.

Geology

Several articles have already been published dealing at length with the geology of Gowganda, which in the main is similar to that of Cobalt. The oldest formation is the Keewatin, consisting of basic igneous rocks, both massive and schistose in structure, and always highly metamorphosed. Much of this formation appears to be more or less altered diabase, differing considerably from the later and much fresher looking Pre-Cambrian diabase in which the silver veins are found. Two silver-bearing veins and two veins carrying smaltite and niccolite assaying a few ounces in silver have been found in the Keewatin. This formation covers a large area near Miller lake. Little attention has been paid to it in the neighborhood of the diabase dikes, which would seem to be well worth careful prospecting.

The Laurentian rocks, granites, syenites and gneisses, intrude the Keewatin. No veins of value have been found in the Laurentian nor is it likely that any will be.

Huronian Sediments

The Huronian sediments, conglomerate, quartzite, arkose slate and greywacke, originally covered all the older rocks, but they have been worn away by a long period of erosion so that only scattered patches are now left. At Cobalt this formation has by far the greatest economic importance, but in the Gowganda district only one producing silver vein has been found in the Huronian. This is near Miller lake, and is among the best veins in the camp. Another strong vein, 6 in. wide, containing smaltite and niccolite, occurs in Huronian quartzite and conglomerate, but the assays show only a few ounces in silver to a depth of 40 ft. The absence of good finds in the Huronian rocks has caused them to be locally considered of little importance, but it may well be that more careful prospecting will be richly rewarded.

Pre-Cambrian Diabase

The youngest rocks in the district and so far the most important are the Pre-Cambrian diabase or gabbros, which cut through all the later formations in sills, sheets and dikes. These rocks are, no doubt, of the same age as the diabase at Cobalt and along the Montreal river. At Cobalt there are a few good producing veins in the diabase, but with one or two exceptions they are pockety and irregularly mineralized. This characteristic holds true in the diabase veins of the Montreal river and Gowganda districts. The veins at Gowganda may be divided into three classes: (1) Gash veins; (2) fissure veins; and (3) veins in faults.

Gash Veins

The gash veins are of but little importance. These seem to have been cooling cracks in the diabase, and erosion has only left the roots of the cracks on the present surface. They are narrow, have a length of 50 ft. or less, and usually pinch out at 30 to 50 ft. in depth. Some small silver showings were found in these veins, but development has resulted only in disappointment to their owners and a few hundred pounds of ore.

Fissure Veins

Fissure veins appear to be persistent with little or no evidence of faulting. These veins can be traced from 50 to 500 ft. in length and as far as developed they continue in depth. As a rule, they do not exceed 2 or 3 in. in width though some widen out in places to 8 or 10 in. The main filling is calcite, with mud resulting from decomposition near the surface, and often bands of quartz. With these are associated the cobalt minerals and native silver. A little argentite, ruby silver and silver chloride are to be noted in spots. Chalcopyrite, galena, bismuth and pyrite are often found, but seem to have no influence for or against the silver and cobalt minerals.

The ore occurs in shoots, none of which are long. No great quantity of ore has yet been extracted from any one of these shoots. This type of vein is by far the most predominant in the camp, and the future of Gowganda seems to be largely dependent on the proportion that the pay shoots will bear to the worthless portions of the veins.

Two Main Systems of Fissure Veins

Although striking in all directions, the best veins have so far been developed along two systems or ranges whose longer axis is north and south. The western range, known as "The Ridge," lies along the west shore of Gowganda lake and has a length of four miles. Over 200 veins have been found on this ridge with silver occurring in about 50 of them. Near the south end of the ridge are the O'Brien, Bartlett and O'Kelly mines, and north of these the Welsh, Reeves-Dobie, Crawford, Silvers Ltd., Mann, Boyd-Gordon, La Brick, Bishop, Trans-Continental and Dufferin, besides several smaller properties which are not mentioned. The Reeves-Dobie has over 20 veins. The Welsh claims are said to have 40. The Boyd-Gordon on the 75-ft. level passed through 14 veins with a north-and-south crosscut 400 ft. long; but the number of veins bears little or no relation to the value of the properties as ore producers.

The eastern system of veins starts south of Miller lake and west of Le Roy lake. It runs northward to the south end of Everett lake, a distance of three miles. Along this range are the Le Roy mines, Canadian-Gowganda, Northern Mining Company (Morrison), Gates mine of M. J. O'Brien, Millerett mine (Blackburn), Bonsall, Le Heup and Everett lake mines. The number of veins is not so great as on the western range nor has there been so much development, yet the outlook would seem equally favorable.

Veins in Fault Zones

The veins in fault zones are a third type of vein of which, until recently, little notice was taken. These are remarkably strong and persistent fault fissures filled with calcite and fragments of the diabase wall rock. The width of these veins is from 2 to 8 ft., and some of them have been traced for over half a mile. The calcite is largely crystalline and stained brown in spots. There are probably 20 such veins in the district. Low silver assays are reported from nearly all of them, and in one, a native silver shoot 15 ft. long and 6 in. wide has been found and sinking is shortly to start on this property. Many of the second type of veins appear to be really offshoots from these big calcite ledges, and several tons of good ore have been extracted from these offshoots quite close to the parent vein. The big fissures may be expected to hold strong to considerable depth, and if pay shoots should be found in depth they may, in connection with their offshoots, play an important part in the future of the camp.

Mann Mines, Ltd., No. 1 Vein, Gowganda

Cobalt and Gowganda Compared

Cobalt was discovered in the summer of 1903 and the production for 1904 was $136,217. Gowganda, discovered in 1908, has produced $400,000 up to March 31, 1910. Cobalt was on the railway line. Gowganda is 55 miles from the railway with a winter road that lasts only four months, and during its first summer was only accessible by a canoe and river route 100 miles long, with 20 portages. Cobalt worked all during its first year with hand steel, whereas Gowganda had nine power plants almost from the start. Though handicapped by remoteness and difficulty of transportation, few camps have been so favored by the confidence of investors and the readiness to spend large sums of money to hurry developments.

Not many persons in the camp would care to predict that Gowganda will in the next year produce ore to the value of $1,500,000, as Cobalt did in its second year, but still it may do so. In camps like Gowganda, one does better not to predict at all. The developed high-grade ore reserves of the camp are small, and it is probable that for three or four years at least they will continue to be so. Like a famous silver mine in Mexico, "as soon as they get any ore in sight, they take it out of sight."

Low-grade Ore Reserves

The developments to date have proved up fair reserves of low-grade ore which cannot be profitably shipped at present, and if these reserves continue to develop, Gowganda must either have a railroad or put in mills next winter. This feature of the camp is one of great importance, for the low-grade reserves have a large prospective value.

For another year at least the shipments will all come from the high-grade oreshoots and the success of the operations will depend on the frequency with which such shoots are encountered.

To extract the rich ore is a comparatively easy matter once it is found. The mining and shipping costs, high as they are, are small compared to the cost of exploration and development necessary to locate the oreshoots.

Future Outlook

The future of Gowganda is still uncertain, but it has done much in its first year. The general conditions are steadily improving. Labor is better and more plentiful. Supplies are becoming much more reasonable. The winter freight rate for 1909 averaged close to $4 per 100 lb. from the railroad. The summer rate was $7.50. In 1910 the winter rate averaged $1.75 and now that a wagon road has been built from Elk lake, it is probable that the summer rate will be about $3 per 100 lb. Five new power plants have been added to the camp this year and it is likely that all the older plants will operate steadily during the year. Not including purchase price of properties, something like $2,000,000 have already been spent in equipping and developing the Gowganda district. In some cases the output of the mines has already justified this expenditure. There can now be no doubt that silver exists in considerable quantities at Gowganda, and the owners of the mines mean to keep on finding it. The record of the camp to date is a favorable augury for a profitable and steadily increasing production.

Assaying Sulphide Ores

By F. G. Hawley *

Assaying oxidized ores for gold and silver by the crucible method is usually much simpler than assaying sulphide ores. One of the principal reasons for this is that sulphides are strong reducing agents and it is difficult to determine beforehand just what the reducing power will be. If an excess of litharge is used in the flux, as is customary, an abnormally large button may be formed. An attempt to correct this by the use of niter, and not correctly estimating the amount necessary, may result in an undersized button or possibly none at all. One method to obviate this trouble is to roast and treat as an oxidized ore. This not only lengthens the process, but may also cause some losses. Another way is to run a preliminary assay to determine the exact amount of niter necessary. This, although it is undoubtedly reliable, is a long process. If many determinations are to be made and the results wanted quickly, a shorter method is desirable.

Estimation of Sulphides

I have worked out a method that, with a little practice, combines rapidity and accuracy. It has been in use for several years at Cananea and has proved satisfactory. The new feature involved is the manner of determining the percentage of sulphide and a formula governing the use of niter. When the ore is received in lumps of fair size, the sulphide contents can usually be determined with sufficient accuracy by simple inspection. But if the ore is received as pulp, a small amount of it is vanned and the sulphide contents noted.

The method of vanning is as follows: A number of color plates, more often called spot plates, are placed in a row end to end and a small amount of each sample placed in the corresponding depression, using only the outside row of holes. The samples are now vanned, four at a time, in a basin of water and the approximate per cent. and kind of sulphide noted.

Reducing Power of Various Sulphides

Pyrite is the commonest sulphide and has the highest reducing power, so it is taken as the standard and made the basis of calculation. The reducing power of some other common sulphides as compared with pyrite is as follows: Chalcopyrite, ⅔ of pyrite; blende, ⅔; pyrrhotite, ⅔; arsenopyrite, ⅔; stibnite, ½; galena, ⅓; and chalcocite, ⅓ of pyrite. From this we see that 45 per cent. galena or 30 per cent. stibnite has about the same reducing power as 15 per cent. of pyrite.

When using one-half assay ton of ore with an excess of litharge and a fair amount of soda and borax, it is found that 15 per cent. of pyrite will reduce a lead button of about 22 grams, which is about the size required. If the ore contains more than 15 per cent. pyrite or its equivalent in other sulphides, enough niter is added to oxidize the excess. For every 5 per cent. of pyrite above 15 per cent., 2.1 grams of niter are needed. For an ore containing 25 per cent. pyrite, I would add 4.2 grams of niter.

With an ore containing 10 per cent. pyrite and 30 per cent. zinc blende, the blende is equivalent to 20 per cent. pyrite, which, added to the 10 per cent. pyrite present, gives the equivalent of 30 per cent., and using the above rule, 6.3 grams of niter are required.

Lack of Sulphides

On the other hand, if there is not enough sulphide present to reduce the proper-sized button, flour or some other reducing agent would have to be added to supply the deficiency. Suppose, for example, the ore contained 10 per cent. pyrite, or 15 per cent. blende, or 30 per cent. galena, each of which would give a button of about two-thirds of the size required, we would have to add one-third of the regular amount of flour, the regular amount being about 1¾ grams for a 22-gram button.

A convenient way to add the flour is to have two standard fluxes made up in bulk, one containing enough flour to reduce the proper-sized button, and the other containing no reducing agent. A brass scoop holding about 84 grams, which is the usual amount of flux for a charge, simplifies weighing; in order to take one-third of the amount of flour, we take one-third of the scoopful of reducing flux and finish filling with the nonreducing. A small brass scoop is also made to measure the niter. It holds 4.2 grams of niter, which is the right amount to oxidize 10 per cent pyrite. If 20 per cent. pyrite or an equivalent amount of other sulphide is present, use one-half measure of niter. If 25 per cent. is present, one scoopful is needed.

Standard Fluxes

The standard fluxes are made as follows:

Reducing flux: Litharge, 15 kg.; sodium carbonate, 4 kg.; borax, 2 kg.; flour, 0.44 kg. A measure of this flux weighs about 84 grams, which makes a charge of the following composition: Litharge, 60 grams; sodium carbonate, 16; borax, 8; flour, 1.75.

For the nonreducing flux the following is used: Litharge, 15 kg.; sodium carbonate, 3.5; borax, 2.5; silica, 0.5. A measure full of this flux also weighs about 84 grams and gives a charge of approximately the following: Litharge, 60 grams; sodium carbonate, 14; borax, 10; silica, 2.

It will be seen that these fluxes are similar in composition except for the flour. The nonreducing flux is made slightly more acid than the reducing, because the sulphide ores are usually more basic than the oxidized ores on which the reducing flux is used.

The high litharge is especially desirable in eliminating the copper from the lead button and forcing it into the slag. No trouble is experienced from matte, the excess litharge decomposing it.

It is not claimed that these fluxes are of universal application, but they will give good results on a greater variety of ores than any other standard flux I have ever used.

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[*] Chief chemist, Cananea Consolidated Copper Company, Cananea, Sonora, Mexico.

Lanyon-Starr Smelting Company

The 1909 report of the Lanyon-Starr Smelting Company, operating zinc properties in Joplin, Mo., and Oklahoma, shows net earnings of slightly over $44,000, without allowing for depreciation. After charging off expenditures made during the last three years, the profit and loss surplus shows a balance of $17,000. Total construction account for plant and operatives' houses amounts to $272,000. The company operated four blocks of the smeltery during 1909, and the fifth will be started within a few weeks. A third kiln will be constructed this summer, so that the complete plant of six blocks should be in operation in the fall. This new construction will cost about $20,000. The company has a capitalization of $500,000 common stock and $250,000 6 per cent. cumulative preferred stock. There are now 15 per cent. back dividends due on the preferred, but it is expected that by July 1, payments on this issue will be resumed.

East Rand Proprietary Mines, Ltd.

SPECIAL CORRESPONDENCE

This corporation claiming to be the largest gold producer in the world, is capitalized at £25,000,000. The property consists of 3417 reef-bearing claims: A claim consists of 1.47 acres so the area is about 6023 acres. During the year ending Dec. 31, 1909, 1,830,280 tons of ore, assaying 7.63 dwt., were crushed, from which were received 635,908 oz. fine gold or 6.95 dwt. per ton crushed. Owing to the ore being more refractory than is usual on the Rand extraction results were not as high as in many of the mines. The average tailings assayed between 0.6 and 0.7 dwt. The total value of the yield was £2,671,750 or 29s. 2.3d. ($7.10) per ton; cost, £1,412,693, or 15s. 5.2d. ($3.75) per ton; profit, £1,259,057, or 13s. 9.1d. ($3.34) per ton. The ore reserves are estimated at 11,371,761 tons of an average value of 5.7 dwt. Of these 8,778,118 tons have a milling value of 6.7 dwt. The value of the ore reserve is estimated at £12,500,000. The company employed 14,346 colored laborers and 2176 whites.

SATISFACTORY DEVELOPMENT AT ANGELO DEEP

It is stated that recent development in the Anglo Deep mine has resulted most favorably and that owing to lower working costs 71 per cent. of the ore exposed at a depth of about 4000 ft. is payable against only 27 per cent. when the mine was first opened. It is expected that at the end of 1910 nearly five years' ore supply for the mills will be developed.

TO CRUSH 200,000 TONS PER MONTH

Arrangements have been made to increase crushing capacity to 200,000 tons per month. A new compressor plant to drive 350 drills will be completed in June, 1910. Development and equipment expenditure at the end of 1910 will leave a liability of over £1,000,000 to be paid off. Meanwhile dividends are kept down to 40 per cent. per annum which yields a bare 8 per cent. on the present market price of shares, viz., £5. When liabilities have been paid off it is evident that by milling 200,000 tons per month with a profit, even reduced from the present rate of 13s. ($3.16) per ton to 10s. ($2.43) per ton, £1,200,000 profit would be gained. And as lower working costs are expected and development is said to be showing most favorable results a large increase in dividend rate should be possible. The life of the mine has been extended by acquiring claims from the Government and other deep claims. Up to the end of 1908 6,000,000 tons of ore had been milled at an average yield of 38s. ($9.24) per ton.

SCHEME OF OPERATION TO BE BETTERED

The large sum being sunk in development may appear excessive as the interest on money thus spent is an item not generally included in working costs. Work is being pushed to connect the inclined shafts of the outcrop mines with the vertical ones of the deeps so that a reorganization of the scheme of handling ore, water and labor may be taken in hand, and mechanical haulage further introduced into the underground mining scheme. All work as far as possible will be confined to day shifts as thereby a noticeable economy is gained from bettering the health and efficiency of labor. Already 80 per cent. of work done is done on the day shift.

OPINIONS DIFFER AS TO ECONOMY

The chairman remarks "I see no reason why your company should not always have the minimum working costs which it is possible from time to time to obtain and as I have so frequently pointed out minimum working costs mean maximum possible profit per ton, maximum possible life and consequently maximum profit per ton." This gospel is, however, apparently being challenged and the remarks of the chairman of the Rand Mines and of Mr. Marriott, consulting engineer to Ecksteins, published in the same paper form a somewhat amusing and instructive commentary upon this doctrine.

Huelva Production

The shipments of ores from Huelva, (Spain), in 1908 are given in the following table in metric tons:

Shipper.	Cupreous Pyrites.	Iron Pyrites.	Iron Ore.	Copper Precipitate.	Copper Ingots.
Rio Tinto	597,856	668,638	200	12,415	14,679
Tharsis Sulphur and Copper	228,057	187,068	102	3,341	......
Société Française des Pyrites de Huelva	....	239,400	......	......	......
Peña	807	135,827	......	1,721	......
San Predo	18,978	1,977	......	4	......
San Miguel	7,054	21,660	......	711	......
United Alkali	103,225	41,203	......	1,258	......
Esperanza	86,991	9,583	......	29	......
Companario	....	13,079	......	......	......
Huelva Copper	18,581	....	......	67	......
Compañia de Minerales de Huelva	25,719	....	5	32	......
La Hispalense	5,486	7,088	......	17	......
Bede	....	....	......	875	......
Ardila Iron Ore	....	....	33,437	......	......
Various	87	1,817	......	31	......
Totals	1,122,841	1,330,370	33,744	20,531	14,679

The destination of most of the ore was as follows:

Country.	Cupreous Pyrites.	Iron Pyrites.
Belgium	35,854	18,893
France	15,612	322,037
Germany	123,968	212,922
Holland	193,761	178,856
Italy	30,396	108,106
Russia	......	37,622
Spain		36,677
United Kingdom	173,063	81,993
United States	239,996	268,626

The Hedley Gold Mining Company

The Hedley Gold Mining Company exercised its option on the Nickel Plate mine at Hedley, B. C., Aug. 12, 1909. From that date until Dec. 31, the company reports 17,119 tons crushed with an average assay of about $12.45 per ton. The recovery was $161,394 (about $9.45 per ton) and expenses were $94,543 (about $5.50 per ton), leaving a profit of $66,851 from operations. The company closed the year with a balance of $79,041 after setting aside $35,520 for an initial dividend paid Jan. 4, 1910.

The ore reserves at the time the option was exercised were estimated at about 150,000 tons with an average gold content of $12 per ton. An extensive development campaign is planned for the spring, and also such addition to the water supply as will render the mine independent of weather conditions.

Treating Arsenide Ores

F. P. Dewey, of Washington, D. C., describes in U. S. Pats. 954,263 and 954,264, April 5, 1910, a process for treating metallic arsenide ores, especially adapted for those found in the Temiskaming district of Canada, recovering the arsenic in the form of a soluble sodium arsenate. The object of Mr. Dewey's invention is to convert the arsenic into arsenic acid, and recover this acid in the form of a soluble arsenate.

The process is as follows: The metallic arsenide, after being crushed, is roasted or otherwise oxidized at a low temperature for the formation of metallic arsenates. A temperature not much above 600 deg. C. is particularly important, in order to obtain a maximum amount of arsenic acid. The arsenates are next decomposed by caustic soda with the formation of sodium arsenate and various hydrated oxides of the metals originally combined with the arsenic in the ore. The arsenate solution may then be separated from the insoluble residue. The patents have been assigned to the Dewey Ore Reduction Company.

Mining Costs vs. Profits

In his address at the last meeting of stockholders of the Rand Mines, Ltd., chairman R. W. Schumacher said: "Managers of various mines have in the past during times of stress often been forced to mine the ore that was most accessible; low-grade ore in the hanging-wall or foot-wall was eagerly broken in order to keep the stamps running; sometimes also an unnecessary amount of waste was mined. The results in these instances were certainly lower working costs, and lower working costs for a long time remained the popular cry.

"But with low costs in many cases were combined lower profits and bad mining. Low working costs are undoubtedly desirable as long as they are perfectly legitimate, but they are entirely secondary and subservient to the desirability of making the maximum amount of profit per claim treated. Two or three managers connected with our mines have boldly brushed aside the idol of low working costs and have achieved excellent results thereby.

"H. M. Thomas last year was acting manager of the City and Suburban Gold Mining Company for several months, and by organizing his underground work carefully, by narrowing his stopes and deliberately raising his working costs, increased the profits of the mine to an appreciable extent. W. T. Anderson for the last six months or so has been at the Village Deep, and he goes further than stoping as little waste rock as possible. He is convinced that it will pay to leave in the hanging-wall some of the low-grade ore which had hitherto been taken. The result, it is confidently expected, will be higher profits and bigger dividends, and who then will care whether the working costs are raised or not?"

Natural Gas in Kansas and Oklahoma

The Iola, Cherryvale and Neodesha fields are still producing gas, although in limited quantities. In each of these fields gas is now being sucked by pumping. Neodesha appears to be in better condition for gas supply than Cherryvale. At Iola the local production is insufficient for the requirements and gas is piped in from Neosho and Wilson counties.

In Montgomery county, Kansas, the pumps of the Kansas Natural Gas Company are having a serious effect upon the pools in the northern part of the county. The smelting works at Deering and Caney are obtaining considerable gas from the Vanderpod pool, just over the line in Oklahoma.

Reports from Bartlesville, Okla., indicate that the smelters at that place still have an abundant supply of gas, their draft up to date having reduced the original rock pressure but little. Outside of the consumption by the zinc smelters there is but little industrial use for gas as yet in the Bartlesville district.

Amalgamated Copper Company

The operations of the Amalgamated Copper Company were given in detail in the JOURNAL, March 26, and the Anaconda report was published May 28. The annual report of the Amalgamated company for the year ended April 30, 1910, gives the net income for the year as $5,963,968. This compares with $3,633,980 for the year ended April 30, 1909 and $6,680,557 in 1908, the record being $14,154,400 in 1907. The income account compares as follows:

	1910.	1909.
Net income	$5,963,968	$3,663,980
Dividends	3,077,758	3,077,758
Surplus	2,886,210	586,222
Previous surplus	12,595,015	12,008,823

The company's balance sheet as of April 30, 1910, compares with 1909 as follows:

Assets:	1910.	1909.
Invested in securities	$159,881,245	$156,481,847
Loan to Washoe Copper Co	7,200,000	7,200,000
Cash and cash assets	3,079,914	3,593,102
Total	170,161,159	167,274,949
Liabilities:		
Capital stock outstanding	153,887,900	153,887,900
Accounts payable	22,565	22,565
Dividends payable, May	769,439	769,139
Surplus and reserve	15,481,255	12,595,045
Total	170,161,159	167,274,949

ANACONDA AND PARROT COMPANIES

Details of the mine operation of the Anaconda and Parrot companies have already been published in the JOURNAL. The reduction works at Anaconda treated for all the companies during 1909, 3,517,386 dry tons of ore, of which 1,282,681 tons were from the company's own mine. The Anaconda production was 75,860,194 lb. of copper, 2,363,184 oz. of silver, and 7466 oz. of gold. To this should be added 475,239 lb. of copper produced from the precipitation plant.

The Parrot property has been closed since Dec. 4. The total production last year was 122,349 dry tons, yielding 5,407,255 lb. of copper, 308,757 oz. of silver, and 723 oz. of gold.

BOSTON & MONTANA

The Boston & Montana Company did 51,818 ft. of development work during 1909, and the mines produced 1,374,504 dry tons of ore. The Great Falls reduction works treated 1,092,168 tons of ore, from which were produced 79,037,783 lb. of copper, 1,457,256 oz. of silver, and 9071 oz. of gold.

The Boston & Montana mines furnished more ore than the reduction works could handle, and the excess tonnage was shipped to the Washoe plant; the production from this plant was 22,913,567 lb. of copper, 424,790 oz. of silver and 2698 oz. of gold, making a total production for the Boston & Montana company, 101,951,350 lb. of copper, 1,882,046 oz. of silver, and 11,770 oz. of gold.

The new stack has effected some saving, and further economies which will be embodied in a new concentrator will work for still lower costs.

WASHOE COPPER COMPANY

The Washoe mines were developed to the extent of 6398 ft. last year, and the company produced in ores and concentrates 205,377 tons, which were treated at the Washoe reduction plant. The yield was 8,224,179 lb. of copper, 920,814 oz. of silver, and 2472 oz. of gold.

TRENTON

The Trenton Mining and Development Company produced in ores and precipitates, 157,167 dry tons of ore yielding 7,168,318 lb. of copper, 623,728 oz. of silver, and 577 oz. of gold.

BUTTE & BOSTON

The Butte & Boston development works opened up large amounts of ore, all of which occur in regular vein formation. The Berkley shaft is three compartments and is down 800 ft. The developments at the East Gray Rock exposed large bodies of pay ore. West Gray Rock shaft is 1100 ft. deep, two compartments to the 700 level and three compartments from the 700 to the 1100 level. Only fair results were obtained from development work, mainly in the upper levels of this shaft.

Ore and precipitates amounting to 372,965 tons were produced, yielding 20,955,910 lb. of copper, 1,158,672 oz. of silver, and 7377 oz. of gold.

Lake Copper Company

The third annual report of the Lake Copper Company, Houghton, Mich., for 11 months ending April 30, 1910, states that the mining was confined chiefly to the development of the Lake lode. This work amounted to 4377 ft. of drifting and crosscutting, at a cost of $9.57 per ft., and 1638 ft. of underground diamond-drill work.

During this period 10,125 tons of rock passed through a stamp mill, yielding 170,801 lb. of fine copper, or 21.064 lb. per ton of rock. In the course of sinking the main shaft a new lode was encountered which is called the "East" lode. A new steel shaft house, rock bins, hoisting plant with a capacity of 2000 tons per day, together with other equipment, are now under construction. The total expenditures during the year were $120,507, leaving $184,165 as the balance in banks and trust companies.

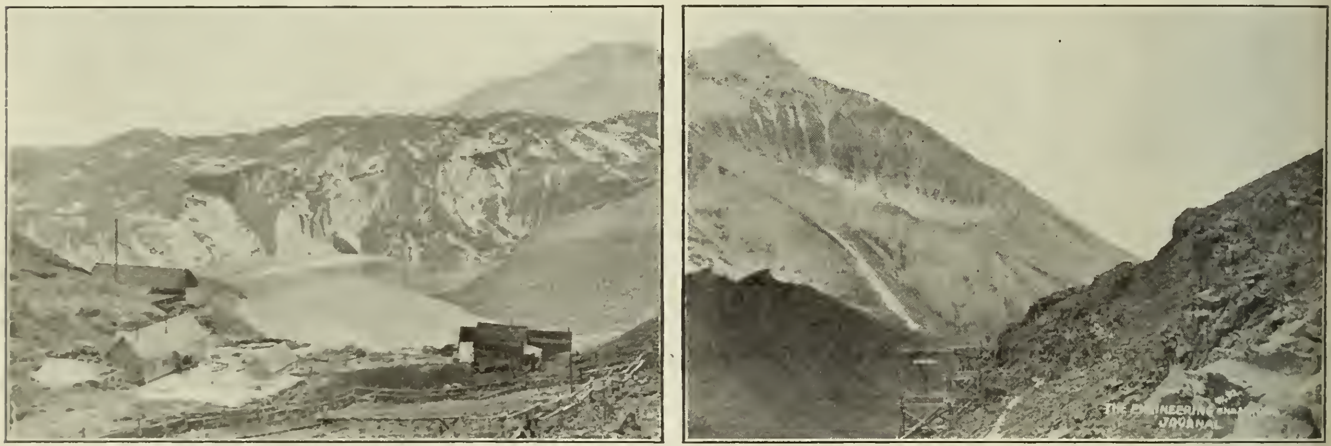
The Kennicott Bonanza Copper Mine, Alaska

Copper River Railroad Building to This Mine; Ore Contains Much Chalcocite; Vein Cuts off at Greenstone; Talus Slope of Copper Ore

BY L. W. STORM*

The Kennicott Bonanza mine is known simply as the Bonanza among those familiar with copper mining in Alaska. It has had a picturesque history from the time of its discovery in 1900, through a period of complicated law suits and changes of ownership until the present time. It is now owned by the Kennicott Mines Company, one of the Guggenheim organizations.

Upon the richness of this mine have been based most of the enthusiastic predictions as to a future preëminence of Alaska in copper production. Its actual value has been variously estimated by mining engineers at from ten to twenty million dollars, and is the principal reason for undertaking the construction of a railway nearly 200 miles in length through a new and difficult country from the seaport of Cordova on Prince Wiliam sound, up the Copper and Chitina rivers to the mine.



LOWER CAMP AND TRAMWAY AT KENNICOTT BONANZA MINE

The Bonanza is situated in the Alaskan interior in latitude 61 deg. 30 min. north, about 60 miles west of the Canadian boundary and 100 miles northwest of Mount St. Elias. It lies in the eastern part of the Chitina copper region, an area covered principally by the rugged ranges of the Wrangel mountains and drained by the northern tributaries of the Chitina river, whose waters flow into the Copper, and thence into the Gulf of Alaska. The Copper river is a poor stream for navigation, with rapids impassable for boats near its mouth. Moreover, its cañon does not afford an easy route for trail building into the interior, so the route has been by way of Valdez, over the coast range of mountains and up the Chitina river. The distance is about 180 miles over a trail that is none too good in places. All supplies come into the region over this trail, mostly in the winter on sleds drawn by horses. The minimum cost of such transportation from Valdez to the mine is 12c. per pound.

Bonanza mountain, upon whose western slope the orebody occurs, stands east of the Kennicott glacier, rising to a hight of about 5000 ft. above the glacier and 7000 ft. above sea level. The mine is about 1000 ft. below the mountain top, the faulted zone which it occupies standing nearly vertical and striking at a slight angle across the backbone of a spur called Native ridge, which runs down in a southwesterly direction from the main north-and-south comb of the mountain.

VEIN DOES NOT EXTEND TO DEPTH

Two formations only of those occurring in the Chitina region are essential in this connection. They are: (1) The Nicolai greenstone, consisting of a number of flows of basaltic lava of Triassic age or older, amygdaloidal in places, considerably altered, close grained, hard and varying in color from brown to light green; (2) The Chitistone limestone (Triassic), overlying the greenstone with bedding planes parallel to the flow planes of the lava. Its true color is bluish, but on the surface this weathers to gray.

Later formations come above the lime and there have been intrusions and dikes formed of diabase, andesite and porphyry. Some of these show about two miles south of the mine beyond the line of a great fault which has displaced the beds, but near the mine there are only the two formations. The top of the mountain is of lime, the base is of greenstone. The contact of the two, which is also parallel to the bedding and flow planes, strikes northwest and southeast and dips about 25 deg. northeast. Its outcrop appears plainly on the mountain side, crossing Native ridge at a point about 100 ft. southwest of the lowest point of the outcrop of the orebody, leaving this entirely in the lime. In fact, the main orebody appears to extend downward no further than the top of a 50-ft. bed of shaley lime, which forms the base of the limestone series.

Practically no ore can be seen in this lower bed, and in the greenstone, still lower, traces even of the faulted zone which forms the vein are hard to find, the displacements being small. A few particles of glance and bornite and oxidized ores appear, as they do in many other places elsewhere in the greenstone; at several places small flakes and slugs of native copper were found which suggested the name of Native ridge, but in the greenstone near the Bonanza present developments show no ore of any consequence.

OUTCROP NEARLY PURE CHALCOCITE

The ore of the main body is chalcocite with considerable azurite and a little malachite. It occurs in more or less irregular masses in the faulted zone, usually roughly parallel to the main, almost vertical fault planes; though it follows, to some extent, minor fault planes as well which intersect the vein at various angles. It also follows the bedding planes of the lime, forms stockworks in the crushed limestone and ramifying chamber-like deposits such as are usual in lime. The ore often has the blocky structure of the lime, of which it is evidently a replacement. The massive chalcocite carries from 60 to 70 per cent. copper, three or four dollars to the ton in silver and a little gold.

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*Mining engineer, Valdez, Alaska.

A striking feature of this orebody is that the great masses of chalcocite which compose it appear directly on the outcrop, covered, if at all, with a mere film of azurite; and these rich masses standing in pinnacles on the comb of the ridge, or showing as blotches on its steep western face, constitute one of the most remarkable surface showings of ore to be seen anywhere in the world. The effect of this sight upon the imagination, enhanced by the majestic setting of castellated limestone cliffs above and the Kenicott glacier winding thousands of feet below, may account for some of the extravagant tales told of the richness of this mine.

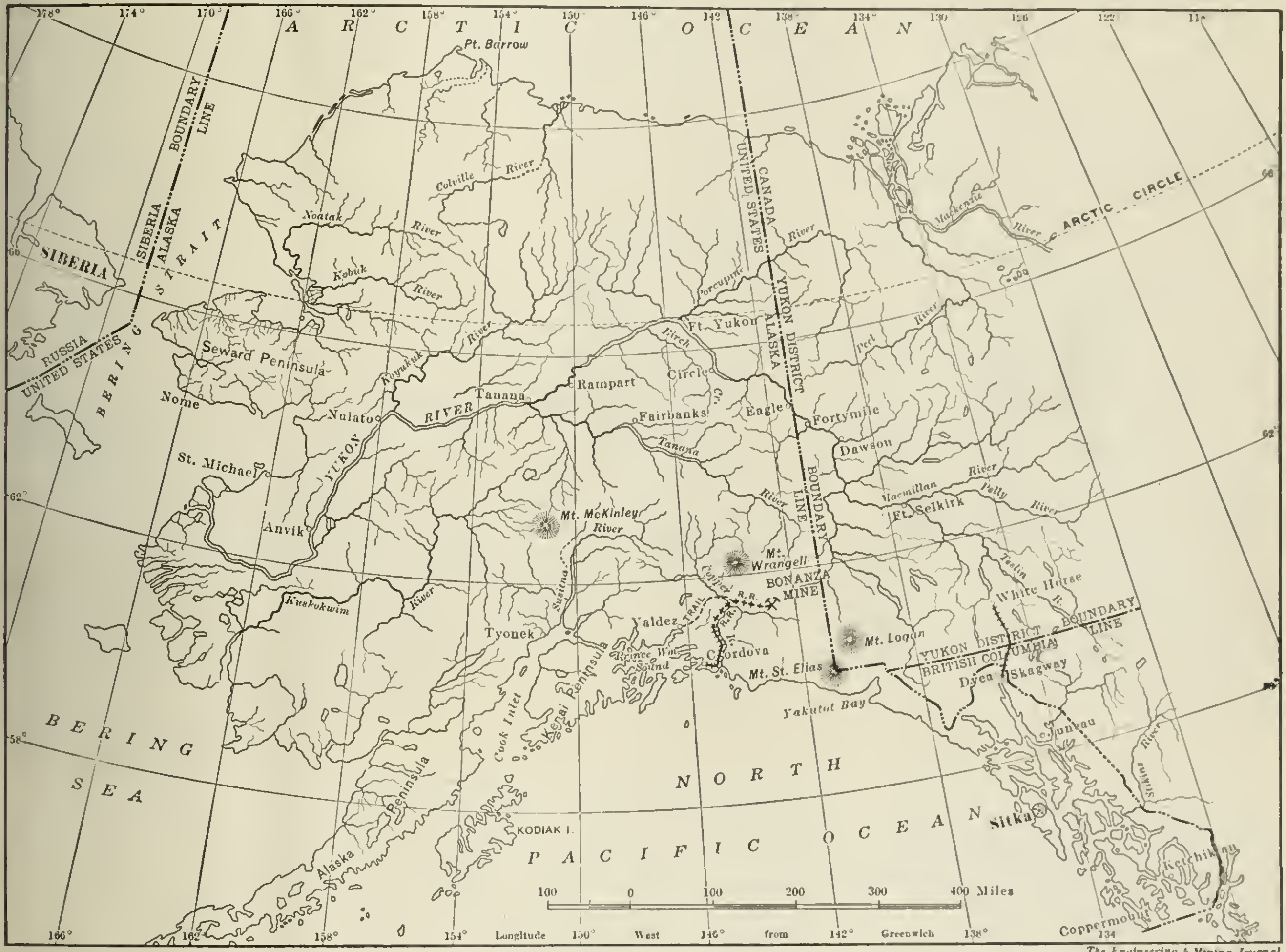
This outcrop is about 25 ft. wide and something over 400 ft. long. The southern half of it, beginning just above the outcrop of impure lime, shows two roughly parallel bands of chalcocite, 4 to 10 ft. wide, running in the direction of the vein and separated by about 10 ft. of lime. These bands show breaks and irregularities in places, and on the north end, give place to thinner stringers or interlacing seams of glance and azurite which thin out as they follow the vein northward and pass finally into barren limestone. Between the masses of rich ore and for a distance of from 5 to 10 ft. on either side, the lime often shows seams and veinlets of azurite. Underground the orebodies show more complexity, with the tendency to follow minor faults and to spread out along bedding planes.

A Talus Slope of Rich Ore

The surface shows another unusual feature in the richness of the talus slope, or slide, as it is called, composed of float ore and limestone that have weathered off from the comb and slid down on the east slope of the ridge. Its width is the length of the outcrop of high-grade ore (about 300 ft.); its length down the slope from the outcrop is 500 ft. or more; its depth varies from 3 to 20 ft. Test pits sunk here and there over the surface gave an average of 4 ft. and most of them had not penetrated through the slide, which is frozen hard even in summer, except for a foot or so on the surface. The average copper contents determined by sampling the material taken from these pits was 13 per cent.

A quantity of ore, probably as great or greater than that of the slide, has gone down over the steep cliff to the west of the outcrop, but it lies buried in a semi-glacier of snow, ice and rock débris, which has slid down from a sort of cirque above, and can be only partially recovered if at all. A bulkhead of logs to prevent further loss of ore on this slope has been built below one of the richest pinnacles.

The amount of underground development is small. It has been deemed expedient by the management to put off extensive development until the railway is completed, when the present high working costs due to expensive transportation will be obviated. The outcrop and the slide provide a good supply of ore to commence shipping as soon as facilities are provided. Such workings as exist are shown in the accompanying diagrams. They consist of a short tunnel through the vein near the south end



Map of Alaska Showing Bonanza Mine and Copper River Railroad of the outcrop from the west face of the ridge; and a small system of workings entering from the east slope further north and comprising an upper tunnel extending through the ridge, a longer adit tunnel directly underneath, an 80-ft. winze connecting the two and an intermediate level running northerly and southerly from the winze. This winze and the intermediates follow the vein: the upper and lower tunnels cut through it. The lowest tunnel is in the limestone, well above the greenstone. The ore it exposes is exactly like that on the outcrop, and it cuts through seams of ice ½ to 3 in. thick, which evidently extend down from the surface.

Genesis of Ore Uncertain

It is difficult to explain the genesis of such an unusual copper deposit as this, consisting uniformly from top to bottom of copper glance with a slight admixture of azurite. There can be little chance for error in assuming the greenstone to be the original source of the mineral, and the azurite to be secondary. The difficulty lies in deciding as to the primary or secondary nature of the glance.

The following facts favor the primary view: (1) No residues of leaner sulphide ores exist to represent a previous, more primary condition of the copper. This applies to all neighboring deposits in the limestone as well as to the Bonanza; regardless of great difference in size and shape, none of them show any sulphides leaner than glance. (2) The ground is steep, and the erosive action of snow and ice is so rapid that the ore is broken and carried away from the outcrop before it can be altered and its leachings carried into the ground. Moreover the frozen condition of the ground would prevent free descent of water into the vein. This is against secondary enrichment

The following considerations favor the secondary view: Copper glance appears to be exceedingly stable under the conditions prevailing at the Bonanza. Only the merest film of azurite is formed on the surface as an alteration product, and pieces of glance are found in an unaltered condition buried under slide where they must have lain for ages. Water in the form of ice does penetrate to great depths in the limestone, and it may be that through its agency these deposits have reached a limiting character as chalcocite upon which the carbonated water can have no effect further than to alter it slowly to azurite.

The current theories on ore genesis rest upon data obtained mostly under conditions so different from those of this northern region that they are hard to apply here.

Ore Reserves

It is manifestly impossible, under the circumstances, to estimate closely the available ore in this deposit, but in order to give some idea as to the general class to which the mine belongs, it may be worth while to present here some calculations of tonnage based upon reasonable assumptions. I will assume: (1) That the main high-grade orebody comprises a triangular block limited by the outcrop above, by the top of the impure lime below, and by a vertical dropped from the end of the outcrop on the north. The thickness may be taken at 20 ft., of which one-half is ore. This is about equivalent to a rectangular block 350x150x10 ft., or 525,000 cu.ft., which at 6½ cu. ft. to the ton, gives about 80,000 tons of ore, carrying, say, 50 per cent. copper. (2) The slide consists of a rectangular block, 300x500x4 ft., or 600,000 cu.ft., which at 12 cu.ft. to the ton gives 50,000 tons of ore, carrying, say, 12 per cent. copper.

The available ore running 3 to 20 per cent. copper, between and around the larger rich masses, probably equals or exceeds the high-grade ore in tonnage, though not in value. These figures leave out of consideration the possible underground extension of the orebody to the northwest, or down into the basal limestone bed or lower, and the development of chamber deposits leading away from the main zone along bedding planes and cross fractures in the limestone.

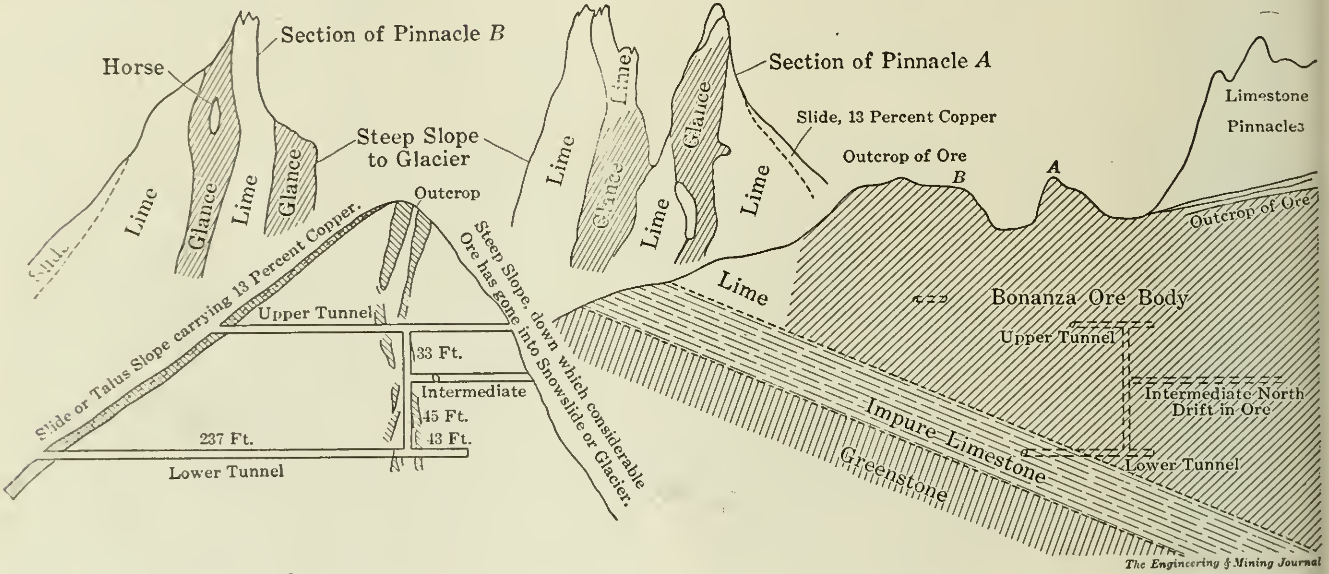
The most promising of these possibilities are those of the chamber deposits and the underground extension to the northwest. Indications are that some beds of the limestone are more favorable to ore deposition than others. The one whose outcrop exposes the Bonanza is evidently favorable and the ore may follow it back into the mountain, although not passing into the beds above or below.

Shipments Await the Railroad

Hand mining is practised altogether, something over a dozen men being employed underground. Miners receive $4.50 per day of eight hours, surface men $4. The charge for boarding is $1.25 per day. When railway transportation is available, equipment for working on a larger scale can be provided. The slide will probably be worked by a system of cuts.

Treatment will be ordinary smelting, with previous rough hand sorting for the rich ore, and probably mechanical concentration for the lower-grade ore, perhaps including the slide.

Preparations for shipping as soon as the railway is finished, are about complete. An aërial tram to bring the ore from the mine to the lower camp nea the glacier was finished in 1909. It wa made and installed by the Trenton Iro Works. The total length is 15,000 ft. difference in elevation of terminals, 400 ft.; diameter of carrying rope 1¼ in. diameter of hauling rope, ⅞ in.; capacit of buckets, 5 cu.ft.; speed, 500 ft. pe



Longitudinal and Cross-sections Through Kennicott Bonanza Mine min. It is built in two sections, the upper, 7000 ft. long, delivering its loaded buckets to and receiving empty ones from the lower section, which is 8000 ft. long. The longest single span is 1500 ft. All the lumber and timbers for its construction were sawed out of native spruce by a sawmill of 10,000 ft. daily capacity at the lower camp.

Besides the sawmill there are at the lower camp a boarding house with accommodations for 50 men, a large stable, warehouse and a small log office building. At this camp the railway will receive the ore for shipment, 196 miles to Cordova. There it may be transhipped by sea to a smeltery, or possibly treated there in a smeltery built for the purpose. About 100 miles of the railway are built, and by the end of 1910 it is proposed to have it finished to the mine and in operation.

Mineral Deposits on Private Land Claims

Special Correspondence

Mr. Andrews has presented a bill in the House of Representatives which has been given some serious consideration within the last few days by members of the committee on mines and mining, and some action may shortly be taken with respect to it. The bill in question is intended to authorize the exploration and purchase of mines within the boundaries of private land claims.

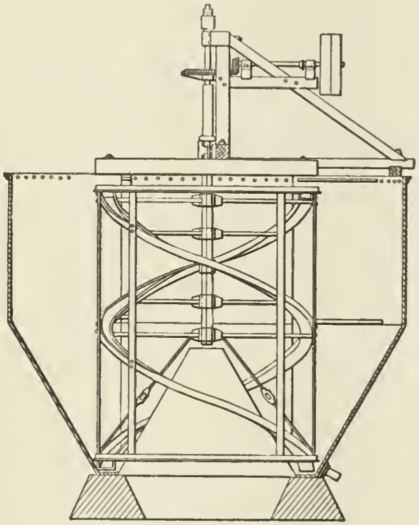
The first section of the bill contains the fundamental proposition of the measure and provides: "That hereafter all gold, silver and quicksilver deposits, or mines, or minerals of the same, on lands embraced within any land claim confirmed, or hereafter confirmed, by the decree of the court of private land claims, and which did not convey the mineral rights to the grantee by the terms of the grant, and to which such grantee has not become otherwise entitled in law or in equity, are hereby declared to be free and open to exploration and purchase under the mining laws of the United States, the local mining laws and regulations, and such regulations in addition thereto and consistent therewith as may be prescribed by the Secretary of the Interior from time to time, by citizens of the United States and those who have declared their intention to become so."

In section 4 it is provided that the locators of all such mineral claims shall within the period of 90 days take steps to "acquire the lawful right to use the surface ground embraced within the limits of such claim and necessary access thereto, and they are hereby authorized to acquire the same by condemnation under judicial process: *Provided*, That before beginning such condemnation proceedings the locator shall tender to the owner of the land in which such mineral claim is located the sum of $2.50 per acre in full payment for the said surface ground, and the receipt of such sum by the owner of the land shall authorize the immediate entry of the locator upon such land."

Several sections are concerned with the filing of notices, marking of boundaries and various other details.

Pulp Agitator

R. W. Gordon, of Denver, Colo., has recently patented (U. S. Pat. 954,511) a device for agitating cyanide solutions. The machine consists of a tank, in which a revolving conveyer raises the settled particles from the bottom of the tank discharging them at the top where they again settle to the bottom. The settling sands gather at a certain place on account of the construction of the lower wall of the tank and the insertion of a cone in the bottom of the tank. The rotation of the conveyer constantly elevates the settled particles of ore and discharges them at the top. This gives rise to three vertical currents, one upward in the path of the conveyer and two downward. The rotation of the pulp solution is prevented by baffles. The device is claimed to be particularly adapted for use ahead of filters to deliver a homogeneous feed either continuously or intermittently.


The Engineering & Mining Journal

Gordon Pulp Agitator

Long Service of a Blast Furnace

The Jones & Laughlin Steel Company is taking down Eliza furnace No. 1 at Pittsburg, in order to replace it with a new stack. Eliza No. 1 was built in 1889, rebuilt in 1893 and again in 1901, its size being then 100x22 ft. Since 1901 it has made 1,331,000 tons of pig iron, an average of nearly 148,000 tons a year.

Rand Mines, Ltd.

Special Correspondence

The Rand Mines, Ltd., owns a number of separated deep-level mines on the Rand. The chief subsidiary is the Crown Mines Ltd., which is engaging in a friendly rivalry with the East Rand Proprietary Mines, Ltd., to be the largest gold producer. At this mine also the crushing capacity is to be increased to 200,000 tons per month and it is aimed to develop 11,000,000 tons within two years. Reserves on Dec. 31, 1909, were, however, only 4,000,000 tons so that the East Rand Company has a long start. The profit of the Rand Mines, Ltd., for 1909 was £1,994,655. The subsidiary companies mined 4.145,785 tons of which 3,651,084 tons were crushed. The average yield was 31s. 1.72d. ($7.57) per ton, costs being 18s. 3.984d. ($4.46) per ton, profit 12s. 9.74d. ($3.11) per ton.

The most interesting portion of the report is, however, the chairman's remarks in regard to low working costs which may be compared to remarks made at meetings held during the last two years and to the remarks of the chairman of the East Rand Proprietary Mines.

In summing up his views upon the "idol of low working costs" the chairman of the Rand Mines, Ltd., states: "Clearly the less waste that is mined under a given unit of superficial area the richer will be the mining and milling charged to it, and the greater will be the profit." And referring to the new mining system being adopted, he says, "The whole idea of this new system is to encourage careful and conscientious mining, and to get good work done."

Sand Filling for Stopes

Sand filling of stopes by means of water is to be more largely adopted and the mines have availed themselves of the services of J. Walen, a German expert on this system of filling. It is expected that sand filling of the stopes will enable mechanical ventilation to be more easily carried out as air currents will not be divided and dispersed in the large open areas of abandoned workings, but will be confined to the levels.

The 1909 report of the General Electric Company shows that the company has invested in copper properties $1,129,961, represented by capital stock, and $1,918,642 by advances. These investments include the Bully Hill Copper Mining and Smelting Company. Winthrop, Shasta county, Cal., a railway company and other equipments, and the properties of the Hermosa Copper Company, Grant county, N. M. Liberal sums have already been spent in developing these properties.

Changes in Mine Regulations During 1908-1909

Fourteen States enacted new or amendatory laws which may be considered under this head during the years 1908 and 1909, Oklahoma enacting its first law on this subject and Idaho doing practically the same.

OKLAHOMA

The Oklahoma statutes direct the preparation and furnishing of maps; prescribe methods of working; the provision of two exits; of passage ways around shafts; the supply of shields for mining machines; speaking tubes; timbers; installation of electric wires; construction of shelter holes along travel ways; require wash rooms to be furnished; supplies to be provided for first aid in case of injury by accident; direct employment of shot firers, and of mine foremen where more than 10 workmen are employed; and regulate the construction and operation of hoists and the use of explosives. The weighing and screening of coal are regulated, and the employment of convicts in mines is prohibited. An inspector of mines is to be elected, and the State divided into three districts, each with an assistant inspector, such assistants also to be chosen by popular vote from and after 1910. The laws of Oklahoma relate principally to coal mining.

IDAHO

The law of Idaho is adapted to the operation of mines of minerals other than coal. The Idaho statute first makes provision for security in case of fire, both by prescribing the furnishing of extinguishers and by directing the installation of fire doors. New buildings, timber sheds, and the like are to be constructed only at a safe distance from the entrance to the mine, except where necessary as a protection against the snow. The collars of shafts and all openings in mines are to be safeguarded so as to prevent the falling of persons or objects therein; safety hoists are to be constructed according to prescribed requirements, and indicators furnished so that the engineer will be able to know at any time the exact location of the bucket or cage.

Other provisions relate to the storage and use of explosives, storage of oils, and the employment of hoisting engineers, who must be at least 21 years of age, of proved experience and qualifications, and not addicted to the use of intoxicating liquors. Electric wires are to be insulated or otherwise properly guarded; a code of signals adopted, and prescribed means of exit arranged for.

INSPECTORS IN VARIOUS STATES

Laws relating to mine inspectors were passed in several States, including Kentucky, Montana, Nevada, Ohio, and Wyoming. The Kentucky statute provided for two additional inspectors, and requires all inspectors to pass an examination to determine their competency before being appointed. In Montana, also, the inspector must pass an examination before appointment, this provision being substituted for the earlier requirement of graduation from a school of mines.

The Nevada law created the office of inspector of coal mines, the incumbent to have had seven years' experience in underground workings; he is given authority to enter and inspect mines, order changes, and to investigate accidents, and annual reports are required to be made to the Governor of the State.

QUARTERLY INSPECTIONS IN OHIO

The law of Ohio provides for the appointment of three additional inspectors, making the number of inspectors and inspection districts 10, instead of seven, as before; the chief inspector must have had five years' experience and be acquainted with the uses and dangers of electricity in mines. The same act directs that at least quarterly inspections be made, instead of "as often as possible," as in the earlier law; a map or plan must also be furnished for each vein worked, and more efficient provisions were enacted for the securing of ventilation. This law also directs that shaft men be employed to attend hoists; that self-dumping cages be not used unless they can be securely locked; and that shelter holes be furnished for the use of door boys.

The Wyoming statutes reduces the terms of mine inspectors from six years to two, and establishes their offices in the inspection districts instead of at the State capital; inspectors are made police officers, with power to make arrests for violations of the mine laws, and may order workings closed if their directions are not complied with. Detailed annual reports are required, covering the subject of inspections made, accidents, their causes and remedies, and suggested methods for the safe operation of mines.

THE USE OF EXPLOSIVES

Other statutes were enacted, covering a variety of details connected with the operation of mines, the use of explosives, the handling of workmen, etc. Thus, a statute of Kansas regulates blasting, prohibiting the use of dynamite except under rules agreed upon by employers and employees and approved by the State mine inspector; employees are not to be sent into any sinking shaft or development work after a charge of dynamite or other detonating explosive has been fired, until the smoke and gases are removed. Another Kansas statute directs the sprinkling or removal of dust from mines, requires all drill cuttings to be removed at least 15 ft. before shots are fired, and prohibits the use of coal drillings for tamping.

Mine explosives are the subject of an Ohio statute, which regulates the sale, storage, size of packages, and the locking and opening of boxes containing explosives used or to be used in mines; the tamping of charges and the firing of shots are also regulated by this law.

INSPECTION OF EQUIPMENT

Semi-weekly inspections of ropes, cages, catches, brakes, etc., used for hoisting men are directed by a statute of Missouri, the reports of such inspection to be recorded. Another statute of the same State requires shaft men to be employed where men are hoisted, regardless of the power used, instead of only where steam is used as a motive power, as provided in an earlier law.

A statute of Ohio directs the insulation of electric wires and the installation of shields on mining machines. A Wyoming statute provides for the sprinkling of dusty places, and the monthly removal of accumulations of dust, including slack, machine cuttings, and track cleanings. The law of Pennsylvania is changed only by adding certain counties to the anthracite-coal inspection districts and by repealing the act of June 10, 1883, which prescribed the method of determining the amount of clean coal for which payment should be made to the miners.

SAFETY LAMPS

The exclusive use of safety lamps, magnetic locked, air locked, or lead locked, is prescribed in gaseous mines in Washington, except by superintendents, foremen, and certain designated employees, who may use other lamps of a type approved by the State mine inspector. Safety lamps are to be the property of the operator of the mine. Other laws of this State provide that weekly measurements of the quantity of air furnished for ventilation are to be made, and a record thereof kept; and amend the laws relative to maps, plans, etc., directing signboards to be placed at the intersection of ways, so as to indicate the most direct means of exit from the mines.

COMPRESSED AIR

The New York legislature enacted a law regulating employment in mines and tunnels, applicable chiefly to tunnel work where the employee is exposed to conditions induced by the compression of air. The hours of labor are regulated according to the degree of air pressure, ranging from eight hours, with an interval in the open air of 30 min., if the pressure does not exceed 28 lb. per sq.in., to two hours when the pressure equals 46 lb. per sq.in. and is less than 50 lb.; this period of two hours is to be divided into periods of one hour each, with an interval of not less than four hours. Employment under a pressure of more than 50 lb. is prohibited except in case of emergency.

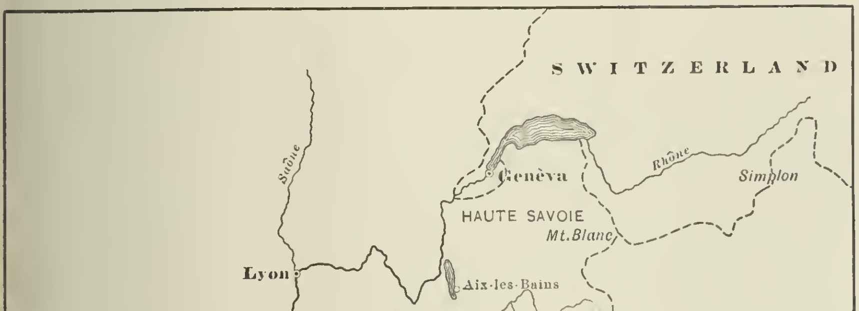
Intermediate locks or stages of decompression must be provided for employees leaving work. Employees who have worked three months continuously in compressed air must be examined by a medical officer and may not again work unless shown to be physically qualified therefor; nor may an employee who has been absent from his work for three or more successive days for any cause, be permitted to resume work without reëxamination. All applicants for employment must be examined, and if they have not previously worked in compressed air they shall not be permitted to work during the first 24 hours of employment more than one-half the period provided for in the section regulating the hours of labor. After this first day's work, they must be reëxamined and may not be permitted to work unless of approved physical condition. A medical locker and supplies, with a medical attendant in charge, must be maintained and be at all times available for the use of employees. Properly heated, lighted, and ventilated dressing rooms, with baths, toilets, and hot and cold water service, must be supplied.

Notes on the Aluminum Industry in France

BY TONY CALLOT*

The principal French deposits of bauxite are situated in the departments of Hérault, Bouches du Rhône and Var, in the southern part of France. This raw material occurs in two characteristic varieties—white and red. The former contains but little iron and much silica and is used mainly for the manufacture of sulphate of aluminum. The latter is particularly well adapted to the manufacture of pure alumina.

Between those two kinds of ore there are a number of intermediate varieties in which silica takes the place of Fe_2O_3, while the amount of Al_2O_3 present varies between 55 and 70 per cent. We may even quote a variety nearing the hydrargillite yielding 78 to 80 per cent. Al_2O_3, almost no Fe, 2 to 3 per cent. SiO and 2 to 3 per cent. TiO_2. Unhappily this variety is a rare one, but has been found at Loupian (Hérault). In the department of Hérault the bauxites do not form regular deposits; their composition varies constantly, and only frequent chemical analyses enable the miners to prepare homogeneous shipments of ore.



The Engineering & Mining Journal

SKETCH MAP, SHOWING SITUATION OF FRENCH BAUXITE DEPOSITS

In Bouches du Rhône, where bauxite was first utilized as an aluminum ore, the quarries are of small importance and the mineral is too high in silica. The bauxites of Les Baux and Iaradon are used principally by the makers of firebrick.

BEST FRENCH BAUXITE FOUND IN VAR

The best ore is found in the Department du Var, where it is shipped under the formal guarantee of a minimum of 60 per cent. Al_2O_3 and a maximum of 3 per cent. silica. This ore is red and homogeneous; its specific gravity is low, and it may be crushed easily without leaving any residue. Some white grains of almost chemically pure alumina are occasionally seen in the ore.

The best quarries in this district are owned by the Société Electrométallurgique Française and by a recently incorporated company controlled by the Guilini Brothers, of Ludwigshafen. The former company treats about 40 tons per day at the Gardanne works; 12 to 15 tons are also dealt with at Salindres. This bauxite is also shipped to Germany, England and America.

TREATMENT OF THE ORE

Two processes are used in France to obtain alumina from the bauxite. The Société Electrométallurgique Française at Gardanne uses the Bayer process. The crushed ore is attacked under pressure by a solution of caustic soda, thus producing aluminate of soda which is separated by filtration. The aluminate of soda being unstable, alumina precipitates spontaneously. It is advisable to aid this precipitation by adding some alumina previously prepared, or by agitation of the solution.

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*Mining engineer, 160 Boulevard Malesherbes, Paris, France.

The precipitated alumina is practically free from silica and phosphorus, and has a sandy appearance. It is easily cleaned by washing, and then calcined, yielding Al_2O_3, which is suitable for the manufacture of aluminum. The Gardanne works produces 20 tons of Al_2O_3 per day.

The other process was used at Salindres 30 years ago. It was then abandoned until 1897 when the Société Pechiney undertook the manufacture of aluminum at Calypso, St. Michel de Maurienne. Many German and Austrian works have used it. In this process the pulverized bauxite is charged with carbonate of soda in ordinary soda furnaces. The aluminate of soda thus obtained is dissolved in hot water, separated by filtration from the iron oxide, then purified and decomposed by CO_2, which causes the alumina to precipitate. The remainder of the process is similar to that of Dr. J. Bayer. The Salindres works produces at least 6 tons of alumina per day.

Large Consumption of Electric Power

Aluminum is extracted from alumina by electrolysis when the material is melted in an electric arc. This process was invented by Mr. Héroult and patented in 1886. The graphite crucible forms the cathode, and the alumina is dissolved in a flux of fluorspar and chryolite.

The large amount of electric power required (a horsepower-year producing 200 to 250 kg. of aluminum) has caused manufacturers to erect their works close to big water falls, mainly in the Alps along the valley of the River Arc. This valley is called la Maurienne. Thus the Société Electrométallurgique Française utilizes 56,000 h.p.; the Compagnie des Produits Chimique d'Alais (Pechiney & Co.), 50,000 h.p.; the Société d'Electrochimie and others, about 66,000 h.p.; making a total of 150,000 h.p. All this power is not at hand throughout the year, and it is also partly used for the manufacture of special setels. Probably about 100,000 h.p. is used for aluminum furnaces.

Goldfield Consolidated Mill Operations

BY JOHN TYSSOWSKI

During the last year or so many changes of method and equipment have been inaugurated at the new 100-stamp mill and cyanide plant of the Goldfield Consolidated Mines Company. As a result excellent cost and extraction records have been made and a stamp duty attained that is comparable to the records made on the Rand. At the present time between 8½ and 9 tons of ore per stamp are being crushed though ¼-mesh screens per 24 hours with 1050-lb. stamps.

Treatment

The treatment scheme now adopted is to crush in stamp batteries to ¼-in. or smaller size, classify in three-compartment boxes, recrush to 20 mesh in chilean mills and elevate to settling cones. The overflow from these is under 200 mesh. The underflow passes to Dorr classifiers and then to tube mills.

The combined slime discharge, all under 200 mesh, goes to Deister tables, concentrates from which are run over amalgamation plates to remove free gold. Tailings pass to the cyanide plant where the treatment scheme includes agitation in Pachuca tanks, filtration in Butters filters and zinc-dust precipitation of the gold, the precipitate being recovered in Merrill filter presses. Concentrates are treated by a special cyanide process devised by J. W. Hutchinson. There is a separate plant for this work. Shortly after my visit a portion of the mill was damaged by fire, but I understand that the treatment scheme will be unchanged.

Mill Machinery

For each 50 stamps there is one three-compartment classifying box the pulp from which is distributed to chilean mills. There are three of these, which are 6-ft. Monadnock machines built by the Trent Engineering Company, Reno, Nev. They are run at 30 r.p.m. The bucket elevators, two in number, are housed in steel and run at 420 ft. per min. Each delivers to an 8-ft. settling cone, the underflow from which feeds three Dorr classifiers. The Gates tube mills, three to each side of the mill, are 5x22 ft. and are run at 26 r.p.m. Coarse discharge joins that from the chileans and is re-elevated, classified and again ground in the tube mills. As stated, everything, after being reduced to 200 mesh, passes to Deister concentrators of which there are 78 primary and 16 secondary tables.

The Pachuca cyanide-agitation tanks are 15 ft. in diameter by 45 ft. high. About 40 cu.ft. of free air per minute at 25-lb. pressure are required for each charge of 100 tons of dry feed. The dilution of the pulp is about 1½ to 1 (1.30 sp.gr.). The usual agitation period is 16 to 18 hours in a 1-lb. KCN solution carrying 0.5 lb. CaO: $Pb(C_2H_3O_2)_2$ is added at the ratio of ½ lb. per ton. The Butters filter cycle is 3 hours; tailings contain about 35 per cent. moisture.

Extraction

The excellence of the results obtained at the Goldfield Consolidated mill is proof enough of the efficiency of the treatment scheme and operations. Late returns show that a total gold recovery of over 93.7 per cent. is being made, 70 per cent. of the metal being recovered in concentrates (which represent 4¾ per cent. of the tonnage treated) and 23.7 per cent. in the cyanide plant. In cyaniding the concentrates a 96 per cent. gold saving is claimed, this making a total net recovery of 90 per cent.

The water consumption in the mill is only 0.8 ton per ton of ore crushed. Battery heads are kept up to at least $30 per ton. The consumption of cyanide per ton of ore crushed is 1.51 lb.; of lime, 7.31 lb.; zinc, 1.31 lb.; lead acetate, 0.88 lb.; water as stated, 0.8 ton. These figures include the treatment of concentrates.

Segregated Costs

Considering the high grade of the ore treated, the high cost of labor, power and supplies (ordinary day labor costs $4 and power $6 per horsepower-month) a remarkable showing is also being made in the matter of milling costs. For November, 1909, a complete segregation of the milling costs per ton of ore crushed is: Crushing and conveying, $0.049; sampling, 0.012; stamping, 0.21; amalgamating, 0.051; elevating and separating, 0.012; tube milling, 0.202; superintendence, 0.069; concentrating, 0.054; neutralizing, 0.041; settling, 0.047; agitation, 0.382; filtration and discharging (includes cost of upkeep of tailing dam), 0.089; assaying, 0.056; stable, 0.002; precipitating, 0.146; refining, 0.230; water, 0.114; surface, etc., 0.006; steam heat, 0.024; watching, 0.048; storehouse and office, 0.033; lighting, 0.016; general, 0.005; electrical department, 0.007; mechanical department, 0.002; total, $1.907. The average for 1909 was $2.04 per ton of ore milled.

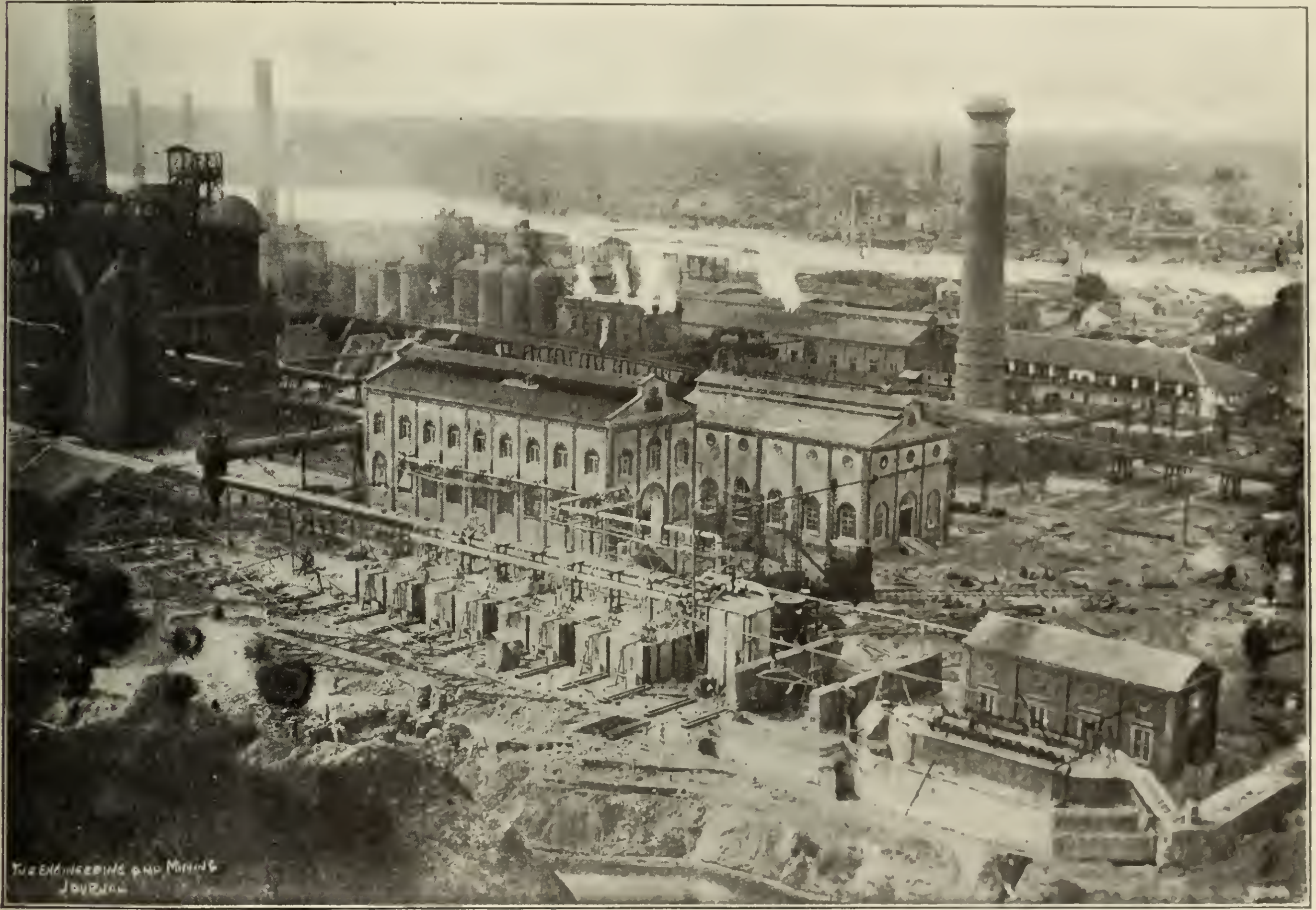
The technical skill of the men in charge of the operations and the excellent accounting system which makes such close segregation of charges possible, no doubt explain the results obtained at this mill. For the data herein contained I wish to acknowledge my indebtedness to J. W. Hutchinson, mill superintendent, and E. A. Julian, former assistant.

Iron and Steel Works at Hanyang, Hupe, China

Latest German Equipment Used for Making Pig Iron, Steel, Rails, Plates, etc. Little Use for Labor-saving Machines in Mining

BY A. J. SELTZER*

The Hanyang iron and steel works is the only one in the whole of China which is producing steel. No better illustration of the conservatism of the Chinese people need be cited than the above statement, for it is well known to all who have traveled at all extensively in this ancient empire that there are huge deposits of excellent iron ore in almost every province. A little over twenty years ago one of the Shanghai viceroys decided to erect an iron works, but just at that time he was transferred to Hupe so the works was built in Hanyang instead of Shanghai. This placed it somewhat nearer the base of supplies, but it is now far removed from all of the raw materials.



General View of the Iron and Steel Plant at Hanyang, China

During the first few years of its existence this plant made pig iron only, but in 1893 it began to make steel. Two small bessemer converters were installed, but owing to high phosphorus and other difficulties the government was unable to place the works on a paying basis, so it was abandoned in 1894 and fell into the hands of wealthy Chinese. The new owners engaged Belgium and French engineers who remodeled the two 60-ton blast furnaces, doubling their capacity, installed three 30-ton Siemens-Martin open-hearth furnaces, put in a rail mill, erected a blooming mill and built a foundry. Thus remodeled and enlarged the works began to turn out excellent rails.

Present Plant and Equipment

At the present time the plant consists of the two original but remodeled blast furnaces, four 30-ton Siemens-Martin open-hearth furnaces, one Wellman pig mixer, a 100-cm. reversing blooming mill, an 80-cm. reversing plate mill and a 10-ton furnace for melting scrap. The Siemens furnaces are fed with cold scrap part of the time, but for the most part they receive the molten pig from the Wellman mixer, the duplex process being used and the pig washed in an open-hearth furnace to free it of phosphorus. To increase the capacity and also to lower the cost of steel making it has been suggested that the combination process be used; that is, to take the molten pig from the pig mixer, transfer it to bessemer converters for upwards of 40 min. to eliminate practically everything but the phosphorus, then transfer it to the open-hearth furnaces.

The blooming mill, plate mill and also the rail mill are driven by powerful three-cylinder engines, the cylinders being 115 cm. in diameter and 150 cm. stroke. The rail mill is 75 cm., reversing, and there is also an 85-cm. beam mill. These mills are all modern German types and are equipped with electric cranes. The large mills have gas-heated Morgan continuous furnaces. The blooming mill has soaking pits for heating the ingots. The ingots are brought hot from the steel furnaces on the cars on which they are cast. All the steel is top cast, two ingots at once, the ladles having two stoppers. The ladles are handled by a 50-ton crane. The present rail mill has a capacity of 250 tons per day, rolling two rails from a bloom, and 85-lb. rails are made. It has been suggested that the rail mill be remodeled to roll rails direct from the ingot.

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*Imperial Mining College, Wuchang, China.

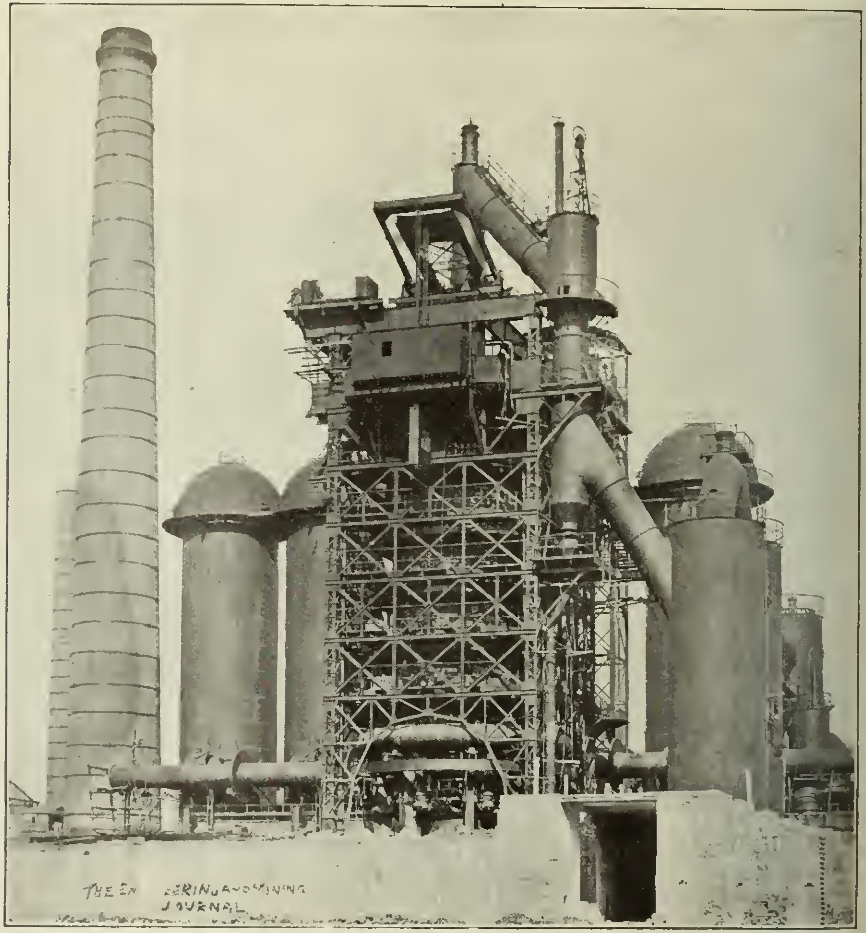
WATER JACKETING ARRANGEMENT

The company is just completing a blast furnace of the latest German type. It is 32 m. high, diameter of the crucible is 3.15 m. and there are 16 tuyeres, eight to be used at a time and eight to be held in reserve. The interesting part of this furnace is the water-jacketing scheme, which is shown in an accompanying illustration.

Small cast-iron pans, 45 cm. long, 42 cm. wide and 11 cm. deep, are set into the brickwork around the outer circumference and flush with it, giving the outer circumference almost the appearance of a network of these pans from the tuyeres to within 3 m. of the top of the furnace. These pans are placed in horizontal rows around the circumference. The rows are 75 cm. apart and the horizontal distance between pans is 100 cm. The pans are so arranged that each pan in a row is not directly underneath one in the row next higher, but the space is so divided as to expose as little of the brickwork as possible. The interior end of each pan is closed, but the outside end has an open space or slit across the top, and through this a 3-cm. iron pipe passes to supply the cooling water. Another similar pipe leads out of the bottom of the pan at the other side and delivers the water to the next lower pan. Thus the water is kept in circulation throughout the network of pans. When the water has traveled through four pans it has become hot enough to go to the troughs which surround the furnace.

CONSTRUCTION WORK

To give an idea of the slowness of construction in China, it might be mentioned that it has required three years to construct this furnace. This furnace represents the latest German patents and it will be interesting to see how these new ideas work out in practice. The foundation is already completed for another furnace precisely like this one and it is evident that the company intends to increase the output several hundred per cent. This new furnace will probably be blown in about Feb. 15. The walls are constructed of large firebrick and are strapped with strong bands, 2½ cm. thick and 12 cm. wide. It will be fed by hand buggies, as labor here is so cheap and plentiful that mechanical devices are scarcely considered



THE NEW GERMAN BLAST FURNACE AT HANYANG, CHINA

A MOUNTAIN RANGE OF IRON ORE

The company has its own iron and coal mines. The iron mines are situated at Tayeh, 145 km. down the Yangtse Kiang from Hanyang and 26 km. back from the river. Here there is really a mountain range of iron ore, the main orebody appearing in three hills, each 250 m. high. Two of the hills are quite near each other, being separated by a narrow valley; the third is at a distance of 6 km. and the vein is barren between.

A CONTACT DEPOSIT

This is a contact deposit, the contact on the north wall being a compact, close-grained diorite, the south contact being a pure, almost white, marbly limestone. The diorite being very hard and not seriously affected by weathering, has not been eroded to any great extent and lies against the iron ore to its maximum hight. The limestone has been greatly eroded and in many places has left the hematite near the surface. The richest part of the range has a southeast-northwest trend, but just beyond this rich part the vein is almost barren and runs practically due east and west.

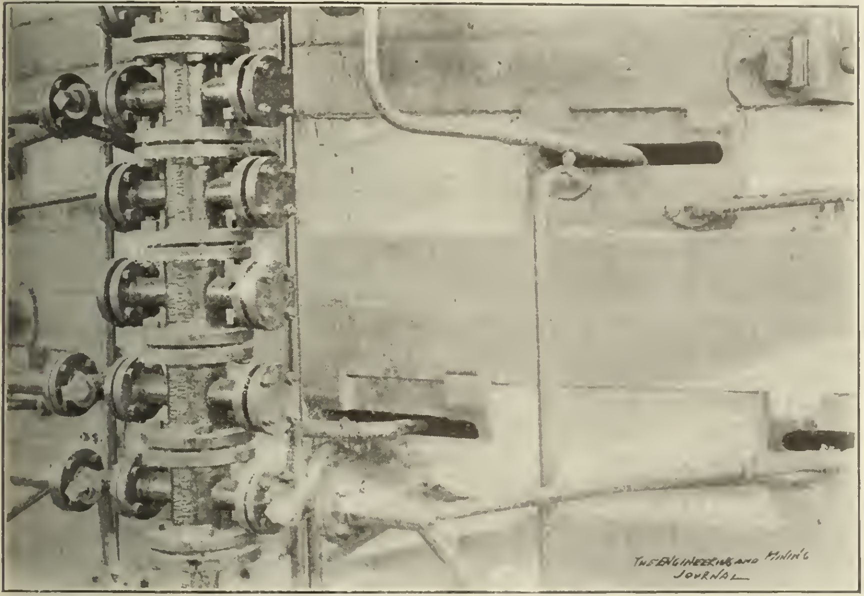
The ore is a good, hard hematite and it is necessary to blast most of it. The drilling is all done by hand and a poor driller is Mr. Chinaman. He is not only disgustingly slow, but it is practically impossible to convince him that the Western method of pointing holes is far superior to his ideas on the matter, and even after the holes have been marked for him he will often ignore the marks and place the holes according to his own views. The German engineer in charge of the mines informed me that one German driller would break as much ground as eight to ten Chinese.

The work in these iron hills is all open-cut, and as the ore is blasted it is sent down inclined planes in one-ton cars and loaded into 11-ton cars from an ordinary coal-tippling system, drawn to the river in trains of 12 cars and there loaded into the company's lighters and towed up to Hanyang by the company's steam launches. Each lighter holds 350 tons, and one launch tows two lighters. Practically no prospecting or exploitation has been done upon this wonderful deposit, so in reality but little is known of its contents below the ground level, or its continuity beyond these three rich hills.

OUTPUT WILL BE INCREASED

At the present time the Hanyang works is being supplied with 350,000 metric tons annually; next year this must be increased to 500,000; and 125,000 tons goes to Japan each year. The present output from the three hills is about 1000 metric tons per day, but will soon be increased to 1600 tons. At the present output, the ore in sight will last 70 years, but there is every reason to believe that the vein not only increases in richness with depth but also grows wider.

The company's coal mines and coke ovens are situated at Pinghsiang, which is about 300 km. up the Yangtse Kiang from Hanyang and 175 km. south of the river. Here are the second largest coal mines which are being operated in China. There are 280 coke ovens, and besides supplying coal and coke for the Hanyang works, these mines supply both coal and coke for a large number of steamers, foundries, etc. The Hanyang plant receives at present 160,000 tons of coal and 110,000 tons of coke per year from these mines, and this amount is soon to be materially increased.



System of Water Jacketing the New Furnace

Wages and Labor Conditions

About 15,000 men are employed at the iron mines, steel works and collieries. The following is the schedule of wages at the coal and iron mines per day of ten hours: Miners, 250 to 300 cash (8 to 9.5c.); loaders and pushers, 100 to 150 cash (3.25 to 5c.); tippling coolies, 100 to 125 cash (3.25 to 3.75 c.); small boys and old men who carry the ore in wicker baskets, 80 to 120 cash (2.65 to 3.65 c.). The cost of mining one ton of ore is 270 cash, or 9c., and stripping cost per ton of ore is 30 cash, or 1c. gold.

The scale of wages at the steel works is a little higher and is about as follows: Rollers on mills, 350 to 700 cash (10.5 to 21c.); heaters on furnaces and open-hearth steel melters, 550 cash (29c.); helpers on furnaces, 350 to 500 cash (10.5 to 27c.); first helpers, 350 cash (10.5c.); blacksmiths, 700 to 1000 cash (21 to 34c.); common labor, about 7.5c. gold per day, and boys and women about 5c. The men at the steel works work fairly well, but the miners are shiftless, resembling the Mexican in that they will work just enough days per month to provide sustenance, but no more. They work on an average of 21 days per month.

PRODUCTS AT HANYANG.

	Foundry Pig Iron, Per Cent.	Basic Pig Iron, Per Cent.	Open-hearth Steel, Per Cent.	Finished Steel, Per Cent.
C....	3.8	3.9	3.34	0.40
Si...	2.5	0.65	.....	0.085
Mn..	1.0	1.10	0.26	0.089
S....	0.01	0.045	0.24	0.055
P...	0.02	0.25	0.045	0.028

Analyses of Ores and Products

The following analyses are of the ores at Tayeh, the coal and coke at Pinghsiang and the products at Hanyang:

ANALYSES OF TAYEH ORES.

	Hematite, Per Cent.	Brown Iron Ore. Per Cent.	Magnetite. Per Cent.
Fe............	62	48	65
Mn...........	0.3	7.0	0.13
SiO_2.........	4.0	6.0	3.0
Al_2O_3........	2.0	....	....
S.............	0.02	0.01	0.06
P.............	0.05	0.03	0.12

The Tayeh limestone is of good quality, containing 96 per cent. $CaCo_3$. The Pinghsiang coal contains: Ash, 10 to 25 per cent.; volatile matter, 25 to 35; sulphur, 0.2 to 0.6 per cent. The coke contains: Ash, 10 to 25 per cent.; sulphur, 0.3 to 0.6; phosphorus, 0.06 to 0.25 per cent.

The analysis of blast-furnace slag is as follows: SiO_2, 33 per cent.; Al_2O_3, 16; CaO, 46; MgO, 2; Fe, 1; Mn, 0.60 per cent.

The steel made by this plant is of an excellent quality in every respect. The rails for the Peking & Hankow railroad were furnished by this company and it is now making rails for the Canton & Hankow railway and the new road that is being built to Chang Sha. The following two tests are among the most severe to which the rails are subjected: An 85-lb. rail, 3 ft. 6 in. between supports, stood a weight of 40 tons for five minutes, with a permanent deflection of 3/16 in.; a drop test of one blow with a 2200-lb. weight, falling 25 ft. caused a 2.5-in. deflection.

Accidents Comparatively Rare

His Excellency V. K. Lee, a versatile Chinese, is the general manager, and all the other responsible positions and heads of departments are filled by German engineers and metallurgists. The lesser foremen are Chinese and they are exceedingly proud of their positions. The thing which impresses one most on entering the plant is the almost innumerable heaps of scrap, old brick and mortar, junk of all descriptions, that are piled about in almost every part of the works. No general junk yard is set apart, but the whole plant from end to end is littered up with junk. This is, of course, in strict keeping with the Chinese mode of living.

Over 5000 Chinese are on the payroll at this plant; they swarm about each operation as thick as bees about a honeysuckle, and it is next to impossible for one to understand why they are not burned, scalded, crushed and killed by the score. Taking into consideration the fact that the Chinese are a playful and usually careless people, the small number of accidents which occur is almost marvelous. Of late years the company has been installing electric motors, hoists, etc., and a great deal more of the work is being done by machinery. However, because of the abundance and cheapness of Chinese labor, hand labor is resorted to wherever practicable. One sees all the coke being loaded and carried about in bamboo baskets on the shoulders of the coolies and the blooms and ingots being pulled about with tongs by the coolies; all handling of the rails is done by hand. These men become expert in the handling of steel and pig iron, and as blacksmiths and foundrymen they are also efficient.

Instances of Chinese Superstition

Many interesting incidents of the gross superstition of the Chinese people might be related in connection with this plant. Owing to the company's rapid expansion in the last few years it is now cramped for ground, being hemmed in on one side by the Han river, on another by the mighty Yangtse Kiang, on the third by the Government arsenal and on the fourth by Turtle hill. There is only one method of escape and that is through the sacred Turtle hill. About three years ago the company proposed tunneling through this barren and unused hill, but a great cry immediately arose from the people, and even the gentry. Protests came from all sides, that if the company tunneled the hill it would disturb the sacred dragon, greatly anger him and bring disaster upon the people. So extensive was the protest that the company was forced to abandon the proect.

The company then began to fill in a small marshy pond, which was near the base of the hill—again a wild protest, this time that the dragon washed his feet in this pond and that his bathtub should by no means be disturbed. Through strenuous efforts the company persuaded the people that it wished only a small part of the pond filled and would leave a wholesome bathtub for the honorable Mr. Dragon. As it is essential that the company secure more ground, and this Turtle hill is the only possible way of acquiring it, it is now endeavoring to convince the Chinese that it will neither bring disaster and destruction on the people nor anger the dragon.

It is interesting to note that several large shipments of pig iron have gone to New York from the Hanyang works. In November a shipment of 50,000 tons left for New York, and about six months earlier another large shipment went to the United States. Pig iron from Hanyang can be laid down in New York for less than the price quoted in Pittsburg. The Hanyang plant is a wonderful development for China and it is earnestly hoped that it will mark a new era for this conservative people.

Calculation of Recovery in Concentration

BY THEODORE J. HOOVER *

It frequently happens that some idea is desired as to what recovery is being secured in tests or in milling operations when it is not possible to get the weights of the products. The following formulas are believed to be absolutely sound in theory, but it should never for a moment be lost sight of that they are founded on the following assumptions:

(1) That the samples taken represent, without any error whatever, the average of the material.

(2) That the assays of the samples are absolutely correct.

RATIO OF CONCENTRATION AND RECOVERY

Having granted the two above assumptions, we can combine and transform certain symbols and get expressions for percentage of recovery and ratio of concentration which contain only the known quantities, to wit: Assay of ore, assay of tailings, and assay of concentrates.

Of the known quantities, let $a =$ assay of ore; $b =$ assay of tailings; and $c =$ assay of concentrates.

For unknown quantities, let $x =$ tons of ore; $y =$ tons of tailings; and $z =$ tons of concentrates. The following equations are self-evident:

$$\frac{x}{z} = \text{ratio of concentration.} \qquad (1)$$

$$\frac{100\,c\,z}{a\,x} = \text{per cent. of recovery.} \qquad (2)$$

$$a\,x = b\,y + c\,z. \qquad (3)$$

$$x = y + z. \qquad (4)$$

Now, by a proper transformation of equations (3) and (4), we can get expressions for (1) and (2) containing only the terms a, b and c, as follows: Multiply (4) by b and subtract the product from (3):

$$\begin{array}{r} a\,x = b\,y + c\,z \\ b\,x = b\,y + b\,z \\ \hline a\,x - b\,x = c\,z - b\,z \end{array}$$

Transforming, we have:

$$x\,(a - b) = z\,(c - b) \qquad (5)$$

or

$$\frac{x}{z} = \frac{c - b}{a - b} = \text{ratio of concentration,} \qquad (6)$$

or

$$\frac{z}{x} = \frac{a - b}{c - b}. \qquad (7)$$

Now, if we substitute (7) in (2), we have:

$$\frac{100\,c\,(a - b)}{a\,(c - b)} = \text{per cent. of recovery.}$$

As a result, then, we have the following two useful formulas:

$$\text{Per cent. of recovery} = \frac{100\,c\,(a - b)}{a\,(c - b)}.$$

$$\text{Ratio of concentration} = \frac{c - b}{a - b}.$$

It cannot be urged too strongly that the above formulas must be used with caution. When actual milling operations are being carried on and the weights of ore and concentrates are taken daily, and where there are smelter returns to be used as a check, these formulas are useful as a check on samplers and assayers.

CHECKING BY ACTUAL WEIGHTS

In small tests where careful hand samples are taken by several persons at different points in the concentrating scheme, and taken in different ways, I have acquired sufficient confidence in the formulas to use them as guides in planning work; but ultimately all the results must be checked by actual weights of products. If the samples are taken and assayed with care, the recovery by weights in nearly all cases has checked up with the theoretical recovery as deduced by the formulas.

ERRORS WHICH MAY AFFECT RESULTS

An investigation of the effect of certain errors is instructive. Assume first a fixed error in sampling and assaying which we will call n per cent. too high. Then, by the formulas, per cent. of recovery =

$$100\left(\frac{(c + n\,c)\,(a + n\,a - b + n\,b)}{(a + n\,a)\,(c + n\,c - b + n\,b)}\right)$$

or

$$100\left(\frac{c\,(1 + n)\,[a\,(1 + n) - b\,(1 + n)]}{a\,(1 + n)\,[c\,(1 + n) - b\,(1 + n)]}\right)$$

But $1 + n$ cancels out, and it is evident a constant error does not effect the result. This, however, is a condition of affairs which rareiy holds in actual practice.

More often the condition will be somewhat as follows, though not often would the errors be so large:

(1) Sample A taken by trier out of trucks; error of, say, 1 per cent. too high.

(2) Sample B taken by tip sampler at flume at end of mill; error of, say, 2 per cent. too low.

(3) Sample C taken by trier out of trucks from concentrates bins; error of, say, 2 per cent. too high.

(4) Assays of A, B and C made volumetrically by a man who does not reach the end point of his titration by say 0.1 c.c. This error, for convenience, we will say is 3 per cent. too low on ore, 10 per cent. too low on tailings, and 1 per cent. too low on concentrates.

Applying these erroneous values in our formula, we have the percentage of recovery as follows:

$$\text{Recovery} = 100\left(\frac{\left(c + \frac{2\,c}{100} - \frac{c}{100}\right)}{\left(a + \frac{a}{100} - \frac{3\,a}{100}\right)} \times \frac{\left(a + \frac{a}{100} - \frac{3\,a}{100} - b - \frac{2\,b}{100} - \frac{10\,b}{100}\right)}{\left(c + \frac{2\,c}{100} - \frac{c}{100} - b - \frac{2\,b}{100} - \frac{10\,b}{100}\right)}\right)$$

Simplifying, we have

$$\text{Recovery} = 100\left(\frac{c\left(a - \frac{88\,b}{98}\right)}{a\left(c - \frac{88\,b}{101}\right)}\right)$$

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*General manager Minerals Separation Company, Ltd., 62 London Wall, London, E. C., England.

Now, if the true values are: Ore, 3 per cent.; tailings, 1 per cent.; and concentrates, 12 per cent., the real theoretical recovery would be 72.7 per cent., but by the erroneous assay values secured in the above sample the theoretical recovery seems to be 75.3 per cent.

As large errors were assumed in sampling and assaying, much larger, in fact, than any engineer would be inclined to admit possible in his case, what shall we say of those cases where the discrepancy in actual operations between the theoretical recovery and actual recovery is much greater than the difference between 72.7 per cent. and 75.3 per cent. and generally in the opposite direction? It is quite a common thing for engineers to belittle recoveries based on theory, and in order to see just what this means let us take another case not more radical in its assumptions than many within the knowledge of most engineers.

For this purpose I shall define three terms:

(1) The real theoretical recovery. By this I mean the unattainable figure which would take into account every atom and molecule; this figure no one ever knows, but we try to get at it approximately by our samples and analyses.

(2) The apparent theoretical recovery. This is based on applying the above formulas to the figures we have secured by sample and assays as representing the value of ore, tailings and concentrates. As shown above it takes a large strain on our credulity to allow the apparent theoretical recovery to exceed the real theoretical recovery by 2.6 units.

(3) The actual recovery. This is shown on the books of the mine by the assays and weights of the products. This amounts in known cases to as much as 10 per cent. below the theoretical recovery.

Having defined the terms we will assume: Real theoretic recovery, 75 per cent.; apparent theoretical recovery, 77.5 per cent.; and actual recovery, 67.5 per cent. As we have already strained our credulity in the interpolation of sampling and assaying errors, we must look elsewhere for an explanation of an error of 7½ units.

There are probably three chances of error which are independent of and do not contribute to the vitiation of samples and assays:

(1) Errors of moisture determination. Moisture determinations can, with proper care, be easily and accurately made. The error, which is often a large one, comes in the sampling rather than in the determination of the moisture in the sample; ores of wet or clayey mines and wet concentrates are difficult to sample accurately. If the moisture is reported higher than the truth, the percentage of recovery as derived from the assay and weight of concentrates will be too low. Conversely, if the moisture is reported lower than the truth, the recovery as derived from the assay and weight of the concentrates will be too high. A consideration of the various methods of taking samples of wet concentrates for moisture leads one to believe the commonest error is to report the moisture in concentrates too high, and so the actual recovery as calculated on this basis is generally to low.

(2) Errors in weight. There should be little error in this regard, but the tare of trucks and wagons is often assumed from one weighing and no alteration ever made for wet or muddy weather or lost parts. In a recent case on a famous mine the error in weight due to a dishonest employee was an increase of 40 to 50 tons per day reported on the weight of the ore, amounting to an error of 20 per cent. The most common case of error in weights is on the side of giving good measure.

(3) Losses in handling. These may be, and often are, great. Concentrates shipped to Europe in bulk may shrink 5 per cent. in weight, or concentrates stored in heaps in the open may shrink rapidly, due to the wind. These two losses, however, should be taken into account when one is calculating the actual recovery.

In a mill itself there is a daily accumulation of spills which are often hosed or sluiced through the floor; millmen are generally careful not to allow this material to get into the tailings sampler.

Having briefly reviewed the possible errors, the apparent theoretical recovery and actual recovery in the case taken for illustration appear somewhat as follows: Apparent theoretical recovery, 77.5 per cent.; actual recovery, 67.5; errors in assaying and sampling, 2.5; errors in moisture determination, 1.5; errors in weight, 2; losses in handling, 4. Attention to the details of each of these operations will always serve to reduce the gap between theoretical and actual recovery, and it behooves an engineer to get the gap closed rather than to take the complacent attitude that "the theoretical recovery is always too high."

Mining in the Province of Oriente, Cuba

BY W. T. GREY

Little has been written about the mineral resources of Cuba and as no proper geological survey has ever been made, one of the country's most important resources has been neglected.

In the province of Oriente, about five miles north of the town of Holguin, are a number of gold mines that have been exploited with more or less success since the time of the early Spaniards; some of the old workings would seem to indicate even an earlier date, and it is known that gold was obtained in considerable quantities from the Indians in this part of the island by their Spanish conquerors.

The workings of some of the mines are extensive but shallow, due, no doubt, to water difficulties encountered by these early miners. The fact that rich ore has been found in many of these mines just below the old workings goes to prove the above theory. The country rock is serpentine, which is one of the most ancient rocks of the island and the most productive of metals.

At the present time, with the exception of the Santiago mine which is being worked by the Holguin-Santiago Mine Company, an American company, nothing has been done in this district but prospecting or preliminary work. The ore of the Santiago mine is soft and easily mined, and an average assay of the ore shows it to contain about 2 oz. gold and 0.38 oz. silver per ton.

The strike of the Santiago vein is northeast and southwest and it dips at an angle of 20 deg. from the perpendicular. The value of the ore blocked out at the present time above the 200-ft. level is estimated to be over $600,000 which, when the comparatively small amount of underground development work is taken into consideration, holds out promises of a brilliant future. The small 30-ton amalgamating and concentrating plant that was installed on this property a little less than two years ago, although making a poor extraction, has produced $100,000 in gold.

Adjoining the Santiago mine on the west is the Mejor mine, owned by El Mejor Mining Company, of Scranton, Penn. The development on this mine consists of three 50-ft. shafts, and H. C. Saunders, superintendent, states that his company is planning extensive development work to be carried out in the near future. East of the Santiago mine, little work has been done thus far on the vein, but the one shaft started shows good ore at 60 ft. This mine is owned by the Cuban Gold Mining Company, of Havana, Cuba.

The alluvial deposits of this district are still intact, and are of importance. Generally speaking, this part of the island offers an encouraging field for well directed exploration.

Coal Mining at Morgantown, West Virginia

System of Operation Typical of District. One Unique Feature Is the Aerial Tramway Which Carries Coal over the River to Storage Bins

BY R. B. BRINSMADE*

Morgantown, W. Va., is a city of 12,000 people, and is situated on the right bank of the Monongahela river, 100 miles south of Pittsburg. The city contains the State university and mining college, and lies at an altitude of 900 ft. among the hills of the dissected Cumberland plateau, some 50 miles west of the Allegheny mountains. The Pittsburg coal seam outcrops within the city limits, and is now being worked at the Tait mine, two miles down the river, and at the Fulmer mine, on the Morgantown & Kingwood railroad, a mile to the northeast.

THE TAIT MINE

The Tait mine is a drift operation opened on the left bank of the Monongahela river, across from the village of Star City. The Pittsburg seam outcrops 200 ft. above the water and 300 ft. below the crest of the plateau at this point. At intervals of 40 and 60 ft., respectively, above the Pittsburg bed, are the Redstone 5-ft. seam and the Sewickley 4-ft. seam, but these are not worked.

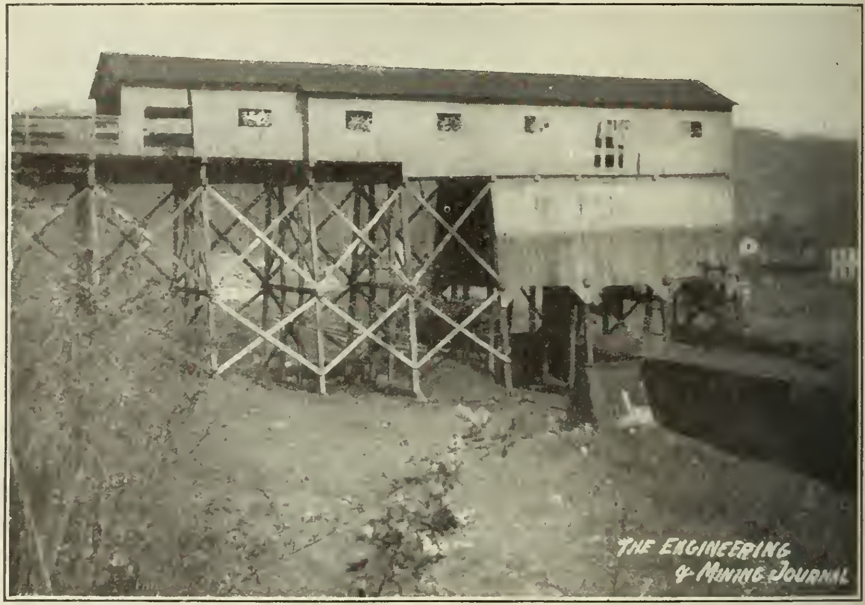
The Pittsburg seam shows 9½ ft. of clean coal with an inch parting, 3½ ft. from its top; the floor is 18 in. of fireclay resting on a thick bed of shale, and is nearly flat. The roof is an 18-in. layer of clod, which is overlaid by a 1-ft. seam of coal. This last seam is left in the mine, as is also about 18 in. of coal at the top of the main seam to prevent the clod from falling.

The mine is laid out on the two-entry room-and-pillar system. The main entries are run on the face at 1200-ft. intervals, and from these the butt entries are turned at right angles on 348-ft. centers, with 30-ft. pillars between the haulway and air course; all entries are 9 ft. wide. The rooms are run on the face and are 15 ft. wide on 40-ft. centers with necks 9 ft. wide. The pillars are robbed on the retreating system and the present development permits an output of 500 tons in 10 hours.

The undercutting is done by hand pick, and for the headings it is 3½ to 5 ft. deep, while the breaking down of the coal is accomplished by two shots of black powder for which holes are bored by a 2-in. breast auger. In the rooms the undercut is made in two benches horizontally, one bench being alternately driven 2 ft. ahead of the other, with the undercut made 4 ft. deep and two shot-holes being used for each bench. One miner can undercut, blast and load five to eight of the 3200-lb. wooden cars during one shift. To assist the natural ventilation, 9-ft. crosscuts are driven at 80-ft. intervals along the entries and rooms.

THE HAULAGE SYSTEM

The cars are hauled from the rooms by horses over a track of two 3x4-in. oak rails. In the main entry the trains are hauled over 16-lb. steel rails by a modified power-plane system to the head terminal of the aërial tramway, or they can be run around the hill on a gravity tram to the bins above the steamboat dock.



SHOWING GENERAL STYLE OF COAL TIPPLE COMMON IN THE MORGANTOWN FIELD

The aërial tramway carries the coal from the pit mouth over the Monongahela river to storage bins above the tracks of the Baltimore & Ohio railroad on the east bank. It is on the Bleichert system and was built by the Trenton Iron Company. It has only one span, 920 ft. long, with a drop of 116 ft. The carrier rope is locked-coil, 1⅜ in. diameter on the loaded side and ⅞ in. on the other, while the traction rope is 1⅝ in. and of Lang lay. The carrier and traction ropes are kept at constant tension by heavy weights hanging over pulleys at the lower terminal.

The steel tram buckets hold 1360 lb. of coal and are placed 200 ft. apart for the capacity of 50 tons per hour. More or less buckets can, however, be used as all the ropes are under constant tension and the drop of the catenary is all that varies with changing loads. For operation there are three men, one at the bottom to straighten up the self-dumped buckets, and two at the head terminal; one to handle the braking sheave and the other to load the buckets from the coal hopper above, which is filled direct from the mine cars.

THE FULMER MINE

The Fulmer mine now belongs to the Elkins Coal Company and is designated as No. 5. As these workings lie nearer the rim of the Monongahela basin than the Tait mine, the Pittsburg seam is thinner (8 ft.) and shows no additional 1-ft. seam above. The coal rests on a fireclay bottom and it is all taken out up to the layer of draw slate, which underlies the sandstone roof. The coal is clean, except for a 2-in. parting 18 in. from the roof, whose joint planes run parallel to the face cleat of the coal, and this condition requires a careful watching, during undercutting and pillar robbing, to avoid accidents.

This mine has an output of 400 tons daily and is laid out also on the two-entry room-and-pillar system. The entries are 11 ft. wide, with 30-ft. pillars between haulway and air course; the butt entries are placed at 352-ft. centers along the main entry, so that the rooms can be 279 ft. long and have a 30-ft. pillar along their ends. The rooms are at 35-ft. centers and are 22 ft. wide, except for the 25-ft. neck where the width is only 11 feet.

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*Consulting mining engineer, Morgantown, W. Va.

THE COAL IS UNDERCUT BY ELECTRIC-CHAIN MACHINES

In this mine, only the pillars are undercut by hand pick, the headings and rooms being worked by four Jeffreys' electric-chain machines, which make a cut 6½ ft. deep by 3½ ft. wide. A heading takes three and a room takes six cuts for a run. There is little sulphur to bother the chain cutter, which is kept about 6 in. above the floor to avoid the irregularities of the latter. The undercutting of 8 to 10 rooms forms the average day's work for one machine.

TIMBERING AND BLASTING

In the entries, there is but little timbering, except at the entrance, but the roof of the rooms is supported by two rows of unbarked hardwood props placed 6 ft. apart, longitudinally, between the track and the inbye rib.

Holes 2 in. diameter and 6 to 7 ft. long are put in by breast augers on an up-slant of 15 deg., just under the roof. A 15-in. paper cartridge of black powder, fired by a squib, is used in each hole, except in wet places, where carbonite is substituted.

THE PILLARS ARE ROBBED ALONG A LINE OF ADVANCING TRENCHES

As soon as the first two rooms next the main entry are completed, the pillar between them is attacked at its far end, and, as the succeeding rooms along the butt entry are completed, their pillars are similarly cut out along a line of advancing trenches. The joints in the roof make it drop in blocks, which often extend to the surface a few score feet above, and the robbing thus requires great care in the manipulation.

In the rooms, the rail weight is 16 to 20 lb., in the entries it is 30 lb., and on the surface tram it is 60 lb. per yd.; the gage throughout is 44 in. For inside work, there are two 5-ton and one 3½-ton, and for outside work there is one 10-ton locomotive; all these are of the Jeffrey make, type D.M., class 70, and have class 16 controllers. The inside locomotives are fitted with wire reels so that they can leave the trolley wire of the entries and gather the cars in the rooms.

The outside tramway from the pit mouth to the tipple in the railroad, 1¼ miles distant, has an average grade exceeding 3 per cent. It crosses the county road twice by taking the current from a trailer running along the high-feed wire, the low trolley wire being cut out for the road. The round trip takes one-half hour, down trip being at rate of 10 to 12 miles per hour, and the up trip half as fast.

VENTILATION

The fan is a Clifford-Capell exhauster 10 ft. in diameter and 110 r.p.m. It is belted to the countershaft of an electric motor of 60 h.p. and 800 r.p.m. There are four intakes, owing to the fact that several of the main entries run clear through the hill, and this allows the separate splits to be short, saves overcasts and greatly decreases the power necessary for circulating the 65,000 cu.ft. of air per minute which passes the fan. The break-throughs in entries and rooms are 11 ft. wide and placed at 65-ft. intervals. The overcasts and brattices in the entries are concrete; in the rooms they are of boards.

To handle the water which collects in the low places of the floor, a niche is cut in the rib to hold a barrel which can be filled by the trackman with a hand pump and drained through a pipe to one of the central sumps. Two of the sumps are let out by siphons of 2½-in. pipe, several hundred feet long, and three are drained by centrifugal pumps. The latter are Worthington pumps of 8 h.p., belted to Westinghouse electric motors, type E, going 1400 revolutions per minute.

THE TIPPLE ARRANGEMENT

To handle the mine output of 400 tons daily, about 150 wooden cars with loose wheels and a capacity of 2½ tons are in use. The trains of 16 cars arrive at the tipple from the mine and are run over a Phillips patent crossover dump, by which they are arithmetically tipped over the screens and returned to the empty track. Only slack and lump coal are separated, the former for sale to cement works and the latter for the rolling mills nearby.

The electric current is supplied by the Union Utilities Company, of Morgantown, at 6600 volts, 3 phases and 60 cycles. It is first stepped down to 160 volts in three Westinghouse transformers, whence it passes to a Westinghouse, 200-r.p.m. rotary converter, where it is changed to a direct current of 250-volt pressure for general use in lighting, haulage and pumping.

LABOR

The regular mining force comprises about 80 men; of these, 63 are miners and laborers, eight are trainmen and three are bosses, the rest being carpenters, smiths and electricians. The skilled men are mostly Americans, while the Slavs and Italians are numerous among the unskilled force, who work for a wage of from $1.60 to $2.50 per day. Coal cutting and loading are done on contract, and the mine, like most of those in northern West Virginia, is worked nonunion. There are two 10-hour shifts, though only a few loaders and pumpmen come out on the night shift, as a rule.

Locomotive Haulage on the Overhead Trolley System

SPECIAL CORRESPONDENCE

At the meeting of the North of England Institute of Mining and Mechanical Engineers on April 9, a paper was presented by Henry Moore Hudspeth on "Electricity at the Shamrock Collieries, Herne, Westphalia, Germany."

In the section on haulage, he said that locomotive haulage on the overhead trolley-wire system is adopted; the voltage system being 200 volts direct current, the rails serving as the return. For converting the alternating current to direct current, there are two motor generators, connected up to the low-tension side of 5000-1000-volt static transformers by means of a high-tension lead-covered armored cable for 1000 volts, with oil switches, and fuses on each phase, at both ends. Under ordinary conditions each motor generator sustains eight locomotives in working order. At present, two of the locomotives are standing by in reserve, and consequently one of the motor generators is as a rule standing in reserve. Each has an output of 6.5 kw. at 230 volts and 730 r.p.m., the outgoing trolley wires being charged at this voltage. The generators are compound wound, each being connected up to the direct-current switchboard from which the feeding cables for the line go.

IN CASE OF A SHORT CIRCUIT

The trolley wires are firmly attached to the roof and insulated therefrom by means of double-shed porcelain insulators, which are fixed at distances apart varying from 16½ to 20½ ft. and have a protective iron covering. In the event of a short-circuit between the trolley wire and the rails, the whole line through the growth of the current operating a blowout switch is instantly made dead. The necessary lighting is done at the landings, etc., by simply putting 220-volt lamps between the trolley wire and the rail.

Each locomotive is provided with two compound-wound motors having a normal of 11.8 and a maximum of 17.7 h.p. each, so that each locomotive has a normal of 23.6 and a maximum of 35.4 h.p. They are wound for a voltage of 220, and run at 500 r.p.m., driving on to the wheels through 5.33 to 1 gearing. The motors which are entirely inclosed for keeping out the dust, are hung on to the frame by springs.

Mr. Hudspeth says the frame of the locomotives rests through strong springs on to the steel axles, and by means of a drawbar with spring, no jerk is given to the set of cars on starting. The driver's seat being as low as possible is arranged so that the handwheel of the brake can be operated by the right hand, while the left hand of the driver serves for the operation of the controller. The controller is arranged for series and parallel connections for running the motors either in parallel or in series and is also provided with a reversing switch. A protecting roof is fixed on to the locomotive for the purpose of protecting the driver against the overhead-trolley wire. This forms the highest point of the locomotive, and is at 53 in. above the rail level. The overall length of the locomotive is 128 in., the greatest breadth being 40 in. beyond which no part projects. By normal revolutions of the motors, the speed attained by the locomotives is equivalent to 8 miles per hour.

THE PLANT WILL HANDLE ABOUT 2000 CARS PER SHIFT

At present about 4 miles of haulage road are under electrification, and the plant is built to deal with about 1920 cars of coal in a working time of about 7½ hours, this being equivalent to an approximate output of 2116 tons per day, the average weight of coal per car being about 0.55 ton.

The whole of the electric haulage at the colliery is at the 1870-ft. level; curves of a less radius than 32¾ ft. are avoided and the average gradient of the roads is in favor of the load, amounting to 1 in 450. This small even gradient is good for locomotives, and may in some measure account for this success. There are, however, cases under this company in which the full load is drawn up a gradient of as much as 1 to 80.

Mr. Hudspeth presents a table of costs for the month of March, 1909, representing 26 working days of 16 hours each as follows:

COSTS OF ELECTRIC LOCOMOTIVE HAULAGE AT THE 1870-FT. (570-M.) LEVEL, SHAMROCK 1 AND 2 COLLIERIES.

	Marks.	
(1) Interest on capital at 4 per cent.	500.00	$120.00
(2) For renewal of plant, life taken at 15-year rate, 4 per cent. = 4.993 per cent. on capital	624.13	$150.00
(3) Oil and grease	37.80	$9.07
(4) Waste, etc.	0.73	$0.17
(5) Repairs	849.66	$204.00
(6) Power: 15,725 units at 0.72c.	471.75	$113.00
(7) Wages	3453.80	$829.00
(8) Subscriptions to workmen's fonds, etc.	323.49	$77.52
Total cost of haulage	6261.36	$1502.76

The total output of locomotives was 63,308 tons, and the cost per ton was therefore about 2.2 cents.

The Tennessee Coal, Iron and Railroad Company has begun the construction of 280 Koppers by-product coke ovens at Wylam, near Ensley, Ala. With 560 ovens now under construction at Gary, Ind., and 280 built at Joliet, Ill., in 1907, this will give the Steel Corporation 1120 Koppers ovens. The estimated daily output of the Wylam plant, with Alabama coal, is 3150 tons coke, 22,000,000 cu.ft. fuel gas, 35,000 gal. tar and 44 tons sulphate of ammonia.

Electricity in Coal Mines*

By W. M. THORNTON

The peculiar feature of the electric current is that, although in bulk and under great pressure enormous power can be transmitted, yet the main current can be subdivided almost indefinitely and still serve a useful purpose. Electric lighting by arcs was first applied to open-air lighting, but with the invention of the incandescent lamp, electric lighting was carried underground. Underground lighting having proved a success, low-voltage motors were installed for haulage and pumping. They had flexibility of control, but the cost of installation was so high, both in cables and in machines, that long-distance transmission to points far underground was almost prohibitive. The introduction of the 240-volt incandescent lamp, and the three-wire system of distribution for house lighting, led to the 480-volt motor. The great reduction in the cost of cables and machines for a given power consequent on this, was followed at once by an increase in the use of electricity underground, which has been maintained at an increasing rate up to the present time.

ADOPTION OF HIGHER PRESSURES AND ALTERNATING CURRENT

The introduction of 500-volt motors underground, however, had some disadvantages. These motors sparked considerable when they had to carry severe overloads. Shocks which at 100 volts were rarely dangerous, at 500 volts became deadly in the humid condition of the air and skin. Lastly, the arc at the break of a cable at the higher voltage was more prolonged and its igniting power greater. These dangers, although they have been lessened, have still to be conquered. For sparking alone, the introduction of three-phase motors is an undoubted gain. They are not so readily controlled in speed as continuous-current motors, and they require almost as much attention, but they do not spark, and their switch gear can be inclosed in oil.

With regard to shock, anything over 400 volts seems to have the power of paralyzing muscular movement, although men differ remarkably in this. A shock taken through the palm of the hand is much more severely felt than through the fingers. Everything considered, there is not much difference between direct or alternating voltage as regards shocks at moderate pressures. In modern practice, with high-tension alternating systems, the risk of shock is not increased in proportion to the voltage, for in the first place greater precautions are taken to inclose and protect live parts, and the knowledge that contact is possibly fatal is more in the minds of the workmen.

Of all of the forces of nature which have to be met in working coal, gravitation is the most dangerous. Of the fatalities occurring in Great Britain in the years 1903-1908, 99.17 per cent. had nothing to do with electricity. With regard to the ignition of gas there is only one word to be said—that since a spark from a hand generator is sufficient to ignite it, when gas is present, electricity should be absent or entirely inclosed.

ELECTRICITY AND COAL DUST

With regard to coal dust, it is only within the last 20 years that this has been seriously considered as an explosive. It has been proved that coal dust can be ignited by bare flame, like gas, requiring, however, longer contact at the start, and it is this question of time of contact and volume of flash which until recently had not been worked out. The temperature to start a local ignition was found to be 140 deg. C., pointing to the ignition of gases released from the coal rather than to decomposition of the coal by oxidization. This temperature is fortunately beyond anything met with in ordinary electrical engineering practice, except, of course, in arc lamps; however, in the case of an incandescent lamp resting on coal dust ignition took place freely. A local ignition, but not an explosion, of coal dust has been known to have been produced by a stream of iron sparks from a belt.

A series of experiments were carried on to determine what electrical current at any given voltage would, when broken quickly as by a switch, or slowly as by a cable parting, or through the blowing of a fuse, ignite dust collected from the walls and timbers. These experiments were conducted for both direct and alternating current. It was found, that with direct non-inductive circuits, the least current causing ignition at 100, 250, 500 and 600 volts, were respectively 70, 11, 5.9 and 4.8 amp. With the same alternating voltages they were 120, 36, 11.8 and 7.5 amp. A point of interest which was obtained from the result is that it is not the energy of the flash which controls the percentage of risk, but its volume and duration. The energy is proportional to the square of the current flowing. In every case the increase in ignition was directly proportional to the increase of the current.

So far, then, as danger from the quick break of a circuit in a cloud of dust is concerned, alternating current is, at the usual voltage of 500, twice as safe as direct, and at 250 volts much more. At 100 volts the ratio of safety is the same as at 500, because at the lower voltages volume of current is the dominating factor, and at the higher, duration of arc.

The difference between the two is even more marked in the blowing of a fuse.

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*Abstract of article published in *Colliery Guardian*, May 6, 1910.

The percentage of ignition is more than four times greater with direct than with alternating current under the same conditions, at a voltage of 100.

Mechancal Improvements

Whatever the degree of danger may be, it is much lessened by the use of switch and distribution boxes with wide flanges. It is certainly true that the general adoption of the metal-to-metal wide flange wherever possible would do more to inspire confidence among men handling the apparatus than almost any other immediate reform—excepting perhaps the adoption of low-voltage distribution.

The essential feature in the use of alternating current is its power of safe and efficient transformation from high to low voltage. Apart from the question of cost, the combination of a transformer and motor is in every way safer, at least underground, than a motor wound for high tension supply. It is unlikely that direct pressures above 1000 will ever be used underground on account of the difficulty of maintaining sound insulation. If then electrical energy is to be used for all purposes in collieries, and economical transmission is essential, it is difficult to see how direct current can compete with alternating for large collieries or group of collieries.

The Protection of Cables

Perhaps the most vexing question at the present time is whether or not cables should be armored. The two dangers in underground cable work are shock and arc. With armoring, the latter can be entirely removed, but the risk of shock remains where contact with, say trailing cables, is possible. Where there is likelihood of contact and shock, which is for all practical purposes only on trailing cables, unarmored cables served with small ropes have been found satisfactory. The coal-cutter motor frame is earthed through a pilot on to the armoring beyond the gateway end switch.

No colliery manager should be expected to decide matters of policy or detail in his electrical plant unless he is himself a competent elecrtician. It follows that if the executive electrician is also to be "competent," he must have had a recognized training and should have passed some qualifying test. This would not weed out the habitually careless, but it would enable responsibility to be fixed.

The only barite mine in California is in Mariposa county, a few miles below El Portal, on the Merced river. An incline tramway has been built, with bunkers, and the ore will be shipped to the Leona Chemical Company, Oakland, where it will be used for paint. The Chemical company and the mine are owned chiefly by F. M. Smith.

The Dan River Coalfield in North Carolina

The United States Geological Survey has recently made an examination of the Dan River district, in Stokes and Rockingham counties, North Carolina, to determine whether or not it contains any important coal beds. The work was done in March and April by R. W. Stone, geologist, who has been investigating coal lands for the Government for the last eight years. Mr. Stone examined all the known prospect pits and had a number of them reopened.

Mostly Black Shale

The coal-bearing rocks consist of a narrow belt of black slaty shales which extends from a point just north of the Virginia line southwestward through Leaksville, Madison, and Walnut Cove to Germanton, N. C. Some people in the district believe that these black shales, which they regard as a "sign of coal," are thicker where they lie under cover and that if they are followed far enough down they will be found to be coal. This idea has no foundation in fact but has been the incentive to much useless labor and unwarrantable expense. At a few places on Dan river in the black-shale belt, thin beds of a hard semi-anthracite have been found. This coal disintegrates very slowly and consequently should be as thick at the surface as it is underground. It varies in thickness, however, from place to place and is as likely to be thinner at considerable depth as it is to be thicker. Scarcely more than a foot of good coal has been found in any one bed in the district in a distance of 30 miles along the outcrop, a fact which further diminishes the probability of finding thicker beds below the surface.

The black shale is well exposed at the bridge over Dan river half a mile below Leaksville, in the streets of Madison, and in the railroad cut on the county line at the mouth of Carter creek, but in none of these places does it show any sign of coal. The beds dip to the northwest at angles ranging from 20 to 60 deg., so that a prospect becomes a slope, and in this district all slopes have to contend with a large amount of water.

Only a Little Good Coal

During the Civil war coal was mined on the Wade plantation, 3 miles above Leaksville, and shipped by boat to Danville. Although the coal is semi-anthracite, the bed is so broken up by shale partings and so small in extent that operations were soon discontinued. Subsequent prospecting on either side of the old pits shows that the bed is a small lens and carries only a few inches of coal.

More than 50 pits have been dug within 3 miles of Walnut Cove in search of coal. Some of these diggings represent several weeks' work and the expenditure of a considerable sum of money. High-grade coal has been found, but it is nowhere more than a few inches thick.

Black Shale Resembling Coal

A bed of what appears to be soft, flaky coal has been found at several places in the vicinity of Walnut Grove. This material is bright black and looks like some form of coal, but it is probably only a coaly shale. Its soft and flaky character seems to be due to crushing that has produced widespread effects in this region, and it will probably be found in the same soft condition even where it lies at considerable depth. As this coaly shale is of the same character for several miles along the outcrop there is no reason to suppose that it changes to coal down the dip of the beds, where it is under greater cover. Mr. Stone sunk a pit half a mile south of Walnut Cove and found that this bed is at that point more than 10 ft. thick. Analysis shows that it contains a high percentage of ash, and thorough tests prove that it will not burn, and therefore has no fuel value.

"Soft Coal Vein" Contains No Coal

Halfway between Walnut Cove and Germantown several large pits have been dug and some coal has been recovered from a bed of semi-anthracite less than a foot thick. This coal rests on coaly shale which is so bright and black that it has been mistaken for coal and which is known at Walnut Cove as the "soft coal vein." It is not coal, however, and there is no reason to believe that it has been changed to coal even where it lies at great depths. As this is by far the thickest and most conspicuous bed resembling coal that has been found in the district, the statement that it is not coal will doubtless be disappointing to those who have been counting on it as a future source of wealth.

No Valuable Coal Beds in Dan River Region

Mr. Stone's conclusion is that there is no reason to expect to find commercially valuable coal beds in the Dan river district. The beds of semi-anthracite found there are only local; they are of small lateral extent and only a few inches thick. It is, therefore, useless to expend money and energy in this region with the hope of developing a coal mine. Anyone desiring to study the character of the beds near Walnut Cove would do well to visit them now, while the excavations made by Mr. Stone are still fresh.

The general strike of the coal miners in New South Wales reduced the coal production of that State from 6,520,749 tons in 1908, to 4,393,603 tons in 1909; a loss of 2,127,146 tons, or 32.6 per cent.

Treatment of Mine Ponies

BY A. H. STOKES *

An article dealing with the treatment of mine ponies, published in the January issue of *The Humane Review*, gives a gloomy view of the underground surroundings and cruelty to pit ponies—so much so that the life of the animal appears to be one of inhuman treatment, and cases of revolting cruelty are described as having occurred underground. I believe the statement to be exaggerated and wanting in important details. I regret to say that cases of cruelty do sometimes occur, and that occasionally, through ignorance or carelessness, the ponies are neglected and badly treated; however, it is only fair that the public should be made acquainted with the precautionary measures, both statutory and otherwise, which are available for the protection of pit ponies and for the detection and punishment of those responsible for cruelty or inhuman treatment.

The article published in the *Review* is quite dramatic, and most sensational. The first paragraph of the article concludes as follows: "Beyond all who mutely suffer, unconsidered, unprotected, in submerged and nameless horror, encompassed in miasmal oblivion, stands the pit pony."

As a general rule, the stables underground are whitewashed frequently, well ventilated and cleaned daily. It is also a fact that these stables compare favorably with stables on the surface. Although all districts throughout Great Britain do not have uniform laws, the following special rules, which apply to a number of districts, are typical of the general rules prevailing throughout the entire country:

(a) "Every horsekeeper shall see that no animal under his care is allowed to work while in an unfit state, and shall report to the manager, undermanager, or deputy, any injury received by any animal."

(b) "Every person in charge of any animal shall report immediately to the horsekeeper, or deputy, any injury received by such animal while in his charge."

(c) "Every person in charge of any animal shall report to the manager, undermanager, or deputy, in case he finds that such animal cannot pass along any road without rubbing against the roof or timbering."

(d) "Every horse driver shall carefully convey his cars and use sprags, lockers, or other means of scotching the cars, when necessary."

Other districts have the following rule: "Every person who shall observe or become aware of any breach of discipline, or of the Act or special rules, shall, as soon as possible, report such breach to the manager, undermanager, enginewright or deputy."

The author of the *Review* article cites more than a dozen complants covering practically every phase relating to the treatment of pit ponies. He condemns the present method of lowering the ponies down a shaft, and states that the ponies are not only neglected and cruelly treated, but are overworked and underfed. Such complaints would lead a reader to suppose that brutality was systematic, and neglect, the lot of the pit pony when once down below. Any visitor to the stables in a mine may occasionally find a pony suffering from serious injury, accidentally received in the mine, but let the same visitor, when he returns to the surface, make his way to the nearest hospital and, if in a large colliery district, he could possibly find a poor man or boy, one or more, lying seriously injured and suffering from accidental injury received in the mine. It may even be that the pony in the mine and the driver in the hospital bed received their injuries from the same fall of roof.

Mining operations always have been and always will be dangerous, and there are few mining men who live to threescore years but who have either been more or less seriously injured, or have had a narrow escape from being killed.

INSPECTORS AND PROSECUTION

It is true that no mine inspector can periodically examine every pony when at work in a mine, any more than can the inspectors of humane societies and policemen see every horse at work on the surface. However, all the pit ponies can be seen in the stables if the inspector has cause to suspect that cruelty and neglect have prevailed. In all large and well managed mines, a veterinary surgeon periodically examines the horses in the mine and makes a report upon their condition. This is better than an inspector of mines examination.

The writer of the article in the *Review* has suggested eight rules for compulsory observance. Although there is nothing suggested that will be of material assistance to those responsible for the care of ponies. I will cite the rules in the order given:

No. 1. "The numbering of every animal on descending the shaft." A man's children are named, not numbered, equally so every pony in a mine is named, and if not named before its descent, it soon will be by the driver. I have never yet met a pony in a mine without a name. The name, in my opinion, is far better than number.

No. 2. "No pony to be engaged under or over a certain age." As the minimum and maximum ages are not stated, it is unnecessary to remark further than to say that ponies should not go down under four years old, but five years is preferable.

No. 3. "Limitation of hours of ponies' work." In some mines a register of the shifts is kept. It is a matter difficult to deal with, for. in pits of moderate size spare horses are not kept, and if one falls lame or injured, it becomes necessary at times to work some of the others overtime.

No. 4. "A meal half way between the allotted hours of work." In the present arrangement of eight hours' work at mines there are only about fifteen minutes for either men, boys or ponies to get food. To take the ponies back to the stables for a meal, or even for half an hour's rest, would be impracticable with the present limitation of the hours of labor.

No. 5. "Supply of water for every animal engaged." In most mines there is a supply of water taken into the workings for the ponies, but there are cases where the pony would be the eight hours without water.

No. 6. "Every driver to be licensed and registered, and time in charge booked." I think this unnecessary, for the driver of any pony on any day can soon be known if required. The youths are appointed drivers, and their names registered in the time-books.

No. 7. "Every injury to a pony to be reported, investigated and registered." I presume "every injury" must be taken to mean serious injury; if so, the special rules and regulations of most mines already provide for this.

No. 8. "Periodic examination of all animals by veterinary surgeons invested with plenary powers." I have already stated that in many mines there is a periodical examination, and there is an adequacy of plenary power at command if required.

The suggestions in my opinion show a regrettable want of knowledge of the precautionary measures taken to secure the humane treatment of pit ponies.

NOTE—Abstract of article appearing in "Colliery Guardian," April 15, 1910.

*Formerly chief inspector of mines for Midland district in England.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Albert Howe Carpenter is visiting New York.

E. P. Mathewson, of Anaconda, was in New York last week.

John D. Ryan will return to New York soon, and will leave at once for Europe.

W. M. Brewer, of Victoria, B. C., recently went to Ketchikan district, Alaska.

D. D. Mann, of the Canadian Northern Railway, has gone on a trip to the Pacific coast.

Louis A. Wright, consulting engineer for the General Development Company, is in New York.

J. W. Hutchinson, general superintendent of the Goldfield Consolidated mines, is in New York.

Allen H. Rogers has left New York for New Mexico and Arizona, to be gone about four weeks.

E. L. Dufourcq has returned from his extensive trip on professional business through the West.

S. F. Bretherton has returned to San Francisco after examining mines in Plumas county, California.

J. B. Tyrrell, Toronto, has gone on a tour of inspection to the north shore of the St. Lawrence, in Quebec.

Hugh G. Elwes has been appointed manager for J. F. Hill, of Chicago, at Papantla, Vera Cruz, Mexico.

W. H. Seagraves, for several years manager of the Veteran mine, left Ely, Nev., recently for Valdez, Alaska.

Robert Hawxhurst, Jr., has removed his office from 62 London Wall to 623 Salisbury House, London, E. C., England.

R. E. Harris, president of the Nova Scotia Steel and Coal Company, and Thomas Cantley, general manager, are in Toronto.

Carl F. Dietz and Dyke V. Keedy, of the firm of Dietz & Keedy, of Boston, have gone to Nova Scotia on professional business.

Francis L. Robbins, formerly president of the Pittsburg Coal Company, has been spending some time in the coal regions of Alabama.

A. Piatt Andrew, the present director of the Mint, has been selected as assistant-secretary of the Treasury, to succeed Charles D. Norton.

A. D. Geiger has sold out his interest in the cyanide plant of the Cortez Metals Recovery Company at Cordez, Nev., and has returned to Boston.

J. W. Turnbull has been looking over coal properties in Nicola Valley district, B. C., for the Consolidated Mining and Smelting Company of Canada.

John G. Worth, who has been situated at Reno, Nev., has removed to New York, where he has opened an office as mining engineer, at 27 William street.

R. H. Morris, of Mexico, has been commissioned to examine coal lands in Similkameen district, B. C., for prospective buyers resident in Spokane.

G. H. Carnahan, in charge of the mining department of the Compañia Metalurgica Mexicana, has recently been in Denver, and is now in New York.

E. A. Julian, formerly assistant mill superintendent at the Goldfield Consolidated, is now in charge of operations of the Picacho Basin Mining Company, near Yuma, Arizona.

Dr. Benzo Katsura, professor of metallurgy in the Tokio Imperial University, who has been making a tour of the metallurgical districts of the United States, has returned to Japan.

Dr. J. Bonsall Porter will shortly return to Montreal from a trip through western Canada with the McGill summer mining school. A little later he will proceed to Europe on a visit.

Hiram W. Hixon has completed the course of lectures he has been delivering at the University of Pennsylvania, and will reside for the summer at 509 Seventeenth street, Ocean City, N. J.

R. L. Bartlett, recent graduate of the course of mining geology at the Massachusetts Institute of Technology, has accepted a position with Frederick G. Clapp, geological engineer, Pittsburg, Penn.

Dr. Eugene A. Smith, for many years State geologist of Alabama, was presented with a silver loving cup by the alumni of the University of Alabama at the recent commencement of that institution.

W. R. Fairley, of Birmingham, Ala., for several years member from Alabama of the national executive board of the United Mine Workers of America, has been appointed immigration inspector at the port of New Orleans.

F. T. Rubidge has resigned his position with the New Jersey Zinc Company, at Franklin Furnace, N. J., and is now with Ladenburg, Thalmann & Co., New York. His personal address is 117 Park street, Montclair, N. J.

Guy R. Johnston, of Birmingham, Ala., until recently vice-president and general manager of the Alabama Consolidated Coal and Iron Company, is opening an office as consulting and contracting engineer in the Brown-Marx building, Birmingham, Ala.

OBITUARY

William H. Austin, formerly of Boston, died in the City of Mexico, May 24, aged 45 years. He had had an office as consulting mining engineer in Mexico for several years past.

Percy Lincoln Baldwin, a mining engineer for some time past at El Oro, Mexico, died at the American hospital in the City of Mexico, May 25. He was 35 years old.

Ely C. Woods, a graduate of the Michigan College of Mines and for some time past with El Rayo Mining Company at Santa Barbara, Mexico, was killed, May 28, by a fall of ore in the mine.

John Deguee died in Brooklyn, N. Y., June 2, aged 74 years. He was born in Germany and educated as a mining engineer. He was connected with the Calumet & Hecla Company for many years, retiring from active work several years ago.

Edmund H. McCullough died at Philadelphia, May 31, aged 61 years. He had been a coal operator in the Irwin field in Pennsylvania for many years, and for 20 years was president of the Penn Gas Coal Company and the Westmoreland Coal Company, the most important concerns in that district.

SOCIETIES *and* TECHNICAL SCHOOLS

Wisconsin State Mining Trade School—The first commencement occurs at Platteville, Wis., on the evening of June 10. Hon. J. W. Murphy will deliver the commencement address.

Sherbrooke Mining Institute—At a meeting held at Sherbrooke, P. Q., May 21, the following officers were elected: Chairman, Col. J. J. Penhale; secretary, W. H. Smith; executive committee, T. H. Crabtree, L. N. Adsit, J. Greenshields and J. R. Pierson.

Canadian Mining Institute—The eighth general meeting of the Western Branch was held at Grand Forks, May 26. W. Fleet Robertson, of Victoria, B. C., provincial mineralogist, who is this year's chairman, presided; and E. Jacobs, branch secretary, was also in attendance. Several papers were read, as follows: By O. E. LeRoy, on "The Geology of the Ores of Phoenix Camp, B. C."; by L. Reinecke, on "Silver and Gold Deposits on the West Fork of Kettle River"; by Chas. Camsell, on "The Mineral Resources of a Part of Yale District, B. C."

Among those present were Dr. J. Bonsall Porter, professor of mining engineering at McGill university, Montreal, Quebec, who was in the Boundary district at the time with his summer mining-school students; Frederic Keffer, mining engineer for the British Columbia Copper Company; O. B. Smith Jr., mine superintendent, and W. A. Williams, smeltery superintendent, for the Granby Consolidated. The mayor of Grand Forks and Martin Burrell, district representative in the Dominion House of Commons, welcomed the visitors. The next meeting will be held at Kaslo.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

June 4—Black-sand mining has become active again on the ocean beach of Monterey bay, between Aptos and Port Rodgers. Near San Andreas, 16 claims have been staked out along the bluffs which face the beach. The plants are about alike and consist of several canvas-lined sluice boxes into which the black sand is delivered through hoppers. A gasolene engine is used to pump water for sluicing. A sump hole is dug in the beach for water supply and an old-fashioned China pump delivers the water to the sluices. These beach claims do not pay every year, but must be let lie "fallow" for two or three years to permit the storms to concentrate the auriferous sands of the ocean beach.

At the last meeting of the Anti-Débris Association, a communication was received from Butte county stating that dredgers were depositing tailings in Honcut creek, which finally reaches the Feather river, and that damage was being done. The committee on dredge mining of the Association was given full power to take such steps as thought necessary, and the attorneys of the Association were instructed to commence any proceedings requested. It is evident that dredging operations in different counties are being pretty closely watched by the Anti-Débris Association.

The Beer Gold Mill and Extraction Company has been incorporated with a capital of $100,000, to erect a custom mill at Sacramento.

Denver

June 6—For some years past there has been a good deal written and talked about the copper deposits of Red Gorge and Yarmony, along the line of the Moffat road, just below the mouth of Gore cañon. Several companies were organized, and more or less deceptive prospectuses issued, and a good deal of stock sold. After a fitful existence, during which the promoters failed to make good their promises, all of the operations have ceased without discovery of pay ore. For 15 miles in this district, the Grand river flows in a half circle, as it were, around the base of Yarmony peak, and the track of the Moffat road follows the river. Just above the track in various places the Weber grits have been impregnated with azurite and malachite, and this stratum of beautiful blue and green colored sandstone has been made the basis for the flotation of these companies. Altogether, about eight carloads have been shipped to Denver, none of which carried sufficient to pay the freight. The average yield of the impregnated strata, which vary from 1 to 3 ft. in width, is about 2 per cent. copper, and it might be selected to run 7 per cent. One claim only is now being worked by individuals. It is like the rest: a bedded deposit, and dips about six degrees from the horizontal. A contract for 100 ft. of sinking has been let, and the incline is down 100 ft. The expectation is to run into sulphides, in which case the ore could be concentrated. The Silurian limestone shows under the Weber grits in places 100 ft. thick. Yarmony peak is basalt. This volcanic outburst is probably responsible for the thermal waters which have painted the rocks with the bright colors of the "carbonate of hope" and "oxide of expectation."

On May 27, about 450 men at the Globe plant of the American Smelting and Refining Company struck for an increase of 30c. per day in wages. A committee met with General Manager Guiterman, who told them that such an advance was out of the question with smelteries running at half capacity, owing to the lack of ore supply, but he offered to submit to the board of directors of the company a recommendation to restore the scale of wages in effect prior to the fall of 1907. The men are now conferring over this proposal, and it is likely the matter will be settled in this way. The strike has been perfectly orderly and quiet.

Butte

June 5—At the recent special meeting of stockholders of the Alice Gold and Silver Mining Company held at Salt Lake, a protest was entered by the minority stockholders against the sale of all the company's property to the Anaconda Copper Mining Company, but the sale was nevertheless carried by the majority. The protest is made upon two grounds; first, that the company has no power to make transfer over the objection of any stockholder, and second, that the 30,000 shares of Anaconda stock is not adequate consideration for the transfer. Referring to the inadequacy of consideration, the protest says: "The consideration is wholly inadequate and out of proportion to the value of the group of properties belonging to the Alice company, and the properties of the Anaconda company. The number of shares of the Alice Gold and Silver Mining Company is 400,000 and of the Anaconda company, 4,200,000 shares. The ores disclosed in the workings of the Alice company at this particular time probably show as great or greater obtainable values than at any time in its history. It is well known that there are enormous bodies of zinc ore above the water, that is, above the 700-ft. level, which, as shown by a number of carloads recently extracted for test, contained 17 per cent zinc, 5 to 10 per cent. lead, about 10 oz. silver, and from $2 to $3 gold, and a much greater tonnage of ores of like character below the 700-ft. level to the lowest workings, 1500-ft. deep, carefully estimated in the aggregate at more than 2,000,000 tons." The protest ends with the suggestion that a $500,000 bond issue be authorized to build a mill for the treatment of the company ores, which it is claimed would be more profitable than making the proposed sale.

The stockholders of the Parrot Silver and Copper Mining Company, who voted against the sale of the property to the Anaconda company, have instituted action in the local district court to have the valuation of their shares determined and that amount paid to them by the company. The petitioners are Louis Foss, 200 shares; B. Herber Richardson, 1125 shares; William E. Wall, 1000 shares; Mary G. Knight, 225 shares; Henry B. Jackson, 800 shares; and Isaac Bradford, 150 shares.

The assurance of a railway through the district has caused the Silver Camp district in Cascade county to take on a new lease of life. Patsy Clark and others have taken an option on the Mike Horse company properties. It is planned to put a concentrator on the property. At the Anaconda mine of the Dick Kruger company, exploration work with diamond drills is being pushed. Wells & Murphy are working the Montgomery group which carries gold, silver and lead. With another 30 ft. the tunnel will cut the orebodies from the upper workings. The Midnight Copper Company has driven the lower tunnel on its property about 600 ft., and should tap the orebodies in another 100 ft. When this has been done a concentrator will be erected.

John D. Ryan, writing to the Butte Business Men's Association, says: "The mines of Butte are better developed, more economically worked, and considering the returns from the sale of the metal, more profitable than they have been at any time in the history of the district. The purchase of other companies by Anaconda will insure stability, permanence and economical operation and will mean extension of operations and the steady employment of labor. The price of copper is low at present, but consumption the world over is greater than ever before and there is demand for all that is being produced. The average cost of copper in Butte is low enough to enable the district to maintain its position as the leading copper-producing district of the world. I can say that mining operations will increase rather than diminish during many years to come."

The Gilmore & Pittsburg railway, concerning which there has been considerable mystery, has recently filed with the secretary of state its resolution of directors stating that the intention is to build from Salmon City, Idaho, to Armstead, Mont., then to Dillon, Mont., and from there to Butte. The fact that considerable work is being done on the Great Northern between Great Falls and Butte in the way of improving the roadbed and track, gives rise to the rumor that James J. Hill is behind the Gilmore & Pittsburg and that he is constructing a new north and south line which will run into San Francisco.

The Government land office has finally decided the contest which the Government instituted against the British-Butte company application for patent to placer claims west of Butte. The company was successful on every point and will obtain patent. This marks the end of a long drawn out contest between the local Government land officials and the company. When the company first applied for patent the local officials took the position that the requisite amount of work had not been done on the claims, refusing to allow the 600-ft. shaft on the property to apply as work toward a placer patent. Government experts were then sent to examine the ground and they decided that the ground was chiefly valuable for quartz and not placer mining, so they objected upon that ground also. Considerable feeling has been aroused against the local officials because of the position which they have taken toward this and other applications for patent to mining land in the vicinity of Rocker, five miles west of Butte. If an application be sought for placer patent, the officials seem invariably to consider the ground as quartz and *vice versa.*

Salt Lake City

June 5—The Utah Mines Coalition Company filed suit in the district court, May 27, against the City Rocks Mining Company, to recover damages of $1,500,000 for ore alleged to have been wrongfully taken from the plaintiff's property between Big and Little Cottonwood cañons by the defendant company. It is alleged that the City Rocks company has trespassed upon the Black Bess, Oregon, Oregon No. 2, Stanley and Butte mining claims owned by the Utah Coalition company, and has taken ore from that property, valued at $500,000. Treble damages are asked for the taking of the ore, and the court has also been asked to issue an order permitting the plaintiff company to make a survey of the underground workings of the City Rocks property.

By the order of the Secretary of the Interior, 8620 acres of land along the Price river have been withdrawn from entry for power-site purposes. Approximately 24,152 acres of land on the Sevier river have been restored to entry. These lands were included in temporary power-site withdrawal No. 103, and are situated in Juab, Millard and Sanpete counties.

During the week of June 2, a large tonnage has been handled from the camp of Bingham. On May 23 the Denver & Rio Grande Railroad moved 217 cars of ore for the Utah Copper Company in ten hours. From May 23, 7 a.m. to May 24, 7 a.m., 378 cars of ore were loaded and sent out by the Utah Copper, and in addition 24 cars of ore from the United States Mining Company and the Utah Consolidated company, making a total of 402 cars for 24 hours. Taking each car as 55 tons, this would make over 22,000 tons of ore sent out of Bingham in one day. The tonnage was handled over the single line of the Denver & Rio Grande.

Goldfield

June 4—At the meeting of the directors of the Goldfield Consolidated, May 26, the usual quarterly dividend of 30c. per share and a special dividend of 20c. were declared. The disbursement will be made July 31, to stockholders of record June 30, and will amount to $1,779,549. When this dividend is paid the Consolidated will have paid in dividends in 1910 $5,338,647, of which $3,559,098 were posted in 1910, the first dividend of $1,779,549 having been declared in December, 1909. At the meeting were president George Wingfield, A. H. Howe, of Goldfield, J. H. Carstairs, of Philadelphia, and J. D. Hubbard, of Chicago.

Word has been received from C. R. Zabriskie, connected with the "Borax" Smith enterprises, to the effect that he has floated the $5,000,000 bond issue required for the construction of the railroad from Goldfield to Ely, and that construction will start this summer. The road will go through rich mining country where there are low-grade gold, silver and lead mines, which, with transportation facilities will be able to ship. It is understood that the road will connect with the Western Pacific near Shafter, Utah, and with the Tonopah & Tidewater at Cuprite, 14 miles south of Goldfield. This would give the Western Pacific a transcontinental line direct to Los Angeles.

A deal will be consummated soon by which Philadelphia men will take over 12 claims in the Cirac mining district, 40 miles north of Tonopah. Three years ago several hundred tons of high-grade ore were shipped from the camp and the purchasers expect systematic development to produce results.

Deadwood, S. Dak.

June 5—The Homestake company continues to operate its mine and mills successfully with exclusively non-union labor. The entire plant has now been run at full capacity for over three months, during which time three of the usual 50-c. monthly dividends were paid.

In spite of the defeat of the union in its attempt to force the closed-shop principle upon the Black Hills, resulting in the exclusion of union labor from this district, the local organ continues to publish misstatements, evidently for the consumption of such outside unions as are contributing to its funds. Agents have attempted to dissuade miners in other fields from coming to the Black Hills. Their want of success is evident from the number of new men already here, and the number continuing to arrive from Michigan, Colorado, and the Missouri-Kansas field, a large proportion bringing their families. Some of the more absurd reports circulated were to the effect that the mills were run at a drop much smaller than the normal one, or that only a fraction of the stamps were dropping, and that the ore-trains were made up largely of empty cars, to correspond with the limited amount of ore which the imported non-unionists were able to break and shovel as compared with the men formerly employed, and that the dismembered bodies of men killed in unmentioned accidents were conveyed in sacks at night to the cemeteries.

The firm stand taken by the city judges in punishing breaches of the peace, the employment at the inception of trouble of a sufficient number of armed guards to protect Homestake property, and the instalment of a searchlight at the Ellison hoist, have combined to make the situation at Lead a comparatively peaceful one. There have, however, been several instances of individual employees being set upon and beaten by union men. The placing of dynamite in the chuck of a drill, and the nailing down of a signal cord in the mine, are evidence that the union has had some spies in the mine, as was openly boasted.

On May 24 an explosion of about 1400 lb. of dynamite occurred in the magazine of the Sunnyside mine near Terry, belonging to the Mogul company. Circumstances indicate that this was the work of union sympathizers. This impression is confirmed by recent attempts to set fire to the Homestake cyanide plant at Blacktail, by throwing bottles containing phosphorus.

The great majority of the employees are now English speaking. This applies to those who have renounced the union as well as to the new-comers, as few Italians or Slavonians have signed the company card, most of them being deterred through intimidation. The Finns and Scandinavians are divided. The number of union men holding out in the camp is now much diminished, as many left Lead immediately after the spring elections, at which they had hoped to capture the offices of mayor and judge.

A local paper recently published a statement that the Homestake company was about to increase its present mill capacity, already including 1000 stamps, by the addition of 400 stamps and a corresponding enlargement of the slime plant at Deadwood. This is denied by the management. A small addition to the slime plant has been under way for several months.

At Cyanide Plant No. 1 at Lead, steam power has now been entirely replaced by electricity, which is next to be extended to Plant No. 2 at Blacktail. Current is purchased from the Consolidated Light and Power Company. Work is proceeding steadily at the Homestake hydroelectric plant on Spearfish creek, and was contained without interruption throughout the labor troubles.

Birmingham, Ala.

June 6—The American Steel and Wire Company has let the contracts for the concrete work and superstructure for the plant to be erected near Ensley, and by June, 1911, it is expected that the plant will be in operation. Tracks have been laid to the site.

The Southern Iron and Steel Company expects to have all of the machinery at its new steel rod, wire and nail mills at Alabama City, in operation before another month. Already there is a satisfactory output of wire fencing, rod, wire and nails, and a strong demand is being met for the products.

The Alabama Fuel and Iron Company has increased its capital from $2,500,000 to $3,500,000 and has purchased extensive iron-ore properties, taking over the properties of the Russellville Iron Ore and Metal Company. The company heretofore has been in the coal-mining business. Recent developments indicate that iron making will be added.

The North Birmingham Turnbuckle and Drop Forge Company, which recently started up a plant at North Birmingham, announces that its make for two months has been sold ahead. The plant may be enlarged.

The coming into Birmingham on its own rails of the Atlanta, Birmingham & Atlantic railroad, the new line from Birmingham to Brunswick, Ga., 500 miles, means much for the industrial section of Alabama. The railroad company is interested in the Birmingham Coal and Iron Company.

Scranton, Penn.

June 8—The miners who are on strike at the Pennsylvania Coal Company collieries will return to work during the week; the officials of the company, the members of the Conciliation Board and the officers of the United Mine Workers acting in coöperation brought the men on strike to a realization of their false position. President McEnaney, of the miners' union, has declared that if the men do not return to work under the provisional arrangements which the company is offering to them spontaneously, that the union will leave them to their own resources. On the other hand, Captain W. A. May, general manager of the company; W. W. Inglis, general superintendent, and President W. W. Connell, of the Conciliation Board, declare that as soon as the men return to work a special meeting of the board will be called to examine and settle grievances as quickly as possible.

The majority of the miners employed by the company are foreigners, most of them Italians, the most intractable of the nationalities employed in the anthracite mines. They cannot be brought to understand that the award of the Anthracite Commission applies to union and nonunion men alike. President McEnaney's declaration had a sobering effect on the men's attitude toward the company, and they finally agreed to leave the settlement to the Conciliation Board.

During the course of the strike there have been a few outrages perpetrated by the strikers, but they were not serious in their results.

Cobalt

June 2—An important discovery of native silver on the Devine properties at Maple mountain has drawn attention to this district. This section has never been visited by a boom, but operations are being carried on in a systematic manner, and during the last few months several good finds have been made. Maple mountain has only shipped six tons of ore, but the indications for a permanent camp are stated by some to be favorable.

The new plant for the sampling of both high- and low-grade Cobalt ores will shortly be in operation. The plant has a capacity of 30 tons per day.

During May, 18 Cobalt mines shipped 4,536,097 lb. The output for the first five months of 1910 is 60 tons less than the shipments for the corresponding period of 1909. The value of the ore is, however, much greater, on account of the larger number of concentrators now in operation. Besides this, approximately $60,000 worth of fine bullion was shipped from the cyanide plants of the O'Brien and Buffalo, which does not figure in the above shipments.

Toronto

June 6—The Canadian Government has appointed a royal commission on industrial training and technical education consisting of the following members: Prof. James W. Robertson, of Montreal, chairman; Hon. John N. Armstrong, North Sydney, N. S.; Dr. George Bryce, Winnipeg; Gaspard Deserres, Montreal; Gilbert M. Murray, Toronto, representing the Canadian Manufacturers' Association, and James Simpson, Toronto, representing the Dominion Labor Congress. Thomas Bengough, of Toronto will be secretary and reporter. The commission will begin its duties in July and after a tour of investigation throughout Canada will visit the United States, Great Britain, France, Germany and perhaps other European countries.

Official returns show that notwithstanding new discoveries the annual yield of petroleum in Canada is steadily decreasing. The Government pays a bounty of 1½c. per gal. The payments for last fiscal year ended March 31 were $203,588 as compared with $260,698 for 1909.

A merger has been arranged embracing several iron and steel companies, principally in western Ontario, and a charter applied for for the Canadian Steel Corporation, capital $25,000,000, with headquarters at Hamilton, Ont. The companies included are the Hamilton Steel and Iron Company, Canada Screw Company, of Hamilton, Nut and Bolt Company, Toronto, with branches at Brandford and Gananoque, and the Montreal Rolling Mills Company. A committee of four representing the companies are at work on the details. The project includes extensions to the plant of the Hamilton Steel and Iron works, comprising an additional blast furnace and the installation of a steel rod mill involving an expenditure of $1,500,000.

Mexico City

June 5—Unusual activity continues in the Altar placer fields. An evidence of this is in the figures obtained from the government offices at Hermosillo and Altar, which show that during April more denouncements were made in the Altar district than in all the other districts of Mexico. Most of these are denounced in the name of Luis Serrano, representative of the Banco de Sonora at Altar.

The building of the Pearson road, connecting Madera and Terrazas, in Chihuahua, with possible branches into Sonora, is stimulating mining along the route. The Tigre district is considering an outlet east from the Tigre district to Casas Grandes, which would give much cheaper rates into El Paso. It is reported that Charles Seawell, of Chihuahua, has obtained a concession to build a railroad into the Guaynopa district, and that a smeltery will be erected at the mines.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

The spring cleanup of gold for the Nome district is estimated at $1,175,000. The spring output of the Innoko and Haiditarod districts combined is estimated at $1,250,000.

Joe F. Plien, an Otter Creek operator, is building a dredge having a capacity of 2000 yd. per day. James Flodine will place a dredge on Arctic creek, a tributary of Cripple river, 18 miles from Nome. O. Silverton and A. Johnson will place a dredge on the Solomon river, on a claim adjoining the one which they have been working. Frank H. Waskey is building a dredge to be placed on Iron creek, in the Kougarok district, 55 miles from the coast. The latter three dredges will each have a capacity of 1500 cu.yd. per day and will be in operation by the middle of the summer.

Wanowky—Much development will be done this season on these gold mines, Seward district, by Watson & Snow.

North Star—This company has been incorporated at Cordova, and will start development on claims in the Abercrombie cañon on the railroad.

Cliff—The new mill is in operation. The result of an 18-day run is reported at $21,000. B. F. Millard, Valdez, is manager.

Alabama

JEFFERSON COUNTY

The red ore mine of the Schloss-Sheffield Steel and Iron Company, near Bessemer, which has been drowned for several months, has been unwatered and will resume at once.

Arizona

GILA COUNTY

Inspiration—Two drills are sinking on the Colorado claim, where a two-compartment prospect shaft is being put down. One of these holes has struck ore and the other is in the capping, which in this locality is 500 ft. thick. Thus far the orebody has been shown to extend over 2500 ft. west of the Joe Bush shaft and about 600 ft. east of it, making the length of the proved ore belt fully 3100 ft On the north edge is the Scorpion shaft. The orebody is thickest along the contact of the granite with the schist. The extraction tunnel in Keystone gulch, 500 ft. southwest of the Joe Bush shaft, has been driven 650 ft..

Old Dominion—The company is doing the bulk of its development work on the United Globe property, lying east and north of the main workings.

Dixon Copper Company—A two-months option on this property, 10 miles west of Globe, has been taken by John O'Keefe, of El Paso, for Pittsburg interests.

Pinal Mountain—This property, 8 miles south of Globe, has developed copper-gold ore. H. H. Harvey is in charge.

Arizona Commercial—The company will undertake an extensive drill exploration of the Black Hawk lode from the 700-ft. level. The adjoining Superior & Boston encountered ore on the Black Hawk lode at 1000 feet.

Live Oak—Drill hole No. 4, 600 ft. southwest of the vertical shaft, encountered chalcocite at 355 ft. and proved the orebody to be 90 ft. thick at that place. Hole No. 3 encountered ore at 320 ft. from the surface and passed through a body averaging 2½ per cent. copper for 130 ft. Drift No. 208, driven eastward on the 200-ft. level, has passed continuously through chalcocite ore averaging from 2 to 2½ per cent. copper for 200 feet.

National Mining Exploration—Drifting westward for 100 ft. on the stringer of ore cut on the 660-ft. level has shown the vein to have a width of 30 inches.

Warrior—The drill hole on the Winnie claim, near the line of the Inspiration, is 330 ft. deep. At this depth, gray schist, containing pyrite, has been encountered. From the stopes on the 250- and 300-ft. levels of the mine, 75 tons is extracted daily for shipment.

YAVAPAI COUNTY

Hillside Consolidated—The company is developing at Cherry. A small mill is in commission. M. M. Green is manager.

Arkansas & Arizona—The company operating in the Jerome district is installing pumps and machinery preparatory to sinking from 600 ft. to 2000 feet.

California

BUTTE COUNTY

George Strange—J. F. Lynch and R. A. Gruss have taken a bond on the property at Oregon City, where rich float has been found. Prospecting will be done.

INYO COUNTY

Buckeye—The capacity of the mill is 300 tons daily. The electric road from the mine to the mill is completed. Mill buildings and power house are erected and machinery in place. Work is being done on the water-flume.

MARIPOSA COUNTY

Number Five—At this property near Hornitos, Martin Sutherland, superintendent, arrangements are being made to install machinery including a mill.

Exchequer—The directors have ordered E. S. O'Brien, manager, to raise the dam across the Merced river 15 feet higher and to begin the installation of machinery at the power house.

MODOC COUNTY

Fort Bidwell Consolidated—The largest transaction yet occurring in Hoag district was the recent transfer of 400,000 shares in this company to A. J. Cummings, of Detroit, Mich. A number of needed improvements will be made.

MONO COUNTY

Standard Consolidated—This company has been listed on the New York Curb. It owns the Bodie Consolidated, Bulwer, Mono and other mines at Bodie.

NEVADA COUNTY

Oro Grande—This mine at Steep Hollow, 15 miles north of Grass Valley, will be opened by Hugh Craney and associates.

PLUMAS COUNTY

Dr. C. L. Burt has bought from Butterfield and Gobert the placer and quartz mines on Squirrel creek east of Quincy. The deal covers 400 acres of mining ground, including several rich small veins. Doctor Burt will develop the properties.

SAN LUIS OBISPO COMPANY

La Cuesta—This company has found its two-stamp mill too small and has ordered a 10-stamp mill.

SHASTA COUNTY

Several new stamp mills are being built in the Whiskytown district and new orebodies have been discovered.

Cave Creek—This company, owning the McClure group, is developing systematically.

Little Nellie—This property, near the Iron Mountain, will ship 100 tons daily to Martinez.

Evening Star—At this mine, Old Diggings district, new machinery is being installed.

Carnegie—Work has been resumed on this group, four miles from the Mammoth, formerly the Clipper.

First National Copper—The company has 5500 stockholders. All but 4000 out of the 600,000 shares have paid the assessment. The company reports a working capital of $600,000 with no debt, and ore reserves of 1,800,000 tons.

Mad Ox—This mine near Stella has been leased to Mr. Lindboom, of Berkeley, who has started work.

Evening Star—Since this mine at Old Diggings, George Bayha superintendent, installed its machinery, it has shipped two carloads of ore daily to Kennett.

SIERRA COUNTY

Reese Ravine—The management intends to extend the tunnel on the Sebastopol side into the main ridge to tap the channel.

Ramshorn—S. Arnold has made first payment on this group to William Penman, of Goodyear Bar, and the ground is being prospected by tunnels.

Omega—Financial returns from this mine at Forest not having been satisfactory, F. W. Rohrer, of Berkeley, a large stockholder, has taken this in hand with a view to making improvements. The main tunnel will be driven and lateral gangways extended so more gravel may be extracted and a new tunnel will be started in a few days to tap the main body of gravel within 300 feet.

TRINITY COUNTY

Jewel Creek—Much gold has lately been taken out of this creek cañon near Minersville and the ground in the vicinity has been staked out and is being prospected.

TUOLUMNE COUNTY

Goldship—These mines, near Groveland, have resumed under charge of John D. Martini.

Chileno—This mine at Tuttletown, has been bonded to Frank L. Mitchell, of San Francisco, and active operations will be commenced.

Colorado

LAKE COUNTY—LEADVILLE

A. Y. & Minnie—The rebuilding of the the surface plant of this mine, recently destroyed by fire, is progressing rapidly and by late summer operations may be resumed.

Lovejoy—Good ore is being taken out of the tunnel being driven to intersect the Lillian gold oreshoot.

Evelyn and Castle View—These Carbonate hill mines have maintained a steady production during the past winter under the Nicholson lease. The Waterloo, Morning Star, Evening Star and Catalpa have also aided in sustaining the reputation of Carbonate hill for productiveness.

Ibex—Eighteen 75-lb. sacks of gold ore, estimated to yield 600 oz per ton, have been shipped recently by Brown Brothers, lessees.

St. Louis—The rich gold streak has been proved to extend down to the third level, where it has been encountered recently, the vein at that depth being 5 ft. wide.

SAN JUAN DISTRICT

Yukon—This property, comprising 560 acres on Boulder mountain, has been started, under lease to W. B. Lowe. The development to date, 2500 ft. in the Yukon tunnel and 1400 ft. in the Lamont tunnel, and drifts and upraises, has been by hand work. Fifteen veins have been cut, ranging from 3 to 35 ft.

Gold Nugget—This group in Maggie gulch has encountered high-grade sulphide ore.

TELLER COUNTY—CRIPPLE CREEK

The output of the Cripple Creek district for May was 57,105 tons, having a bullion value of $1,349,502, or an average of $23.63 per ton, being 60c. per ton higher than the average for April. All the plants, except the Golden Cycle, report an increase in the tonnage treated over April, but it is generally understood that this latter plant bedded for future treatment a considerable portion of the ore shipped to it in May, thus making its decrease only apparent.

The deep drainage tunnel was advanced 393 ft. in May, making the total distance driven 13,611 ft., and carrying the breast to within 873 ft. of the El Paso shaft. About 100 gal. of water per minute is flowing through the tunnel.

Stratton's Independence—Results for April: Production, 2190 tons, averaging $22.66 per ton; dump ore milled, 6400 tons; net working profit to the company at mine and mill departments, $12,270.

Acacia—Lessees working through the Wrockloff shaft, at the north end of the Burns claim, have disclosed a new orebody, from which 50 tons of $20 ore have been broken in drifting on the vein. The Acacia company received over $600 in royalties in May from leasers.

Strong—Two cars of ore, estimated to carry 5 oz. gold per ton, were shipped from this property last week, the ore coming from a 4-ft. vein in the lower workings. The output from this mine is about 40 cars per month of ore, yielding from 2 to 16 oz. per ton.

El Paso Consolidated—A. L. Burris, president, has purchased the 75,000 shares held by George Bernard. A new orebody in the mine at the 300-ft. level is said to be running $100 per ton. The May production of this property amounted to 2750 tons.

Vindicator—This mine has discovered rich ore at the 1400-ft. level. The width of the vein is 7 ft. It is said that the Golden Cycle mine, adjoining, is also getting its richest ore at about the same depth.

C. O. D.—This old-time producer, in Poverty gulch, has started up under lease to the Frank Thomas Leasing Company.

Home Fraction—Lessees operating on this property on Gold hill, formerly belonging to the Temomj company, but now owned by the Stratton Estate, sent out the initial shipment last week. The ore came from 250 ft., is highly oxidized, and carries from $25 to $35 per ton.

Idaho

CŒUR D'ALENE DISTRICT

Stewart—The indebtedness of the company is reported at $40,000 and the production is $35,000 per month. The company is grading for the compressor, and a station is being cut for a shaft.

Jack Waite—This lead-silver mine will start shipments soon as the wagon road is finished.

Roanoke—This property, which includes the Sherman mine, is being developed by B. M. Francis, who has contracted to sink a 300-ft. winze on the ore and drift on the vein.

Indiana

CLAY COUNTY

Every mine in the district is working full force and full time. Any good miner can earn $25 a week. The cause of this activity is the strike of the Illinois miners. Illinois operators who hold coal lands in this field are preparing to sink shafts. The O'Gara Coal Company is putting down two block-coal mines south of Staunton. The Vandalia Coal Company will also commence work in a few days to sink two shafts in the same district, while between the two the Collins Coal Company will put down a shaft near Centerpoint. The Crawford Coal Company is opening a new shaft, as is also the Schripfarman Coal Company, just south of Brazil. Other companies will put down shafts this summer.

VIGO COUNTY

Mining bituminous coal without the use of explosives, doing away with the possibility of danger from such cause and greatly facilitating the work, has been given a thorough demonstration in mine No. 4 of the Deep Vein Mining Company, near Terre Haute. The demonstration was conducted by Dr. Henry M. Payne, of New York, and was successful in every respect. The machine, known as a hydraulic mining cartridge, is of simple construction and operates on the same principle as does a hydraulic-pressure jack. It is a cylinder of forged steel, 21 in. long and 3 in. in diameter and having eight duplex rams or pistons arranged in a row along one side. Water is forced through the cylinder by means of a high-pressure screw, which forces the rams or pistons out from the cylinder, thus dislodging the coal without the danger from blasts and falling shale roofs. The preparation for the work is the same as when preparing to fire a shot. The coal is undercut and a hole is drilled for a blast. The machine is injected in the hole and by use of a high-pressure hydraulic screw the coal is dislodged with despatch. In two attempts made, 52 tons of coal were dislodged within 30 min. and the miners began loading the coal immediately, whereas they are usually forced to wait 24 hours or until the mine is cleared of dangerous gases and powder fumes after each blast.

Montana

BUTTE DISTRICT

Butte & Superior—Superintendent Atwater expresses the belief that the new concentrating mill will be in operation in two months, at which time the company will increase its output to 450 tons per day, the ore for treatment being divided between the new concentrator and the Basin. It is reported not improbable that advantage will be taken of the offer of the Clark interests to treat some of the ore.

East Butte—The company has filed its annual statement as follows: Paid up capital $2,750,000; assets $6,149,812 and liabilities $149,812.

Butte & Ballaklava—The report is that the directors will declare a dividend within a short time. The company has been shipping to the Pittsmont smeltery regularly since March and is now mining between 100 and 200 tons daily.

GRANITE COUNTY

In the Georgetown district interest seems to be centered in situation of the Southern Cross mine. It has been known that the United States Smelting, Refining and Mining Company has had an option on the property but for what length of time, or at what figure is not made public. The rumors alternate between the consummation of the sale and a report that all negotiations are off. The officers of the Southern Cross company refuse to give out a statement. Martin & Newkirk are working the Venezuela mine which adjoins the Southern Cross and are mining $75 ore from a 7-ft. vein, recently cut. The incline shaft is down 75 ft. Hugh McFadden is working the Montana mine under lease. The lead at the surface is 50 ft. wide and at the 40- and 100-ft. levels shows the same width. Ernest & Benson are leasing on the Revenue and indications in the tunnel are good.

LEWIS & CLARK COUNTY

Empire—An Eastern syndicate has secured a lease on the mine, near Marysville and operations will shortly be begun under the direction of J. S. C. Wells. The mine was originally worked for gold but at depth the values turned to copper, silver and lead. A 50-stamp mill and a 500-ton cyanide plant are on the property.

LINCOLN COUNTY

The Shaughenessy group, eight miles south of Libby, has been operated under lease by Town & McCorkle since February. The lower tunnel strikes the lead at 145 ft.; drifts have been run both ways. A shipment will soon be made. On what is known locally as the "Big Dike" south of Libby much work is being done. Hartz, Bockman, Blew & Campeau have recently let a contract for 200 ft. of tunnel on their claim, on the "Dike." The Bluebird Mining Company has also had a force at work on its claims under the direction of Henry Brink. The Crackerjack Mining Company has recently put men to work on its Vaughan and Greenwell placers, south of Libby, under the direction of Henry E. Kuphal and B. J. Lamey.

MISSOULA COUNTY

Black Bear—This property is being developed and a reduction plant will be installed. Albert Reeves, of Salem, is manager.

SANDERS COUNTY

French Bar—The company owns the Golden Messenger, Faith, Little Dandy and Iron Quartz claims, near York. On the Golden Messenger, work on the new tunnel level was started in February. At 125 ft. south of the incline shaft, an east and west cross vein was encountered which has been drifted on 400 feet.

Nevada

ESMERALDA COUNTY

Florence—The statement filed with the bullion tax collector for the first quarter of 1910 shows 10,516 tons mined, with a gross yield of $137,162. Cost of extraction was $71,016; reduction $39,844; smelting and sampling $14,524. Net profits $11,779.

Combination Fraction—A large orebody is being developed north of the main shaft near Mohawk ground, at 500 ft. The mill is almost ready.

Atlanta—J. A. Houlahan, of the Boom lease is installing a 25-h.p. hoist preparatory to more development on the 400-ft. level. There are now seven leasers actively at work on the Atlanta estate.

Merger—A second lot of 30 tons is ready for shipment by the Ford lease operators.

Goldfield Consolidated—J. W. Hutchinson, mill superintendent, is in New York securing data on the refining of bullion. It is planned to enlarge the refinery to over double its present capacity. Returns show that during May, 19,800 tons of ore were milled, dropping only 70 stamps, with a 95-per cent. extraction. Twenty of the new mortars for the mill are now on the ground.

LINCOLN COUNTY

New York-Search Light—A 20-stamp mill will be built on the property. This follows the inspection of the property.

Prince Consolidated—The company has purchased the last one-fourth interest in the Davidson and California lode claims.

NYE COUNTY

Tonopah ore shipments for week ended May 29 are: Tonopah 3350 tons; Montana-Tonopah 1005; Tonopah Extension, 800; West End, 160; Midway, 50; total 6865 tons.

Tonopah—The diamond drill from the 1500-ft. station has proved lode porphyry at 2200 ft. after penetrating about 1500 ft. of rhyolite. Bullion shipments consisted of 74 bars valued at $65,000. An average extraction of 92 per cent. was recorded.

Tonopah-Belmont—The mill, after six months of idleness, is dropping 60 stamps, crushing 200 tons.

Tonopah Extension—Coarser screens have been installed at the batteries, increasing the capacity about 10 per cent. Bullion amounting to $14,000 resulted from cleanup for first half of May.

Bonnie Clare—The mines in the Gold mountain district are being opened up in anticipation of the completion of the railroad to the mill which should be in operation by July 15.

Pioneer—Fifty tons from the old lease dumps are being shipped daily to the Mayflower mill.

Montgomery Mountain—Samuel Newhouse, M. M. Johnson and H. E. Perry, of the reorganization committee have extended the time for subscribing stock in the new company until June 15.

WHITE PINE COUNTY

Nevada Consolidated—During May, the company treated approximately 238,000 dry tons. The grade was a little over 2 per cent. On the Sunset claim, four or five drill holes have been put down. Owing to the capping, this ore is not adapted to steam-shovel mining.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—The report for the 10 months of the fiscal year from July 1 to April 30 shows: Receipts, $28,255,903; expenses, $27,176,005; net earnings, $1,079,898. As compared with last year, this shows decreases of $2,036,869 in gross and $602,899 in net earnings.

BITUMINOUS COAL

Monongahela River Consolidated Coal and Coke Company—The report for the six months of the fiscal year from Nov.

1 to April 30 shows net earnings from operation of $775.036. Charges were for coal royalty, $221.531; depreciation of plant, $208.581; taxes, insurance and interest, $435.765; total, $865.877, leaving a deficit of $90.791. Net earnings decreased $203.413, notwithstanding an increase in coal mined; while the deficit compares with a surplus of $119.296 last year.

South Dakota

Minnesota—This mine has again commenced operations and is the only property in the district which is working under the former "open-shop" system.

Mogul and Golden Reward—These mines, near Terry, with mills near Deadwood, recommenced operations some time later than the Homestake and are also working continuously with nonunion labor.

Utah

Carbon County

Pittsburg-Salt Lake Oil Company—This company owns 480 acres of asphaltum land near Sunnyside. The country rock consists of interbedded sandstones and shale, some of the sandstone beds being more or less impregnated with hydrocarbons. This is a good grade of asphaltum, and in places constitutes up to about 10 per cent. of the rock. Plans are being made to develop the deposit, and produce asphaltum for paving.

Juab County

The Tintic ore shipments for the week ended May 27 are: Gold Chain, 2 cars; Undine, 1; Yankee, 1; Ridge & Valley, 3; Iron King, 6; Scranton, 2; Colorado, 9; Sioux Consolidated, 14; Dragon Iron, 33; Iron Blossom, 22; May Day, 2; Uncle Sam, 6; Eagle & Blue Bell, 3; Gemini, 4; Chief Consolidated, 2; Bullion Beck, 2; Centennial-Eureka, 28; Grand Central, 8; Victoria, 2; Lower Mammoth, 3; Mammoth, 1; Opohongo, 3; total, 157 cars.

Salt Lake County

The largest trestle on the Tintic branch of the Denver & Rio Grande was partially burned May 24. The Salt Lake road has put on two extra freight trains from the Tintic district to handle the ore while repairs are being made.

Columbus Consolidated—Three shifts per day are worked in the mill, and 20 tons of concentrates produced which net around $20 per ton. On the 400-ft. level, a strike of 1 ft. of ore running $50 in copper, gold, silver and lead has been announced. The company is following it to the contact.

Prince of Wales—Ore carrying galena has been uncovered at the surface near the old workings of the mine at Alta. The strike is reported to be about 6 ft. wide, and has been uncovered for 30 feet.

Revall—A contract has been given for driving the main tunnel 200 ft., which will give it a total length of 1000 ft. This is expected to take it into the beds in which the Cardiff company has opened ore.

Lower Mammoth—The draft on the 2000-ft. level is being continued south to the contact. A winze is being sunk in ore below the 2000 level. The winze was started on one of the walls of the high-grade ore encountered a few weeks ago. Shipments are being made from development on this level together with ore from between the 1700 and 1800. On the 2100-ft. level ore carrying more gold than usual has been opened.

Opohongo—From three to four carloads of ore are being shipped a week, a greater part of which is being mined on the 400 level. The company is working 28 men. No merger is pending between the Opohongo and Gold Chain as has been reported, though the companies have an operating agreement.

Iron Hat—The claims of the Three Metals Mining Company in East Tintic have been acquired by this company.

Carisa—Between 5 and 6 ft. of ore have been opened in a raise from the 500 level. Three feet of this shows galena and assays 32 per cent. lead and 40 oz. of silver. This ore is in unprospected territory.

Iron Blossom—Drifting is being done on the 600-ft. level to cut the gold vein opened by the workings on the 500. The copper vein has been followed from the 700- to the 1100-ft. level.

Governor—Operations will be started soon by this company in search of the gold vein of the Iron Blossom, developed to within a short distance of the northern boundary of the property.

Tintic Central—Three shifts are being worked in the shaft which is now at 800 feet.

Summit County

American Flag—Ore running well in gold, silver and lead is reported to have been opened on both the 500- and 1100-ft. levels.

New York Bonanza—In the face of the drift on the 800-ft. level, a fissure has been encountered 3½ ft. wide and filled in part with lead carbonate. The strike is southeast of the shaft in ground not developed by the upper levels.

Tooele County

Dry Cañon—The first shipment from the old Kearsarge mine in Dry cañon, recently taken under lease by this company, assayed: Gold, 0.14 oz.; silver, 32.1 oz.; lead, 20.3 per cent.; copper, 2.7 per cent.; iron, 12.4 per cent. Development was carried into new territory. The Kearsarge in former years produced extensively from one shoot.

Ibex Standard—A consolidation of the Ibex and Vindicator mine was ratified at a meeting of the stockholders in Mercur. The stock is to be increased from 125,000 to 500,000 shares, of a par value of 25c.; 175,000 shares will be used in payment for the Vindicator claims, the remaining 200,000 shares being treasury stock. A compressor will be installed and development started.

Washington

Ferry County

Republic—Arrangements have been made by Manager J. L. Harper, with the Tacoma smeltery, to increase the monthly ore-treatment contract from 2000 to 3000 tons for three years.

Pacific Ore Reduction—This company, E. R. Davidson, manager, has broken ground for a 100-ton custom cyanide mill at Republic. The schedule of charges ranges from $3 to $4.50 a ton.

Okanogan County

Jim Hill—Buildings are being erected and preparations made to start a tunnel. Machinery will be installed.

Wyoming

One million three hundred thousand acres in Wyoming have been withdrawn from coal entry, pending classification and valuation.

Canada

British Columbia

Slocan Star—Byron N. White, of Spokane, Wash., managing director, is at Sandon, arranging for resuming work on a large scale in the mine and mill, which have been tied up by litigation.

Whitewater—Concentration will be resumed at the mill. Exploration in the Whitewater Deep mine has been in progress throughout the winter. The Deep Mine, Ltd., working another part of the property, has let a contract for 150 ft. of raising from the lowest adit, driven in 1909 to 2000 ft., and has arranged for opening exploratory workings at the top of this incline raise. The old mine workings are 500 ft. above the deep-level tunnel.

Ontario

The shipments from Cobalt for the week ended May 27 are: Kerr Lake, 304,346 lb.; La Rose, 380,988; Crown Reserve, 148,315; Temiskaming, 80,000; Right of Way, 58,000; Chambers Ferland, 58,300; Trethewey, 56,300; Nipissing, 56,000; Buffalo, 57,780; Bonsall, (Gowganda), 20,080; total, 1,220,109 pounds.

Foster—Drilling at 400 and 500 ft. has given good indications.

King Edward—A new high-grade vein has been cut on the 70-ft. level.

Paymaster—This property has started work again.

Laguna—Work will be recommenced.

Coniagas—The first vein picked up on the third level in the conglomerate shows as high values as on the second.

Drummond—The extension of the Hargraves vein has been located and shows silver.

La Rose—Surface trenching at the Fisher-Eplett property has disclosed numerous veins with cobalt and silver.

Peterson Lake—The struggle for control was decided at the meeting, May 30, by the election of a new board of directors, including Sir Henry Pellatt, Major Murray, J. W. Scott, Col. A. M. Hay, and Hugh Blain. Only one of those elected, Vice-president J. W. Scott, was a member of the former board. A resolution was passed in favor of extending the leases.

Trethewey—The new vein at the 75-ft. level has been tapped again at 150 feet.

Union Pacific—A contract has been signed for sinking the shaft to 200 feet.

Temiskaming—The main shaft, down 450 ft., is being sunk to 500 ft., which will give the deepest working mine in Cobalt.

Bonsall—This Miller Lake mine has made an initial shipment of 10 tons to the Deloro smeltery.

McKay—This Gowganda property has cut the Morrison vein at the 100-ft. level.

Dominion Iron and Steel—The output for year ended May 31 was: Pig iron, 255,717 tons; steel ingots, 302,216; rails, 146,910; rods, 81,579. The output for May was: Pig iron, 22,585; steel ingots, 26,455; rails, 13,962; rods, 3975 tons.

QUEBEC

The recently discovered Graphite deposits at Amherst 90 miles northeast of Montreal are being equipped with a plant consisting of an 80-h.p. boiler, compressor and hoists. The vertical shaft has a depth of 50 ft. but will be sunk to 100 ft. The ore is a flaky ore of high grade, occurring in lens-shaped bodies and veins over 200 ft. wide in a pyroxene formation.

Dominion Gold Fields—This company, formerly the Beauce Gold Fields Syndicate, is pushing exploration on the Gilbert river, county of Beauce. Drills are at work on the right bank of the river on lot 9 and 10, and at 24 ft. an ancient river channel has been found, running parallel with the Gilbert. On the upper Des Meules creek tests have demonstrated that part of the ground which had been washed 20 years ago still contains coarse gold in paying quantities. A survey is in progress for a ditch from Mill river, 3 miles distant. It is proposed to exploit the alluvial deposits by means of an hydraulic elevator. H. N. Ball, is in charge.

Mexico

CHIHUAHUA

Año Nuevo—This company, successor to the Mary Mining Company, has completed a cyanide plant at Arechuyvo.

Sierra—The 20-stamp mill at El Salto, Ocampo, is operating. Robert Linton is in charge.

GUANAJUATO

San Cayetano—The capital of the company has been increased to $1,500,000. The Adolph Lewisohn interests, of New York, are in control.

SONORA

A petition has been filed with the Federal government by the Copper Queen Mining Company, asking for concessions to transmit electrical power from Douglas, Arizona, to the El Tigre, Roy, North Tigre, South Tigre and Cinco de Mayo mines. The locality is but 50 miles south of the border and no opposition to the project is expected.

Nacori Chico—These properties, which yielded some surface outcroppings rich in gold, and created considerable excitement three months ago, have been disappointing, and but little work is now in progress.

Mendorico—This company has relinquished its lease on the Mina Grande mine, Moctezuma district.

Carmen Consolidated—The long-contested suit between J. P. Casey and C. B. Bell, for one-half of the receipts from a sale of the company's stock, has been decided in favor of the plaintiff, Bell.

Ancient Gold—This company, owning the Reyes and Cura Morales mines, Ures district, has developed gold-silver ore in a 200-ft. tunnel. The erection of the 200-ton mill is planned.

El Temblor—Final payments have been made on this property by H. C. Carr and associates.

Pedrazzini—An incline shaft on the Mercedes, 15 miles south of the Chispas mine, has revealed ore averaging 15 per cent. lead, 25 per cent. zinc and 20 oz. silver. A site is being graded for a 100-ton mill, which will be speedily erected.

Creston de Cobre—Since the recent placing of a large pumping plant on this property, 30 miles west of Hermosillo, the work of crosscutting the veins has gone steadily forward. Work on a reduction plant will shortly be resumed.

Greene-Cananea—Experimental smoke tests are being made by this company, with a view of determining the loss through this channel, and to take steps to save a part.

Mazatan—This company, of Boston, offices at Hermosillo, has commenced, at the base of the west slope of the Rodirquez mountain, a tunnel to be used as a drain, a general transportation and prospecting tunnel for the mine. A contract is let to drive this tunnel 2000 ft. This company is sinking a shaft on its No. 2 property, and has struck shipping ore at the 150-ft. level. A steam hoist and concentrating plant are being shipped to the property.

Cerro de Plata—This company, of Lexington, Ky., operating 18 miles northwest of Imuris, is developing a large oreshoot. A 20-stamp mill and cyanide plant will be installed. Frank Strauk is superintendent.

Africa

RHODESIA

Gold production in April is reported at 54,237 oz., being 40 oz. less than in March. For the four months ended April 30, the total was 195,301 oz. in 1909, and 210,870 oz.—or $4,358,683—in 1910; an increase of 15,569 oz. Other production reported for the four months in 1910 included 76,340 oz. silver; 27 tons copper; 252 tons lead; 16,705 tons chrome ore; 15 tons asbestos. The coal production, all from the Wankie mines, was 54,720 tons. The number of men employed at the mines at the beginning of April was 34,855, of whom 1730 were white men and 33,125 negroes.

WEST AFRICA

Gold production of the Gold Coast and Ashanti in April was 16,363 oz., a decrease of 1264 oz. from March. For the four months ended April 30, the production was 88,897 oz. bullion in 1909, and 68,323 oz. in 1910; a decrease of 20,574 oz. The bullion reported this year was equal to $1,353,863, or 65,499 oz. fine gold.

Asia

KOREA

Oriental Consolidated—The May cleanup was $130,500.

Australia

QUEENSLAND

Gold production in Queensland in April is reported at 38,700 oz. This makes a total of 139,934 oz., or $2,892,436, for the four months ended April 30; an increase of 19,812 oz., or $409,514, over last year.

Central America

COSTA RICA

Montezuma Mines—The company assets have been sold at court sale, to Bancroft Smith, for $45,000. The liabilities were $76,127.

New Caledonia

The only exports of ore reported by the *Bulletin du Commerce*, of Noumea, in March were 7790 tons nickel ore. This makes the total exports of nickel ore from New Caledonia for the three months ended March 31, this year, 23,318 tons.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, June 8—In the East the bituminous-coal trade is quiet with some signs of improved demand, and with labor troubles generally adjusted. Car shortage is beginning to be a source of some complaint. The anthracite trade is quiet and uneventful.

In the West the situation is gradually adjusting itself as far as the Illinois line. In Ohio and Indiana there is some friction over local agreements, but no serious differences. In Illinois, however, the situation is serious. The southern districts, which seceded from the State association, are at work, but in the northern and central districts the strike is growing acute, and the local unions have taken the extreme step of calling out the engineers and pumpmen, which will seriously embarrass the operators. The latter continue firm in their position. In the Southwest no change is reported.

COAL TRAFFIC NOTES

The Department of Mines of West Virginia reports the production of coal in the State in 1909 as follows: Used in operating mines, 751,985; sold to local trade 380,430; used at coke ovens, 4,646,905; shipped from mines, 35,734,446; total, 41,513,766 long tons, an increase over 1908 of 2,326,756 tons. The coke made was 3,125,451 short tons, an increase of 2,326,756 tons over the previous year.

Coal tonnage reported by the Monongahela River Consolidated Coal and Coke Company, six months of fiscal year from Nov. 1 to April 30, short tons:

	1908-9.	1909-10.	Changes.
River coal...........	2,529,439	2,158,047	D. 371,392
Rail coal...........	339,695	1,017,061	I. 677,366
Total...............	2,869,134	3,175,108	I. 305,974

The decrease in river shipments was offset by a very large increase in rail shipments; the total gain being 10.7 per cent.

Shipments of anthracite in May are reported at 5,679,601 long tons, being 544,795 tons less than in April, but 615,788 tons more than in May, 1909. For the five months ended May 31 the shipments were 27,043,872 tons in 1909, and 27,416,625 in 1910; an increase of 372,753 tons, or 1.4 per cent., this year.

Shipments of anthracite by Lake from Buffalo for the season to May 31 were 926,870 tons, an increase of 445,025 tons over last year.

Coal tonnage originating on the Southern railway lines, three months ended March 31 [illegible]: Tennessee district, 332,192; Alabama district, 748,039; total, 1,080,231 short tons, an increase of 275,788 tons over last year.

New York

ANTHRACITE

June 8—There is about the usual business forward. Most collieries are running steadily, the only exception being the Erie Railroad mines where the foreign miners are on strike; and this trouble is today settled.

Schedule prices for domestic sizes are now $4.45 for broken and $4.70 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, $3@3.25; buckwheat, $2.20@2.50; No. 2 buckwheat or rice, $1.65@2; barely, $1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

BITUMINOUS

The seaboard soft-coal trade continues to look up a little so far as sales are concerned. New England is buying more, and New York harbor trade is better, though still irregular. Buyers show an obstinate preference for the lower-priced coals, apparently looking at cheapness rather than quality.

There is no change in quoted prices. Good Miller vein steam coal can be had at $2.65@2.70, f.o.b. New York harbor; and there is a range of 20c. below this and 25c. above for coals of lower or better quality. Gas coal is in good demand, but at low prices.

Car supply is still irregular and mines are complaining. Transportation is fair, but there are occasional delays in getting coal to tide.

In the coastwise-vessel market the demand for boats is still fully up to the supply; in fact, smaller boats are a little scarce. Owners hold to 70@75c. from New York to points around Cape Cod, and no charters can be had for less.

Birmingham

June 7—The coal demand in Alabama is improving. So far all deliveries are on time and up to contract. The operators assert that the contracts in hand call for a large quantity of coal but that there is sufficient time given for the delivery. Coal prices are not so strong. The larger consumers who buy at close figures have been in the market. Labor is needed in some parts of the coal-mining section.

The Mulga mine of the Birmingham Coal and Iron Company, where an explosion occurred on April 20, has resumed operations. Extensive repairs were made in the mine and additional improvements were put in to prevent every possibility of trouble. Sprinkling machines and electric-firing wires, so that all firing will be done after the men have left the mines, have been put in and other improvements made. The mines of the Palos Coal and Coke Company, where an explosion occurred on May 5, will not be ready for a resumption of operations for 30 or 40 days yet. Many improvements have been recommended by the State mine inspector at this place which must be put in before the resumption can take place.

Chicago

June 6—Larger sales are being made of Eastern coals, particularly to railroads, in default of any resumption of supplies from the Illinois mines, and the amount of such coal sold doubtless will continue to increase as the big consumers of steam coal come to the bottom of their storage piles. It will be, however, as it is now, buying in small lots, by most steam-coal users, for the man who has been accustomed to Western screenings at $1.40@2 does not fancy having to pay double that price or more for smokeless or Hocking. Nor does he fancy paying $2.25@2.50 for Indiana screenings as he has to do now. The market, however, must continue to use a large amount of coal, even with users economizing as much as possible. So the market for coals from east of Illinois is a large one.

Indiana and such Illinois coal as gets into market bring $2.50@2.60 for lump, $2.30@2.40 for run-of-mine and $2.25@2.50 for screenings. Smokeless holds up to circular prices of $3.55 for lump and $3.15 for run-of-mine and Hocking to $3.15. There is considerable fluctuation from these prices from day to day, and it may be said, indeed, that there really are no fixed market prices now. The supply of Eastern coals is well regulated, apparently through close watching of day-to-day conditions, but there is little danger of overshipping for the next week at least.

Cleveland

June 6—Some small troubles still remain to be settled in some of the Ohio districts, but nothing serious, and coal is coming forward freely. Indiana mines seem to be furnishing the Chicago market now, and little Ohio coal is going there. The Lake trade is improving.

Quotations for Middle district coal, f.o.b. Cleveland, are $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.65 for slack; No. 8 district from 15 to 20c. higher. Massillon domestic is $2.95 for lump and washed nut, and $2.65 for slack. Pocahontas is quoted $2.85 for lump and $2.45 for run-of-mine.

Indianapolis

So far as Indiana is concerned, the coal market is excellent. There is no accumulation of coal; it is moving rapidly to the markets where it is already sold at good prices. The operators are not expecting this harvest to last a great while and are booking orders for future delivery when opportunity is given. The premium prices that now prevail at the mines will not rule after mines are opened elsewhere. They also realize that the labor question is not yet completely settled in this State. Four weeks of deliberation have failed to bring the desired satisfactory agreement between miners and operators. While the situation is nervous, the work of production is being pushed to full capacity. Indiana coal operators do not fathom the purposes of the railroad companies in advancing freight rates on coal for manufacturers in the State.

Pittsburg

June 7—The coal market is in good condition, and operators are well pleased with the situation, considering the backwardness in some other lines. Lake shipments have been heavy, nevertheless some producers are behind their requisitions. Demand from manufacturers is fairly good. The car supply is adequate. Prices last reported are well maintained: Mine-run and nut, $1.20@1.25; ¾-in., $1.30@1.35; domestic 1½-in., $1.50; slack, 80@85c. per ton.

Connellsville Coke—The market has been quiet. A contract for 4500 tons furnace coke monthly over second half has been put through at $1.70. Prompt furnace coke has been sold at $1.60 and at $1.65 per ton.

The Thompson-Connellsville Coke Company, with two plants of 400 ovens each, the Tower Hill-Connellsville Coke Company, with two plants of 250 and 310 ovens and the Isabella-Connellsville Coke Company, a new company which expects to have 200 ovens completed by Oct. 1, are to unite as the Thompson-Kuhn Coke Company. Directors controlling 85 per cent. of the capital stock have agreed to the terms of merger, which represents practically the exchange of stock in the three companies for stock in the new company. When this consolidation is effected efforts will be made to bring in about a dozen other and smaller interests in the neighborhood.

We quote standard grades of Connellsville coke: Prompt furnace, $1.65@1.70; second half contract, $1.70@1.80; prompt foundry, $2.15@2.25; contract foundry, $2.25@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended May 28 at 396,443 tons, an increase of 3000 tons, and shipments at 4066 cars to Pittsburg, 6172 cars West and 1084 cars East, a total of 11,322 cars.

St. Louis

June 6—The market for the past week has remained about stationary, though a slight downward tendency is noted. Operators who can tie up a big bunch of coal for delivery extending three or four weeks are willing to take it at slightly under current figures. As yet there seems to be no indications that the Carterville and Springfield districts will sign up. As long as these mines stay out the price of coal will remain about stationary. The railroads are all buying coal heavily, and in fact are taking most of the coal that is being made. A number of industries, such as the brick, firebrick and cement companies, in whose cost of production coal figures very largely, have practically shut down. St. Louis is a big center for these industries, consequently a number of the largest buyers of coal are not on the market.

Current prices are as follows for the St. Louis market:

	Mine.	St. Louis.
Illinois, Standard:		
Mine-run	$1.50	$2.02
2-in. lump	1.75	2.27
2-in. screenings	1.60	2.12
Pocahontas and New River:		
Lump or egg	1.50	4.00
Mine-run	1.10	3.65
Pennsylvania Anthracite:		
Nut, stove or egg	.....	6.55
Grate	.....	6.30
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	.....	5.40
Gas house	.....	4.50
Smithing	.....	4.15

Mine-run is practically the only size that is being made at present. The demand for screenings far exceeds the supply and screenings are bringing higher prices than mine-run. Lump coal, however, is not in very good demand, consequently few screenings are being made.

A little trouble has been experienced by the Fifth and Ninth districts since signing up and several mines have been shut down for a day or two on account of dissatisfaction of the miners with the terms of the agreement. One clause in particular, which the miners agreed to, was if there was going to be a closed shop on one side there was to be a closed shop on both and the miners agreed to work only for mines that were members of the Operators' Association outside of the independents who had signed up prior to the time the agreement had been made. While this included nearly the entire district yet there are a few large mines shut down on this account. In two mines the drivers were not satisfied with the scale that was signed by their representatives and refused to abide by it, insisting upon more money and as a consequence shut down these mines for several days. It is therefore evident that the operators of the two districts have a number of matters to thrash out before the agreement made will be satisfactory to all parties.

The anthracite trade has been good and continues to hold up. All sizes are selling well, including chestnut which has been a slow seller. This is due to the fact that the country trade has opened up and is taking coal.

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, four months ended April 30, long tons:

	1909.	1910.	Changes.
Anthracite	699,350	950,154	I. 251,104
Bituminous	2,072,696	2,573,135	I. 500,439
Total exports	2,772,046	3,523,589	I. 751,543
Steamer coal	1,908,202	2,068,230	I. 160,028
Total coal	4,680,248	5,591,819	I. 911,571
Coke	330,370	307,863	D. 22,507

Canada took this year 2,385,817 tons of coal or 67.7 per cent. of the total. Cuba took 269,643 tons of coal. The coke went chiefly to Mexico and Canada. Of the bunker coal reported this year 2,046,993 tons were loaded at coast ports and 21,737 tons at Lake ports.

United States Coal Imports—Imports of coal and coke into the United States, four months ended April 30, long tons:

	1909.	1910.	Changes.
Anthracite	3,115	22	D. 3,093
Bituminous	388,077	623,167	I. 235,090
Total coal	391,192	623,189	I. 231,997
Coke	64,186	37,454	D. 26,732

Canada furnished this year 537,517 tons of coal and nearly all the coke; Australia, 35,197 tons of coal; Japan, 45,937 tons of coal. Imports are chiefly on the Pacific Coast and in the far northwestern States.

French Coal Production—Coal production in France for two years, metric tons:

	1908.	1909.	Changes.
Coal	36,632,724	37,253,305	I. 620,581
Lignite	751,600	718,553	D. 33,047
Total	37,384,324	37,971,858	I. 587,534

Of the total in 1909 the Nord and Pas-du-Calais furnished 24,951,607 tons; the Loire, 3,730,101 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on May 28: Best Welsh steam, $4.02; seconds, $3.81; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.16; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, June 8—Without any marked change, the iron and steel markets show more activity in several lines. There is, however, an insistent demand for concessions, which shows that much of the improvement in the buying demand which has been recently shown depends on the maintenance of a low range of prices.

In pig iron there has been rather heavy buying of foundry iron in Eastern territory, coupled with many inquiries for second-half needs. It is evident that many large users of pig are approaching the end of their stocks, but they are still unwilling to buy, except at concessions, believing that the bottom has not yet been reached. Basic iron in the Central West is in much the same position. In the East some trade has been taken by Virginia and Alabama furnaces, which are willing to meet buyers' views, and a few Eastern furnaces have followed.

Preliminary estimates show that the production of pig iron in May was about 100,000 tons less than in April; the loss being about equally divided between the steel works and merchant furnaces.

In finished material buying is better, but there also low prices are demanded. This is especially the case with structural steel, for which many small orders are forward. Some larger contracts are under discussion. In other lines business is improving. The jobbing business in bars and small material is generally good.

The Panama Canal Commission is beginning to market the great accumulations of scrap. One cargo, consisting of 1,991,500 lb. mixed iron and steel scrap, was offered to bidders this week.

Iron Shipments by River—The United States Steel Corporation, through the Carnegie Steel Company, has let contracts for several steel barges, to be used in shipping iron and steel from Pittsburg down the Ohio and Mississippi rivers to points in the South. The barges will be built by the American Bridge Company.

Baltimore

May 6—Exports from Baltimore for the week included 1,618,000 lb. zinc dross to Liverpool. Imports included 2475 tons spiegeleisen and 400 tons ferromanganese from Rotterdam; 26,950 tons iron ore from Cuba.

Birmingham

June 7—Small-lot purchasing of pig iron is noticed in Southern territory, the aggregate showing up well. The market is far from being strong yet, but the manufacturers say that there is much improvement as compared to a month ago. There has been one blast furnace blown in since last week, which had been out for repairs. It is understood that one or two furnaces now in operation will shortly be blown out for necessary repairing. The pig-iron demand right now is equal to the make and a little better. The quotations are now firm at $12 per ton, No. 2 foundry; in fact, there is intimation that the prices for the product are going to be increased shortly. The inquiries for iron received by Southern manufacturers indicate there is need for a large quantity of iron. There is no delay in deliveries.

Chicago

June 6—Buying of pig iron has been more general in the last week than for several weeks previously, and the stronger condition bids fair to continue. Sales of malleable especially have been large. The foundry melters, the chief buyers in this market, are placing contracts for last-half tonnage at $11.50@12, Birmingham, or $15.85@16.35, Chicago, for Southern No. 2 and $16.50@17 for Northern No. 2. Increased buying has tended to stiffen prices. Southern holds generally to $12, at which it has a slight advantage over Northern. Apparently the melters have concluded that the wait for a lower price than $11.50, Birmingham, has gone to its limit and recognize that the turn of the market is decidedly upward, the production of pig iron having been curtailed long enough to reduce furnace stocks to the market requirements. That being the case, we may look for very general buying for the next two or three weeks. There is still an element of the melters that holds to the policy of buying in small lots for delivery within 30 to 90 days, but in general the trade is becoming a strong one for the last half, with some disposition to reach into 1911 deliveries, though this is yet confined almost wholly to inquiries. Furnace agents are inclined to name low prices on the nearer deliveries and hold out for higher on the more extended requirements. Northern furnaces are getting a larger share of the tonnage with the stiffening of Southern.

In iron and steel products buying is generally good, though railroads have to some extent held off because of wage and rate troubles. Structural steel is active. Coke sells well at $5 for the best Connellsville.

Cleveland

June 6—Some trouble was caused last week at the ore docks by a strike of the dockmen, but the trouble has been adjusted. No sales reported.

Pig Iron—A number of inquiries and sales are reported, mostly for small lots, but making up a good aggregate tonnage. Current quotations, Cleveland delivery, are $16.90 for bessemer; $15.75@16 for No. 2 foundry; $16.10@16.35 for No. 2 Southern; $18.50@19 for Lake Superior charcoal.

Finished Material—Several local contracts for structural steel are being closed. Some more orders for bars are also noted. Mills report specifications on contracts coming in more freely; while jobbers report small trade active.

Philadelphia

June 8—Brokers and furnace agents agree in the statement today that the demand for pig iron, outside of basic, has fallen off. Besides this a few inquiries from large buyers outside of this territory have been withdrawn, the supposed reason being that consumers scent a further drop. The influences underlying the market point to further weakness, particularly in steel irons. A few furnace companies in this territory offered to furnish iron up to the end of the year at the prices named, but up to today none of these offers has been accepted. Basic iron is offered at $16, and business is pending at a shading from this figure. Gray forge has been dull even at a shading under $16 for Pennsylvania make. The weakness of forge is due to liberal offerings of Southern forge and to a purpose of Southern makers to entrench themselves more strongly in this territory. Several large foundry interests have allowed their stocks to run low and they will probably continue their hand to mouth buying throughout the summer unless conditions change radically. There is a difference of $1 to $1.50 in No. 2 foundry, and this difference may be increased.

Bars—Reports today from interior mills show most of them with a fair amount of orders, while some may be obliged to restrict production in July unless orders come in. Quotations are fractionally lower. City and country stores maintain the usual average of sales.

Sheets—Recent business is less encouraging because of the cautious course of large buyers. Prices have been practically uniform on the small orders reaching the mills.

Pipes and Tubes—Late advices from pipe mills show no lessening in output, but less buying of raw material. Tube discounts are unchanged and no new orders of any consequence have been sent to the mills.

Plates—The probability of shading has served to hold up some pending business. The mills are well supplied for the present and the inquiries made show a large amount of business within reach.

Structural Material—Weakening influences are at work and further shadings have been made. The business in the past week has been confined to relatively small lots.

Scrap—The scrap market is absolutely featureless and makers of scrap are offering supplies of various kinds at lower prices than have prevailed for some months.

Pittsburg

June 7—There are two iron and steel markets, a sentimental and a practical. The former has shown many fluctuations this year; while last week it was reported much depressed over the suit brought on Tuesday by the Government against certain midwestern railroads to enjoin freight advances announced for June 1, again this week it is reported as correspondingly encouraged over the apparent compromise reached at the White House conference Monday. The practical market, on the other hand, has shown relatively little fluctuation this year. It has comprised a pretty steadily declining volume of business. As the depletion occurred in each line prices softened slightly, except in the case of pipe, where the first restriction in output occurred. Pipe presented so serious a case that the mills recognized price-cutting would do absolutely no good. Reports of cancelation and withholding of orders by railroads, on account of opposition to freight rate advances, are obviously overdrawn. Moreover, the proportion of iron and steel production passing to railroad consumption is popularly overestimated. Production promises a further curtailment this summer.

Pig Iron—On the inquiries for foundry iron by the Westinghouse Air Brake Company and the Babcock & Wilcox Company mentioned last week, less iron has been bought than was expected. Latest advices are that none of the Babcock & Wilcox business has been closed, while the air-brake company is reported to have bought a moderate tonnage, probably less than 5000 tons, of storage iron at a special cash price quite below the furnace price. Bessemer and basic iron are quotable at 25c. lower, and prices even below the new open quotations have been made in special cases. Pig iron is now clearly below the cost of production at Valley furnaces, using purchased ore and coke. The question now is whether the demand will be restricted to the tonnage which can be made by furnaces which have raw material connections of their own. They have room for further cutting, but if the market requires iron made by furnaces which purchase their raw materials, prices must advance. We quote at Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, $15.75@16; basic, $14.75@15; No. 2 foundry, $15; forge, $14.50; malleable, $15.25 per ton.

Ferromanganese—The market is extremely quiet and nominally quotable at about $40.50, Baltimore.

Steel—The market is softer on bessemer steel, there being resales, also surplus production of rail mills. Open-hearth continues scarce. We quote: Bessemer billets, $25@25.50; sheet bars, $26@26.50; open-hearth billets, $28@28.50; sheet bars, $29@29.50; rods, $31@32, all f.o.b. mill, Pittsburg or Youngstown.

Sheets—Demand is moderate and shading is about the same as formerly, $1 to $2 on black and $2 to $3 on galvanized, from regular prices which are 2.40c. on black and 3.50c. on galvanized, with painted corrugated roofing at $1.70 a square and galvanized at $3. Blue annealed sheets continue scarce, at about 1.90c. for prompt delivery, the regular price being 1.75c. for late delivery.

St. Louis

June 6—The market for pig iron remains slow, though business picked up a little last week. Buyers are evidently of the opinion that the bottom has been reached and feel that they can get no further price concession by withholding from the market. The price is $12 f.o.b. Birmingham, or $15.75 St. Louis, and is the lowest price since the panic.

FOREIGN IRON TRADE

United States Iron Ore Movement—Imports and exports of iron ore in the United States, four months ended April 30, long tons:

	1909.	1910.	Changes.
Imports............	350,440	822,018	I. 471,578
Exports............	32,921	36,839	I. 3,918

Of the imports this year 502,680 tons came from Cuba and 268,804 tons from Europe.

Imports of manganese ore for the four months were 68,123 tons in 1909, and 81,013 in 1910; increase, 12,890 tons.

METAL · MARKETS

New York, June 8—The metal markets generally, while they show no marked change for the week, have had rather a downward tendency, with no special activity.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
April 1910..	$36,283,625	$ 2,100,918	Exp. $34,182,707
" 1909..	6,337,994	3,345,861	" 2,992 133
Year 1910..	47,199,706	11,669,276	" 35,530,430
" 1909..	44,316,626	15,504,136	" 28,812,490
Silver:			
April 1910..	4,696,534	3,840,495	Exp. 856,039
" 1909..	4,952,251	4,222,147	" 730,104
Year 1910..	18,336,081	15,238,634	" 3,097,447
" 1909..	19,426,181	14,675,365	" 4,750,816

Exports from the port of New York, week ended June 4: Gold, $220,600, to Cuba and South America; silver, $933,525, to London and Paris. Imports: Gold, $117,330, from central and South America; silver, $183,801, from the West Indies and Mexico.

The Treasury Department estimates the gold in circulation in the United States on June 1 at $594,954,808. On the same date the treasury held $175,469,637 gold in its current balances and $857,003,869 against gold certificates outstanding.

Exports of silver from London to the East from Jan. 1 to May 26, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India..	£2,161,200	£2,640,310	I. £ 479,110
China	1,075,100	1,113,500	I. 38,400
Straits. ..	82,800	.... .	D. 82,800
Total......	£3,319,100	£3,753,810	I. £ 434,710

India Council bills in London sold at an average for the week of 15.94d. per rupee.

Messrs. Pixley & Abell write from London: "On May 24 news was received that the Chinese Government had published an edict establishing a silver-dollar currency, with subsidiary coins as well, throughout the Empire. Whether the government is willing and able to give effect to this edict remains to be seen, but should it bring about this reform and establish a uniform currency throughout the empire, in place of the chaotic local system of weights of silver which now do duty for currency, the absorption of silver in that country should be greatly increased and the future prospects of this market improved thereby."

Gold—The price of gold on the open market in London has been unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. No exports from New York are noted.

Platinum—Business is quiet and prices are unchanged. Dealers ask $30 per oz. for refined platinum and $35.50@36 per oz. for hard metal—platinum-iridium alloy.

Our Russian correspondent writes, under date of May 26, that the market is rather strong. The stocks from last year are nearly exhausted. At Ekaterinburg prices are unchanged at 6.30 rubles per zolotnik—$23.69 per oz.—for crude metal. 83 per cent. platinum. In St. Petersburg the same grade cannot be bought under 25,000 rubles per pood—$24.50 per oz.—with prospects of an advance.

Silver—Silver advanced to 24¾d. under orders from the Continent, but under the weight of spot silver, which seemed to be in supply above prompt requirements, the price has receded to 24½d. in London.

SILVER AND STERLING EXCHANGE

June.	2	3	4	6	7	8
New York....	53¾	53[illegible]	53[illegible]	53⅜	53¼	53⅜
London	24¾	24[illegible]	24⅝	24⅝	24[illegible]	24½
Sterling Ex..	4.8710	4.8650	4.8670	4.8665	4.8665	4.8650

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver 0.925 fine.

It is rumored that the Granby Mining and Smelting Company will build new zinc-smelting works at East St. Louis.

The European zinc convention appears to be in difficulties over the question of allotment, which question has been the source of disruption of all previous spelter conventions.

Copper, Tin, Lead and Zinc

June.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
2	12⅞ @13	12½ @12¾	56⅝	32⅞	4.32½ @4.37½	4.17½ @4.22½	5.02½ @5.05
3	12⅞ @13	12½ @12¾	56 9/16	32¾	4.32½ @4.37½	4.17½ @4.22½	5.02½ @5.05
4	12⅞ @13	12½ @12¾	....	33	4.32½ @4.37½	4.17½ @4.22½	5.00 @5.02½
6	12⅞ @13	12½ @12¾	56 5/16	33⅛	4.32½ @4.37½	4.17½ @4.22½	4.97½ @5.02½
7	12⅞ @13	12½ @12⅝	56 7/16	33	4.32½ @4.37½	4.17½ @4.22½	4.97½ @5.00
8	12⅞ @13	12½ @12⅝	56⅜	32⅞	4.32½ @4.37½	4.17½ @4.22½	4.97½ @5.00

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market is quiet and little business is reported either for home trade or export. Prices are somewhat lower, and at the close Lake copper is quoted at 12⅞@13c.; electrolytic copper in cakes, wirebars and ingots at 12½@12⅝c. Casting copper is quoted nominally at 12¼@12¾c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c base, carload lots at mill.

Transactions in the London standard market were small and prices have receded somewhat. At the close, spot is quoted at £56 7s. 6d., and three months at £57 2s. 6d. per ton.

Refined and manufactured sorts we quote: English tough, £59; best selected, £60@£60 10s.; strong sheets, £68@£69 per ton.

Exports of copper from New York for the week were 3240 long tons. Our special correspondent gives the exports from Baltimore at 431 tons.

Tin—The London market has been a dull affair during the week under review. Transactions were small and as no decided tendency developed, fluctuations amounted to but fractions. The close is cabled as weak at £148 17s. 6d. for spot and £150 2s. 6d. for three months.

Toward the end of last week some activity was instilled into the domestic market by liberal purchases on the part of the largest consumer. The purchases embraced near-by and future tin and caused a premium to be established again for spot material, which seems to be strongly held. Previous to these purchases there were sellers in the market at below the importation basis. The metal closes at about 32⅞ cents.

Lead—The market is quiet but firm, and at the close, St. Louis is quoted at 4.17½@4.22½c., and New York at 4.32½@4.37½ cents.

The London market for Spanish lead is somewhat firmer at £12 12s. 6d. and English lead is held for £12 15s. per ton.

Spelter—There is little demand. While consumers are not well covered, they continue to hold off, and the metal that has been offering for sale has not been readily absorbed. Prices have receded somewhat and at the close St. Louis is quoted at 4.97½@5c., and New York at 5.12½@5.15 cents.

New York quotations for spelter June 2-3 were 5.17½@5.20c.; June 4, 5.15@5.17½c.; June 6, 5.12½@5.17½c. June 7-8, 5.12½@5.15 cents.

The London market for good ordinaries is somewhat lower at £22 2s. 6d. and specials £22 7s. 6d. per ton.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—The market continues firm, with good sales and many inquiries. Demand seems to be well up to the supply of the metal. We continue to quote 23¾c. per lb. for No. 1 ingots in large lots, New York delivery. The foreign market continues active, with prices firm.

Antimony—The market is reported still dull, and sales are only of a retail character. There is no change in current prices, which are given at 8⅜@8½c. per lb., for Cookson's; 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—Business is on a moderate scale, and prices are unchanged. New York quotations are $47 per flask of 75 lb. for large orders; $48@49 for jobbing lots. San Francisco, $46@46.50 for domestic orders and $2 less for export. The London price is £8 15s. per flask, with £8 13s. 9d. quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio.

Imports and Exports of Metals

Exports and imports of metals in the United States, four months ended April 30, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.	
Copper, long tons	87,136	49,814	Exp.	37,322
Copper, 1909....	88,895	49,260	Exp.	39,635
Tin, long tons....	165	18,092	Imp.	17,927
Tin, 1909........	129	14,332	Imp.	14,203
Lead, short tons.	24,433	36,494	Imp.	12,061
Lead, 1909......	29,592	35,413	Imp.	5,821
Spelter, sh. tons.	397	1,170	Imp.	773
Spelter, 1909....	1,894	1,064	Exp.	830
Nickel, lb........	5,031,463	11,866,507	Imp.	6,835,044
Nickel, 1909....	3,653,202	6,255,032	Imp.	2,601,830
Antimony, lb.....	....	3,192,360	Imp.	3,192,360
Antimony, 1909.	8,648	3,252,770	Imp.	3,244,122
Platinum, oz.....	... .	36,303	Imp.	36,303
Platinum, 1909.	....	40,015	Imp.	40,015
Quicksilver, lb...	88,327	....	Exp.	88,327
Quicksilver, '09	143,268	....	Exp.	143,268
Aluminum, value	$142,622	....	Exp.	$142,622
Aluminum, 1909	65,185	....	Exp.	65,185
Ores, etc.:				
Zinc oxide, lb. ..	9,161,834	....	Exp.	9,161,834
Zinc oxide, '09..	9,701,223	....	Exp.	9,701,223
Zinc dross, lb....	2,011,989	....	Exp.	2,011,989
Zinc dross, '09..	7,875,465	....	Exp.	7,875,465
Zinc ores, lg. tons	8,431	23,349	Imp.	14,918
Zinc ores, 1909.	2,025	31,641	Imp.	29,616
Antim'y ores, lb.	....	....	....	....
Ant. ores, 1909.	504	3,288,693	Imp.	3,288,189
Chrome ore, tons	20	12,726	Imp.	12,706
Chrome ore, '09	....	15,272	Imp.	15,272

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in 1910 were 17,726,203 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported this year, only metal contents being given. Exports of copper sulphate this year were equivalent to 689,353 lb. copper.

Zinc and Lead Ore Markets

Platteville, Wis., June 4—The highest price paid this week for zinc ore was $41.50; the base price, 60 per cent. zinc ore, was $41@42.50 per ton. The base price paid for 80 per cent. lead ore was $48 per ton.

SHIPMENTS, WEEK ENDED JUNE 4.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville............	448,370	....	333,300
Galena..............	314,120	....	....
Highland............	256,300	....	....
Cuba City............	254,955	....	160,260
Shullsburg............	125,000	....	....
Montfort............	120,000	....	....
Total..............	1,518,745	....	493,560
Year to date..........	35,798,656	2,651,689	7,700,280

In addition to the above there was shipped during the week to the separating plants, 3,501,428 lb. zinc concentrates.

Joplin, Mo., June 4—The highest price paid for zinc sulphide ore was $46, the base being $40@43.50 per ton of 60 per cent. zinc, in car lots. Zinc silicate sold as high as $28, on a base of $22@24 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $38.92 per ton. Lead sold as high as $49 per ton, and some offers were declined at this figure. Owing to the refusal of holders to sell, the shipment of lead was reduced to the minimum of the year, with one exception. The average price, all grades of lead, was $48.64 per ton.

The zinc shipment was 885 tons less than last week, and the lead shipment, 42 tons less. The production was inreased by the resumption of work by most of the mines shut down on account f strikes. All of the mills that were losed down on account of prices are till idle, awaiting a price of at least $45 er ton of 60 per cent. zinc before retarting.

SHIPMENTS, WEEK ENDED JUNE 4.

	Zinc, lb.	Lead lb.	Value.
Vebb City-Carterville	2,886,260	385,210	$67,162
oplin	1,929,220	331,590	49,036
alena	1,142,770	64,370	25,000
ronogo	861,010	46,530	19,125
adger	772,660	......	16,225
lba-Neck	647,430	......	14,242
uenweg	649,760	92,950	13,937
purgeon	316,050	29,310	4,610
uapaw	238,340	......	4,428
liami	409,070	8,760	4,299
urora	283,890	......	3,560
ranby	204,010	5,170	3,115
arthage	121,620	......	2,614
arcoxie	117,390	......	2,347
aginaw	63,460	......	862
Totals	10,642,940	963,790	$230,562
3 weeks	252,197,540	36,426,810	$6,034,742

inc value, the week, $207,120; 23 weeks, $5,080,004
ead value, the week, 23,442; 23 weeks, 954,738

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
anuary	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
ctober	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, June 8—The general market is quiet, though a fair business is being done in most lines.

Nitrate of Soda—Business continues fair for the season, with prices unchanged, at 2.15c. per lb. for spot lots; 2.07½@2.12½c. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on June 1 as follows, in long tons:

	1909.	1910.	Changes.
Stocks, Jan. 1	9,140	14,000	I. 4,860
Imports, 5 mos.	134,450	192,580	I. 58,130
Total supplies	143,590	206,580	I. 62,990
Deliveries, 5 mos.	143,340	197,980	I. 54,640
Stocks, June 1	250	8,600	I. 8,350
Afloat for U. S.	65,000	89,000	I. 24,000

Quantities afloat include all cargoes due to arrive at United States ports by Sept 15, next.

Copper Sulphate—Business is rather quiet, and prices are unchanged, at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller orders.

Arsenic—The market continues dull, and sales for the week were not over 50 tons. Prices are a shade lower, $2.30@2.40 per 100 lb. being quoted for white arsenic.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, four months ended April 30:

	Imports.	Exports.	Excess.
Copper sulph. lb.	....	2,757,410	E. 2,757,410
Copper sul., '09	....	1,873,866	E. 1,873,866
Bleach, lb.	32,954,122	....	I. 32,954,122
Bleach, 1909	30,017,652	5,152	I. 30,012,500
Potash salts, lb.	231,481,630	1,939,363	I. 229,542,297
Potash salts, '09	117,442,260	1,469,219	I. 115,973,041
Soda salts, lb.	13,601,487	186,993	I. 13,414,494
Soda salts, 1909	4,676,542	236,720	I. 4,439,822
Acetate lime, lb.	....	23,366,325	E. 23,366,325
Acetate, 1909	....	32,306,476	E. 32,306,476
Nit. of soda, tons	195,689	2,490	I. 193,199
Nitrate, 1909	130,578	2,709	I. 127,869
Phosphates, tons	8,064	337,946	E. 329,882
Phosphates, '09	3,997	340,130	E. 336,133
Sulphur, tons	11,742	8,091	I. 3,651
Sulphur, 1909	10,606	9,030	I. 1,576
Pyrites, tons	235,499	....	I. 235,499
Pyrites, 1909	223,913	....	I. 223,913
Magnesite, lb.	87,649,914	1,621,742	I. 87,028,172
Magnesite, 1909	....	....	....

Exports include reëxports of foreign material. Figures for magnesite not reported prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 105,942 tons.

MINING · STOCKS

New York, June 8—The market opened after the holiday with a general break in all stocks and has been in the dumps nearly all the week. Prices quoted have been low and tending lower, with occasional little rallies on profit taking, but no permanent improvement. Today matters look much better and sharp advances are recorded.

Several sales of Homestake are noted, 350 shares changing hands at $85.50@86 per share.

The Curb followed the Exchange for the most part. Copper stocks were generally lower and depressed, with an uneasy tone. Sales were quite large, but quotations fell off considerably. The Cobalt stocks were the best part of the market, holding up well in price, and improving on several dividend declarations. The Nevada gold stocks were a little more active, but not strong.

Sales of securities at public auction in New York, June 2, included the following: 100 shares Tintic Company, $3 par, $100 for the lot; 100,000 shares Red Mountain Railroad, Mining and Smelting Company, $1 par, $50 for the lot; 400 shares Columbus & Hocking Coal and Iron Company, $100 par, $6.87¼ per share; $25,000 Columbus & Hocking Coal and Iron Company collateral trust bonds, $9250 (37); agreement to deliver $5000 in first-mortgage bonds Canadian Bessemer Ore Company, $11 for the contract.

Boston, June 7—Although copper shares have been sympathetically weak, there has been no pressure owing to the thoroughly liquidated condition of the market. Several annual reports have issued during the week, prominent being that of the Lake Copper Company, Amalgamated and East Butte. Sentiment appears to be quite hopeful, but people are cautious and do not feel sanguine enough to take on fresh lines.

Lake Copper had an $8 drop to $44 but came back quickly to above $50. This company's stock list is a big one and shows a wide distribution of the stock.

Calumet & Hecla directors reduced the quarterly dividend rate from $8 to $7, and

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company.	March.	April.	May.
Arizona, Ltd.	2,886,000	2,340,000	....
Balaklala	1,263,733	1,199,311	....
Boleo (Mexico)	2,148,383	2,777,800	... .
Copper Queen	10,809,488	9,920,000	.. ..
Calumet & Ariz.	2,820,000	2,100,000	....
Cananea (Mexico)	3,700,000	4,262,000	....
Detroit	1,698,975	1,930,000	....
Imperial	825,000	800,000	....
Nevada Con. (Est.)	5,339,466	5,500,000	5 500,000
Old Dominion	2,674,000	2,325,000	....
Shannon	1,468,000	1,288,000	1,326,000
Superior & Pitts.	2,370,000	2,130,000	....
Utah Copper Co.	7,853,288	7,902,643	....
Butte District	24,000,000	25,000,000	27,000,000
Lake Superior	19,250,000	16,250,000	....
Total production.	89,366,867	86,934,754	....
Imports, bars, etc.	20,178,202	21,180,396	....
Imp. in ore & matte	6,181,476	12,527,371	....
Total	115,726,545	120,642,521	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
VI, 1909	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31 332,403
V	123,242,476	59,305,222	45,495,440

	VISIBLE STOCKS.		
	United States.	Europe.	Total.
VI, 1909	169,848,111	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	251,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Osceola directors are expected to make a reduction from the $6 rate paid six months ago. Neither is a disturbing factor as both have been discounted. The declaration of an extra interim dividend of 5 per cent. by the Nipissing Mining Company had no effect on the market price of that issue. The stock has maintained a firm tone right along of late. Butte-Ballaklava has not held so strong as there has been more or less profit taking on the recent sharp advance. North Butte and Lake Copper were today's strong issues in sympathy with the abnormal overnight advance in Wall Street.

Curb trading has been restricted and prices rule lower. Ohio Copper, Chino and Inspiration have been the leading issues. The belief is now general that Davis-Daly stock will have to bear another assessment.

Assessments

Company.	Delinq.	Sale.	Amt.
Alameda, Ida.	June 16	July 2	$0.00½
Amador, Ida.	Feb. 21	June 30	0.01
Andes, Nev.	May 31	June 21	0.10
Beck Tunnel, Utah	June 14	....	0.01
Black Jack, Utah	....	....	0.01
Blue Bell, Idaho	Mar. 14	June 1	0.002
Brownstone, Utah	Apr. 15	June 10	0.00½
Bullion, Nev.	May 8	June 6	0.05
Caledonia, Nev.	June 17	July 8	0.10
Con. Virginia, Nev.	May 9	June 3	0.20
Crown Point, Nev.	June 26	July 20	0.10
Hancock Con., Mich.	Au.Oct.	....	3.00
Helvetia, Ariz.	....	....	0.50
Hypotheek, Ida.	May 14	June 14	0.00½
Mangus Dev., Mich.	May 7	....	2.50
Mexican, Nev.	May 17	June 9	0.15
Ojibway, Mich.	Oct.	....	1.00
Reindeer, Ida.	May 31	Aug. 1	0.00½
Rhode Island Copper, Mich.	....	....	0.50
Sierra Nevada, Nev.	June 21	July 12	0.10
Union, Nev.	June 9	July 1	0.10
Utah Con. of Tintic, Utah	May 15	....	0.01
Yellow Jacket, Nev.	June 9	July 11	0.15

Monthly Average Prices of Metals

SILVER

Month.	New York. 1909.	New York. 1910.	London. 1909.	London. 1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York. Electrolytic 1909.	New York. Electrolytic 1910.	New York. Lake. 1909.	New York. Lake. 1910.	London. 1909.	London. 1910.
January	[illegible]	13.620	13.280	13.870	61.198	60.923
February	12.940	13.[illegible]	13.295	13.719	57.688	59.388
March	12.[illegible]	13.[illegible]	12.[illegible]	13.[illegible]	56.231	59.214
April	12.[illegible]	12.731	12.[illegible]	13.091	[illegible]	57.238
May	12.[illegible]	12.[illegible]	13.238	12.885	59.338	56.313
June	[illegible]		13.548		59.627	
July	[illegible]		13.363		58.556	
August	[illegible]		13.296		59.393	
September	12.87[illegible]		13.200		59.021	
October	[illegible]		13.[illegible]		[illegible]	
November	[illegible]		13.[illegible]		58.917	
December	[illegible]		13.647		59.906	
Year	12.[illegible]		13.[illegible]		58.732	

New York, cents per pound. Electrolytic is [illegible] London, pounds sterling per long ton [illegible] standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32.403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	33.125	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York. 1909	New York. 1910.	St. Louis. 1909.	St. Louis. 1910.	London. 1909.	London. 1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	[illegible]	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1909.	New York. 1910.	St. Louis. 1909.	St. Louis. 1910.	London. 1909.	London. 1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	[illegible]	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	[illegible]	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer. 1909.	Bessemer. 1910.	Basic. 1909.	Basic. 1910.	No. 2 Foundry. 1909.	No. 2 Foundry. 1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	[illegible]	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.10	15.02	15.94	15.08	16.18
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS June 7

Name of Comp.	Bid.
Listed:	
Acacia	.06
Cripple Cr'k Con.	.02
C. K. & N.	.17
Doctor Jack Pot	.10
Elkton Con.	.81
El Paso	.82½
Fannie Rawlins	.05
Findlay	.08
Gold Dollar	.11
Gold Sovereign	.03
Isabella	.19
Mary McKinney	.59
Pharmacist	.03
Portland	1.20
Vindicator	.91
Work	.06
Unlisted	
Golden Cycle	1.00
United Gold Mines	.08

SALT LAKE June 7

Name of Comp.	Clg.
Carisa	.45
Colorado Mining	.60
Columbus Con.	.57
Daly Judge	3.50
Grand Central	1.25
Iron Blossom	.92
Little Bell	1.25
Little Chief	‡.15
Lower Mammoth	.48
Mason Valley	7.00
Maj. Mines	.58
May Day	.05½
Nevada Hills	.80
New York	.13
Prince Con.	.71
Red Warrior	‡6.00
Silver King Coal'n	2.47½
Sioux Con.	.19½
Uncle Sam	.36
Victoria	‡1.07½

SAN FRANCISCO. June 7.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.11	Belmont	3.37½
Belcher	.70	Daisy	.07
Best & Belcher	.25	Jim Butler	.28½
Caledonia	.47	MacNamara	.27
Challenge Con.	‡.24	Midway	.27
Chollar	.11	North Star	.05
Confidence	.74	West End Con.	.65
Con. Cal. & Va.	.96	Atlanta	.11
Crown Point	.70	Booth	.15
Exchequer	‡.21	C.O.D. Con.	.09
Gould & Curry	.19	Columbia Mt.	.07
Hale & Norcross	.32	Comb. Frac.	.51
Mexican	.95	Great Bend	.02
Ophir	.75	Jumbo Extension	.21
Overman	.85	Oro	.05
Potosi	.40	Red Hill	.03
Savage	.20	Sandstorm	.01
Sierra Nevada	.19	Silver Pick	.06
Union	.19	St. Ives	.11
Yellow Jacket	.75	Tramps Con.	.05½

N. Y. EXCH. June 7

Name of Comp.	Clg.
Amalgamated	67½
Am. Agri. Chem.	43
Am.Sm.&Ref.,com	77
Am. Sm. & Ref., pf.	103½
Anaconda	41⅜
Bethlehem Steel	‡27⅞
Col. & Hock. C. & I.	‡6⅛
Colo. Fuel & Iron.	34
Du Pont P'd'r, pf.	‡87½
Federal M. & S.	‡41
Great Nor., ore ctf.	58¼
Nat'nal Lead, com.	74¼
National Lead, pf.	‡107½
Nev. Consol.	20
Pittsburg Coal	17½
Republic I&S, com.	30
Republic I & S, pf.	93
Sloss Sheffi'd, com.	69½
Sloss Sheffield, pf.	‡117½
Tennessee Copper	25
Utah Copper	44⅞
U. S. Steel, com.	79
U. S. Steel, pf.	116
Va. Car. Chem.	59¾

N. Y. CURB June 7

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	17
Braden Copper	4
B. C. Copper	5⅝
Buffalo Mines	‡2½
Butte Coalition	18¾
Caledonia	1¼
Chino	12
Cobalt Central	.10
Cobalt Prov.	59
Con. Ariz. Sm.	1¾
Cumberland Ely	9
Davis-Daly	1⅝
Dominion Cop.	‡7
Ely Con.	.56¼
El Rayo	3 5/16
Florence	2.22
Gila Copper	5⅞
Giroux	7¼
Gold Hill	‡⅞
Goldfield Con.	8½
Greene Cananea	7¾
Guanajuato	‡1⅝
Guggen. Exp.	190
Kerr Lake	.08 5/16
La Rose	4⅜
McKinley-Dar-Sa.	.96
Miami Copper	20⅜
Mines Co. of Am.	60
Mont. Shoshone	⅞
Mont.-Tonopah	‡.70
Nev. Utah M. & S.	1
Newhouse M. & S.	3½
Nipissing Mines	11 9/16
Ohio Copper	2⅛
Pacific Sm. & M.	⅜
Ray Central	2 [illegible]
Silver Queen	.35
Standard Oil	621
Stewart	1
Tonopah	8 1/16
Tonopah Ex.	‡.90
Tri-Bullion	11/16
W. Va. Wyo. Cop.	‡2 [illegible]
Yukon Gold	4⅜

LONDON June 8

Name of Com.	Clg. £	s	d
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	8	0
Esperanza	2	12	6
Tomboy	0	18	9
El Oro	1	7	0
Oroville	0	8	0
Mexico Mines	8	11	3

BOSTON EXCH. June 8

Name of Comp.	Clg.
Adventure	‡6
Allouez	40
Am. Zinc	24½
Arcadian	5
Arizona Com.	16⅜
Atlantic	6¾
Boston Con.	‡17
Butte & Balak.	18¾
Calumet & Ariz.	61
Calumet & Hecla	570
Centennial	16½
Con. Mercur	‡.10
Copper Range	64½
Daly-West	8
East Butte	8¼
Franklin	12
Granby	40
Hancock	18
Helvetia	3
Indiana	17½
Isle Royale	19½
Keweenaw	3½
Lake	51½
La Salle	12
Mass	8¼
Michigan	4½
Mohawk	50
Nevada	19¾
North Butte	32½
North Lake	11⅜
Ojibway	7
Old Dominion	35½
Osceola	135
Parrot	14
Quincy	74¾
Shannon	10½
Superior	42¼
Superior & Bost.	10¾
Superior & Pitts.	11½
Tamarack	50
Trinity	5½
U. S. Smg. & Ref.	41¼
U.S.Sm. & Re., pd.	49⅜
Utah Apex	3
Utah Con.	21
Victoria	3
Winona	7¼
Wolverine	112
Wyandotte	1½

BOSTON CURB June 7

Name of Comp.	Clg.
Ahmeek	165
Bingham Mines	3
Boston Ely	2
Boswyocolo	.08
Cactus	2 7/16
Calaveras	5½
Champion	.05
Chemung	8
Chief Cons.	1⅛
Cons. Ariz.	2
Corbin	.06½
Crown Reserve	3
First Nat. Cop.	3⅝
Indiana	17½
Inspiration	7 1/16
Mackinaw	.06
Majestic	.53
Nat'l Mine	.27
Nevada-Douglas	2½
New Baltic	6¾
Oneco	3
Raven Copper	42
Ray Con.	17
Rhode Island Coal	7
San Antonio	7¼
Shattuck-Ariz.	25
South Lake	5
Superior & Globe	.38
Trethewey	1⅜
Tuolumne Copper	3¼
Vulture	9
Yuma	.50

‡Last quotation

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The Zinc Ore Market at Joplin

According to the statistics that we published in the JOURNAL of April 16, the receipts of zinc ore from Missouri and Kansas, as reported by the smelters amounted to 304,581 tons in 1909. This total comprises the output of the Joplin district proper, but excludes that of Oklahoma.

Out of the total shipments from Missouri and Kansas, 285,680 tons were received by 11 smelters. Ten of these smelters bought in excess of 10,000 tons each; six in excess of 25,000 tons. Five smelters, who make sulphuric acid as a byproduct, bought an aggregate of 122,410 tons. Certain others among these smelters make a specialty of producing a grade of spelter somewhat superior to what goes nowadays as ordinary prime western, and for that purpose buy selected ores. It is impossible to state the amount of such purchases, but we are safe in saying that the purchases of ore from which sulphuric acid is to be recovered, or special brands of spelter are to be made, in 1909 accounted for fully 50 per cent. of the total output of Missouri and Kansas.

In the remainder of the output is included the production of calamine and of blende that is below standard grade and sells ordinarily at a considerable discount. The Joplin blende is not, nowadays, by any means so uniform in quality as it used to be. A good deal more "sludge" is produced now than formerly, and also a good deal of "sheet ground" containing pyrites is worked, producing a concentrate that is higher in iron than the pristine ore of the district.

The competition for ore in the Joplin district has driven a number of smelters out of that market, there being several who did not purchase a pound of ore at Joplin in 1909. They have been unable to stay in that market in competition with those smelters who can bid relatively high for ore because they are going to make acid from it, or realize some other special advantage. This condition, which has been manifest for a long time in the narrowing margin between ore and spelter, signifies that in reality the producers of the ore realize its sulphur value.

We can indicate only approximately what the sulphur value of such ore is. Pyrites fines, containing about 45 per cent. sulphur, are worth in the Eastern market about 10c. per unit of 20 lb. Joplin blende of the best grade contains about 30 per cent. sulphur, the value of which is relatively less than in pyrites, partly because of the lower grade of the ore and partly because blende is less easily burned than pyrites. If a price were made per unit of sulphur in blende, it might be expected to be in the neighborhood of 7½c., corresponding to about $2.25 per ton of ore of the best grade. Consequently, if the smelters who formerly were able to purchase ore on a $14 margin are now able to do so only upon a $12 margin, they are in effect paying for about all the sulphur value of the ore, the market being established by those smelters who produce acid. This condition will, of course, tend to increase the number of smelters making that byproduct.

The Copper Statistics for May

The unfavorable character of the copper statistics for May is not to be denied. A substantial decrease in the European visible supply was more than offset by an unexpectedly large increase in the American accumulation. During the first five months of 1910, the world's visible supply has increased from 385,970,911 lb. to 399,568,373 lb. This assumes that the copper afloat from America, which ranges ordinarily from 10 to 25 million pounds, was the same in amount on June 1 as on Jan. 1. Although this copper is visible, it is not included in the statistics.

Insofar as the reported visible supply is concerned, the statistics indicate that during the last five months the consumption of Europe and America has been a little less than the supply. However, there is no doubt that the invisible supply has diminished in this country and perhaps also in Europe, and that actual consumption has consequently been in excess of the production. This idea, together with the probability that during the remainder of this year there will be no great increase in production, has been the basis for such optimism respecting the situation in copper as could be expressed. If, however, a reaction in commercial conditions in this country is going to retard our consumption of copper, the outlook is ominous and the market cannot be expected to hold its own under a maintenance of the large production. Safety will lie only in a curtailment of production.

Curtailment is indeed what ought to have been inaugurated six months ago and what ought to be started now; not concerted curtailment that might be illegal, but individual curtailment based upon the recognition that more copper is being produced than is immediately required, and that it is a poor policy to sacrifice resources for a lower price than they ought to fetch. This is an argument that should appeal especially to those producers whose cost is so high that no real profit is realized at present prices.

We are inclined to think that some producers will be more disposed to consider this matter, now that there are lean times in the stock market. There was until recently an object in making a large production by mines whereof it was desired to distribute the stock. There might be no profit in producing copper, but the sale of stock yielded a good profit to some persons interested. There is no longer any market to speak of in Wall Street and State Street, and consequently we shall hear less of the wonderful profits that some mines are earning or are going to earn. We are getting to the point where promoters are thinking that they may have to work their mines for what they are worth. This may even have a healthful reflex action upon the market for the metal.

The Proportioning of Dust Settling Flues

The proportioning of flues for the deposition of dust from metallurgical furnaces used to be chiefly a matter of rule of thumb. Indeed, it was often far worse than that, the whole design showing an ignorance of the principles involved. Thus we frequently saw long, narrow flues with many changes of direction, or larger flues with baffle walls to give the gaseous current a zigzag direction, through which the gas had to sweep with whirlwind velocity, a condition that is naturally opposed to the deposition of its solid matter.

The proper condition is, of course, a large flue in which the velocity will be checked sufficiently for the solids to fall by gravity, just as when a muddy stream discharges into one side of a lake and a limpid stream flows out from another side. However, there are other conditions to be observed in the designing of dust chambers, such as the matter of superficial exposure that affects the cooling of the gas, and structural features that affect the sucking in of external air.

In present practice these principles are much better considered than formerly, and in most modern works the chimneys and flues are proportioned with respect to the velocity of the gas that is to pass through them. The importance of this is well illustrated by some results at the Tyee smeltery, Ladysmith, B. C., recently communicated by Thomas Kiddie in the Transactions of the American Institute of Mining Engineers. The dimensions of the dust chamber were 155x10x8 ft. In a period of two years, with a velocity of 20 ft. per second, the recovery of flue dust was 2 per cent. of the ore smelted. In another period of two years, with a velocity of about 7 ft. per second, the recovery was 3.1 per cent. The flue dust was worth $14.92 per ton.

In another plant having a dust chamber 300x16x10 ft., three years of operation at velocity of 21 ft. per second gave 2.9 per cent. of flue dust. One year at 7.5 ft per second gave 4.4 per cent. In this case the flue dust was worth $30.20 per ton.

The application of such figures to a smeltery treating 350,000 tons of ore per annum—a 1000-ton plant, which is nothing out of the ordinary in these days—is illuminating. Even a velocity of 7 ft. per second is higher than the precept of the best practice, which indicate about 4 ft. per second as the proper rate for the most efficient deposition of dust.

The Directorship of the Bureau of Mines

The delay in nominating a director for the recently created bureau of mines is due to the contest among several candidates for this position. In this contest political considerations have unfortunately entered.

The leading officials of the Geological Survey have been playing an active part with respect to the nomination of the head of the new bureau and have engaged in measures in connection therewith that are hardly proper from a scientific organization. In this the Geological Survey is not only defying the expression of many of the best opinions in the mining profession, but also is committing a mistake that will do a great deal to alienate many mining men who have always been warm friends of the Survey.

Without reference to any special candidate we say emphatically to the President and to Secretary Ballinger that the mining industry demands that in making the appointment to this position all political considerations be dismissed. The new bureau should enter upon its duties uncontaminated by any poison of politics and if the leading officials of the Geological Survey have been animated by political considerations they should be promptly reprimanded. If the administration and the bureaucracy has any doubt about the temper of the mining industry in this matter they will soon learn.

Edward C. Hegeler

Edward C. Hegeler, one of the founders of the Matthiessen & Hegeler Zinc Company, of Lasalle, Ill., died at Lasalle, June 4. He was one of the founders of the zinc-smelting business of the United States and was prominently identified with this industry throughout his life.

Mr. Hegeler came to the United States in company with F. W. Matthiessen, in 1857, immediately after their graduation from the *Bergakademie* at Freiberg, Saxony. The Lehigh Zinc Company, of South Bethlehem, Penn., had been for several years attempting to smelt the zinc ore of its mine at Friedensville, Penn., without success. The ore was of troublesome character, and it was not then known in America how to smelt such ore.

Matthiessen and Hegeler obtained permission from the company to experiment on their own account at the abandoned plant. They did it on a small scale, using one muffle placed in a kiln altered for the purpose. They demonstrated that anthracite, as well as New Jersey clay could be used, and made some spelter in this experimental way, but failed to come to an agreement with the owners of the property for building works, largely on account of the financial crisis prevailing at that time.

The two young men had become satisfied as to their ability to smelt zinc ore in a commercial way and foresaw the great future of this industry in the United States. Looking around for an opportunity, they turned their attention to the West, where they studied the zinc deposits of Wisconsin, and later, in 1858, they began the erection of the present works at Lasalle. They proceeded with scientific deliberation. Lasalle was selected as the point where the Illinois coalfield approached nearest to the Wisconsin zinc mines, which at that time were the only supply of zinc ore, the Joplin mines being still unknown. In fact, Matthiessen and Hegeler established their works directly over a coal mine, from the shaft of which the coal was delivered to the furnaces without intermediate handling. The works at Lasalle went into operation in 1860, and have continued without interruption to the present time. For many years they were the largest single producer of spelter in the United States.

The history of these works has been a record of uninterrupted success, and it has been without question the greatest commercial and technical triumph that the zinc-smelting business of this country has witnessed. The wisdom of the original selection of location, so deliberately made, has been proved by the development of a great smelting industry in the same region by other concerns.

From the beginning, attention was directed toward improvement of the art of zinc smelting, and this was a work in which Mr. Hegeler gloried and excelled. In the early days of zinc smelting in the United States there were comparatively few trained metallurgical engineers, and most of the smelters were content to follow blindly the lead of those who had gone before. Consequently, there was little or no progress among the rank and file. Mr. Hegeler was practically the only one of the early zinc metallurgists who displayed noteworthy originality. Some of his innovations were of questionable value, but many were of great importance and obtained common adoption, and in the history of zinc smelting in the United States the name of Hegeler certainly stands with that of Wetherill as the two men who have made the greatest contributions to the metallurgical art.

Mr. Hegeler naturally first took up the subject of the distillation furnace and early directed his attention to gas firing. He showed that this practically eliminated the restrictions as to hight of a distillation furnace; but since it would have been inconvenient to build and operate a furnace so high as his system of firing permitted, he built a very long furnace and turned the gas in at one end, which came to substantially the same thing as if he had built a furnace of equal hight and turned the gas in at the bottom. This was accomplished by introducing the quantity of gas required to heat the whole furnace and burning it gradually by the introduction of air at intervals.

Hegeler's first large furnace, which was erected in 1872, had a high-arched combustion chamber, 40 ft. long, containing 408 retorts (204 per side), arranged in five rows. In connection with this furnace there were many peculiarities, which were abandoned in later constructions, but the general principle has remained unchanged and the length of the furnace was increased finally to 1008 retorts, but that was found to be too long for satisfactory working and the number was reduced to 864. As to whether these excessively long furnaces are good or bad practice is a question. Their use has been confined to Lasalle and to works in the natural-gas fields of Kansas and Oklahoma. However, the long Hegeler furnace certainly had the important result of leading to the introduction of labor-saving devices for charging and discharging the retorts, which subsequently became a distinctive feature in American zinc-smelting practice in general. The method of preparing the charge by means of a mechanical mixer and bringing it to the furnace in a large car, moving on a track in front of the furnace, from which it could be shoveled directly into the retorts; the tapping of the spelter from the condensers into a kettle carried by a truck, with a shield to protect the men from the heat of the furnace; and the drawing of the residues from the retorts with the aid of a car, having a protecting shield and rollers to support the heavy rabbles which are put into the retorts; these were all in regular use at Lasalle previous to 1882. Also in use at that time were the auger machine for making retorts and a plunger machine for making condensers.

Probably the most important invention of Mr. Hegeler was his muffle roasting furnace in 1881. With its aid the manufacture of sulphuric acid as a byproduct of blende roasting was begun in the same year. Mechanical roasting furnaces had previously been used in Europe, but had not found much favor, and to this day are regarded somewhat askance, even for simple roasting, not to speak of roasting for sulphuric-acid manufacture. Yet the Hegeler furnace has been in regular and successful use since 1881. After the expiration of the patents upon it, other zinc smelters engaging in sulphuric-acid manufacture in this country adopted it, and among them it is the only furnace employed for this purpose at the present time.

Mr. Hegeler was also the first to inaugurate the rolling of sheet zinc in the United States. A complete list of Mr. Hegeler's inventions would be long. His was perhaps the most original mind that has concerned itself with the art of zinc smelting during the century of its history. During his 50 years of life and practice at Lasalle he resided close to his works. The beauty of his great mansion, with its adjacent gardens, in close proximity to the great metallurgical establishment is an object lesson in taking care of metallurgical smoke, which ordinarily desolates the surrounding country. Mr. Hegeler brought up his sons in his business, with which they continued to be connected until a few years ago, when they started out for themselves. Although in the later years of his life Mr. Hegeler withdrew from the direct management of his business, with its commercial cares, he maintained a live interest and supervision over the strictly metallurgical work.

Rumor of Reorganization of Butte & Superior Company

It is generally believed that a reorganization of the Butte & Superior company is under way. The plan is to issue $1,000,000 of 6-per cent. convertible bonds, cut the present capital stock in half and increase the par value of the shares from $5 to $10. This will provide sufficient money to erect a mill and leave a balance of $300,000 for working capital. The Butte & Superior company is a zinc operation, controlled largely in Duluth where the stock has been selling around $3 per share.

Renewed Activity in San Juan Region of Colorado

Denver Correspondence

The high mines of that rugged region in southwestern Colorado, known as the San Juan, have fairly entered upon their work of marketing the ore developed during the winter, and a great many that have been idle for some time have been reopened.

In the Telluride district 100 cars of ore were shipped in May, as against 82 in May, 1909, the Liberty Bell, Smuggler and the Tomboy, in Savage basin, being the chief producers. The Marshall basin dumps, treated at the Pandora mill, and the '76 mine, are adding their quota, and the Favorite group at Ophir, under the management of Felix Leavick, is credited with new and important discoveries of free gold.

In the Ouray district, the mines below town are active. The Wedge is shipping steadily and will increase the output of silver-lead ore to four carloads per week. The Bright Diamond has rehabilitated the American mill, and a new aërial tram will convey the ore to it from the mine. The Calliope old workings have been broken into by the tunnel, and a force is clearing them out, prior to exploitation.

In the Sneffels district, above Ouray, the Revenue and the Camp Bird are working about 250 men each, and the Thistledown, where the concentration mill has just been started, has about 40 men at work. This is a silver-lead producer, and under the management of M. L. Thistle.

The Red Mountain district, between Ouray and Silverton, will soon be shipping, as the road to Ouray is being shoveled out, and the railway from Silverton to Ironton will be running again shortly. The Silver Link mine, located on the road to Poughkeepsie gulch, belonging to Standard Oil people, and idle for many years, is being reopened under the management of Fred Seaburg.

All the Ouray section seems greatly encouraged by the offers of the new Kuenzel smeltery at Buena Vista to buy the ore, the smelting charge being $4, and the freight $5 per ton, with immediate settlements on control assays of every lot shipped to this point.

In the Animas Forks district, above Silverton, the Otto Mears railroad is open, and shipments from the Frank Hough and other mines on Engineer mountain to the Durango smeltery have commenced.

The Bagley tunnel, which cut a number of big low-grade veins last summer, and was closed down during the winter, is being reopened in charge of Charles Gagner.

Goldfield Consolidated

The preliminary report of the operations of the Goldfield Consolidated Mines Company for May shows an increased tonnage over that for April, amounting to 37.5 per cent. The total value of the output is, however, less by $113,144.

MAY PRODUCTION.

	Wet Tons.	Dry Tons.	Assay, Oz.	Value.
Combination..	4,945	4,656	1.18	$114,742
Mohawk......	6,848	6,549	1.32	180,472
Red Top....	4,583	4,409	1.31	121,136
Clermont.....	4,392	4,204	2.63	605,306
Shipping ore from Clermont......	727	691	25.88	....
Total......	21,495	20,509	2.41	$1,021,656

Results of Milling Operations

There were 19,818 dry tons milled during the month. The average value of the ore treated was $32.89 per ton; total value, $651,868. The loss in tailings was $31,260 and the value realized, $620,628, which indicates a 95.2-per cent. extraction. In April an extraction of 95.57 per cent. was made.

MAY EXPENSES.

		Amount.	Per Ton.
Bullion tax and marketing bullion..................		$22,000	
Administration, etc.......		21,000	
Total general..........		$43,000	$2.10
Mining..................		81,000	3.95
Transportation...........		3,000	0.15
Milling and cyaniding..........	$51,000		
Marketing concentrate residues..	$16,000		
		$67,000	$3.27
Construction.............		40,000	1.95
Cost of marketing high-grade ore.............		33,000	1.61
Net cost...............		$267,000	$13.03
Loss in tailings.........		31,260	1.52
Total costs and losses...		$298,260	$14.55

The average value per ton of ore mined in May was $49.81. A profit of $35.26 per ton, or a total of $723,396 was realized.

Developments

The total advance in May was 2661 ft., equal to 1 ft. for 7½ tons ore mined. This work was all done in new ground, extending the partially explored areas. New ore was taken from main levels as follows: Combination, 180-ft. level, 422 tons assaying 1.54 oz.; Mohawk, 350-ft. level, 358 tons assaying 0.76 oz.; 450-ft. level, 76 tons assaying 1.21 oz.; 600-ft. level, 219 tons assaying 0.44 oz.; Clermont, 600-ft. level, 546 tons assaying 1.26 oz.; 650-ft. level, 243 tons assaying 5.97 oz.; 750-ft. level, 102 tons assaying 0.99 oz.; 900-ft. level, 306 tons assaying 1.21 oz.; total, 2272 tons assaying 1.63 oz. The tonnage of new ore found gained on the amount mined, but the grade of it does not equal the high average of the ore extracted during the last three months.

New Oreshoot in the Mohawk

The most interesting discovery was on the 450-ft. level of the Mohawk, where an orebody was encountered between the Mohawk and the Red Top shafts. This is apparently an entirely new oreshoot not previously opened on any level. It lies in the middle of a section of ground about 500 ft. long, between the above mentioned shafts. For some reason this tract has remained unexplored even at the surface. Explorations are now being directed into it at several different points.

The mine is reported in good condition at all points. The mill reconstruction is now proceeding rapidly. Practically all material required is on the ground and the essential parts should all be completed by July 1. It is expected that a somewhat increased tonnage will be treated during June.

Construction in other directions is also proceeding as fast as circumstances will permit. A complete fire-protection system has been planned, and material ordered. The storage-battery plant is in process of construction. Transformer stations and other points vital to the operations are being made as nearly fireproof as possible. This involves some minor buildings of steel and concrete.

May Oil Dividends

The accompanying table gives the amount of dividends paid by a number of California oil companies during May, 1910, together with their total dividends to date, as reported by the California Stock and Oil Exchange, San Francisco.

Name of Company.	May, 1910, Dividend.	Total Paid to Date.
Amalgamated Oil..........	$50,000	1,500,000
American Petroleum, pf......	25,000	1,310,166
Caribou..................	20,175	740,883
Claremont................	10,000	345,000
Columbia.................	9,992	294,782
Del Rey..................	3,927	11,783
Empire...................	2,000	2,000
Euclid...................	3,500	131,000
Home.....................	2,000	478,000
Illinois crude............	2,000	92,000
Imperial.................	500,000	2,500,000
Kern River...............	2,000	104,000
Linda Vista..............	3,859	76,770
Mascot...................	5,000	20,000
Mexican Petroleum........	85,617	3,648,577
Monte Cristo.............	50,000	490,000
Palmer...................	18,020	286,401
Parafline................	3,000	21,000
Piedmont	3,890	26,877
Pinal....................	15,000	917,086
Premier..................	10,000	20,000
Producers................	80,000	80,000
Record...................	7,500	70,000
Rice Ranch...............	3,000	105,000
Royalty..................	300	16,067
S. F. & McKittrick........	15,000	370,000
Sauer Dough..............	4,988	527,279
Section 25...............	10,000	30,000
Sesnon...................	8,000	118,000
Traders..................	15,000	209,117
Union....................	124,813	6,617,881
United...................	40,375	2,259,711
Wabash...................	3,000	126,000
Total for May, 1910.....	$1,136,956	

The Uraniumite Company of America has been incorporated at Buffalo, N. Y. with a capital stock of $400,000. It is the intention to produce uranium and its alloys.

The Freiberg School of Mines

Special Correspondence

Upon the occasion of placing the estimates for the maintenance of the mining college at Freiberg before the second chamber of the Saxon diet, the government authorities made the following statements:

The mining college has had a steady gain in students during the last 10 years, averaging 454 for the year, 191 of whom were Germans and 263 foreigners. Of the 191 Germans there were only 73, or 16 per cent. from Saxony, the State which supports the college. The regulations for the admission of aliens to the college[1] have been rendered more severe, in order to bring the standard of previous education more in accord with that required of natives. Recently a bright young man, who had been actively engaged at a mill in the Transvaal, was sent from there by a benefactor to attend the lectures at the Freiberg college. After a six-months' trial he came to the conclusion that owing to his insufficient previous education he was unable to follow the lectures, although he spoke the German language fluently. It is hardly necessary to say that he returned to his native land without having accomplished anything. Undoubtedly there have been many cases of this kind among aliens.

College Fees

Stands in the laboratories and drafting rooms are reserved for Germans only during the first fortnight of the annual term. After that foreigners are accommodated. The registry fee for Germans is 12 marks, and for foreigners 24 marks. Foreigners have to pay an extra tax of 200 marks annually besides the tuition fees fixed for all students. The graduating fees amount to 100 marks for Germans, and 200 marks for foreigners. The fees for acquiring an academic degree are 240 marks for Germans, 480 marks for foreigners.

Attitude of Saxon Government

The Saxon government recognizes the desirability to find larger and better lighted quarters for the valuable collections of the college, but, in order to erect new buildings an appropriation of several hundred thousand marks would have to be made, which the Government does not feel at liberty to recommend at the present time. It wants to be sure that the attendance of the college will remain the same after the Freiberg mines have been closed for good, and that the reduction works will be able to secure sufficient smelting material without the ores of the Freiberg mines. Nor has the question of the maintenance of a mine for teaching purposes been definitely settled. Such a one would need two shafts to insure safety and sufficient ore to employ 50 men steadily besides the supervising officials. It is estimated that this scheme would cause a permanent expense of from 80,000 to 100,000 marks per annum and an amount of at least 50,000 marks, at once, to equip the mine with the proper machinery and buildings for teaching purposes.

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[1] There is a *Bergakademie*, or mining college at Freiberg, which ranks with a university, and a *Bergschule*, a school of a lower order, for the education of foremen, surveyor's handy man, laboratory attendants and the like.

The American Iron and Steel Institute

The first regular meeting of the American Iron and Steel Institute, organized in 1908, was held at the Waldorf-Astoria, New York, May 27. Judge E. H. Gary called the meeting to order with the announcement that various obstacles had prevented an earlier meeting to perfect the details of the organization, and that in the meantime a committee had been appointed to nominate directors to fill vacancies.

Some discussion then took place as to the best plans to be pursued to promote the future prosperity of the organization, during which it developed that the officers had some partly perfected plans of a most ambitious character for the future. It is hoped that in the near future permanent quarters may be secured and a secretary chosen who will be able to give his entire time to the work of the organization.

Some of those present urged that it be the policy of the association to give a large measure of attention to the technical and practical phases of the industry, while others felt that the gathering of statistics and measures to promote the commercial prosperity of all concerned should not be overlooked.

It was finally decided by a unanimous vote to hold the first annual meeting in the fall, probably in the month of October, at which time there will probably be a two-days' session, with reading of papers and discussions on popular subjects bearing upon some features of the business.

The subjects discussed at the dinner were international competition and some phases of the labor question; the latter with especial reference to the new plan of the Steel Corporation to avoid Sunday work, or at least to restrict employees to a six-day week.

The officers elected were: President, E. H. Gary; first vice-president, Powell Stackhouse; second vice-president, Willis L. King; third vice-president, Charles M. Schwab; treasurer, Edward Bailey; secretary, W. J. Filbert. The following directors were also reëlected: Edward Bailey, E. A. S. Clarke, Willis L. King, Samuel Mather, John A. Topping, T. J. Drummond, W. J. Filbert, J. C. Maben, W. A. Rogers and J. F. Welborn.

Publication of Invention before Patenting

By J. F. Brandenburg *

I have frequently been asked the question, if an inventor publishes an account of his invention, in a technical journal or elsewhere, what effect does such a publication have upon an application for patent on the invention filed by him subsequently? Under the statute, such a publication which is not more than two years prior to the date of the application for patent is no bar to the granting of a patent. In other words, an inventor may wait as long as two years after publishing his invention before applying for his patent. It may even be a distinct advantage to have published a full and clear description of the invention previous to applying for a patent thereon. In event of an interference, that is, a proceeding in the Patent Office to determine which of two rival claimants is entitled to the patent, the proof of publication may be of value in establishing priority of invention. But for this purpose, the publication must have been full and clear; so that if an inventor desires to secure this advantage by publication, he should make the description and illustration complete enough so that the invention could be performed by others skilled in the art.

On the other hand, if the invention has not been reduced to practice, i.e., successfully performed or embodied in an operative machine, it would be a mistake for an inventor to feel that by publication he had fully established his right to a patent, so that he could allow the invention to rest entirely idle for two years, or even for a shorter period, before filing his application. The question of diligence is often a controlling one in the Patent Office in interference proceedings and in the courts in patent suits; and it is best to complete an invention by reducing it to practice or by filing an application for patent as soon as possible after conception. In other words, an inventor loses no rights, up to the expiration of two years, by the publication of his invention, and may even gain an advantage as just explained; but publication will not atone for slothfulness.

H. A. Buehler, State geologist of Missouri, reports that the shipments of tailings from the Joplin district for the year 1909 amounted to 937,937 tons. These are used largely for railroad ballast and concrete.

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*Expert in patent causes, 2 Rector street, New York.

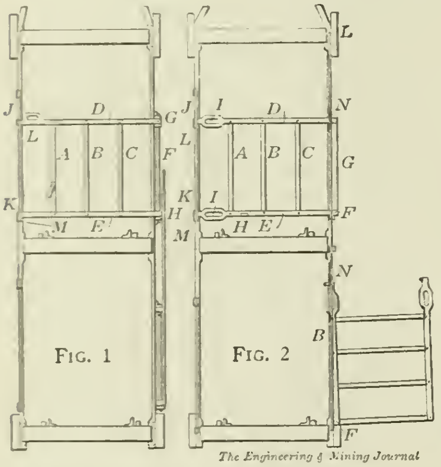
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Collapsible Gate for Cages*

The object of the gate shown in Fig. 1 is to allow the gate to collapse into a minimum space, in the case of complicated headgears. The gate should be so constructed that in case the cage is signaled away without its being closed, it will do no damage during its journey in the shaft.

The gate is constructed of flat iron bars, built up in such a manner as to allow of both a horizontal and a vertical motion. The vertical bars *A B C*, are made 1¼ in. wide by ⅜ in. thick, and are riveted 9 in. apart to the horizontal bars *D* and *E*, which are 1¾ in. wide by 7/16 in. thick. Loose rivets ⅝ in. in diameter, are used so the gate will collapse into the desired form. The horizontal bars are 24 in. apart, the lower bar being 6 in. from the bottom of the cage-deck. The whole gate swings horizontally upon a rod *F* which is ¾ in. in diameter and to which the horizontal bars are attached by loose rivets *G H*, ¾ in. in diameter, thus allowing of the vertical movement. The top horizontal bar has a hand hole 1½x4 in. to allow of the lifting of the gate. When the gate is closed, the ends of the horizontal bars rest in slots *J* and *K*, being kept in position by catches *L* and *M*.



COLLAPSIBLE AND RIGID GATE FOR SHAFT USE

When opening the gate, it is lifted clear of the catches, and is moved first in a horizontal and then in a vertical direction, in which latter position it is retained by a shackle until the cage is ready for moving away, when the gate is closed. The gate is easily manipulated. If anyone wishes to get out at any station in the shaft, it is only necessary to lift the gate vertically to the cage-hoops and to walk out.

RIGID GATE

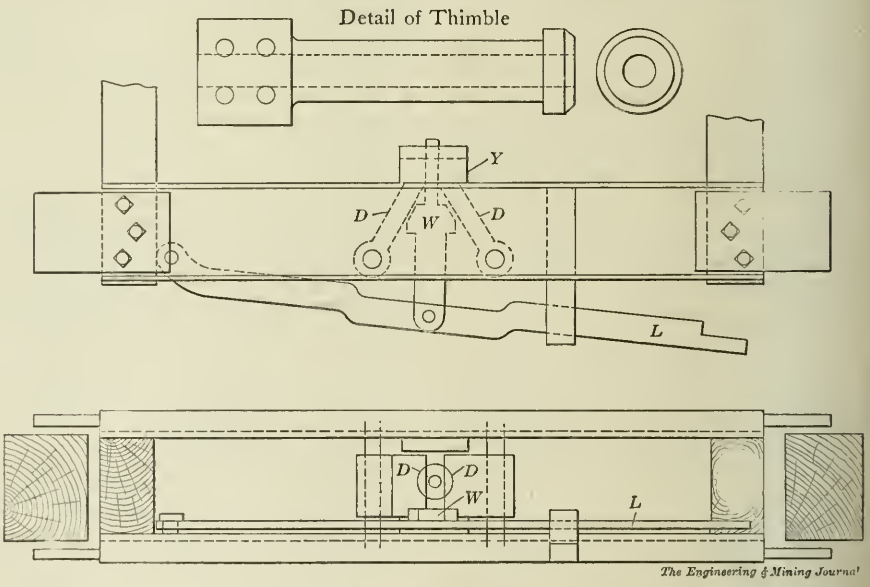
This gate, Fig. 2, is a somewhat similar type to the collapsible gate, and is recommended when space is not a serious consideration. It must, however, be closed before any movement of the cage takes place. In this gate the vertical bars *A B C* are riveted with fixed joints to the horizontal bars *D* and *E*, and the whole gate swings vertically on only one pivot or axis *F* which is ¾ in. in diameter. On the hinged end of the gate there is attached an additional vertical bar *G*, 1¾x⅜ in., for the purpose of stiffening the structure. There is, moreover, an additional hand-hole *I* provided in the lower horizontal bar, to which is also attached a stop-piece *H*, 2½x½x½ in., which prevents the gate, when opened, from going too far through the slot *N*. It is simple in construction and is not likely to get out of order.

Launders in Concentrating Mills

The ordinary launder in concentrating mills is a wooden trough, lined with sheet steel. When the steel lining wears through, which quickly happens, the trough becomes leaky and a general nuisance until it be relined. Sometimes it is useful to substitute for the ordinary launder a 3-in. or 4-in. wrought-iron pipe. When a hole wears in this, the pipe may be turned 90 deg., or as much as necessary, and this may be continued until the pipe is so far gone that it has to be relegated to the scrap heap.

Safety Crosshead for Bucket Shaft

A crosshead is in use at the Colby mine at Bessemer, Mich., which holds the bucket whenever the crosshead is stopped either accidentally or intentionally. C. E. Holley describes the device as follows: At a suitable distance above the bucket, the thimble shown in the accompanying sketch is attached to the cable by U-bolts. The crosshead is made up of channels bolted to vertical timbers. Across the bottom channels is a yoke *Y* through which the cable passes, and this yoke rests on the top of the thimble, thus supporting the crosshead.



SAFETY CROSSHEAD FOR HOISTING WITH BUCKETS

OPERATION OF CROSSHEAD

The dogs *D* close in below the collar of the thimble preventing the bucket leaving the crosshead in case the crosshead should stick in the shaft while being lowered. When the crosshead strikes the stop at the bottom of the guides, the lever *L* is raised, raising the wedge *W*. This wedge forces the dogs apart and permits the thimble to pass down between them, lowering the bucket without the crosshead. The wedge is guided by an extension, which slides in a hole in the yoke.

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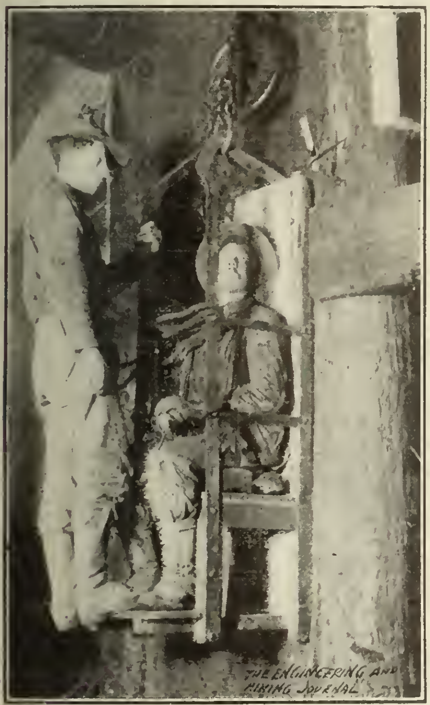
*C. A. Crofton, *Trans.* North of England Institute of Mining and Mechanical Engineers.

Apparatus for Conveying Wounded Men from Stopes

Most well managed mines pay particular attention to the physical welfare of their employees. They find it profitable to do so. Yet, even though all possible pains are taken to prevent injury, when the inevitable accident does happen and a man is seriously wounded, the facilities for getting him quickly and comfortably to where medical attention can be rendered are usually lacking. This is especially true when accidents occur in stopes, for, with no special arrangement for his removal at hand, the wounded man must often be carried down ladderways or lowered through a timber chute in improvised slings.


THE ENGINEERING AND MINING JOURNAL

Injured Man in Special Chair for Conveying from Stopes

At the Morning mine of the Federal Mining and Smelting Company, near Mullan, Ida., although every provision is made against accidents, specially constructed chairs for conveying wounded men from stopes are always kept in the levels above which ore is being mined. The design of these chairs is shown in the accompanying photograph of a man strapped in and ready to be lowered. The frame of iron strips gives the necessary stiffness and strength to the apparatus, and the side framing and high back protect the wounded man while he is being lowered.

A man strapped tightly into such a chair rides comfortably to the level, where, if desirable, the chair can be disconnected from the hoisting rope and used to convey the man where medical treatment is available. If similar contrivances were put in all of our mines many a poor fellow would be saved much real torture.

Bell Signals in Lake Superior District

By W. L. Fleming

The code of bell signals given below is that adopted by the Cleveland-Cliffs Iron Company for all its mines in the Lake Superior district. The code was described by O. D. McClure before the Lake Superior Mining Institute in order to call attention to the desirability of a uniform code for the district.

BELL SIGNALS AT CLEVELAND-CLIFFS.

1 bell, stop.
2 bells, lower.
3 bells, hoist.
4 bells, lower men.

Engineer must slow up at levels when lowering men.

4 slow bells, lower men slowly.
5 bells, hoist men.
5 slow bells, hoist men slowly.
6 bells, blasting signal.

Engineer must answer by raising rope two feet, then lower back two feet. Engineer will then stand at hoist under strict attention to hoist until given 3 bells.

7 bells, turn on or off steam.
8 bells, turn on or off air.
9 bells, danger signal.

Then ring number of level where danger exists. No person, except the cage tender, shall ring any bell, except in case of danger or when the main shaft is being sunk

After danger signal is given engineer will obey hoisting and lowering signals with extreme caution until notified that danger no longer exists.

15 bells, or notification by messenger, releases danger signal and informs engineer that hoisting conditions are normal.

Fire: 10 bells, then give level signal, then give 10 bells again.

LEVEL SIGNALS.

2—1	bells,	1st level.	4—1	bells,	11th level.
2—2	"	2nd "	4—2	"	12th "
2—3	"	3rd "	4—3	"	13th "
2—4	"	4th "	4—4	"	14th "
2—5	"	5th "	4—5	"	15th "
3—1	"	6th "	5—1	"	16th "
3—2	"	7th "	5—2	"	17th "
3—3	"	8th "	5—3	"	18th "
3—4	"	9th "	5—4	"	19th "
3—5	"	10th "	5—5	"	20th "

Rule 1. In giving signals, make strokes on bell at regular intervals. The bar (——) must take the same time as for one stroke of the bell, and no more.

Rule 2. No person must get off or on the bucket or cage while the same is in motion. When men are to be hoisted or lowered, give signal for men.

Rule 3. After signal "Ready to shoot in shaft," engineer must give signal when he is ready to hoist. Miners then "spit fuse" get into the bucket and signal to hoist.

Rule 4. All timber, tools, etc., "longer than the depth of the bucket" to be hoisted or lowered, must be securely lashed at the upper end to the cable.

Rule 5. The captain will see that one printed sheet of these signals and rules for each level and one for the engine room is attached to a board not less than 12 in. wide and 36 in. long, and securely fastened where signals can be read at the places above stated.

Rule 6. The above signals and rules must be obeyed. Any violation will be sufficient grounds for discharging the party or parties so doing.

Comparison with Western Practice

The most noticeable difference in this code, as compared with the Western practice, is the one-bell signal. In the West one bell is the signal to hoist or stop, while universal practice in the Superior district is to use the one-bell signal to stop only. It can hardly be an advantage to replace the long-used 3-1 signal for hoisting men by the use of five bells alone. In using the 3-1 signal, the three bells are rung before the men get on the cage, thus giving the engineer warning to stand by his hoist. This is a safeguard well worth observing, especially when using a comparatively light engine and a bucket.

The blasting signal, six bells, must be followed by three bells as the hoisting signal. Quite often the bell cord is heavy and the bells must necessarily be rung slowly. The time required to pull a heavy bell cord three times might preferably be spent by the men at some locality other than on top of a dozen or two sputtering fuses. Further, the great majority of signals given in an ordinary shift are merely the hoisting signal. The replacement of the simple one-bell signal by three, seems just that much added work on the part of the cage tender, with no corresponding advantage gained.

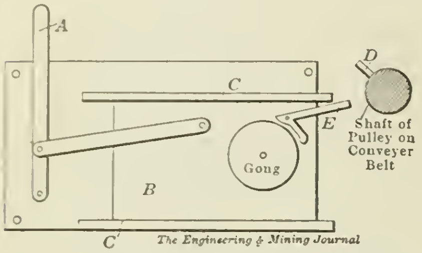
Of course it is probable that the Cleveland-Cliffs mines are all equipped with electric signaling devices, and the addition of extra bells in the signal code would not matter greatly to the cage or skip tenders, but an ideal signal code should be adaptable to all possible contingencies and represent the maximum efficiency under different conditions. The departures from Western practice noted above do not seem to represent an improvement when using electric signals, and certainly are not as desirable when using a heavy bell cord; further, the signals for hoisting men and for blasting are inferior in any case.

Determination of Mill Tonnage

In the new West mill of the Bunker Hill & Sullivan company, at Kellogg, Idaho, a rather clever device is used to check the daily mill tonnage. The apparatus is a timer giving the travel of the conveyer belt from the crusher house to the mill. From the weight of the sample cut in a certain time the corresponding mill tonnage per 24 hours can be determined.

The timing arrangement is shown in the accompanying drawing. On the shaft of the drive pulley of the conveyer belt is a lug *D*. When the plate *B*, on which is mounted a gong, is shoved forward by the lever *A*, the lug on the shaft strikes lever *E*, ringing the gong at every revolution of the conveyer-belt pulley. The plate *B* slides in grooves *C* and *C'*.

The number of strokes of the gong, while the sample is being cut, is noted, after which the sample is weighed and the corresponding mill tonnage per 24 hours figured. A table giving tons per day corresponding to pounds per revolution of the pulley has been worked out for sample weights of from 11 to 40 lb.; it reads to the nearest ¼ lb. The rate of travel of the conveyer belt is constant so that the various tonnages per 24 hours were calculated from the weight of ore carried on any certain length of belt. This is determined by the discharge per revolution of the pulley.


A
D
C
E
Shaft of Pulley on Conveyer Belt
Gong
B
C'
The Engineering & Mining Journal

TIMING DEVICE IN BUNKER HILL & SULLIVAN MILL

Volatilization of Lead and Silver in Cupellation

By DONALD M. LIDDELL*

The following is a record of experiments to determine lead-cupellation losses by volatilization in the ordinary bone-ash cupel, and also the cupellation losses of silver. Fine silver and test lead almost free from bismuth were taken for these experiments, so that any effect of various impurities on the volatilization losses is eliminated.

The method adopted was to bake cupels sufficiently long to insure freedom from organic matter and moisture; weigh the cupel; and cupel known amounts of lead, noting the gain in weight of the cupel. The difference between this weight and the calculated weight, of the original charge in terms of PbO, assuming that the lead is all oxidized to PbO, is the loss of litharge by volatilization.

The objections to the method are: (1) If any lead is oxidized to Pb_3O_4, the loss by volatilization is greater than it appears to be; (2) the cupels may lose weight in handling, which would make the apparent loss greater, although precautions in manipulaion can almost overcome this. The records by individual cupels is shown in the accompanying table, with those cupels which are noted as "frozen and reopened," there was an effort made to run especially cold throughout the cupellation. It is interesting to note how the volatilization losses of lead respond to this, while with the silver the results corroborate the general experience, that a silver assay frozen and then reopened may be correct or may be decidedly low. Omitting the frozen beads it is interesting to note how the loss of silver swings with the feathering of the cupel, being a good proof of the narrow temperature limits within which two commercial assayers must work in order to keep within the ordinary splitting limits.

As of further interest it may be noted the furnace in which the above experiments were run had a forced draft which carried off the lead fumes. When the pipe which carried off the fumes was cleaned after several months' running, the condensed lead oxide was found to carry 23.8 oz. Ag per ton. At this rate the litharge carried off in the above experiments, viz. 4.02 grams, would have contained 3.271 mg. of silver or about 0.16 per cent. of the silver cupelled. This, however, is only two-sevenths the amount of volatilization loss as given by direct assay of the cupel bottoms and determination of the fineness of the beads recovered. However, it is possible that with greater refinements, this method might give valuable determinations of silver losses.

Weight Lead Taken, Grams.	Weight Silver Taken, Mg.	Weight Silver Recovered, Mg.	Per Cent. Ag Recovered.	Cupel Weighed		Addition to Cupel, Grams.	Loss of Litharge, Grams.	Per Cent. Loss.	Remarks.
				Before, Grams.	After, Grams.				
20	109.64	108.02	98.52	34.36	55.54	21.18	0.37	1.81	Copious feathers.
20	102.11	100.40	98.30	34.53	55.78	21.25	0.30		Copious feathers.
20	109.76	107.98	98.38	35.16	56.36	21.20	0.35		Well feathered.
20	100.26	97.80	97.55	34.20	55.17	20.97	0.58		Trace of feathers.
20	103.72	101.52	97.88	35.62	56.82	21.20	0.35		Trace of feathers.
15	101.80	100.56	98.78	35.38	51.34	15.96	0.20	1.46	Frozen and reopened.
15	100.88	97.00	96.15	35.00	50.95	15.95	0.21		Frozen and reopened.
15	105.16	103.32	98.25	34.78	50.69	15.91	0.25		Copious feathers.
15	103.52	101.12	97.68	34.80	50.68	15.88	0.28		No feathers.
15	106.18	103.76	97.72	34.72	50.64	15.92	0.24		No feathers.
10	107.08	105.58	98.60	12.80	23.49	10.69	0.08	1.14	Frozen and reopened.
10	102.20	101.00	98.83	11.89	22.59	10.70	0.07		Frozen and reopened.
10	103.30	101.41	98.20	11.50	22.17	10.67	0.10		Slight feathers.
10	101.70	99.41	97.78	11.03	21.56	10.53	0.21		No feathers.
5	102.91	101.74	98.83	12.23	17.57	5.34	0.05	1.48	Copious feathers.
5	104.40	103.24	98.89	12.16	17.51	5.35	0.04		Copious feathers.
5	106.40	104.72	98.12	12.52	17.84	5.32	0.07		Trace of feathers.
5	101.56	98.96	97.41	12.82	18.09	5.27	0.12		No feathers.
5	105.71	103.01	97.15	12.07	17.32	5.27	0.12		No feathers.

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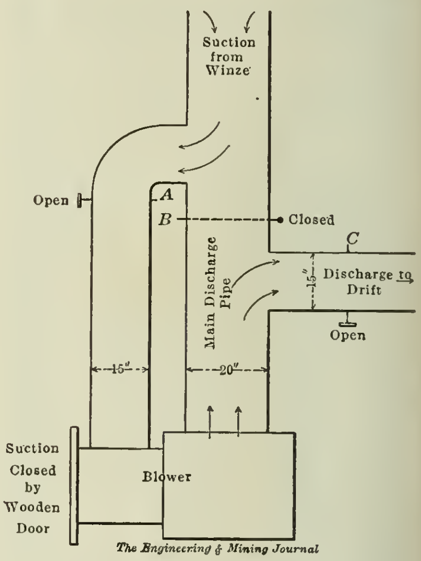
*[illegible] Indiana.

Piping Arrangement for Fan Blower

The accompanying sketch shows a simple piping arrangement for reversing the air current from a fan blower. The scheme is employed on the 2000-ft. level of the Union mine, at Virginia City, Nev., where a Sturtevant, multivane blower is used to supply air to a winze from which levels are being opened. The main discharge of this blower is 20 in. in diameter and the fan is run at 1120 r.p.m., being belt connected to a 20-h.p. motor. The power consumption is about 16 horsepower.

Ordinarily the fan is used merely to blow fresh air down the winze through the 20-in. main-discharge pipe. After blasting, it is, however, necessary to draw the foul air and gas from the winze. The 20-in. pipe then acts as a suction pipe, the air current being drawn (into the blower) through the parallel length of 15-in. pipe and discharged through the 20-in. pipe and connecting 15-in. pipe. A wooden door or gate is used to close the suction end of the blower and the gates *A*, *B* and *C* in the pipes control the air current. The sketch shows the blower drawing air from the winze and discharging it into the drift. After clearing out the winze the door is removed from the suction of the fan, valves *A* and *C* closed, *B* opened, and fresh air is blown into the winze. This is a much more simple arrangement than is usually seen and requires a minimum amount of pipe: The wooden gate to close the suction end of the fan can be quickly constructed of a few nails and some plank.

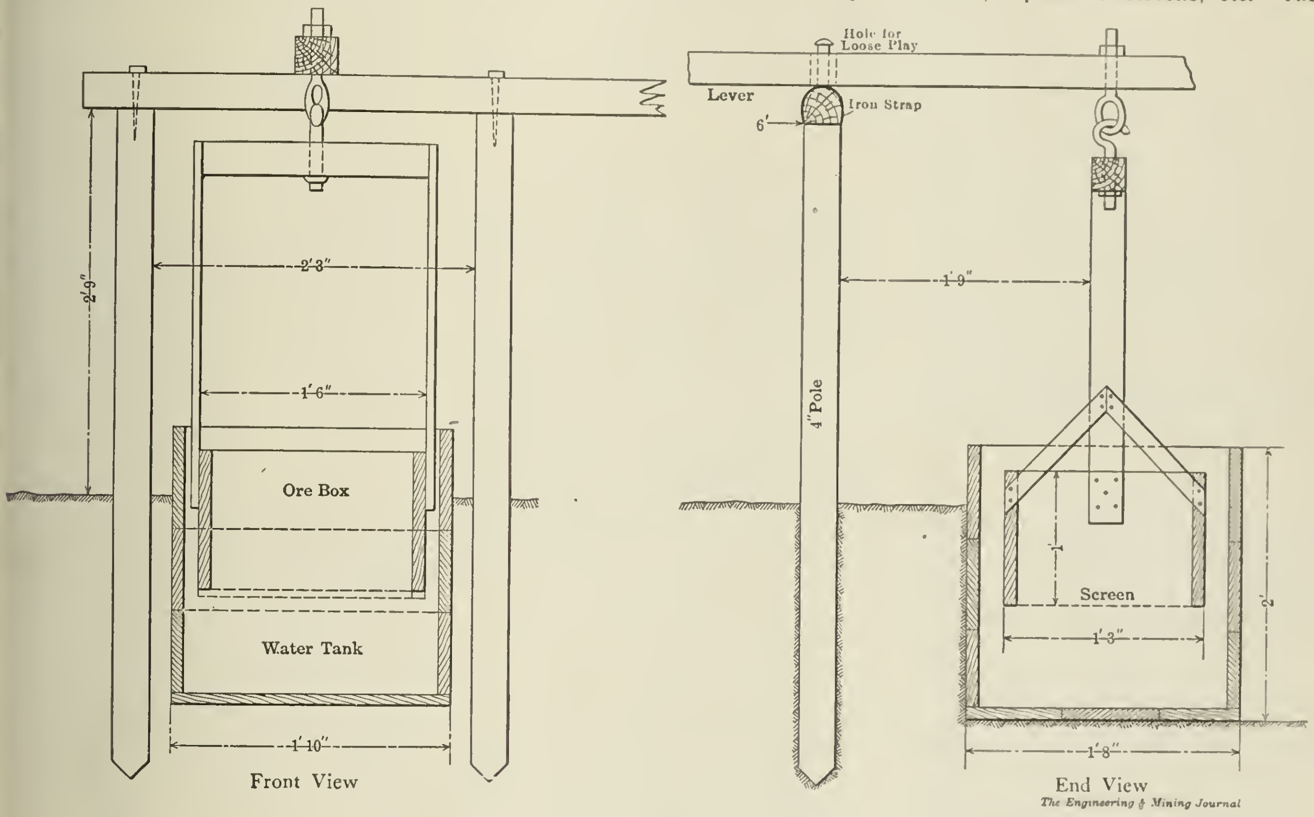


PIPE ARRANGEMENT ON FAN BLOWER USED ON COMSTOCK

It is much quicker and more economical to draw out bad air than to force it out by blowing in fresh air. In the winze mentioned, no time has to be lost between shifts even though the temperature of the air would quickly rise to above 120 deg. F. if artifical ventilation were not resorted to. By this arrangement it is possible to deliver the gases directly to an upcast air current instead of allowing them to mingle with the air currents about the winze station.

Construction and Operation of Hand Jigs

In many outlying districts where water is scarce and the scale of operations at small mines does not permit of a large expenditure for plant, it is often possible to produce small quantities of ore which would yield a shipping product, if suitable appliances could be installed with a moderate outlay. For this purpose a jig operated by hand has proved its usefulness, especially in the treatment of lead, zinc and copper ores.



The Engineering & Mining Journal

Constructional Details of Jig Used at Messina Mine in Northern Transvaal

With sulphide ores, good results can be obtained, provided the ore is fine enough and several sizes carefully screened for treatment. At the Messina copper mine, in the northern Transvaal, a number of hand jigs were installed under the direction of J. M. Calderwood, and he has described[1] their construction and operation.

Ease of Operation

As will be seen from the accompanying sketch, the ore box, having a screen bottom, is moved up and down in the water tank by means of the lever, which is given a quick down stroke with somewhat slower recovery, and just sufficient play or loose motion to give the required movement. The work is soon learned and carried out in an expert manner by boys. The box is filled by shovel, and a few minutes' jigging is sufficient to allow the heavier mineral to settle on the screen and the gangue or tailings to collect on top.

The top layer of tailings is first removed by means of a tin scraper, and then the concentrates. The concentrates are not removed each time the tailings are scraped off, but allowed to accumulate until in the judgment of the operator there is a sufficient accumulation of clean product, which is then dried and bagged for shipment.

Little Water Required

The tank or hutch is kept full of water, and the fine material and slimes settle in the bottom and are emptied as often as necessary by removing the screen. The quantity of water required is small, and is chiefly to make up for the loss by splashing and for refilling the tanks. The fines mentioned can be retreated in another jig having a smaller mesh screen if of sufficient value.

The mesh of the jig screen depends upon the size of the screened material treated and the proportion of fines desired. For coarse ore, ½-in. iron-wire screening is used, and for finer material ¼- to 1/16-in. screening, although for close work even finer screening may be used. The capacity of the hand jig, of course, depends upon the class of material treated and the grade of the ore as regards its mineral contents. From half a ton to one ton of material per day can be handled by each jig, according to the grade treated and the experience of the operator.

Satisfactory Results

The results obtained compare favorably with the work done by mechanical jigs, as regards the value of the concentrates and tailings produced. The initial outlay is small and the cost of operating a battery of hand jigs is merely a question of labor, repairs to screens, etc. The operation of these jigs may appear to be tedious, and certainly is when compared with the work done by the large mechanically operated jigs, whereby clean concentrates are automatically turned out and the tailings pass off without handling, but the importance and usefulness of the hand jig has been recognized and employed on many occasions where conditions have been feasible for their adoption.

There is much activity in the magnesite mines of Livermore, Alameda county, Cal. Kilns are being built to calcine the magnesite prior to shipment. It has been found too costly to haul the 35 miles to railroad by team and the operators will again use a traction engine. The engine takes 3½ days for the round trip, hauling three wagons besides the oil-fuel wagon.

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[1] *South African Min. Journ.*, March 12, 1910.

The True Story of the Camp Bird Discovery

Denver Correspondence

In 1875 William Weston was sent to London as European agent of the Kansas Pacific Railway. The following year, he received a letter from a friend, Captain Higgin, formerly of the British army, then staying in Del Norte, Colo., with Robert Andrews, assayer, and formerly melter at the Denver mint. Captain Higgin informed Weston that some extraordinarily rich ore was coming there to be assayed from the Wheel of Fortune mine, in the Sneffels district, and advised him to enter the Royal School of Mines and learn the assaying of the ores of gold, silver and lead, and then come out to San Juan. This Weston at once did; and resigning his railway appointment he worked for six months in the metallurgical laboratory and attended the lectures by Doctor Percy, then head of that school.

In October, 1877, Weston arrived at Del Norte, having wagoned his outfit over from La Veta, which was then the end of the railroad; from there he packed his outfit on burros over Cunningham gulch to Silverton, and thence up Mineral creek, and over the divide by Commodore gulch into Imogene basin, in the Sneffels district.

Claims Staked

Here he made the acquaintance of George Barber, an Englishman, and a good miner. The two formed a partnership, built a log cabin, got up some supplies from Silverton, and then staked seven claims; the Gertrude, Una, Crusader, Conqueror, Monument, Emily and Norma. They worked these single-handed for four years. The Gertrude and Una being at the head of the gulch, and at an elevation of 11,500 ft. were almost inaccessible, and on these they did only assessment work. Weston assayed his own ores, as he had brought an outfit with him, and obtained gold returns of from $12 to $20 per ton from Gertrude and Una outcrop ore, but at that time the smelteries would not pay for less than an ounce per ton of gold, and it cost $35 per ton to pack the ore to the Greene smeltery at Silverton, and $45 per ton for treatment, so it would not pay to extract ore running less than $100 per ton.

Una Changes Hands

Weston & Barber conveyed the Una to H. W. Reed and his brother Caleb, they agreeing to drive a crosscut tunnel to intersect the Gertrude and Una vein 150 ft. below its outcrop. This they did, but cut the vein in a "pinch" showing no pay ore. The Gertrude and Una were described in special correspondence of the Journal under the head of "San Juan Mines" in the issue of July 24, 1880, and incidentally prophesied to be the "coming bonanza."

In 1881 W. C. Coman, a mining engineer, of Quincy Ill., visited the basin to examine the Hidden Treasure for Orrin Skinner, a lawyer of that city. He saw the Weston & Barber group, and subsequently they sold it to Skinner for $50,000, receiving $20,000 each in cash, and paying Jim McCoy, of Quincy, who introduced the business, $10,000 as commission.

Orrin Skinner incorporated the Allied Mines Company, the chief stockholders of which being Mr. Blair, Mr. Browning, formerly Secretary of the Interior under President Lincoln, Thomas Ewing, Mr. Sanders, of Haverhill, Mass., and other prominent men in the East. Coman was made manager of the mill and metallurgical department, and Weston, mine manager.

First Company Wrecked

Skinner ordered a large mill, which was entirely unwarranted by the mine development, started in on a stock-jobbing scheme, and soon wrecked the concern, Weston resigning when money was not forthcoming in advance to pay his men. The last work done on the Gertrude was a contract let to drive 50 ft. on the vein. It was late in the autumn and when slides began to run the contractor got scared and quit the work after he had completed only 38 ft. He brought no ore down to the superintendent for assay, nor could the latter get up to the mine; subsequently it was found that the last 10 ft. of rock passed through contained gold, but back of that there was no ore.

About 14 years after this Thomas F. Walsh was running a pyritic smeltery at Silverton, and meantime the Allied Mines properties had been sold for taxes and practically abandoned. In those days no concentration was being done, and consequently silica predominated in the dumps of low-grade ore which would not pay to ship. The veins of the San Juan region are all silicious. Walsh was looking for these low-grade dumps carrying sufficient gold and silver to pay their freight to Silverton as he needed the silica for fluxing the basic ores of the Red Mountain district which he was then treating.

Camp Bird Organized

A. W. Richardson, the first prospector in Imogene basin, still owned and was working some claims there, and he was asked by Walsh to sample the dumps of the Allied mines, Walsh being then in Ouray. Richardson sampled the Gertrude dump, sent the samples down to Walsh, who had Harry Strout assay them. These disclosed some rich gold ore, and a search showed that there was gold in the face of the Gertrude drift. This happened in September, 1896.

Walsh then set quietly to work, and bought up practically the whole basin; the Allied Mines claims, including the Gertrude, on tax titles, and the Una on a bond from H. W. Reed for $10,000. He called the whole group the Camp Bird mines. Eventually Walsh sold out to an English company, and the $6,000,000 which has been paid in dividends was taken out of the Gertrude and Una claims, and not out of any claim called the Camp Bird, which was a claim east of the Gertrude located by A. W. Richardson after the ore had been found in the Gertrude. Walsh was a large owner of stock in the English company, so shared in the above dividends, besides receiving $5,250,000 for the mine; he also took out a large sum from the mine prior to selling.

The above is the true story of the discovery and development of this great gold mine, unvarnished by the various romantic yarns which have been attached to it by sensational newspaper writers, and it resolves itself into the following facts: Weston and Barber located the claims, A. W. Richardson discovered the rich ore, and Thomas F. Walsh, by good management, aided by the mine's extraordinary richness, developed it into one of the world's great gold producers.

Work of the Canadian Department of Mines

The work of the Mines Branch of the Canadian Department of Mines for this season has been arranged as follows:

Extensive work is to be done investigating the peat bogs along the Canadian Pacific railroad and tests of this fuel will be made at the Ottawa fuel testing plant. The iron-ore deposits of New Brunswick and Nova Scotia are to be investigated by Einar Lindeman. An experimental ore-dressing plant for the concentration of iron ores is to be installed at the Ottawa testing plant by G. C. Mackenzie.

The copper resources of Canada will be studied by Dr. A. W. G. Wilson. The season's work on copper will be mostly in Ontario and some of the eastern provinces.

The commercial processes for utilizing the sulphur of pyrite are being investigated with the object of preparing a special bulletin. The molybdenum deposits of Canada will be investigated by Dr. T. L. Walker. A special report on the building and ornamental stones of Ontario is in preparation. A second edition of the monograph on mica will be issued during the year. The manufacture and use of explosives will be investigated by J. G. S. Hudson.

Officers of the division of mineral resources and statistics will visit mining districts in various parts of the Dominion for the purpose of collecting statistics of mineral production. The plant at the School of Mines, Kingston, has been placed at the service of the Mines Branch for conducting certain metallurgical experiments, especially in connection with Canadian zinc ores.

New Keystone Copper Company

The first annual report of Consulting Engineer J. Parke Channing to the directors of the New Keystone Copper Company was made this week. The company is capitalized at $3,000,000, comprising 600,000 shares with a par value of $5 each, of which 358,174 have been issued. The financial report from the beginning of operations to June 14, 1910, shows receipts of new capital amounting to $352,166. There has been expended on the mine $149,245, leaving a balance of $202,921. Mr. Channing's report is given, practically in full, below:

The property of the New Keystone Copper Company consists of about 243 acres of land in Gila county, Ariz., about seven miles west of Globe, in the Miami district. Before the property was acquired by this company the major portion of it was operated by the Keystone Copper Company, which exploited some veins in granite porphyry in the southern end of the property, and large shipments of high-grade carbonate and silicate ores were made.

The developments at the Miami called attention to the possibilities of disseminated ore in the northern portion of the property, where much Pinal schist outcropped, and with that view operations have been continued in that portion of the property for the last year.

Of the total 243 acres surface indications show that probably about 60 acres are underlain with Pinal schist, though in a great many cases the Pinal schist is overlain by a relatively thin sheet of granite porphyry varying from 25 to 200 ft. in thickness, and it is in this district that explorations have been carried on.

Development Work

The work up to the first of June consisted of 30 drill holes, a main shaft 330 ft. deep, from which drifting on the 150-ft. and 250-ft. levels has been conducted to a total length of about 7200 ft. In addition to this, 1200 ft. of raises and winzes have been put through, making a total of approximately 8730 ft. of underground work.

Based upon the results of the underground work there has been developed on 11 acres of ground 2,000,000 tons of ore. The assay of 591 samples from this area gave an average of 2.36 per cent. copper. In addition to this 11 acres there are eight acres prospected by drill holes which would indicate an additional area of probably the same tonnage and value per acre as that already opened up.

The development of the property will be continued by the use of two drills, which will be followed up by underground work, and while it is impossible to predict the future, there seems to be strong probabilities of materially increasing the tonnage already developed and indicated.

The exact relation of the granite porphyry to the ore has not yet been thoroughly worked out and it is not yet known whether or not concentrating ore may be found in the southern part of the property, or in those places more deeply covered by the granite porphyry.

The property is on the mineral belt, the sequence of the properties from the east being Miami, Inspiration, Keystone and Live Oak. The southern portion of the property is well adapted for the driving of tunnels for the extraction of the ore. While the orebody is thin the ground is extremely dry, and mining can be carried on at a low figure by the use of an adit tunnel.

No steps have been taken toward the consideration of a concentrator for the property, it being considered more desirable to thoroughly determine the tonnage of the ground before giving that matter serious consideration.

Utilization of Peat in Canada

The fuel tesing plant in Ottawa is to be operated this season under the direction of B. F. Haanel, by the Canadian Department of Mines, for the purpose of experimentation and demonstration. A second producer, suitable for lignite and bituminous coal, is to be installed at the plant.

The Government peat bog at Alfred is to be operated for a period of about three months to demonstrate the latest process of manufacturing air-dried peat. Several thousand tons will be produced during the present season. Part of the peat fuel produced will be shipped to Ottawa for use in the peat-gas producer plant now installed, and part will be sold for domestic use. The operation of the plant at the bog, which is open to public inspection, is under the direction of A. Anrep. The bog can be reached from Caledonia Springs, or from Alfred, on the Canadian Pacific railroad.

The investigation of peat bogs in Canada, to ascertain their extent and to determine the quality and quantity of peat available, will be continued by A. Anrep after the operating plant at Alfred is closed down for the season.

Steel Making in Great Britain

The British Iron Trade Association reports the production of steel in Great Britain in 1909, as shown in the accompanying table.

The total bessemer or converter steel in 1908 was 1,478,539; open-hearth, 3,817,103 tons. The increase in bessemer in 1909 was 254,681 tons, and in open-hearth ingots 331,305 tons; a total gain of 585,986 tons, or 11.1 per cent. The production of bessemer-steel rails, ties and fishplates amounted to 821,079 tons, which was 105,672 tons more than in 1908 and about equal to the 1907 production. While the production of open-hearth rails increased greatly, there was a falling off in blooms and billets. Imports of blooms and billets were largely increased.

STEEL PRODUCTION IN GREAT BRITAIN.

	Acid		Basic		Total	
	Tons.	Per Ct.	Tons.	Per Ct.	Tons.	Per Ct.
Converter	1,111,042	18.9	622,178	10.6	1,733,220	29.5
Open-hearth	2,763,158	47.0	1,385,250	23.5	4,148,108	70.5
Total	3,874,200	65.9	2,007,428	34.1	5,881,628	100.0
Total, 1908	3,485,306	65.8	1,810,336	34.2	5,295,642	100.0

The steel production of the United Kingdom for 10 years has been, in long tons:

	Bessemer.	Open-Hearth.	Total.
1900	1,745,004	3,156,050	4,901,054
1901	1,606,653	3,297,791	4,904,444
1902	1,825,779	3,083,288	4,909,067
1903	1,910,018	3,124,083	5,034,101
1904	1,781,533	3,245,346	5,026,879
1905	2,009,712	3,879,748	5,889,460
1906	1,907,338	4,554,936	6,462,274
1907	1,859,259	4,663,489	6,522,748
1908	1,478,539	3,817,103	5,295,642
1909	1,733,220	4,148,408	5,881,628

The production of 1909 has been exceeded three times—in 1905, in 1906 and in 1907. It was less than in 1907, the year of maximum production, by 641,120 tons, or 9.8 per cent. The proportions have not varied greatly, that of converter steel decreasing from 35.6 per cent. in 1900 to 29.5 in 1909; while that of open-hearth increased from 64.4 to 70.5 per cent. of the total.

Mining Water

There seems to be a continued demand for water from the Old Dominion mine, Globe, Ariz., in addition to furnishing 1,000,000 gal. per day to the Miami company at 5c. per 1000 gal. when that plant starts, the Old Dominion is negotiating a contract with the city of Globe for between 400,000 and 500,000 gal. daily at a cost of 10c. per 1000 gal. for city purposes. It is not improbable that the Old Dominion will soon come to a position where its pumping costs will not be very heavy, as a result of its income from the sale of water, and this will be a considerable factor in reducing operating costs.

A Silver Bearing Diorite in Southern Arizona

Silver Considered an Original Constituent of the Rock, and Is Inclosed in Secondary Magnetite. Ferro-Magnesian Minerals Much Altered

BY JOSIAH BOND*

The discovery of silver in altered diorite is interesting as describing a new occurrence of silver. Several years ago I determined the presence of copper in small quantities in the First Mountain trap of New Jersey, where it was probably a primary mineral, and following Vogt's suggestion, showed that this was probably the source of the copper deposits underlying that rock mass. In view of the exploitation of what are called mineralized porphyries for copper in these days, this occurrence is suggestive of the possibility of low-grade silver deposits of the same general character. The determination of the rock is by Frederick W. Apgar, of Jamaica, N. Y., and is as follows:

General Characteristics

"In hand specimens the rock presents a granular, mottled appearance, of rather fine grain, greenish gray in color on fresh fracture, weathering to a brownish color on exposed surfaces; the alteration due to weathering extends only slightly beneath the surface.

"A close megascopical examination shows that the prevailing color is due to irregular grains of a green mineral inclosing, in many cases, minute specks of magnetite. In the lighter colored areas the striations of a plagioclase feldspar can be detected with orthoclase and occasionally minute grains resembling quartz in fracture. Cleavage plates of biotite appear sparingly. The finely granitoid texture, with plagioclase as the chief feldspar and moderate quantity of dark ferromagnesian mineral, would lead to the opinion that the rock was either a diorite or possibly a gabbro.

"Under the microscope, however, in thin section, an examination shows the mineralogical characteristics of a diorite, but the presence of pyroxene places the specimen close to the gabbro group, probably as more definitely describing it, the name augite-diorite may be applied. Many interesting metamorphic changes can be traced through various sections, including the presence of minute well defined crystals of native silver disseminated through the rock mass, which is an unusual occurrence in igneous rocks.

"A summary of the minerals composing this diorite follows, tabulated in the probable order of their crystallization from the molten magma: Apatite, zircon and titanite (rare), some magnetite and the silver; part of the magnetite is secondary as will be shown later; then in the order of development, augite, hornblende and biotite and finally plagioclase; and as a binder, filling the interstices, orthoclase and a small amount of quartz.

The Feldspars

"The most abundant constituent of the rock is plagioclase, which occurs in characteristic elongated hypidiomorphic forms varying in length from about 0.2 to 1.7 mm. Twinning, according to the albite law, is universally common. In some cases polysynthetic twinning after both the albite and pericline laws was observed. The majority of the crystals appear to be andesine as indicated by the extinction angles in sections normal to the albite twinning plane (maximum angle slightly over 20), but the composition varies; in a few crystals optical tests seemed to indicate a composition closely approaching labradorite.

"Inclusions of small idiomorphic apatite crystals are comparatively rare, but extremely minute, glassy inclusions are frequently observed. The evidence of alteration in the plagioclase feldspars is not marked, but a slight cloudiness partially due to kaolinization, and partly to the glassy inclusions above mentioned, is visible along crystal boundaries and cleavage cracks.

"Orthoclase, one of the last minerals to form, appears in grains and as a cementing material filling the interstices between the other minerals, it is comparatively fresh in appearance. Quartz, although of infrequent occurrence in the rock, was observed in one section as small, irregular grains, evidently formed at about the same time as the orthoclase.

The Amphiboles

"Compact green hornblende in irregular grains, possibly original, is found sparingly. The amphibole has the peculiar uralitic structure consisting of approximately parallel, fibrous or columnar aggregates, light green with slight pleochroism, and occasionally in aggregates of a radiating fibrous habit. In all cases chlorite and epidote occur in conjunction with the uralitic hornblende and in many instances the remnants of what appears to be a fibrous augite.

"The epidote, distinctly a secondary formation, occurs in pale yellow fibrous aggregates bordering the augite as well as surrounding and penetrating the secondary hornblende.

The Pyroxenes

"Augite in well defined, colorless crystals, evidently original, is found sparingly, nearly always bearing evidence of alteration. The earliest trace is a slight, cloudy greenish or brownish tint. In an advanced stage of alteration, minute greenish fibrous masses and plates spread through the crystal from the edges and give the appearance of a confused aggregate; finally, uralitic hornblende results with only a trace of the original augite remaining.

"All stages in the alteration of augite can be observed in the sections and render it probable that all the uralitic hornblende resulted from the metamorphism of augite. Possibly the compact green hornblende may be still a step in advance in the alteration, being formed from the fiberous hornblende, but the conditions seem to favor more strongly the theory that this is a primary mineral.

Other Minerals

"Cleavage plates and crystals of biotite, usually much corroded and surrounded by aggregates of fibrous hornblende and magnetite, were observed scattered sparingly through the sections, also minute grains and plates of hematite, the latter probably derived from augite.

"Magnetite is present in the rock as an abundant constituent, and bears evidence of having separated early in the solidification of the magma. In other cases it occurs in inclusions and as aggregates and grains surrounding the hornblende, biotite and silver and is certainly a product of later metamorphic change. It is difficult and often impossible to distinguish in all cases with certainty between the primary and the secondary formation.

"Native silver hypidiomorphic crystals varying from 0.05 to 0.2 mm. in size, included in all cases in magnetite, are of constant occurrence through the rock; their sharp crystal faces and angles lead to the supposition that they are an original constituent; a few partially corroded forms and irregular grains are seen.

"In the rock under consideration it thus seems probable that upon consolidation the predominant ferromagnesian mineral was augite, with possibly some amphibole, then later, by partial metamorphism through hydrochemical processes, a change took place and the gradual formation of fibrous uraltic hornblende, replacing the augite with the development of epidote and magnetite, altered the mineralogical character.

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*Patagonia, Arizona.

"It would appear also, from the conditions observed in the slides, that at an early period in this action a partial corrosion or solution of the silver crystals took place, and later by the deposition of secondary magnetite and its segregation around the metallic silver, further change was prevented, preserving the silver as observed, while the alteration of the ferro-magnesian minerals proceeded."

Geology of the Silver Bearing District

The rock above determined lies on the south slope of the Santa Rita mountains in Arizona. The geological sequence has not been determined by competent authority, but it is quite clear that the mass of the rock lies on the slope of an earlier mass of typical syenite, which carries a large variety of accessory ingredients. This syenite seems to be the earliest rock now exposed in this vicinity, and is, as it now seems, the core of the district. On the other side of the mountain are exposed a variety of breccias, which are of later origin. The augite-diorite here described is itself flanked by effusive andesites and dacites and probably these are subsequent to the diorite, though this has not yet been completely demonstrated.

Syenite Contains No Veins

The syenite, so far as now known, presents no veins, but all the other rocks are cut by veins from 3 to 10 ft. wide, all of which, so far as tested, carry silver in or near the outcrop. There has been no work done in depth on any of these veins, but several 100-ft. shafts near by show silver in the bottom, generally associated with lead or copper, or both.

The rock herewith determined is from a point within a few feet of the original surface. As the silver is probably an original constituent of the rock, but is partially corroded, it follows that some part of the silver must have been carried away in solution to be deposited where conditions were favorable to precipitation. The eroded rock must have been enormous in quantity, so that the amount of silver taken into solution has been large, as the carefully sampled rock near the surface still carries 7.5 oz. of silver.

The economic point to be determined is whether the deeper rock may have preserved its full original silver content and be amenable to exploitation. It is such problems that occasionally face the prospector. I may add that since this discovery of silver, some other rocks in the district are found to carry similar disseminated silver, as well as copper, but to what extent has not been fully demonstrated as yet.

Tunnel of the Utah Metal Mining Company

Salt Lake Correspondence

The Utah Metal Mining Company, which is driving the 11,000-ft. drain and operating tunnel between the Tooele side of the Oquirrh range and Carr Fork, Bingham district, Utah, has completed all of its preliminary work and is advancing the face of the tunnel 80 to 90 ft. per week. The tunnel has been straightened and enlarged to 8x10 ft. and is in a distance of 3000 ft. A double track, 24-in. gage, with 35-lb. rail, will be laid its entire length. At present a single track and switches are used. The grade is 0.4 per cent. Waste and supplies are hauled by a Baldwin-Westinghouse locomotive in trains of four cars. The cars are side dump and have a capacity of two tons each. An exhaust fan with a capacity of 5300 cu.ft. per min. has been installed.

Power Plant

Power is produced from the company's own water supply. A pipe-line has been laid from springs in Pine flat and Hansen Springs cañon, both branches of Middle cañon, in which the plant is situated, and gives a head of 750 ft. at the powerhouse. A 125-h.p. Pelton wheel is direct connected to a Westinghouse 55-kw. direct-current generator, and furnishes electricity for the traction circuit. The fan at the entrance of the tunnel is driven by a 15-h.p. motor connected to this line. The water from the tunnel amounts to about 500 gal. per min. This has a head of 160 ft. at the power house, and drives a 20-h.p. Pelton wheel, which operates a separate dynamo for the lighting circuit. An Ingersoll-Rand two-stage compressor with a capacity of 600 cu.ft. of free air per min. is belt-driven by a 60-h.p. Pelton wheel.

Tunnel May Be Used to Transport Ore to International Smeltery

The company has two additional power sites, lower down in Middle cañon. By piping the water two miles from the present power plant, a head of 900 ft. can be secured Below this is another power site, and if it should be required, more than 1000 h.p. can be developed. The company also has a second tunnel site 700 ft. vertically below the tunnel now being driven.

The tunnel started in limestone and has cut interbedded limestone and quartzite with a flat dip. During the last week, mineralized limestone was cut for 70 ft. Two Ingersoll-Rand 3¼-in. drills are used abreast, and three shifts are worked, drilling and blasting each shift.

When the tunnel is completed it is expected that the company will transport some Bingham ores to the International smeltery. To do this, it will be necessary to build an electric road from the tunnel to the smeltery, six miles. This will have a down grade of about 3 per cent.

Leasers are working on the Bingham side and shipping both silver-lead and copper ore. Some of the old upper workings where this ore is being mined are 2000 ft. higher than the new tunnel. The company has built a living house accommodating 40 men, with a library, bath rooms, etc. At present, 50 men are employed.

Recent Tariff Decisions

Two decisions of some importance have been filed by the Board of General Appraisers on duties levied by the new tariff on articles in which the metal industries are interested:

The board has sustained protests filed by the Goldschmidt Thermit Company, Moses Norris and others, regarding the classification under the tariff of metallic chromium, manganese, tungsten, etc. General Appraiser Fischer, who writes the decision, says that these substances differ from the ferroalloys passed upon in an earlier decision of the board in that they have a much smaller percentage of iron in their composition, although in other respects they are identical in character and are used similarly in the manufacture of special steel or alloy steels. The metals in question are combinations of chromium and the other substances mentioned above. The decision says: "We hold the merchandise specified in schedule *A* dutiable properly as claimed at the rate of $4 per ton under paragraph 122 of the tariff act of 1897, by similitude to ferromanganese."

Bort

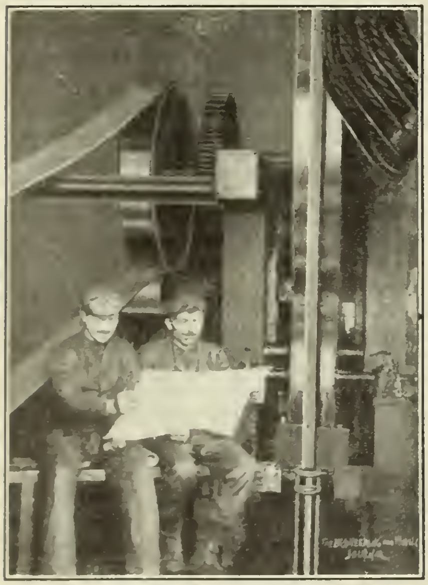
In sustaining a contention raised by the General Electric Company, the board holds that, under the provisions of the tariff of 1909, so called bort, a species of commercial diamond, entitled to free entry. General Appraiser Sharretts, who writes the decision for the board, refers to the fact that a similar issue arose under the Dingley act. He points out that when the earlier decision regarding diamonds for industrial purposes was handed down by the board, the courts upheld the decision for free entry. The board is convinced that the diamonds in question are not intended by Congress to be dutiable at 10 per cent., as alleged by the Government. The decision says that if Congress had intended that diamonds for industrial purposes were to be regarded in the same category with stones for jewelry and decorative purposes, they would have been provided for specifically in the new law with a corresponding duty. As the new law stands, the board believes that diamonds intended for tools and similar uses are free of duty. The protest is sustained accordingly.

Leinweber Method of Extracting Oil from Wells

Endless Cable Carrying Absorbent Material Is Main Feature. Used Successfully at a Depth of 3838 ft. Delivers 7 oz. Oil per Foot of Cable

BY FREDERICK A. TALBOT*

A new method for extracting oil from boreholes was described in the JOURNAL, May 15, 1909. It is the invention of Bruno Leinweber, an Austrian engineer. The principal feature of this system is the employment of an endless cable, which is faced on one side with carpet shag or pile, so as to absorb the oil as the band trails through the contents of the pit, and which is subsequently passed between mangling rollers to drive out the oil with which it has become saturated. The result of the preliminary tests on the Kryg oilfields were considered so satisfactory that arrangements were completed for the thorough testing of the system under normal conditions on the Galician oilfields. Georg Mészáros, the director of the Galician-Carpathian Petroleum Company, has been interested in the experiments, and when the Maryampolski tests were completed he installed the apparatus at Boryslaw, so that comparative results might be obtained with the ordinary methods of raising the oil. These trials have been in progress for a year and have substantiated the claims of the inventor.



FRONT VIEW OF LEINWEBER MACHINE IN OPERATION

IMPROVEMENTS IN THE PROCESS

The inventor has simplified the machine. Instead of having a nest of guide rollers and a pair of pressing rolls, he now employs only two wheels. The upper or driving disk is of large diameter, and the lower disk is about a third of the diameter of the upper. The two wheels are so mounted as to bring their rims together and almost secure a friction drive. The upcoming band passes over the lower disk and under the larger wheel being mangled in the process, so that the oil is driven out, and then round the periphery of the upper wheel from which it drops into the borehole again. This arrangement makes the machine far more compact, and facilitates transport. The complete apparatus can be fitted up in a workshop, transported intact to the borehole and set up, so that the only labor involved is the lowering of the band and the setting of the belt drive from the engine.

EXPERIMENTAL PLANS

An experimental plant was erected so that the laborers would become familiar with the operation of the machine. This installation, known as Plant No. 2, was erected over a borehole 607 ft. in depth, with tubes 5.118 in. in diameter. The band employed was an old steel-wire rope that had been used before in deep borehole investigations. It was considerably worn at places, but it served to familiarize the men with the working of the machine. The cable is 1.968 in. wide, the shag facing being 1.77 in. in width.

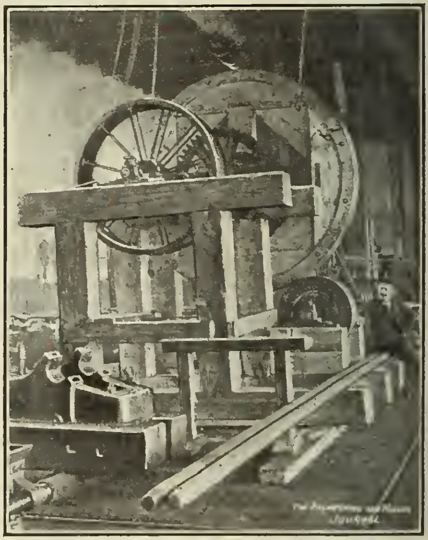
In the course of these experiments it was found that the band offered certain obstruction to the passage of the free gas issuing from the borehole. Pockets of gas formed in the tube, and when they were released suddenly, a violent shock was produced. Efforts were at once made to remedy this defect, and the inventor has now patented a special device whereby this trouble is satisfactorily overcome. The downward and upward traveling sections of the band now offer no impediment to the upward flow of the escaping gases.

The mounting and dismounting of the band at the pit is carried out quickly. It can be lowered to the full depth of 607 ft. in eight minutes, and hauled to the surface in 12 min. Severing or splicing the band to take off, or mount on the machine occupies one-half hour. As the power required to drive the cable is only that to lift the weight of the oil carried in the upcoming section (the two halves of the band counterbalance one another) and the slight friction losses, a high efficiency is secured.

PLANT INSTALLED AT A DEEP WELL

When the men had become familiar with the working of the machine, a plant was erected over pit No. 25. This borehole is 3838 ft. deep, and in order to secure the most successful results, the inventor devised a special type of steel-wire rope, the feature of which is great strength combined with flexibility. It is built up of a series of steel wires of 0.098 in. in diameter; the width of the cable being 2.2 in. It is covered with shag 1.77 in. wide, and the rope has a tensile strain of 12,540 pounds.

The borehole in which this cable is used was badly constructed, the tubes being of varying diameters and badly screwed together at various points. Consequently, in order to avoid the cable scraping the sides of the tubes, the width of the band had to be kept within certain limits. This drawback notwithstanding, the band has been found to possess an absorbing and hauling capacity from a depth of 3838 ft. of 9.16 oz. of crude oil per foot of cable. The oil clings so tightly to the shag that the net yield at the rollers is about 7 oz. per foot of band. It will thus be seen that a certain proportion of oil present in the band travels up and down as a "dead load." The speed of the cable is 2½ ft. per second.



SIDE VIEW OF MACHINE IN SHOP

SPLICING THE CABLE

Special devices have also lately been adopted for splicing the sections of the steel rope so as to secure a flush and exceedingly strong joint. In fact, on several occasions this joint has proved to be far stronger than the main body of the cable. When hemp rope is used, the joints are merely sewn together by an ordinary cobbler's machine.

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*15 Wilbury Crescent, Hove, England

When this apparatus was first set up at Pit No. 25, the lowering and withdrawing of the cable was a somewhat protracted operation. Special tools had to be employed for hauling out the cable and the task lasted about six hours. Recently, however, the inventor has devised a simpler improved system, whereby the rope is hauled up by the winding engine and can be raised from a depth of 3838 ft. in about an hour. The machine framing for this pit was also made massive and heavy, so as to secure strength, but now the inventor has devised what he describes as "quick mounting machines." These are much more compact, lighter, easier to handle and transport from place to place. With the new machine, about two hours will suffice for mounting the band, and it can be lowered to 3838 ft. in 23½ minutes.

Leinweber and Plunger Systems Compared

A striking instance of the possibilities of the process was afforded in connection with Pit No. 25. The plunger system previously used raised 44,000 lb. of oil per day. When the Leinweber band was first installed, it was only operated to a depth of 3615 ft. The first runs proved the plant to be working so satisfactorily that the band was withdrawn and lengthened so as to reach the full depth of 3838 ft. After two days adjusting, it was set to work, and the yield of oil per day was increased by 50 per cent. as compared with the former system, the aggregate yield being 66,000 lb. Even this is not the maximum yield that has been obtained per day by this process, for the cable now in use in Pit. No. 2 was previously used in a borehole 2624 ft. deep and brought to the surface over 110,000 lb. of crude oil daily.

Should the band from any cause suddenly snap when running at full speed, the drive is automatically cut off and the machine at once brought to a stop. The upper end of the band is made fast and the cable wound up until the other end is regained, when the ends are respliced and the band relowered. For lowering purposes the band is coiled on a drum in the roof of the building and its descent is controlled by one man who has two large wooden levers. One actuates the mechanism for guiding the band down the borehole, while the other controls the brake mechanism.

Owing to the complete success of the system further extensions are in progress in the Galician oilfields. The inventor is at present building two new machines for more exacting work. In one the endless cable will be 8530 ft. in length and will be used in a borehole 4265 ft. deep.

Mining Notes from Norway

Special Correspondence

The Norwegian State silver-leaching works produced in the fiscal year of 1908-9 about 8300 kg. of silver, a gain of 1300 kg. over the previous year; but owing to the drop in the price of silver, the works were operated at a loss.

Nickel

The nickel mines at Evje, in Saeterstal, in 1909 produced 6600 metric tons of nickel ore. The smelting of this yielded 168 metric tons of copper-nickel matte, which contained 70 metric tons of nickel. The matte was exported. Recently it has been decided to erect an electric plant for the production of nickel from this product.

Copper

The copper works at Sulitjelma employed last year, 1600 men and produced 110,000 metric tons of pyrite for export, 16,000 metric tons of smelting ore and 8000 metric tons of Elmore concentrate, which yielded 950 metric tons of copper. The Elmore concentration plant has been running since April, 1909, and gives satisfaction. The company's production for 1910 is estimated at 122,000 metric tons of pyrite for export and 25,000 metric tons of smelting ore and Elmore concentrates. The future of this company is considered promising. The ore in sight amounts to about 1,800,000 metric tons.

The famous copper operations at Röros employed daily 600 to 700 men and produced 10,000 metric tons of pyrite for export and about 17,000 metric tons of smelting ore, with a yield of 700 metric tons of copper.

The value of the total Norwegian copper and pyrite production was about $2,000,000, a small increase over 1908. The price of copper during 1909 averaged about £60 a ton, but the price of sulphuric acid was very low, about 3½c. per unit, and this caused the accumulation of a large stock of pyrite at the end of the year.

Zinc

A wet zinc concentration plant near Gru, in Hadeland, was started in November, 1909, and at the end of the year had treated 12,700 metric tons of zinc ore.

The Bergwerks A. G. Norge reported for the year 1909 an output of 5400 tons. Several important discoveries of zinc ore in the eastern part of Norway were reported during the year.

Iron Ore

From the iron districts in the northern part of Norway it is reported that the concentration plant at Sudvaranger expects to start operation in July. Its yearly capacity will be 600,000 metric tons of concentrates and briquets. Also, the plant at Salagen (Amt Tromoso), it is reported, will start operations in a short time and will produce 5000 metric tons of ore or briquets monthly. The works at Dunderlandstale were shut down during the whole year. It is said that operations will be started after a reconstruction of the concentration mill.

Important iron-ore deposits were discovered north of the Trondhjemsfjord in the county north of Breitestade and to the west in the direction of Aafjorden. The ore contains 55 per cent. iron and the orebody is estimated to contain about 7,500,000 metric tons of ore. The production of several smaller mines which were in operation during 1909 amounted to 40,000 metric tons of ore.

The works at Nas, near Tredestrand, commenced the production of crucible steel during the year with a force of 100 men. An electric steel furnace, of Alb. Hiorth patent, was built at Josingfjorden, in the county of Soggendal, and has produced several tons of steel. Also, at Odda, in Hardange, the erection of an iron and steel plant is planned.

Gold Mining in the Priamur District, Siberia

A correspondent of the *Mining Journal* says it is the opinion of geologists that the Priamur gold area in Siberia is practically untouched as to rock gold, and that only the richest sands have been worked at all, whereas reef gold is abundant in all the mining districts of the province. Expressing regret at the hitherto incomplete geological investigation of the Priamur, he continues: "Nevertheless, the gold industry there is gradually growing, as can be seen from the accompanying table furnished by the Irkutsk Mining Department.

MINING IN THE PRIAMUR DISTRICT, SIBERIA.

	1905. oz.	1906. oz.	1907. oz.	1908. oz.
Gold product	241,032	251,131	288,031	251,569
Mines work'd	251	287	278	297
Mines unw'd	617	613	617	790
New claims	300	360	566	157

The correspondent states, in conclusion, that mining technique in the Priamur is low and there is rarely any disposition shown to resort to modern methods; consequently, quiet prevails for the moment. Horsepower has lived its time; but steam and electricity are far from being generally employed. A recent effort to introduce excavators resulted in failure. More hope is now expressed in dredges; though where they are used not much skill in their use is shown, sometimes none at all. The consequence is that the mines are gradually getting into the hands of foreigners.

Report of the International Smelting and Refining Company

The first annual report of the International Smelting and Refining Company, covering the year ended Dec. 31, 1909, has just been published. This company, incorporated under the laws of the State of New Jersey, Dec. 21, 1908, has an authorized capital stock of $50,000,000, of which $10,000,000 is issued. The par value of the shares is $100. The officers of the company are: John D. Ryan, president; Dennis Sheedy, vice-president, and J. W. Allen, secretary and treasurer. The directors are: Charles F. Brooker, Charles N. King, Thomas Morrison, Charles H. Sabin, Chester A. Congdon, Edmund C. Converse, Adolph Lewisohn, William D. Thornton, Urban H. Broughton, Thomas F. Cole, John D. Ryan and Dennis Sheedy.

STATEMENT OF FINANCIAL POSITION

The combined balance sheet, as of Dec. 31, 1909, and the income account of the International Smelting and Refining Company and subsidiary companies, is given in the accompanying tabulation.

COMBINED BALANCE SHEET, DEC. 31, 1909.

ASSETS.		
Fixed:		
Real estate, plants, buildings, railways, machinery, etc....		$7,816,902
Office furniture and fixtures...		800
Deferred:		
Supplies on hand............		266,149
Metals on hand............		72,650
Insurance unexpired..........		4,930
Current:		
Accounts receivable..........		1,615,944
Advance payments on purchases		31,869
Cash in banks and on hand...		1,989,207
		$11,798,455
LIABILITIES.		
Fixed:		
Capital stock—Issue of 100,000 shares par value $100 each..		$10,000,000
Current:		
Accounts payable............		630,309
Payroll labor............		28,824
Reserves:		
Reserve for depreciation.......		203,609
Surplus:		
Net income for year ending Dec. 31, 1909	$1,235,712	
Deduct dividends paid	$300,000	935,712
		$11,798,455

INCOME ACCOUNT, DEC. 31, 1909.

INCOME.	
Tolls on copper and net profits on metals	$2,412,901
Interest and discount............	67,516
Miscellaneous revenues..........	76,124
	$2,586,542
EXPENDITURES.	
Manufacturing and operating costs	$1,079,012
General expenses............	46,004
Depreciation	225,812
	$1,350,830
Net income for year, carried to balance sheet annexed........	$1,235,712

EARLY ORGANIZATION

The board of directors of the company first met and elected officers on March 31, 1909, and immediately thereafter the company took over by assignment, at actual cost, a contract previously entered into by William D. Thornton with the Utah Consolidated Mining Company, providing for the treatment of the ore from the mines of that company for a period of 10 years, beginning Nov. 11, 1908. As a part of the contract, the company acquired a site near Pine cañon, Utah, upon which Mr. Thornton had already begun the erection of a smeltery.

The company also purchased from the United Metals Selling Company all the capital stock of the Raritan Copper Works, the Raritan Terminal and Transportation Company, and the New Jersey Storage and Warehouse Company. The Raritan copper-refining plant at Perth Amboy, N. J., was taken over as of Jan. 1, 1909.

TOOELE VALLEY RAILWAY

To serve the new smeltery the Tooele Valley Railway Company was organized under the laws of Utah. A well ballasted road has been built for a distance of seven miles from a point on the main line of the San Pedro, Los Angeles & Salt Lake Railroad near Tooele to the smelting plant. The expenditures for the year upon the Tooele plant and railroad, and upon land for the smeltery site, amounted to $1,579,628.

DATA ON THE TOOELE SMELTERY

The report includes a description of the smeltery by E. P. Mathewson, who has been in full charge of the construction of the smelting works, railroad, etc. Mr. Mathewson's report contains some later information than was given in the JOURNAL article of April 23, 1910. The capacity of the sampling mill is stated as 4500 tons per day, and the capacity of the sampling ore bins as 6000 tons; that of the blast-furnace storage bin, 3000 tons and of the roaster storage bin, 5000 tons. The 32 McDougal roasters are quoted as each having a capacity of 40 tons of dry ore per 24 hours. The smoke from the roasting department will pass directly into a large dust chamber so arranged that a system of wire filters, such as is in use at the Great Falls plant of the Anaconda Copper Mining Company, may be introduced at the expense of merely hanging the wires.

The five reverberatory furnaces are of the Anaconda type, the hearths being 19 x102 ft., and the capacity of each is estimated at 275 tons of calcined material daily. Adjoining the reverberatory building is the converter building, which is a fireproof steel structure with a clay floor. There are five converter stands, manufactured by the Power and Mining Machinery Company, all electrically operated. Matte from the reverberatories will be tapped directly into the converters, and the slag from the converters will be taken in large ladles by cross cranes to the reverberatory furnaces and poured in hot, thus making a minimum amount of cold slag to be handled. Copper from the converters will be transferred in ladles to the molds in the casting shed adjoining, and at first poured from the crane into the molds and then loaded on cars on a track adjacent for shipment.

WILL BEGIN SMELTING IN AUGUST

Ore will be received from the Utah Consolidated mine over the cableway, having a capacity of 100 tons per hour, which is expected to be finished and in operation by July 1, 1910. It is planned to store 15,000 tons of ore during July, so that active smelting operations can be commenced Aug. 1. Mr. Mathewson states that the construction of the plant has gone on without much trouble, excepting that a delay of about four months was occasioned by the non arrival of the structural steel, due to a fire on the manufacturer's premises in Milwaukee.

International Nickel Company

The annual report of the International Nickel Company for the year ended March 31, 1910, shows a net profit of $2,067,528, after deducting expenses, depreciations, exhaustion of minerals, bond-sinking funds and all other charges. During the year $238,841 were expended for new equipment and additional property. The amount set apart for depreciation of plant was $305,025; exhaustion of minerals $123,581; and sinking funds $184,000. Four quarterly dividends of 1½ per cent. were paid on the preferred stock amounting to $534,745. Dividends of 5½ per cent., amounting to $487,978, were paid on the common stock.

The demand for the company's product was much larger than during the previous year and indicates a broadening of the normal market. During the year the United States battleships "Florida" and "North Dakota," as well as several government vessels, were equipped with propellers of Monel metal and the two Argentine Republic battleships now being constructed are to be similarly equipped.

After making the usual provision for depreciation of plant and mineral exhaustions, which in the opinion of the board was deemed sufficient, the net accumulated earnings applicable to dividend on common stock were $1,499,227, or equal to 16.9 per cent. on the outstanding stock.

Copperas Production in the United States

According to statistics collected for "The Mineral Industry," the production of copperas in the United States, in 1909, amounted to 42,225 short tons, valued at $464,475, as compared with an output of 35,334 tons valued at $388,674 in 1908. Prices were practically unchanged throughout 1909. New York quotations were 55c. per 100 lb. for copperas in bulk, 65@75c. per 100 lb. in barrels and 60@70c. per 100 lb. in bags.

Mines and Mill of the Consolidated Mercur Co.

Wide Veins Worked by Caving System; Little Machine Drilling; Successful Cyanidation of Complex Refractory Ores; Dry Crushing Employed

BY ROY HUTCHINS ALLEN[*]

The Consolidated Mercur Gold Mines Company operates the Mercur, Golden Gate and Brickyard mines, together with a cyanide plant of 800 to 1000 tons daily capacity, at Mercur, Utah. Mercur, a town of but a few hundred inhabitants, is near the southern end of the Oquirrh mountains almost on the line between Tooele and Utah counties, 62.5 miles by rail south of Salt Lake City at the terminus of the Salt Lake & Mercur railroad.

Silver mining was started in this camp in 1868 or 1869, but the work was sporadic and on a small scale, and not until about 1890 when gold was discovered, did the camp begin to attain its present importance and rank as the most famous gold producer in the State. The ore is of low grade and not free milling, and interesting methods of mining and treatment have been developed to work it at a profit.

GEOLOGY

The geology of the Mercur district has been described in some detail by J. E. Spurr[1] and from that report, modified somewhat by the later development in the mines, the following brief account of the geology is taken.

The rocks of the district comprise an exposed thickness of about 12,000 ft. of sedimentary beds of Carboniferous age, chiefly limestones, which have been folded into a simple anticline with its axis in a northwesterly direction. The mines of Mercur are all on the northeastern limb of this fold. The ore deposits occur near the bottom of the series in the lower portion of a bed 5000 ft. thick, known as the Great Blue limestone. This is a comparatively uniform, massive and pure limestone, of a dark, gray-blue color, which on weathering becomes light colored and often nearly white. It has been intruded by several sheets of quartz porphyry, from 4 to 40 ft. in thickness, which in general correspond with the bedding of the limestone in both strike and dip. As seen in the underground workings the limestone has a strike varying from north 23 deg. west in the Brickyard mine to about north 55 deg. west in the Mercur mine, with a dip ranging from 10 to 40 deg. toward the northeast.

The ore deposits underlie the sheets of porphyry and are made up of both altered porphyry and altered limestone. Their lines of greatest mineralization coincide closely in direction with a series of nearly vertical fissures which have a trend toward the northeast. The mineralizing agents are believed to have ascended in gaseous form through these fissures, depositing the ore minerals along the lower contact of the porphyry and impregnating both it and the limestone, forming a total thickness of workable ore varying from 4 to 70 ft. As a rule only a few feet of the porphyry is mineralized, the greater portion of the ore being in the limestone.

The original ore minerals included pyrite, realgar, cinnabar and gold which occurred both associated with the pyrite and probably as a telluride. The greater portion of the ore which lies within the porphyry remains unchanged, while that in the limestone immediately below is almost completely oxidized. The pyrite is in small grains; a few are visible, but most of the grains are microscopic. None of the gold is visible even under a good pocket lens. Realgar and cinnabar are present in but small amount and they are of interest chiefly in the consideration of the genesis of the ores.

The unaltered porphyry is fine-grained, compact and nearly white in color, showing a few inconspicuous phenocrysts of quartz, feldspar and biotite. This unaltered rock, however, is not seen near the ore deposits. There it is almost black, quite soft, and contains small crystals of gypsum, while upon exposure to the air it crumbles and has the semblance of a dried mud. The mineralized limestone is hard and cherty, but the evidence points to the fact that the silicification antedated the deposition of the ore minerals.

THE BRICKYARD MINE

The Birckyard mine lies at the northerly end of the Consolidated Mercur property and adjoins the Geyser claim, which has been abandoned. It is entered by several winzes and by an incline which follows the Brickyard vein. This vein has a strike of north 23 deg. west and a dip toward the northeast varying from 20 to 40 deg. It follows the under side of a sheet of porphyry and is of the character already described. The vein varies from 8 to 40 ft. in thickness, the latter figure including also the "lower vein," which in places is worked with the Brickyard vein. Of this thickness from 2 to 4 ft. is the mineralized porphyry, which is quite as high in gold content as is the limestone, but the porphyry ore is apt to be "basic" (containing sulphides) and refractory, and has to be roasted before the gold can be extracted by cyanide.

Drifts are run close together, rarely as much as 30 ft. apart, and the ore worked out in open stopes. Much of the ore is mined by a modification of drift stoping. The vein is so flat, averaging from 20 to 25 deg., that ore will not run in the stopes and there are therefore but few chutes in this mine, and those of the simplest construction. Practically all of the broken ore is shoveled from the stopes into the mine cars, the drifts being so near together that little wheelbarrow work is required. Pillars are left to support the roof, and these are occasionally supplemented by a few stulls. At the point where the ore is 40 ft. thick it is planned to start an underground glory hole.

The ore in this mine is drilled almost entirely with machine drills, 3⅛-in. Ingersoll and Sullivan machines being used. The ground is hard and breaks badly. In running a 5x7-ft. drift, 13 to 15 holes are required for the round and the face is "slabbed" off. A round is drilled in about 1½ shifts.

The ore is trammed by hand to an incline 1000 ft. long, where it is lowered by a double-drum hoist, working in balance, to the main haulage level, and is then taken in trains of seven cars each to the Golden Gate shaft. All tramming on this level is done by horses or mules.

THE GOLDEN GATE MINE

The ore from the various properties is all brought to the Golden Gate shaft and there hoisted to the surface. This shaft in 6x16 ft. inside the lagging, and has three compartments, each 4 ft. 8 in. by 4 ft. 6 in. wide. The wall- and end-plates are of 8x8-in. timbers, while the dividers are 6x8-in. in section. The shaft was sunk vertically but the encroachment of the waste dump from the mill, which is considerably higher, led to some modifications and peculiarities of construction. From the original collar, the shaft has been carried up through the dump at an angle of 22 deg., then from its point of emergence the skipway is continued at an angle of 45 deg., both from the plane of the shaft and from the horizontal, to the ore bins at the back of the Golden Gate mill.

The two south compartments of the shaft are used for hoisting ore and each contains a skip holding from 2½ to 3

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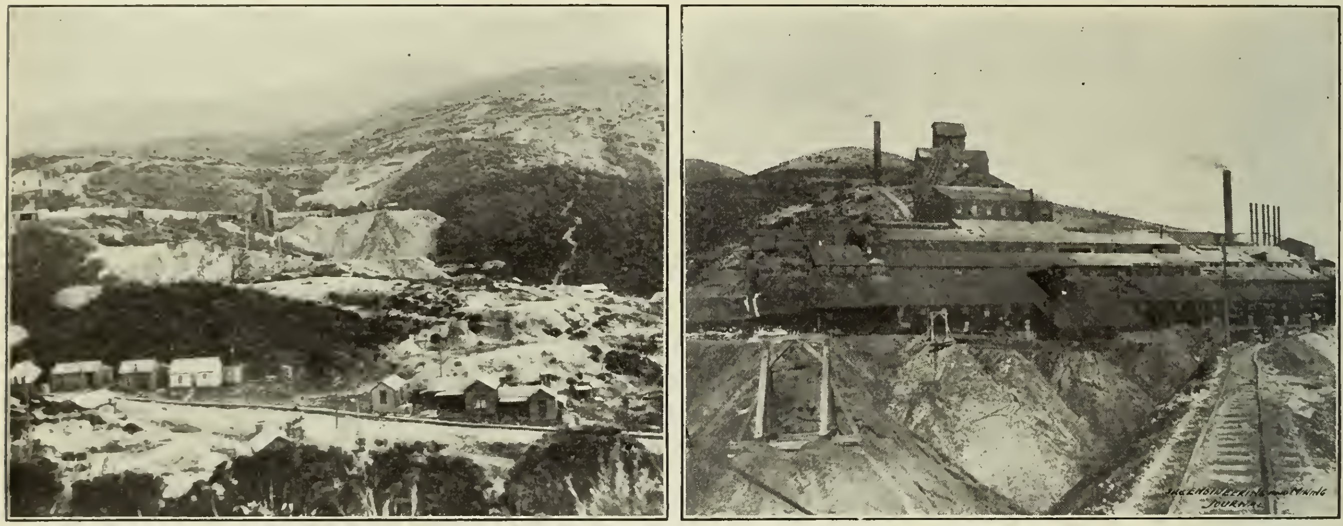
[*] Mining engineer, Lunenburg, Mass.

[1] *Sixteenth Annual Report* (1894-5), U. S. Geol. Surv., Part II, pp. 349-455.



MERCUR MINE AND GOLDEN GATE MINE AND MILL OF THE CONSOLIDATED MERCUR, TOOELE COUNTY, UTAH.

tons. These skips are handled in balance by a Webster, Camp & Lane double cylindrical-drum hoist. The drums are 6 ft. in diameter and 32 in. long, and take a 1⅛-in. hoisting rope. They are driven through bevel and spur gearing by a 150-h.p. Westinghouse type-C alternating-current motor, taking two-phase current with 7200 alternations at 200 volts. The motor has a speed of 580 r.p.m. and is run continuously, the drums of the hoist being thrown in and out by friction clutches. The speed of hoisting is between 500 and 600 ft. per minute.

The third compartment of the shaft contains a cage for handling men and supplies. This cage is operated by a single-drum hoist of the same design as the skip hoist, being driven through bevel and spur gearing and friction clutch by a Westinghouse motor, which runs continuously at 720 r.p.m. The hoist drum is 4 ft. in diameter with a 4-ft. face, and takes a ⅞-in. wire rope.

The ore from the Brickyard and Golden Gate mines is brought to the shaft in end-dumping cars of 26 cu.ft. capacity in trains of seven cars and a brake car, drawn by horses, while that from the Mercur mine is brought by electric locomotives in trains of nine cars each. The cars are dumped by hand at the shaft into ore pockets holding from 60 to 160 tons each. These are provided with what may be called the shovel type of gate—a simple slide gate of sheet iron lifted by a handle and closed with the aid of the operator's foot. In order to prevent ore from falling down the shaft a bulkhead is lowered below the skip which is being loaded, and this deflects any spilled ore into small pockets placed below the large ones, the small pockets holding about four skiploads of ore.

The shaft is timbered with regular shaft sets and lagging, except at the ore pockets, where it is cribbed. The mine is dry, a small air-driven pump, working about one hour daily, handling all of the water. With the exception of the blacksmith shops, of which there is one at each mine, the surface plant is all situated at the Golden Gate shaft. The carpenter shop contains but the ordinary tools, all of the mine timbers being framed by hand, but there is a well equipped machine shop and a small foundry in connection with the mill.

The two compressors are in the hoist room. These are Nordberg two-stage air compressors of the same size. They have cylinders 16 and 10 in. by 28-in. stroke, and are classed as 11-drill machines. One is run at 92, the other at 110 r.p.m. Each is driven by a 125-h.p. Westinghouse type C, 2-phase, 7200-alternation, 200-volt motor, one running at 600 and the other at 580 r.p.m. The normal capacity of each machine is 600 cu.ft. of free air per min. compressed to 80 lb. per sq.in. There are air receivers in the compressor room and also at the entrance to the Mercur tunnel, about ½ mile to the south.

THE MERCUR MINE

The Mercur mine is at the southern end of the property. It has been opened by several adits, but all of the ore is now taken out through one. This adit has a single 18-in. track, 1200 ft. of which are equipped with electric haulage, while on the remaining 1900 ft. horses are used.

The ore is trammed to the collecting station, about 1200 ft. from the portal, by men, or by horses drawing trains of seven cars each. From this point it is taken by either one of two electric locomotives which haul trains of nine cars each along a surface tramway which follows a contour of the hill, then through an adit under the mill dumps to the Golden Gate shaft, at which point the ore is hoisted to the mill bins.

The principal vein is the Mercur, which also runs through the other mines, and which outcrops plainly on the hillsides on both sides of Lewiston cañon. It is dark gray in color and is characterized by fine networks of quartz or calcite with more or less barite running through it. The vein as worked, including the so called "lower" vein which in most places is mined with it, varies in width from 12 ft. to a maximum of 70 ft., with an average width of from 20 to 30 ft. The dip varies from 10 or 12 deg. up to 30 deg. The general relations to the porphyry are similar to those already described.

MINING METHODS AT THE MERCUR MINE

In the narrower portions of the orebody, the levels are driven about 20 ft. apart vertically, and the ore is mined in open stopes which may or may not be timbered with stulls. From the drifts inclines are put up in the vein, and the ore is broken down on both sides of them. These stopes have no fixed dimensions, the width depending upon the extent of the shoot and also upon the character of the roof. About 4 ft. of ore are left next to the hanging-wall to support the roof, and stulls are placed wherever necessary. When the stope has attained its proper size, the ore next the hanging-wall is extracted by the retreating system. The roof is then allowed to cave.

The above method is employed only where the ore has a thickness of less than 15 ft. Most of the orebodies in this mine have a thickness considerably in excess of this figure, and these are mined by a modification of the caving system as used in the soft-ore iron mines of the Lake Superior region.

From the main levels raises are put up at intervals of 25 to 50 ft., and so far as possible, are kept as near the foot-wall as is permitted by the angle of slope at which the ore will run in the chutes. In most places the dip of the orebody is so low that a series of chutes, offset from one another, is necessary, the ore being drawn from one chute and trammed into another nearer the hanging-wall.

Where the orebody is wide, as many as three drifts approximately parallel may be run on each main level, chute-raises being carried up from each drift in order to reduce to a minimum the labor of handling the ore in the stopes. As a rule, only the foot-wall raises are used for both manway and orechute.

From the raises, sublevels are started at vertical intervals of 14 ft., the development on each sublevel consisting only of crosscuts driven to both the foot- and hanging-walls. The work of caving is commenced on the upper sublevel and continued downward in successive steps. In starting this work the ends of the crosscuts next the hanging-wall are widened out until two or more of the crosscuts are connected. A few holes are then drilled in the roof and blasted to start the caving. The broken ore is then shoveled into wheelbarrows and conveyed to the chutes. When waste appears in the broken ore the intervening pillars are successively sliced to the hight of the crosscut toward the foot-wall, meanwhile holding the roof temporarily by stulls. Practically all the work is done by hand, so heavy timbers are not needed to withstand the shocks of blasting. As the working faces of the slices recede, the roof is allowed to cave, only maintaining a safe working place for the men along the new outline of the pillar. After the second slice has been taken out, the back over the working places must be supported by tunnel sets as the pillar itself is liable to crush.

When the ore from one sublevel or block of ground has been extracted, caving is commenced on the sublevel immediately below, where the process is carried out in the same manner. It is not necessary that all of the ore be extracted from one sublevel before caving can be started on another, for caving is carried on at several levels in the mine, but not in the same block of ore.

Recovery and Costs in Caving System

Where the sublevels are 14 ft. apart the thickness of the back which remains to be caved varies from 4 to 7 ft., the lesser thickness having proved the more satisfactory. It is questioned by the mine superintendent whether better results would not be obtained if the sublevel interval were not reduced to 12 ft. By caving a small thickness of ore, a higher percentage of recovery is made, and the operation is kept under better control. It will be seen that in this mine from 50 to 70 per cent. of the ore is extracted by drift-stoping and slicing, leaving but 30 to 50 per cent. to be obtained by caving.

Where the caving is begun next to the hanging-wall it is sometimes difficult to obtain all of the ore along the foot-wall, particularly where the dip of the orebody is low. This method, however, is well adapted to the conditions prevailing in this mine, where the ore is firm and stands well without timbering but the hanging-wall is weak. In case the caving were commenced next the foot-wall the pressure upon the pillars would become almost insupportable by the time the caving had proceeded for two-thirds the width of the deposit.

The system requires little powder or timber, but as employed here requires a large amount of development work and a great deal of shovel and wheelbarrow work. The ore is rather soft and almost all of the drilling is done by hand, there being but seven machine drills in use in the three mines. Mining is done largely by contract, the price in the Mercur mine varying from 60c. to $1.40 per car of 1¼ tons delivered at the electric-haulage station, while in the Brickyard mine the costs in some instances run as high as $4 per car. On the Mercur property considerable ore was taken out on the surface through glory holes, at a cost of about 20c. per car. This ore, however, was of low grade. The limit on ore mined is placed at $3 for oxidized, and $4.65 for base (sulphide) ore, though much ore of less value is mined and milled. Six-dollar ore is considered first-class, while that running $10 per ton is high grade.

Development is done largely by contract, the price for a 5x7-ft. drift varying from $2 to $4 per ft., the average cost being $3.50. The contractors furnish all their supplies and deliver their ore or broken rock to the electric-haulage station. With hand drilling the drifts are run at a rate of up to 70 or 75 ft. per month.

Miners receive $2.75, and machine men $3 for an eight-hour shift, while contractors average about $3.50 per day. The mine is operated two eight-hour shifts every day in the week. From 270 to 290 men are employed underground during the 24 hours and the daily output ranges from 700 to 800 tons of ore. The average figure is, therefore, about 2½ tons of ore per day per man.

The Golden Gate Mill

The Golden Gate mill is situated on the hillside just above the Golden Gate shaft with which it is connected by an incline, as was stated in the description of that shaft. The mill, until recently, has had a capacity for treating 1200 tons of ore daily, but the collapse of the foundations in the north wing of the mill rendered useless eight of the large leaching vats, reducing the capacity to about 800 tons per day.

Apart from the magnitude of its operations the mill is of interest for it represents the result of many years of thought and costly experiment in the endeavor to treat the refractory ores at a profit. It was on these ores that the first large-scale tests of the cyanide process were made in this country, and in the old mill of the company the idea of the vacuum system of slime filtration was first conceived.

In the system as finally devised, the oxidized and base ores are kept separate until the final leaching is done. The two classes of ore are dumped from the skips into separate bins with grizzly bottoms, there being 1¼-in. spaces between the bars. The oversize from each bin passes to a No. 6 Gates gyratory crusher, where it is crushed to pass a 2½-in. ring. The undersize of the grizzlies and the product of the crushers goes to storage bins having a capacity of 1000 tons.

Oxidized Ore

From the bins the oxidized ore is fed through any one of ten gates to a belt conveyer which discharges to a 24-in. belt running at right angles to the first, and on which the ore is carried to the screening and fine-crushing plant. The ore is dropped on a stationary inclined screen having ⅝-in. square holes, the oversize passing into a 15x36-in. Gates roll set with approximately a ⅝-in. space. The product of the rolls passes over a screen similar to the first and with the same size of openings.

The undersize from both screens is raised by a bucket elevator to the fine-ore bin, while the oversize after passing through a 15x26-in. Gates roll is elevated to a trommel having a ½-in. screen, the undersize from which drops into the fine-ore bin while the oversize goes to the coarse-ore bin. The coarse ore falls through pipes to the charging bins, from which it is taken in one-ton cars to form the beds in the leaching vats.

The fine ore is conveyed on belts to a trough in which it is sluiced with cyanide solution into the first Consolidated Mercur mixer-classifier. This machine is a combination of log washer and classifier. The box, which is 20 ft. long, is inclined at an angle of 12½ deg., and the revolving blades of the mixer propel the coarse sand up this slope while the rush of water through the machine carries off the fine sand and slime. The coarse sand goes to a second mixer-classifier, where the slime and fine sand is further removed. The dewatered coarse sand is conveyed to the charging bins and thence to 12 of the leaching tanks, together with the roasted base ore and coarse oxidized ore.

The slime and fine sand from each mixer-classifier flow into a cone classifier which has no rising current. The overflow from the two cones passes to a third cone while the spigot product of each is further sized in a Dorr classifier. These Dorr classifiers are similar in appearance to the paddle conveyers used in many smelting works for conveying hot roasted ore from the roasting furnaces. They consist of a series of back-and-forward moving blades or hoes, suspended from a common rod and operated by a bell crank lever. These hoes convey the fine sand up an inclined trough through which water is running, delivering the clean sand at the upper end, while the slime, practically free from sand, passes out with the overflow.

The sand from the classifiers is sluiced to four leaching vats where it is treated by itself, while the slime from both the cone and Dorr classifiers flows to three settling tanks, 30 ft. in diameter and with slightly conical bottoms, equipped with Dorr continuous slime thickeners. These slime thickeners consist of four slowly rotating arms making six revolutions per hour, to which are attached plows which move the accumulating slime toward the discharge opening at the center of the tank. The treatment of the slime is complete in these settling tanks and the pulp passes directly to the filters. These filters are of the stationary vacuum type, designed by the Consolidated Mercur company, but similar to the Butters filter.

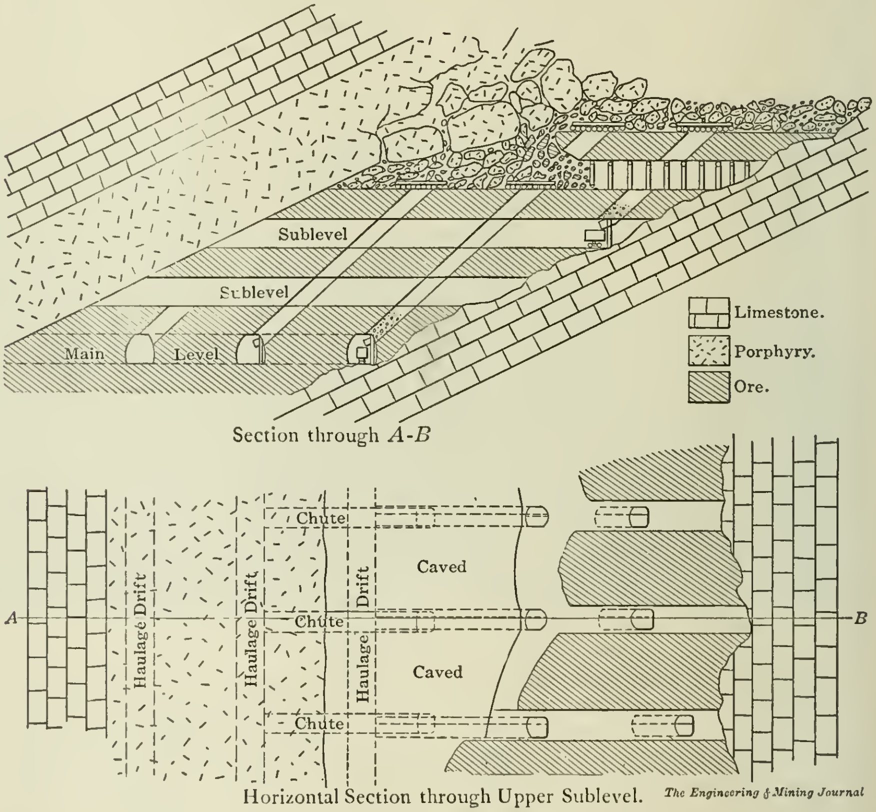
There are 104 filter leaves, each 7 ft. square, placed in hopper-bottom tanks in groups of 16 or 20 each. With a vacuum of about 20 in. of mercury it takes 50 min. to form a cake ⅝ to ¾ in. thick, and another 50 min. to wash it. The filters are washed in the same tank and the washed cake later discharged by forcing water into the interior of the filter leaves. It requires about 10 min. to change from pulp to wash water and about the same length of time to change back again, so the average length of the complete cycle is two hours. The washing is done with weak cyanide solution.

The greater part of the solutions from the filters, as well as the clear overflow from the Dorr slime thickeners, is returned to the upper floor of the mill and is used for sluicing the ore into the mixers, and also as the weak solution in the sand leaching vats.

BASE ORE

The method of preparing the base ore for treatment with the cyanide solution is quite different from that outlined above, for although the oxidized ore will give fairly good extraction even when broken as coarse as 1 in. in diameter, the base ore must be finely crushed and roasted. After passing through the No. 6 Gates gyratory crusher and into the storage bin, the ore is discharged through four gates on an 18-in. belt conveyer which delivers it to a stationary inclined screen having openings ¼ in. square. The oversize passes through a 15x36-in. Gates roll set with a 1-in. space, the product falling on a second screen having the same size opening as the first.

The oversize of this screen passes through a second set of 15x36-in. Gates rolls set ¼ in. apart, the product falling on a third inclined screen which also has openings ⅙ in. square. From this screen the oversize is crushed in a third pair of 15x36-in. Gates rolls set 1/16 in. apart, and is raised by a bucket elevator to two trommels, one of which has a screen with ⅙-in. openings, while the second trommel, which was provided to prevent overcrowding of the first, has a screen with openings ⅛x½ in., it being considered that the two trommels give the same size of product. The undersize of the trommels falls into a storage bin, while the oversize, after passing through a set of 15x26-in. Gates rolls, joins the product of the third set of rolls and is returned to the trommel. The undersize from all of the stationary inclined screens is raised by a bucket elevator to the top of the building and discharged into storage bins.



MINING WIDE VEINS AT MERCUR, UTAH

From these base-ore bins the ore falls through chutes, or is taken by belt conveyers to the roasting furnaces. There are five straight-line furnaces, one Holthoff-Wethey, one Brown and three Jackling. Each has a capacity of 70 to 72 tons of ore daily and consumes about seven tons of coal per day. It takes about six hours for the ore to pass through the furnace, at the end of which time the roasted material goes by conveyers and chutes into the charging bins.

SAND TREATMENT

There are at present 18 rectangular vats, each 25 ft. wide, 50 ft. long and 4 ft. 10 in. deep, with a capacity for 225 tons of sand. Of these tanks four are used exclusively for the leaching of the fine sand from the Dorr classifiers, 12 are used for the coarse oxidized and roasted base ore, while two tanks are held in reserve. The four tanks for the fine oxidized sand are filled by sluicing, while the other 12 are filled by hand, the ore being trammed in V-shaped, side-dumping cars of about one ton capacity, which are dumped from four trestles running above the tanks.

In charging the tanks a layer of the coarse oxidized ore—that which passes a 1-in. and is caught on a ½-in. screen—is formed to a thickness of about one foot. Sixty-four cars of ore are taken to form this layer, which is then leveled off with a shovel. On top of this the tank is filled with a mixture of the coarse oxidized sand from the Consolidated Mercur mixer-classifiers, and the roasted basic ores.

When the tank is full the strong cyanide solution (2 lb. per ton) is run in from the bottom and allowed to rise slowly through the ore. This requires about eight hours. The solution is allowed to stand for four hours, when leaching is commenced. Leaching with strong solution is carried on continuously for 24 hours, then with the weak solution for 48 hours. The weak solution is merely the strong solution which has been used once and which has gone through the precipitating tanks and filter presses. It contains about 1¼ lb. cyanide per ton. The washing requires about 12 hours, the wash water joining the weak solution.

The total time of treatment is thus four days. The treatment of the fine oxidized sand is completed in three days.

The tanks each have eight bottom doors, 18 in. in diameter, through which the sand is shoveled into gable-bottom, side-dumping cars of about two tons capacity; and hauled to the dump by horses.

The gold-bearing solutions go to three precipitating tanks, each of which holds 30 tons. Five pounds of zinc dust are added to each tank and the only agitation received is that resulting from the flow of the solution into the tank during the process of filling. The precipitation of the gold is incomplete in these tanks, the greater part taking place within the filter presses. There are ten Johnson filter presses, each with 36 leaves 24-in. square. Only four presses are required at the beginning of the month, when the leaves are clean, but as the precipitate accumulates more are pressed into service until at the end of the month all are in use. The clean-up is usually made at the end of the month and averages over $60,000 at a time.

The precipitate, with the zinc residues, is treated by the ordinary sulphuric-acid method; the residues from this treatment being roasted and then melted down to bullion. An unusual thing is occasionally noted in the treatment of the precipitate. The ore contains some cinnabar and this is reduced to metallic mercury during the course of the ore through the mill, or forms an amalgam during the precipitation in the filter presses. This amalgam is but little affected by the acid treatment, and during the subsequent roasting the mercury which is driven off and collects in the cooler part of the furnace is found to carry a high percentage of gold. In the ordinary distillation of amalgam the loss of gold is usually small, and the explanation for the losses in this case must be sought in the influence of the zinc in the amalgam.

All Crushing Done Dry

In this mill dry crushing is practised exclusively. This is necessary in the case of the basic ores in order to avoid drying the crushed material before it can be charged into the roasting furnaces; but with the oxidized ores it was found that wet crushing produced a large amount of slime. By crushing dry the amount of slime formed was reduced to about 15 per cent. The amount of slime present in the roasted ore does not seriously affect the leaching qualities, and it was found unprofitable to remove it.

The slime from the base ore is difficult to treat and the extraction is lower than that given by the coarser roasted material, while the latter yields less than the oxidized ore. It is found that the tailing from the coarsest sand (½ to 1 in. in diameter) of the oxidized ore assays no higher than does that from the finer sand, though the percentage extraction is slightly lower on account of the original gold content being less. The slime tailing assays from 15c. to 20c. per ton less than does the sand tailing.

During the fiscal year ended June 30, 1909, the average assay of all tailing was 88c. per ton, while the heads assayed $3.58 per ton, showing an extraction of 75.4 per cent. The consumption of cyanide was 0.66 lb.; lime, 5.4 lb.; caustic soda, 0.05 lb.; and zinc, 0.45 lb. per ton of ore treated. The cost of mining 282,269 tons of ore is given as $1.53 per ton; and of milling, $1.09 per ton, of which $0.3973 was for roasting and $0.3737 for leaching. The cost of roasting was $1.05 per ton of ore roasted. Classifying and slime treatment cost 50c. per ton of slime.

The lack of water is keenly felt in the milling operations and nowhere is a drop wasted. The slime carries away about 45 per cent. of water, but the sand from the leaching vats contains only about 16 per cent. moisture. There is almost no rainfall in the district and the tailing has accumulated in a series of immense dumps radiating from the mill. These dumps now contain about 3,000,000 tons of material which will average nearly $1 per ton in gold, and are fast encroaching upon the little town of Mercur. The mine has contributed much to the advancement and development of metallurgical processes, and in these dumps lies a field for processes yet to be developed.

The Delaware & Hudson Company

This company owns a large estate in the anthracite region of Pennsylvania; it owns and leases a system of railroads running from the anthracite country to the Hudson river and northward into northern New York, Vermont and Canada. The company mines its own coal directly and not through the medium of a controlled company, though it has lately organized a selling company, as explained below. The report is for the calendar year.

The coal-department report gives the shipments for the year from the company's lands as follows:

	1908.	1909.	Changes.
Coal mined.........	6,526,871	6,199,042	D. 327,829
Coal bought.......	287 329	39,611	D. 247,718
Total..............	6,814,200	6,238,653	D. 575,547

The decrease in coal bought is due to the fact that since the organization of the selling company purchases from lessees and others are made by that company. The total fuel tonnage carried by the company's road in 1909 was 7,002,877 tons anthracite, 1,863,136 bituminous and 151,569 coke. In addition the company carried 795,005 tons ore and 759,050 tons of stone, sand, etc., making a total of 11,171,637 tons mineral freight, or 62.7 per cent. of the total freight carried. The railroad earnings from coal were $8,311,479, or 42.6 per cent. of the total receipts.

The income statement of the coal department is as follows:

	1908. Amount.	1908. Per Ton.	1909. Amount.	1909. Per Ton.
Receipts.......	$23,847,116	$3.50	$16,310,290	$2.62
Expenses	22,993,999	3.37	16,103,836	2.59
Net earnings.	$ 853,117	$0.13	$ 206,454	$0.03

Expenses include taxes, which were $301,421 in 1909. The decrease in gross earnings last year was $7,506,826, or 31.1 per cent.; in net earnings, $646,653, or 75.8 per cent. The coal-department relief fund showed receipts of $10,984 from employees and $6988 from the company, a total of $17,972. Accident and death benefits paid were $13,393; the balance of the fund carried over was $7,361, which included $2782 brought forward from preceding year.

The comparison between the two years is not an even one, as in 1908 the coal was sold at various points on the company's lines and at tidewater, while the expenses included transportation and selling, while for a large part of 1909 the coal was taken by the selling company at the mines, that company assuming the transportation and other charges. The comparison, however, serves to bring out the contrast in results between the two methods of handling.

The report says: "The collieries and washeries of the company were idle a portion of the year on account of the general depression in the coal business; they produced 6,199,042 tons of anthracite coal out of a total of 61,969,885 tons produced in the region. The coal-department expenses include construction and betterments amounting to $726,313. Taxes for the year 1909 increased $9119. On June 1, 1909, a contract was made with the Hudson Coal Company by which that company purchases outright, at the pit mouth, all the coal produced from the mines belonging to the Delaware & Hudson Company. . . .

"The litigation referred to in the last annual report in reference to the so called commodity clause added to the Interstate Commerce act in 1906, was terminated during the year by the decision of the United States Supreme Court to the effect that the said commodity clause did not prevent carrier corporations from transporting, in interstate commerce, coal which they had originally mined, but which they had sold before such transportation, nor prevent a carrier corporation from transporting in interstate commerce coal belonging to a coal company some or all the shares of the capital stock of which were owned by such carrier. Since this company now sells in the State of Pennsylvania all the anthracite coal produced from its mines it can, therefore, lawfully transport such coal on its railroads."

The Wolski Hydraulic Rock Drill

Utilization of Water Hammer Effect Produced When a Moving Column of Water Is Suddenly Stopped; Drill Strikes 20 to 30 Blows per Second

BY F. A. TALBOT*

Some interesting and striking demonstrations have recently been carried out in England with a new hydraulic rock-boring drill, which is the invention of Waclaw Wolski, an Austrian engineer connected with the petroleum industry of Galicia. It depends for its action upon the water-hammer effect produced when the motion of a column of water is suddenly arrested. Water under pressure is led through a horizontal striking tube to the apparatus, and flows to waste past a flap valve until the pressure above the valve attains a certain value. The valve then closes and the sudden stoppage of the column of water in the striking tube produces a pressure in the interior of the apparatus many times greater than the pressure requisite to actuate the apparatus. For instance, when the working pressure is 450 lb. the pressure induced by the sudden stoppage is about 3000 lb. per sq.in. This pressure acting on the boring bar forces it forward and a heavy blow is dealt.

The boring bar is rifled, but the rifling is so arranged that it is thrown out of gear on the forward stroke while it is engaged on the recoil. The drill thus strikes a direct blow with a rotary return. The recoil is brought about by means of rubber springs. When the boring bar is forced forward, the pressure in the interior of the apparatus is diminished owing to the greater space thereby created. The valve then opens and a certain quantity of water flows out. By this time the rubber springs have brought the bar back, the pressure again rises, the valve closes, and another blow is struck.

HYDRAULIC TRANSMISSION OF POWER

Hydraulic transmission of power has many advantages in mining work. In the first place, water is nearly always available and a natural head of water is frequently possible. In the second place, such a system is absolutely safe. There are certain serious disadvantages which have hitherto militated against the adoption of hydraulic power. There is difficulty in constructing a powerful hydraulic motor owing to the nature of the force-transmitting medium, which is heavy and almost incompressible. Every stoppage, and every change in direction of the motion of the water, is unavoidably accompanied by a more or less heavy shock of the water in the pipes and the motor; and this phenomenon, increasing in force with the rapidity of the motion, limits the working speed. As it is absolutely impossible to overcome this difficulty of hydraulic shock, the inventor has ingeniously turned this factor to profitable account.

Referring to the accompanying diagrams it will be seen that the apparatus consists of a cylinder in which is a piston free to move; at the rear end of the cylinder is a flap valve kept open by a spring. The interior of the cylinder is in communication with a striking tube *S T* (Fig. 2); at the end *S* is an air vessel. When the valve *V* is opened water flows through the apparatus past the valve *D* into the waste pipe *E*. The rush of water past the valve causes the pressure on the under side to be less than the pressure on the upper side, where the velocity is less.

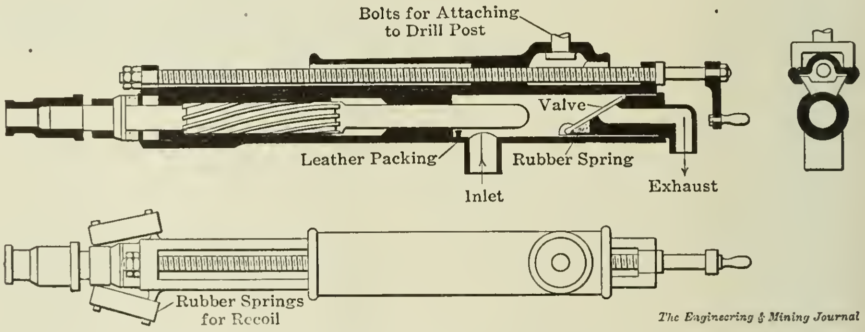

Bolts for Attaching to Drill Post
Valve
Leather Packing
Rubber Spring
Inlet
Exhaust
Rubber Springs for Recoil
The Engineering & Mining Journal

FIG. 1. WOLSKI PATENT HYDRAULIC ROCK DRILL

When the velocity attains a certain value the difference of pressure is sufficient to close the valve, and the column of water in the striking tube is stopped suddenly. The kinetic energy of the water in the tube is communicated to the piston *C* which is impelled forward with high velocity, and the drill delivers a heavy blow upon the stone or rock.

The pressure in the interior of the cylinder is diminished by the moving out of the piston, and at the same time the water, having been compressed slightly by the shock, acts like a spring and surges back into an air vessel. The extent of this surging is, of course, very small, owing to the insignificant compressibility of water, but the combined effect of these two causes is to secure the sufficient fall of the pressure in the cylinder to enable the valve to open. Water then flows through the open valve. The piston is meanwhile being brought back to its original position by means of springs, but before it reaches the extent of its backward travel, and while it still retains an appreciable velocity, the valve *D* closes and the direction of motion is reversed by the hydraulic shock. The same cycle of operations is then repeated.

It will be observed in the diagram that the boring bar is rifled. The female part of the rifling arrangement is provided with a spring device, whereby the rifling is only engaged on the return stroke. The drill thus strikes a direct blow with a rotary return. The boring bar passes through a guide, packed with leather packing, which can be easily replaced when worn. The whole drill can be dismantled in about five minutes.

The actual magnitude of the blow delivered is primarily dependent upon: (1) the weight of the striking column; (2) the velocity of the water when the valve closes; and (3) the weight of the chisel and boring bar. Since the kinetic energy of the striking column is $\frac{WV^2}{2g}$ where *W* is the weight of the column in pounds, *V* the velocity at the instant the valve closes, in feet per second, *g* is acceleration due to gravity; it follows that the magnitude of the blow will be proportional to the weight of the striking column and to the square of the velocity of the column. The weight of the chisel and boring bar affects the problem in so far that a certain relation between the weight of the striking column and that of the chisel and boring bar is necessary in order to insure the most efficient transmission of the energy of the striking column to the chisel and boring bar. As a matter of fact, the best effect is obtained when the mass of the striking column is equal to the combined mass of the chisel and boring bar.

The velocity of the column is fixed

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*15 Wilbury Crescent, Hove, England.

by the velocity at the valve required to produce the necessary difference of pressure to close the valve, i. e., it is fixed by the stiffness of the spring controlling the valve. The rapidity of the blows is limited by the fact that after each blow the striking column is brought to rest, and it must be accelerated to the requisite velocity before the valve will close. The rapidity of working depends, therefore, upon the pressure in the supply mains.

It must be borne in mind, however, that the actual magnitude of the blow is unaffected by the varying pressure in the mains, and depends only on the weight of the striking column and the strength of the spring controlling the valve. Machines of the type described strike from 20 to 30 blows per second. This is a great advantage as compared with percussion machines of existing types, which have a maximum speed of only from 3 to 5 blows per second.

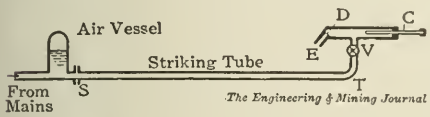

FIG. 2. GENERAL ARRANGEMENT OF TUBE

RESULTS OF TESTS AT LONDON

The demonstrations in London were carried out by Arthur Rowse, at the Millbank pumping station of the London Hydraulic Power Company. The pressure used was 450 lb. per square inch. This, with the particular type of drill used, gave a pressure in the interior of the apparatus of 3000 lb. per sq.in. The tests were carried out on a block of hard Portland stone. The diameter of the drill used was 2.375 in., and the average progress made in the stone was 10½ in. per minute, representing the removal of 46 cu.in. of stone per minute. The drill stood the work so well that after holes aggregating about 25 ft. in depth had been drilled, it was not necessary to do anything to the edge. A stream of water plays on the chisel the whole time and serves the threefold purpose of keeping the chisel cool, of rinsing the borehole, and of allaying the dust. There is absolutely no free dust with this apparatus, as was convincingly demonstrated.

Experimental results with hard rocks such as granite, gneiss, etc., are not at present available, though further demonstrative tests are to be carried out. Such trials have been made in Galicia with the implement and have proved highly satisfactory. The actual quantitative results, however, have not yet come to hand.

The machines can be made to work at any pressure from 75 lb. per sq.in. upward. For the softer rocks such as coal, the lower pressures may be advantageously used, but for the harder rocks, where a larger striking tube and heavier drill bits are used, the higher pressures are recommended, the increase of effect therewith being marked.

If the striking tube is arranged to be straight and nearly parallel with the direction of motion of the chisel, there is little shock on the machine, as the force of the shock is transmitted directly to the chisel; the machine merely serves as a casing and guide for both masses. There is, however, no absolute necessity for the striking tube to be straight if the conditions are not amenable thereto.

It is important to realize the fundamental differences between the hydraulic shock in the case of this machine and the shock in the case of machines where it must be avoided, e. g., in impulse water wheels. There we have an open jet of water, dispersing itself by the impact, scattering itself in all directions and wasting its energy. In this case there is a column of water locked in tightly, which, just as any other elastic body, does not lose any of its energy by collision. The consumption of water for all purposes in a machine of this type is from 3 to 4 cu.ft. per min. The drill is bolted to a post or bar, which may be either held between roof and floor in the ordinary way, or supported on a carriage, or, for small power drills working soft rock, it may be supported on a tripod.

The weight of the apparatus above described and as used in the London demonstrations is about 100 lb., and its length about 4 ft. The former is the weight of the machine itself, exclusive of the bar, striking tube and air vessel. It can be easily manipulated by two men, or, if the emergency arrives, one attendant suffices as the Millbank trials demonstrated.

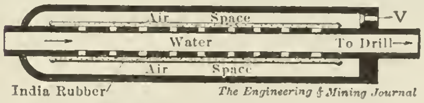

FIG. 3. WOLSKI DRILL. DETAIL OF AIR VESSEL

The air vessel used is not the type shown in the general diagram annexed, but is of the ingenious type illustrated in Fig. 3. The wall of the inner tube is perforated with a large number of small holes like a sieve. Over this is stretched a rubber hose tied up at both ends. The whole is covered by a steel tube closed hermetically at both ends, and the space between this tube and the inner one is filled with air, forced in through the valve *V* by means of a pump. During the boring operation, the hydraulic pressure and the air pressure act against one another, and the rubber, alternately expanding and contracting, forms the elastic separation between the air space and the water space.

Mr. Rowse estimates that the drill will cost much less to construct than existing types of rock drills, and that the speed of working is far in advance of anything at present used in mining practice, while the maintenance costs are extremely small. Should anything go wrong with the apparatus while working, it stops automatically, and it behaves well in broken ground. The efficiency is high, being about 25 per cent. as compared with the 10 to 15 per cent. efficiency of compressed-air drills.

The Bullfrog District, Nevada

A report on the geology and ore deposits of the Bullfrog mining district, Nye county, Nevada, has been published[1] by the U. S. Geological Survey.

Long before valuable ores were discovered at Tonopah and Goldfield the springs in Oasis valley, just north of the site of Beatty, attracted a few wanderers, who established rude ranches along Amargosa river, a feeble rill that furnishes the only drinkable water within a radius of 40 miles.

The discoveries at Tonopah and Goldfield stimulated prospecting throughout southern Nevada, and in 1904 the Bullfrog claim was located. The name is said to have been suggested by the green color of the ore; certainly no one has found in that scorchingly arid region anything resembling a bullfrog.

At first, only the richest ore could be handled but in 1907 three lines of railroad reached the district, and the value of its mineral output was $207,538, principally in gold and silver.

The deposits of the Bullfrog district, unlike those at Goldfield, are not likely to yield quick and large profits with a moderate outlay of capital, though small masses of superficial ore may for some time reward a few fortunate lessees. The ores generally are of low grade and the question whether the deeper sulphide ores can be profitably mined is still unanswered.

Magnesite Production

According to statistics collected for "The Mineral Industry," the total production of magnesite in the United States in 1909 was 9535 tons, valued at $62,391. In 1908 the output was 8967 tons, valued at $52,342. The only commercial deposits of magnesite in the United States are in California, and the high cost of transportation to the Atlantic seaboard prevents competition with the mineral imported there from Austria and Greece. The crude mineral is worth from $3 to $3.50 per ton at the mines, and from $12 to $20 per ton when calcined. The average price in 1909 of crude Grecian magnesite in New York was $9 per ton, and of powdered calcined $32.75 per ton.

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[1] *Bull.* 407, by F. L. Ransome, W. H. Emmons, G. H. Garrey; U. S. Geol. Surv., Washington, D. C.

Empire-Enterprise Zinc Mines, Wisconsin

Ore Occurs in "Flats and Pitches" in Galena Limestone. Contains Marcasite and Requires Roasting and Electric Separation. Haulage by Mules

BY HAROLD C. GEORGE*

The largest body of zinc ore ever worked in Wisconsin is, perhaps,, the Empire-Enterprise orebody at Platteville. At present this orebody is worked a total length of 2900 ft. and an average width of 70 ft. Since these two mines started operations, the Enterprise in 1899, and the Empire in 1903, to Dec. 1, 1909, $1,375,287 have been received from the sale of ore.

Geology

The ore occurs in "flats and pitches" in the lower part of the Galena limestone, which in this district is from 100 to 180 ft. thick, overlying the Trenton limestone and separated from it by a thin bed of clay shale, locally called "clay bed." These flats and pitches are arch shaped. Fig. 3 shows the "flats and pitches" as they are found in the Empire-Enterprise mines, the crevices forming the flats and pitches being larger to one side of the top of the arch than to the other and thus making the main orebody on one limb of the arch. Fig. 4 shows an ideal cross section of the Chamberlain orebody.

FIG. 1. ENTERPRISE MILL, PLATTEVILLE, WIS.

FIG. 2. EMPIRE MILL AND POWER HOUSE

It is generally believed that the crevices which afforded channels for the ore-bearing solutions were formed by the lateral pressure produced by the shrinkage of the earth's crust. These crevices were enlarged by circulating water dissolving the limestone walls, and by subsidence of the strata within the arch, produced by compression of the underlying "oil rock" (the oldest member of the Galena limestone). The oil rock is a light, carbonaceous shale, from one to eight feet thick at various places, but usually from four to eight feet thick under the ore deposits and thinning to the sides, so that subsidence must have been greatest where this member of the Galena limestone is the thickest. It is also believed that the impervious clay bed caused the ore-bearing solutions to travel laterally above its horizon, and the gaseous hydrocarbons escaping from the oil rock aided in the precipitation of the ore in the existing crevices, which forms flats and pitches.

The interior part of the arch *M* in Fig. 3, being free from the pressure of the overlying strata, in subsiding formed openings along the bedding planes and also along lines of fracture perpendicular to the bedding planes, which readily formed water channels and thus were filled with thin sheets of ore. This part of the orebody is generally spoken of as the "core."

Beginning at the western end of the Enterprise mine, the course of the orebody is south 85 deg. east for about 1000 ft., then it turns to the left and continues north 30 deg. west about 400 ft., where it turns to the right, crosses the Empire property line and has a course of north 60 deg. east to the eastern end of the present workings.

History

The Enterprise mine, since the time of discovery in 1899, has been owned and operated by the Platteville Lead and Zinc Company, a company capitalized at $20,000. From the time that mining operations began in 1899 to the first of Dec., 1909, this company sold $577,900 worth of ore, yielding $179,500 in profits.

The Empire Mining Company was organized in the autumn of 1901, but the mine was not discovered until 1903. This company was capitalized at $30,000. From the opening of the mine until June, 1908, when the mine was sold to the Wisconsin Zinc Company, the Empire Mining Company sold $599,587 worth of ore at a profit of $262,900. Since that time to Dec., 1909, under the management of the Wisconsin Zinc Company, the mine has produced $197,800 worth of ore.

Mining Previous to 1908

I will first describe the method of working these mines previous to June, 1908. The upper flats were first worked because this part of the orebody contained less marcasite than the pitches and lower flats, and thus produced concentrates which brought a good market price without roasting and electric separation. Later, when the best ore of the upper flats was worked out, the lower flats and pitches were worked, and finally the entire face was carried forward at the same time. After the upper flats were exhausted, roasting and magnetic separation were added to the milling process, and a high-grade roasted ore was produced. The parts worked at different times in both mines are shown in cross section in Fig. 3.

The parts worked up to this time contained only the main flats and pitches. A face was carried no higher than necessary to get the main orebody, so that in most places the roof was not more than five or 10 ft. from the floor. Small air drills were used, and 6-ft. holes were usually drilled. In the handling of the mill ore, the method used at the Enterprise mine was different from that used at the Empire mine. In the former the large rocks were sorted from the ore by hand and corded in front of the working face, with only a narrow space left for a tramway. At the Empire mine, all broken rock was hoisted and sorted on the grizzly at the surface.

Shovelers, drillmen, helpers and much of the surface labor were paid by the day. The ore was shoveled into "tubs" of 500- to 1000-lb. capacity, and trammed to the shaft by hand. In the Empire mine the ore was trammed from the face to the shaft on one level, while in the Enterprise mine the ore was worked on several levels; the ore in the upper levels being wheeled in wheelbarrows or trammed to the edge of the stopes, dumped to the lowest level, reshoveled into tubs and trammed to the shaft.

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*Director Wisconsin State Mining Trade School, Platteville, Wis.

Recent Work

When the Wisconsin Zinc Company purchased the Empire mine, there was no opening from the Empire workings to the Enterprise workings. But the Enterprise mine had previously been worked on the upper flat to the Empire property line. The Wisconsin Zinc Company began operations at the Empire mine in June, 1908. Mules were introduced in underground haulage from the working faces to the foot of the shaft and the shoveling was placed on a contract basis. Operations were continued on this basis until in 1909, when the western property line was reached, the ore pitched downward and the mine was shut down for surface-equipment repairs, in order to properly handle the low-grade ore which previous prospecting work had shown existed at the foot-wall. Recent developments on this orebody illustrates the tendency toward better methods and mining equipment in Wisconsin zinc mines.

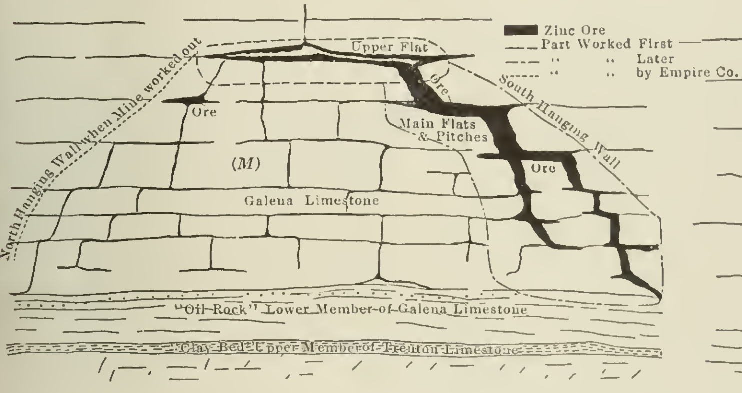

Fig. 3. Ideal Cross-section of the Empire-Enterprise Orebody

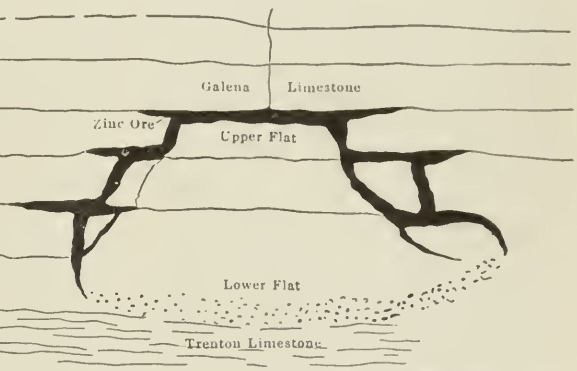

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Fig. 4. Ideal Cross-section of "Flats and Pitches" in Chamberlin Deposit

Equipment of Empire Shafts

The Empire shaft No. 1 is used only for pumping purposes, through the drainage tunnel which connects the main workings with the foot of this shaft. The pumping equipment at this shaft consists of two 9-in. crosshead lift pumps, belt driven by a 60-kw. motor. Running these pumps about half of the time is sufficient to keep the workings free from water. Shaft No. 2 has always been used as the hoisting shaft. The new surface equipment at this shaft consists of a large wooden headframe, shaft house, 200-ton hopper, with a 55-h.p. motor-driven hoist for hoisting the ore from the mine, and a 15-h.p. motor-driven hoist for operating the car on the ore tramway from shaft to mill. At present, ore is being hoisted from this shaft at the rate of four hundred and fifty 1000-lb. buckets in a nine-hour shift. The landing is 200 ft. above the foot of the shaft and the time required for the round trip when hoisting ore without delays, is 45 seconds.

During 1908 and 1909, prospecting with the churn drill showed that the orebody continued to the east at a lower level. To handle this ore, shaft No. 3 was completed in the latter part of 1909. This shaft is equipped with a wooden headframe and shaft house, a 40-h.p. electric-driven hoist and one 8-in. electric pump.

Mine Labor

The mine is worked by two nine-hour shifts. The day shift consists of one foreman, five machine men, five helpers, one "brunoman" or boulder breaker, eight shovelers and one station tender. The night shift consists of one foreman, nine shovelers, one "brunoman," and one station tender. Sufficient rock and ore are broken by drilling on the day shift only. Mining is being done in the footwall, near the shaft, and each shoveler trams his own tubs. He is paid 6c. for each 1000-lb. tub of ore delivered at the foot of the shaft. The method of breaking the ground consists of side shooting. A round of holes generally consists of one lifter, one breast hole and one upper, each about 10 ft. deep. Fifty pounds of 40-per cent. dynamite break on an average, 70 tons of ore. In the near future, 1500-lb. tubs will be used, instead of 1000-lb. tubs.

Empire Mill and Power Equipment

The Empire mill and power plant are housed in the same building, Fig. 2. The mill is of 150 tons capacity in 10 hours. It has two seven-celled jigs. It is run two 10-hour shifts in 24 hours. An average of 21 tons of concentrates is produced in 24 hours. Two revolving, cylindrical roasters of the Brückner type, one provided with a Cleveland-Knowles, and the other with a Ding electric separator. produce a high-grade roasted product from the mill concentrates.

The Empire power plant consists of two 150-h.p. boilers, one 100-h.p. boiler, two steam engines, one a 250-h.p. Corliss used for running the mill, and a 100-kw. electric generator; the other an 80-h.p. engine used for driving a 40-kw. generator when the larger generator is shut down and the mill is not running. A cross-compound steam-driven compressor, Ingersoll-Rand type B-10, furnishes compressed air for mining purposes. In addition to furnishing the power for the mill and roasters, this power plant furnishes all of the electrical power for the hoists at shafts No. 2 and and 3, and for the pumps at shafts No. 1 and 3.

The Enterprise Mine

Mining operations at the Enterprise mine are conducted under difficulties. The former method of working has left the workings full of waste rock, which in many places covers the best ore to a depth of six to 10 ft. As mining proceeds the waste is being moved to worked out parts of the mine. About 150 tons of rock and ore are being handled daily and about half of this amount is hoisted to the surface. Mining is being done only during one nine-hour shift per day. The underground force consists of three drillmen, three helpers and four shovelers. Stopes eight feet high are being worked and the rock is broken mostly with down holes, using 30-per cent dynamite. Rock drills (2¾ in.) are used with cross bits. The rock is hard to drill, but breaks easily.

Surface Equipment at Enterprise Mine

The Enterprise surface equipment comprises two power plants, two hoisting plants, a mill and roasting plant shown in Fig. 1. The mine power plant consists of one 100-h.p. boiler, a Gardner steam-driven compressor, one 30-h.p. steam engine used in connection with a 30-kw. generator, for supplying electric power to the roaster and separator. Shaft No. 1 is used for entrance to the mine and for pumping purposes. A 22-h.p. gasolene engine operates a 16-in. Cornish pump and a belt-driven hoist at this shaft. Running the pump about half of the time is sufficient to keep the workings free from water. Shaft No. 2 is used for ore hoisting. The surface equipment at this shaft consists of a wooden headframe, a 75-ton hopper and a 14-h.p. steam-driven hoist.

The power plant in connection with the mill consists of two 100-h.p. boilers and a 60-h.p. steam engine. The mill is equipped with one eight-celled jig, using the Baldwin tap. The mill is run one nine-hour shift per day, producing from 75 tons of ore an average of 10 tons of 40-per cent. concentrates. A 60-per cent. roasted ore is produced from the mill concentrates. The roaster and electric separator running fourteen 24-hour shifts treat all of the concentrates produced in a month.

The mill is near the Chicago, Milwaukee & St. Paul track. All ore mined up to the present time has been hauled by wagon from the hopper at the shaft to the hopper at the mill. The present labor force consists of about 25 men per shift.

Both of these mines have a great advantage over most mines in the district in that they are near the railroad and have facilities for receiving coal and shipping ore. Many of the other mines have to haul coal and concentrates from one to five miles by wagon. Several years ago these mines were generally supposed to have been worked out, but recent developments still promise a number of years of production.

Mining in New Caledonia

T. Maning, British acting-consul at Noumea, New Caledonia, reports that the stocks of nickel ore within the colony on Dec. 31, 1909, were not less than 122,000 tons; only 79,995 tons were shipped during the year, but the production may be estimated at not less than 120,000 tons. A number of contracts have been made during the last year for forward delivery, and all nickel ore produced has become the property of the smelters. Several large contractors are not inclined to contract for too long a period, feeling confident that lower prices will prevail in the near future.

The result of the first reduction of nickel ore by the electrolytic process at Tau is anxiously awaited. By this process, it is claimed, nickel can be produced at a cost which will enable the selling price to be reduced from £190@200 to £100 per ton.

The chrome industry is confined for the present to one mine, and the export for 1909 was only 32,136 tons—14,344 tons less than in 1908. The price of this mineral has reached a low figure—about £1 2s. per ton for 50 per cent. ore in bulk at mines, or £1 14s. 6d. for 50 per cent. ore in sacks f.o.b. Noumea. The stock of chrome existing in the colony on Dec. 31, 1909, was about 21,000 tons.

There is no demand whatever for cobalt, and producers have now closed down the mines. The stocks in the colony are probably 400 to 500 tons.

Origin of Diamonds in German South West Africa*

By R. G. Pearson

Of the several theories put forward to account for the presence of alluvial diamonds on the Damaraland field, that of Doctor Merensky and Mr. Troye seems to me the only one which is tenable. Their theory is that a pipe or fissure exists under the sea somewhere in the neighborhood of Pomona, and that the sea current deposited the diamonds and wash along the valley bottoms when the coast belt was submerged. As the sea receded, the incessant southwest winds (it is the windiest country on earth) distributed the diamonds, at the same time concentrating the wash in the valleys by blowing away all the lighter sand into the dunes lying a few miles inland.

In support of this theory, the following facts are of interest: That the coast belt was undoubtedly submerged during a recent geological period; that the largest diamonds all occur in the neighborhood of Arch Rock and Pomona, and that the size of the stones grades off to north and south of this point in the most regular manner possible. Taking these facts in conjunction, it is reasonable to suppose that the original source is a pipe or fissure situated near Pomona, probably under the sea.

Orange River Origin

Other theories are that the Orange river is primarily responsible for bringing the stones down with it and that the sea washed them up on the coast. Why, then, the increasing size of stones from the river mouth northward as far as Pomona, after which they decrease, and why the marked difference in characteristics, such as hardness and quality between the German stones and river stones? It must also be noted that the German stones show no signs of travel, being almost nonwater worn. These various arguments all militate against the stones having come from inland.

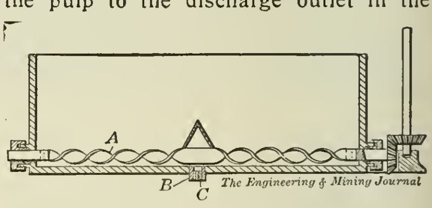
Product of Country Rock

Again, it is suggested that the stones are the weathering product of the country rock, the heavy wash having remained in the valleys and the lighter sand having blown away. The country, to within 10 miles of Pomona, is entirely crystalline schists, granite and feldspar, and is from there southward, covering the richest ground, and that containing the largest stones, almost entirely limestone, onyx and quartzite. From which do the diamonds originate? If from the granite all the valleys should be diamondiferous, whereas only one long valley, or rather a continuous chain of valleys from south to north, contains diamonds in any quantity.

Of the above three theories, only the first seems to me feasible, but I consider that there is also a bare possibility of the Orange river having formerly had its outlet in the neighborhood of Pomona, which would account for the grading off to north and south of that point, the greater deposit to the north on account of the southwest current and wind. I do not think, however, that the existing evidence is sufficient to support this theory and the occurrence of diamonds on Possession island, together with the unique characteristics of the German stones, decidedly opposes the theory.

Pulp Extractor

A device for conveying pulp or other material under water or other fluid with little agitation, and especially adapted for use in connection with ore concentrators, classifiers and settling tanks is shown in the accompanying illustration. The rotary feed screw *A* is placed in the bottom of a V-shaped settler and conveys the pulp to the discharge outlet in the center. Outlets may be placed at one end or both ends of the tank. When the outlet is in the center the screw is right handed from one end of the tank to a flat portion over the outlet, and left handed to the other end.



Janney Pulp Extractor

To control the density or thickness of the pulp discharged from the spout *B*, the spout is made comparatively large in diameter to receive several reducing tubes *C*. These tubes may have openings of different sizes, so when a tube with a small opening is used the discharged pulp will be thicker than if a larger one had been used. The extractor was patented (U. S. Pat. 955,077, April 12, 1910) by W. H. Janney, Bingham Cañon, Utah.

A recent ruling made by the register of the Visalia land office holds that a placer location on which gypsum in commercial quantities has been found and developed, is legitimate even if the claim was primarily taken up as an oil speculation.

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*Abstract of an article in *South African Min. Journ.*, March 5, 1910.

NEW PUBLICATIONS

Economic Geology of the Feldspar Deposits of the United States, by Edson S. Bastin. U. S. Geological Survey. Bull. 420. Government Printing Office.

The Analysis of Silicate and Carbonate Rocks, by W. F. Hillebrand. U. S. Geological Survey, Bull. 422. A Revision of Bull. 305, 1910. Government Printing Office.

Report of the Department of Mines for the Year Ended September 30, 1909: Province of Nova Scotia, by Christopher P. Chisholm, Commissioner of Public Works and Mines.

Geology and Ore Deposits of the Bullfrog District, Nevada, by F. L. Ransome, W. H. Emmons and G. H. Garrey. U. S. Geological Survey, Bull. 407. Government Printing Office.

A Descriptive Sketch of the Geology and Economic Minerals of Canada, by G. A. Young, with Introduction, by R. W. Brock. Canada Department of Mines, Geological Survey Branch.

Report on the Investigation of an Electric Shaft Furnace, Domnarfvet, Sweden, · Etc.. (Second Edition), by Eugene Haanel. Canada Department of Mines, Mines Branch, Ottawa.

Analyses of Rocks and Minerals from the Laboratory of the United States Geological Survey, 1880 to 1908. Tabulated by F. W. Clarke. U. S. Geological Survey,' Bul. 419. Government Printing Office.

Preliminary Report on the McKittrick-Sunset Oil Region, Kern and San Luis Obispo Counties, California, by Ralph Arnold and Harry K. Johnson. U. S. Geological Survey, Bul. 406. Government Printing Office.

The Manganese-ore Deposits of India, by L. L. Fermor. Part I: Introduction and Mineralogy. Part II: Geology (Mode of Occurrence and Origin). Part III: Economics and Mining. Part IV: Description of Deposits. Memoirs of the Geological Survey of India, Volume XXXVII, 1909. Parts I, II and III, 3 Rs. each Part IV, 5 Rs. Geological Survey of India.

Commercial Peat: Its Uses and Possibilities, by Frederick T. Gissing. J. B. Lippincott Company.

The subject is handled in a clear, con-ise manner. The book contains 59 ilistrations showing a number of peat lants and the various kinds of machinery sed. The various processes described over practically all the modern methods mployed in the production, manufacture nd utilization of peat.

Fuel and Reverberatory Materials. Revised Edition, by A. Humboldt Sexton. $2.50. D. Van Nostrand Company.

The general arrangement of the book is similar to the first edition, but the many recent changes and developments in connection with coke ovens, gas producer, and pyrometry practice have been recorded and additions have therefore been made in the chapters dealing with these subjects. The book is well illustrated and shows careful preparation throughout.

Handbook of British Guiana. Compiled by George D. Bayley. Published by the Permanent Exhibitions Committee, Georgetown, Demerara, British Guiana.

An elaborate volume of 608 pages, with many illustrations, giving full information about the geology, natural resources, population and industries of the colony. There is also much interesting matter of a historical nature. The section relating to mining is both descriptive and historical, giving also some account of the production and present conditions of the gold and diamond mines.

The Coal Trade, 1910: A Compendium of Valuable Information Relative to Coal Production, Prices, Transportation, Etc. By Frederick E. Saward. $1.50. Published by the author.

The book is an interesting compilation of valuable facts relating to the coal trade. The information is presented in a manner that makes good reading for mine operators as well as those interested solely in the trade end of the industry. Much technical information is also included so that the volume is in reality a condensed review of the year's happenings in coal mining.

Eleventh Annual Report of the Mining Industry of Idaho for the Year 1909. F. Cushing Moore, State Inspector of Mines.

Mr. Moore has issued promptly a careful review of the varied and growing mining resources of Idaho in the form of the eleventh annual report. It is sufficiently complete for its purpose and apparently shows that the State Inspector is in thorough touch with the mining development of the State. The statistics are complete and in detail, and the descriptions of the districts and of the individual properties are sufficiently full for the purposes of the work.

Joint Report on the Bituminous, or Oil Shales of New Brunswick and Nova Scotia; Also on the Oil Industry of Scotland, by R. W. Ells, L.L.D., pp. 131, 9½x6½ in. Paper; illustrated. Canadian Department of Mines. Government Printing Bureau, Ottawa.

The success which has attended the manufacture of oil from shales in Scotland has resulted in an investigation as to the possibility of rendering the shale deposits of Albert and Westmoreland counties, N. B., commercially valuable. "The Economic Possibilities of American Oil Shales" was discussed in the Journal, July 24 and 31, 1909, by Charles Baskerville. In this article Dr. Baskerville covered much of the ground that this report embraces.

Mineral Production of Virginia During the Calendar Year 1908. By Thomas L. Watson. Virginia Geological Survey, Bull. No. 1-A. University of Virginia.

This annual report by Thomas Leonard Watson, director of the Virginia Survey, and professor of economic geology in the University of Virginia, treats statistically of the mineral production of Virginia for 1908. The varied and not unimportant mineral resources of Virginia are well described. The chapters on the pyrite and copper formations are complete and include the geological features carefully presented. There is also a general article on the Appalachian geology, and considerable definite information about some of the special mineral development of the State.

The Mining Industry in North Carolina During 1907 with Special Report on the Mineral Waters. By Joseph Hyde Pratt. Economic Paper No. 15, North Carolina Geological and Economic Survey.

This report, covering the year 1907, recently issued, is of interest as a historical record, but much of its intended usefulness is impaired by the delay in issuing, particularly in regard to the statistical matters; the description of mines and districts have to be read largely from the retrospective point of view, inasmuch as the developments since the date of the report may have modified or radically changed the status of the property. Much of the report is devoted to the mineral waters of the State, which apparently constitute an important resource and one that is going to be more utilized in the future, as it becomes better understood through the studies of the survey. Apparently the State has a great number of medicinal springs, a tangible asset in view of the situation of the State. The Gold Hill copper district is fully described by F. B. Laney, and a chapter in the report is devoted to the past resources, written by Charles A. Davis. This study seems to indicate that the State may have a large latent resource in the extensive peat deposits, which are becoming more and more available with the development of transportation and the increased local demand for peat products. The report describes the varied and interesting mineral resources of this Appalachian state, and gives one a hope that the future reports may be issued more timely, so that they may be read in the present tense.

An Analysis of the Coal Dust Problem

Showing the Quantity of Dust Necessary in a Mine to Produce an Explosion, and Suggestions That Will Afford Greater Safety Underground

BY AUDLEY H. STOW*

If a small particle of coal is to be classed as dust, it is essential that the relation of its weight to its size and shape shall be such that it will not readily settle from a body of air in motion, the limit in size being the maximum that will not readily settle as long as the velocity under consideration is maintained. The size, rather than the weight, is the more convenient unit of measure, and is equally definite, owing to the practically constant relation, particularly for any given class of coal, between the cubic contents and weight. That the limit in size of the dust should vary with the velocity of the air is plausible; consequently, there is no reason why we may not to advantage determine, or arbitrarily agree upon, a standard maximum-size limit to serve as the nominal dividing line between fine coal and dust.

Effect of High Velocities

Extremely high velocities of air are occasionally, under exceptional local conditions, encountered in actual mining; during the progress of an explosion, sizes of coal that no one would in any sense consider dust may be temporarily in suspension. In adopting a standard maximum size, we should disregard not merely the high velocities realized during an explosion, but also such exceptionally high velocities as in mining operations are realized only at rare intervals.

The maximum size corresponding to a common maximum velocity of the ventilating currents does not as yet appear to have been satisfactorily determined, although the data in this connection rather indicate the 200-mesh screen as the limit in size. The aperture of this screen, as proposed by the council of the Institution of Mining and Metallurgy, London, in 1907, should be 0.0002083 ft.; the radius of the sphere that would exactly fit this aperture is 0.0001042 ft. If we allow 0.0000042 ft. for the clearance required in order that our maximum sphere may without clogging pass through the aperture under consideration, we thus have 0.0001 ft. as the radius of the maximum sphere that will readily pass through a 200-mesh screen.

Illustration of the Size of a Molecule

The mechanical difficulties involved in the construction of screens finer than 200 mesh are rather serious; yet it is evident the sizes of dust smaller than the aperture of this screen are numerous. The limit of mechanical division being the single molecule of coal, Sir W. Thompson's illustration[1] of the size of molecules of the more common liquids and solids becomes of interest in this connection:

"If a drop of rain, or a glass sphere the size of a pea, be magnified to the size of the earth, the molecules being magnified in the same proportion, the structure of the mass would then be coarser than a heap of fine shot, but probably not so coarse as that of a heap of cricket balls."

In using this illustration in the consideration of our maximum sphere, approximate quantities near enough for our purpose will be substituted as follows: If we magnifiy a sphere of coal one-hundredth of a foot in diameter until this dimension becomes 40,000,000 ft., the molecules of coal will then be one-tenth of a foot in diameter, that is, if they are magnified 4,000,000,000 times, their diameter will still be only one-tenth of a foot. In order that their diameter may be a foot, they must be magnified 40,000,000,000 times, equivalent to this number of molecules, in a single row, per linear foot. A single row, the length of the diameter of our maximum sphere that will readily pass through the 200-mesh screen, will thus contain 8,000,000 molecules; if the molecule be taken as the unit of measure, our maximum sphere will then contain $4.1888\ (4{,}000{,}000)^3$, or nearly $(6{,}450{,}000)^3$ molecules. Certainly, if Sir W. Thompson's illustration is only approximately correct, there must still be an almost, if not quite, inconceivable number of sizes smaller than our maximum sphere, and much more than amply sufficient to provide for a considerable difference in size for every appreciable diminution in velocity of the air currents encountered in mining.

Ascertaining Coal Dust Sizes

That any form of screen is totally inadequate to separate the finer grades of dust is evident, yet this operation, with modern scientific methods, should not be at all impossible. For example, if the number of corpuscles in a drop of human blood may within a reasonable degree of accuracy be determined, the relation of sizes of dust to the velocities with which they settle in water should be ascertained without serious difficulty.

Between the grade known as buckwheat coal, for instance, and the standard maximum sizes of dust, as heretofore outlined, there are certain intermediate sizes, which, in instances of unusual velocity, may readily be retained in suspension. These sizes, varying from two ten-thousandths to four thousandths of a foot in diameter, may appropriately be designated as coal "sands."

Dust Necessary to Produce Maximum Explosive Effect

In explosions, and in the presence of a large excess of dust, it is probable, as indicated in instances by extensive deposits of coke, that the fixed carbon does not take an equally active part with the volatile matter. Under these conditions it is not altogether incorrect, in estimating the minimum amount necessary to produce a maximum explosive effect, to disregard the fixed carbon, basing our calculations on the volatile matter alone. However, a minimum figured on this basis is only such in the absence of sufficient air to complete the reaction that would otherwise take place. Consequently, the estimation of the fixed carbon as an active agent, equally with the volatile matter, according to the well known formulas, is clearly essential to the correct determination of the minimum quantity of dust; and is therefore so included, unless otherwise stated. The substantial difference in the amount of these two minimums, however, is of less interest in view of the large quantities with which comparison is to be made.

The minimum weight of coal, for instance, required for the complete exhaustion of all the oxygen in a given volume of air will vary with the composition of the coal as well as with the temperature and hygrometric state of the air; yet the variations due to these two causes, in comparison with the difference between the two minimums just referred to, are so slight that they may be disregarded.

It is sufficient, for all practical purposes, to select some type of coal of average composition as the basis of our calculation. Any one of the several methods available for then determining the minimum, that may be most convenient, is altogether sufficient. The minimum quantity, within a reasonable degree of accuracy, having been determined, we are then enabled to readily estimate the relation, with respect to dust, of certain points bearing on this somewhat objectionable form of coal particularly in underground workings.

The weight of 100 cu.in. of dry air at 16 deg. C., practically equivalent to

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*Consulting mining engineer, Maybeury, W. Va.

[1] "Ganot's Physics," p. 2.

61 deg. F., is 31 grains, or 0.076526 lb. per cu.ft. of air; the specific gravity of marsh gas being 0.559 and the maximum explosive mixture 1 to 9.57 (volume),[2] the quantity of marsh gas required per cu.ft. of air will be

$$\frac{0.0765 \times 0.559}{9.57} = 0.004468 \textit{ lb.}$$

If we consider that the coal contains 20 per cent. volatile matter (which is an average composition), we have, disregarding the volume of air displaced by the dust, 0.004468 × 5 = 0.02234 lb. of coal per cu.ft., or 0.6031 lb. per cu.yd. of air.

There is, with 6-ft. coal, per running foot of an entry 12 ft. in width, the track filling and gob being disregarded, 72 cu. ft. of air space to 12 sq.ft. of either roof, floor, or ribs, equivalent to 0.02234 × 6 = 0.134 lb. of coal dust per sq.ft., or 1.206 lb. per sq.yd. of floor; for instance, with absolutely no dust on either ribs or roof and with neither dust, gas nor smoke in the air.

Fixed Carbon Included

The exact chemical structure of coals not having as yet been determined, it will be assumed that the type of coal selected as the basis of calculation has such a composition that when subjected to destructive distillation, it will yield 56 atoms of fixed carbon, and 11 molecules of methane, practically 20 per cent. volatile matter and 36 per cent. fixed carbon. If we allow 3.64 per cent. for ash, moisture, etc., the volume of air required for the complete combustion of this coal is given near enough by the equation:

$$\overbrace{\begin{pmatrix} 56\ (C)\ + \\ 11(CH_4) \\ +\ \text{Ash} \end{pmatrix}}^{\text{Coal}} + \overbrace{\begin{pmatrix} 156\ (O)\ + \\ 624\ \ (N) \end{pmatrix}}^{\text{Air}} = \begin{pmatrix} 67\,CO_2\ + \\ 22\,H_2O \\ +\ \text{Ash} \end{pmatrix} + 624\,N$$

$$(848 + \text{Ash}) + (11{,}232) = \text{Sum of Atomic Weights.}$$

The sum of the atomic weights of the coal and air being 848 and 11.232 respectively, for one part of coal by weight, free of ash, 13.2453 parts by weight of air will be required. Adding, however, to the sum of the atomic weights of the coal a correction for the ash, we have 880 and 11.232 respectively, corresponding to 1 part by weight of coal, including ash, to 12.7636 parts by weight of air, the weight of a cubic foot of the latter being 0.0764 lb., there will only be required for the complete combustion of 1 cu.ft. of air, 0.0764 ÷ 12.7636, or 0.005985 lb. of coal dust.

The minimum weight of dust may also be calculated from the amount of marsh gas that will consume the same amount of oxygen as the variety of coal just considered, and as shown by the following equation:

$$\underset{39\ (CH_4)\ +}{\text{Methane}} \overbrace{\begin{pmatrix} 156\ (O)\ + \\ 624\ \ (N) \end{pmatrix}}^{\text{Air}} = 39\,CO_2 + 78\ H_2O + 624\ N$$

$$624 + 11{,}232 = \text{Sum of Atomic Weights.}$$

For 1 ib. of marsh gas the equivalent weight of coal is given by the proportion.

$$624 : 880 :: 1 : X \qquad \therefore X = 1.41 \textit{ lb. of coal.}$$

If 0.004468 lb. of marsh gas per cu. ft of air represents the maximum explosive mixture, and if 1.41 lb. of coal will replace 1 lb. of marsh gas, then the minimum weight of coal dust per cu.ft. of air will be given by the proportion

$$1 : 1.41 :: 0.004468 : X \qquad \therefore X = 0.00607 \textit{ lb. of coal.}$$

If 0.006 lb. of dust be taken as the quantity per cu.ft., there will be required per cu.yd. of air, 0.162 lb., thus only slightly more than one-fourth than in the previous section.

With a 6-ft. coal, as in the previous example, 0.006 lb. per cu.ft. of air corresponds to 0.036 lb. per sq.ft., or 0.324 lb. per sq.yd. of floor, ribs or roof, as may be under consideration, 1 lb. of coal dust thus sufficing for the complete exhaustion of all air over 27.78 sq.ft., or 3.09 sq.yd. of floor space.

The minuteness of these quantities is perhaps more evident if, instead of being expressed as weights, they are given as the thickness of a uniform layer of coal, a foot square for instance, in the consideration of either the minimum amount of dust per cu.ft. of air, or per sq.ft. of floor space. The weight of a cubic foot of water at 60 deg. F. being 62.367 lb. and the average specific gravity of bituminous coal, 1.31, the weight of a cubic foot of the latter will be 81.7008 lb. Dividing the minimum weight of dust per cu.ft. of air, 0.006, by the latter figure, gives the 0.00007344th part of a foot as the thickness of the layer of coal 1 ft. square. Then 0.00007344 × 6 = 0.00044064, the minimum thickness of a uniform layer of coal that represents the complete exhaustion of all the air in a mine in which the thickness of the coal is 6 ft. An average thickness of dust may then be expressed in minimums, instead of in fractions of a foot.

The thickness of bond writing paper, 500 sheets of which constitute but 1½ in., equivalent to 4000 to the foot, is but 0.00025; twice this amount in coal, in the shape of dust equally distributed on the floor, for instance, and exclusive of other forms of carbon or carbon compounds, represents more than the minimum amount, 0.005 being a not uncommon thickness of the dust and soot on the ribs on many haulageways, and on the roof on steam-locomotive hauls.

Relative Volumes

Dividing 81.7008 by 0.006 gives 13,617, the number of cubic feet of air required for the complete combustion of 1 cu.ft. of coal, which on this basis, with 6-ft. coal, will consume all the air over 2270 sq.ft. of floor space, or over 6810 sq.ft. of workings, if one-third of the coal is removed on the first mining. One ton of dust, therefore, will consume all the air over 61,290 sq.ft., or 1.4 acres net open work, or over 4.2 acres of workings.

The cubical contents of a particle of dust, spherical in form, are, if r be the radius, equal to 4/3 r^3; if R denote the radius of the outer surface of the surrounding hollow spherical shell of air containing 13,617 times the volume of coal in our particle of dust, we thus have

$$\tfrac{4}{3}\pi R^3 = 13{,}618 \times \tfrac{4}{3}\pi r^3 \qquad \therefore R = 23.88\,r$$

That is, whatever the size of the particle of dust, the radius of the outer surface of the surrounding hollow spherical shell of air will, for the ratio of volumes under consideration, be 23.88 times that of the particle of dust.

A molecule of coal of the composition C_7H_6, for instance, requires for its complete combustion an amount of air near enough represented by the symbols 16 (O) 64 (N), a total of only 80 atoms, or 40 molecules of two atoms each. If air be liquefied by sufficient pressure and reduction in temperature, it appears a somewhat plausible view that the molecules of oxygen and nitrogen will then perhaps be somewhat the same distance apart as the molecules of coal.

A pressure of some 320 atmospheres is, however, required to liquefy oxygen, the inference being, at ordinary temperatures and pressure, that the molecules of oxygen and nitrogen constituting air are in a state of intense vibration, the number of impacts per second, for instance, being probably far past comprehension. Increasing the complexity of the molecule of coal probably also increases its cubical contents, as well as that of the surrounding spherical shell. The increase in complexity should not, however, increase the volume of air required for the combustion of a given volume of coal, provided the proportion of carbon and hydrogen remain the same. That the number of such more complex molecules, for a given volume, is correspondingly reduced, would appear to be indicated by the slight range in specific gravity of bituminous coals.

If the radius of the standard maximum particle of dust, heretofore assumed spherical in form, be taken as unity, then the edge of the cube containing the same volume of coal will be 1.612; if E denote the edge of the surrounding hollow cube of air containing 13.617 times the volume of coal, we thus have

$$E = \sqrt[3]{(1.612)^3 + (1.612)^3 \times 13{,}617} = 38.495,$$

the unit of measure being the radius of the standard maximum particle of dust, the suggested value of which, as expressed in feet, is 0.0001; on this basis, E, as also expressed in feet, will be equal to 0.00385, which is thus, for the relative volumes under discussion, the distance between centers of contiguous cubes and equivalent to 259.74 per linear foot, or slightly less than 22 per inch, for the size of dust, spherical in form, that will readily pass through a screen of 200 apertures per linear inch. A correspondingly smaller number, for larger sizes, is sufficient to produce maximum explosive effect. Clouds of dust in the mines, as revealed by the miners' acetylene lamp with semi-circular shield, certainly appear, in instances and under suitable conditions, extremely dangerous.

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[2] J. T. Beard's "Mine Gases and Explosions."

If one volume of coal requires for its complete combustion 13,617 volumes of air, while one volume of marsh gas requires but 9.57 volumes of air, then one volume of coal may be said to be equivalent to 1423 volumes of marsh gas, thus illustrating in another way the relatively large amounts of dust seen at times in suspension, if expressed in equivalent volumes of this much dreaded gas.

Dust Resulting from Machine Mining

It will be assumed that pick, puncher and chain-machine mining, under the same conditions, result in substantially the same amount of fine coal or cuttings, the larger portion if not all of which, in the presence of a blown-out shot for instance, are capable of sustaining an explosion, although only in part, in the absence of violent disturbance, classed as a true dust. The chain machine, owing to the uniform cut or kerf made, serves as a convenient basis of estimate of the amount of "coal sand" and dust resulting from the mining operation.

A 4-in. cut is equivalent to 27.234 lb. of coal per sq.ft.; the minimum amount per unit of area for a given thickness of coal, as 6 ft. for instance, being the same whatever the width of the place or working; dividing the weight of the coal in the cut by the minimum amount per sq.ft. of floor will give 756 times the minimum as the amount of the cuttings. With a 6-in. cut, which is of advantage in that less powder is required to turn out the coal, we get 1135 times the minimum necessary to produce maximum explosive effect.

The cuttings in a chain-machine mine hardly represent the entire dust contents; 100 times the minimum appears a moderate estimate for the considerable amount of fine coal resulting from the action of the roof on the pillars, which is distributed by the mine cars along the haulageways.

On the basis that 800 times the minimum is the average amount of cuttings, if seven-eighths are loaded at the working faces and five-eighths reach the outside, we thus have the remaining two-eighths, or 200 times the minimum, probably the finer grades, distributed along the haulageways, making, in all, with the pillar dust, 400 times the minimum not hauled outside.

Changes in Amount and Distribution

A considerable proportion of the cuttings remaining at the working faces soon becomes covered with gob; of the 300 times the minimum that distributes along the haulageways, perhaps one-half, the coarser grades of dust and coal sand, remains *in situ* and in time becomes hard and compact or possibly thoroughly soaked with water, and changes in chemical composition so as to be less dangerous, if not entirely harmless. Of the remaining 150 minimums, perhaps 25 are retained within the mine due to adhesion, the same amount carried outside and 100 either carried outside or distributed throughout the working districts by the ventilating currents.

A Practical Example

If the rooms in a given mining district are twice the width of the haulageway to the district, and are driven on 60-ft. centers, 480 ft. in length, with 240 ft. of crosscuts, room width, per room, the total area of the rooms or crosscuts will be 24 times that of the entry. If the haulageway under consideration, off which these 480-ft. rooms are turned, is throughout its entire length ankle deep in dust and thus equivalent to about one-half a 5-in. chain-machine cut, or 500 times the minimum for the entry, then this amount of haulage dust alone, with no other dust in the rooms and with neither dust gas nor smoke in the air, will represent some 20 times the minimum amount for the entire district; nor will a great deal of dust in the rooms be required to bring the average contents up to 100 times the minimum.

Dust ankle deep along the haulageways has been in general, as far as noticed, only local, occurring more particularly on steep mule or fast motor hauls, the average being perhaps as stated, about 150 times the minimum.

Comparison of Pressure and Exhaust Ventilation

The total amount of dust in a given period of time that, for instance, will be carried out of the mine with pressure ventilation, or retained within with exhaust ventilation, will depend not only upon the average dust contents per cu.ft. of air (which may conveniently be expressed in fractions of a minimum), but also upon the number of cubic feet passing through the mine in the period of time under consideration. Owing in part to the minimum amount, expressed as an absolute quantity, being relatively small, while on the other hand the total amount of air for a considerable period reaches quite large figures, it is not surprising that a small fraction of a minimum, per cu.ft. of air, will in time result in a considerable accumulation of dust, whether expressed in minimums or as an absolute quantity; this will perhaps be more clearly illustrated by an example:

The amount of air required for a given area of mine workings depends, in the absence of gas, to some extent upon the proportion of idle unproductive territory, but to a greater extent upon the system of ventilation, and more particularly upon what may be considered a proper allowance of air. I will assume that 200,000 cu.ft. of air per minute is a suitable allowance for a block of workings 5000x5000 ft., or a total area, including pillars, of 25,000,000 sq.ft., in fairly active operation; let us further assume (as convenient figures for the purpose) that the net area of the open work is 10,000,000 sq.ft., leaving as the standing pillars 15,000,000 square feet.

A 10-hour shift being equivalent to 600 minutes per day will thus give per shift 120,000,000 cu.ft., or 12 cu.ft. of air per sq.ft. of net open work, or with 6-ft. coal, just twice the entire contents of the mine; if we assume, with exhaust ventilation, that none of the dust in suspension subject to the action of gravity is carried out, and that this portion of the dust contents of the air is only one-hundredth part of the minimum per cu.ft., there will thus be deposited in the open work each day, one-fiftieth part of the minimum, or in a year of 300 working days six times the minimum. A volume of air, in the latter period of time and exclusive of the interval between actual working shifts, is equivalent to 600 times the total contents having been passed through the mine.

With the pillar work following upon the advance work as rapidly as well planned barriers will admit, the average length of life of the different workings (although only too often much greater) may be reduced to about four years, on which basis, at the rate of six minimums per year, we get 24 minimums as the dust contents at any given date due to the action of the ventilating currents. With the average age of the workings as eight years, a not uncommon figure, we get 48 times the minimum as the average dust contents, while 16 years, for instance, will give 96 times the minimum, one-fiftieth part of the minimum per cu.ft. of air in place of one-hundredth part, doubling these already large figures.

If one-hundredth part of the minimum amount per cu.ft. of air will, with exhaust ventilation, in 4 years give 24 times the minimum for the entire mine, one twenty-four hundredth part of the minimum per cu.ft. of air will, in the same length of time, bring a mine from which all dust has been removed up to its explosive capacity.

The one-hundredth part of the minimum per cu.ft. of air is a rather small quantity that, by an analysis of a small volume of the return, would require fairly careful work to determine with certainty. The probable small quantities involved would rather suggest settling from a continuous current in a bag or dust house through which, with pressure ventilation, known volumes of the return may be readily deflected, thus giving averages extending over a considerable period of time. With exhaust ventilation a number of experimental stations, well distributed over the workings perhaps, are required.

In this connection, 0.42 grain per cu.ft. of air for 120,000,000 cu.ft. per day, equivalent to 7200 lb., or 3.2 atoms of fine dust, does not seem at all an unreasonable figure for a mine that should have an output of 1000 tons per shift.

Reserve Coal Should Be in Solid Blocks

The figures given are incidentally suggestive of a reduction to the least minimum possible of all open work, all reserve coal being, as near as may be practicable, in large solid blocks and not as standing pillars. Large sections of idle workings that must be ventilated are almost ideal dust collectors, and nearly, if not quite, equal to well designed dust flumes—with exhaust ventilation.

The more nearly all entries are driven blank, and all reserve coal is in solid blocks, the more nearly the room-and-pillar system, on the score of dust, may be said to approximate longwall work. The figures given are again incidentally suggestive of the question, whether in instances and with exhaust ventilation the amount of dust carried into the mines from closely adjacent tipples may not be an equally interesting calculation.

Explosive Capacity of a Mine

The minimum amount of dust, 0.036 lb. per sq.ft. of floor space, may be said to represent the explosive capacity of a mine. In the example in the previous section, 10,000,000 × 0.036 = 360,000 lb., or 160.7 tons of dust, equivalent to 300 lb. per day for four years of 300 working days each, representing the explosive capacity of the mine under consideration; in that, if equally distributed and in suspension, this amount will suffice for the complete exhaustion of the total amount of oxygen in the workings at any given moment.

Table of Calculated Quantities

The calculations previously given, and intended more particularly to illustrate the relatively small amounts of dust required to produce maximum explosive effect, are for convenience of reference here summarized; the thickness of the seam of coal mined is assumed to be 6 ft., and the conditions, etc., are as stated in the sections referred to:

FIXED CARBON DISREGARDED.

Minimum Amount of Dust.

Per cu.ft. of air in suspension	0.02234 lb.
Per cu.yd. of air in suspension	0.603 lb.
Per sq.ft. of floor, of roof or of ribs	0.134 lb.
Per sq.yd. of floor, of roof, or of ribs	1.206 lb.

FIXED CARBON INCLUDED.

Minimum Amount of Dust.

Per cu.ft. of air in suspension	0.006 lb.
Per cu.yd. of air in suspension	0.162 lb.
Per sq.ft. of floor, of roof, or of ribs	0.036 lb.
Per sq.yd. of floor, of roof, or of ribs	0.324 lb.
Per cu.m. of air in suspension	96 114 grams.

One pound of coal dust is the minimum for—
  13,617 cu.ft. of air.
  504 cu.yd. of air.
  2,269 sq.ft. of floor, of roof, or of ribs.
  252 sq.yd. of floor, of roof or of ribs.

Minimum as a Uniform Layer.

	Thickness, Cu.Ft.
Per cu.ft. of air	0.00007344
Per sq.ft. of floor, of roof, or of ribs	0.00044064

Relative Volumes.

1 cu.ft. of methane is the minimum for 9.57 cu.ft. of air.

1 cu.ft. of coal is the minimum for 13,617 cu.ft. of air.

Coal requires 1,423 more volumes of air than methane.

1 cu.ft. of coal in the form of dust is the minimum for:
  2,270 sq.ft. of net open work, clear of pillars.
  6,810 sq.ft. of mine workings, including pillars.

One ton of coal is the minimum for:
  61,290 sq.ft. or 1.4 acres net open work.
  183,870 sq.ft. or 4.2 acres mine workings.

Amount of Cuttings (Chain Machine).

4-in. cut equals	765 minimums
6-in. cut equals	1,135 minimums

Minimum per Cu.Ft. of Air.	Explosive Capacities
$\frac{1}{2400}$ in four years, equals	1
$\frac{1}{24}$ in four years, equals	100

Lower Explosive Limit of Dust.

Per cu.ft. of air	0.0044 lb.
Per cu.m. of air	70.775 grams.

1 cu.ft. of coal in the form of dust is the lower explosive limit for:
  18,568 cu.ft. of air.
  3,094 sq.ft. of net open work.
  9,282 sq.ft. of mine workings.

Résumé

It is only evident from the foregoing figures that neither loading out nor improvements in systems of ventilation, nor attention to mine cars, nor devices for cleaning ribs and roof can, at least with present methods, even approximate the degree of freedom from dust that is essential in order that an explosion cannot possibly occur. We should not, however, lose sight of the fact that the smaller the total quantity of dust in a given mine, although far in excess of the minimum amount, the less are the chances of either the necessary quantity being in suspension at possible points of ignition or of a local explosion becoming general. Simple and relatively inexpensive methods for reducing the amount of dust certainly deserve thorough and conscientious trial, in so far as may be at all practicable with the means at our disposal.

We should more particularly not lose sight of the fact that to result in an explosion the dust must be in suspension in air; as long as it remains on roof, ribs or floor, it is harmless. The statement is not infrequently made, in good faith, that there is no dust in a mine, or in a certain section of a mine, as the case may be; nor is the statement necessarily incorrect, in the sense intended, even though the quantity be considerable, as long as all of it remains so thoroughly moistened with water that it cannot be detached from its resting places, as by a closely adjacent blown-out shot. If, however, but one small section of a mine is allowed to become dry, an explosion therein may readily generate sufficient heat to dry out the entire mine as the explosion extends from section to section. Local application of water, in dry mines, can be but little more effective, for instance, than leading out local accumulations of dust, and the same would appear to apply to the use of calcium chloride. Thorough saturation of the entire intake appears the only method by which every particle of dust, in every section of a given mine, can be reached with certainty; while at points at which large volumes of dust are rapidly brought into suspension as by the mining operations, ample volumes of air, free from all forms of dust, appear perhaps equally desirable.

Coal Mining Industry in Indiana

Special Correspondence

The conditions of the mining industry in Indiana, on the whole, are said to be on a better basis and look more encouraging than at any previous corresponding period for a decade. The record for May is believed to be the dawn of a new era in coal mining in Indiana. There are several causes that have contributed to the present prosperity and point to a more propitious future in this State. The contending interests that occasioned a 30-day suspension during April settled their differences more easily and satisfactorily than was expected. The operators and miners have come to realize that arbitration along equitable and practicable lines is far more conducive to the economic advantages and prosperity of employer and employee than by resorting to strikes and lockouts.

The demand for Indiana coal has been unprecedented and in consequence every mine in the State is being operated on full time. Old and new markets are placing orders far ahead of the output of the mines. Never before were there so many coal buyers sent into the Indiana field, and in consequence mine-run coal is readily selling at $1.45 to $2 at the mines. The suspension of mining in Illinois contributed not a little to the extraordinary activity at the Indiana mines. Markets supplied by Illinois mines rushed their agents into Indiana and the operators say the prospect for a steady and full summer's output at high-notch prices was never better. Another cause for rejoicing is the fact that the railroad companies are doing exceedingly well in moving the big daily output. In some instances the railroads have doubled their crews in order to prevent the blockading of coal trains. In this connection it is observed that the railroads are taking care to store coal in order to avoid higher prices, which are almost certain to prevail later on during the year. Of the 60,000 locomotives in this country, Indiana coal is said to feed an unusually large number of them at the present time.

Condition of Mines

The physical condition of the mines in Indiana is good. Chief mine inspector Epperson says there are a few mines in need of repairs, but generally the mines are in excellent condition for speedy and safe operation. During the period of suspension, the operators in control of the larger mines were busy in making them ready for successful operation. In some instances electric lights and haulage were installed and some mines equipped with telephones.

There are perhaps a few hundred more miners employed in the Indiana mines than at any time last year. Operators say more miners could be worked, but experienced men are not obtainable. During the suspension, a large number of the foreign miners left for the old country. Their places, for the most part, have been filled by American miners.

Thousands of acres of coal land are being bought or leased for development. Prospective drilling is being pursued in a number of fields. The Miami Coal Company and the Crown Hill Coal Company have each just completed new shafts in the Clinton field and the Jackson Hill Coal and Coke Company is sinking a new shaft in West Terre Haute district.

Oil Mining

The production of oil in the eastern or Montpelier field and the southwestern or Oakland City field continues to attract investors. New wells are being completed almost daily and the territory is being extended. Thousands of acres of land are under lease and apparently there is but little wildcat operation going on. Indiana is very much richer by reason of her oilfields.

Rock and Cement

According to present indications, the production of cement in Indiana will be a third larger this year than last. The cement mills in southern Indiana are working at full capacity and the new plants in northern Indiana are getting fairly well started.

Rock quarrying as a business is growing extensively in this State. Indiana stone for building purposes is in popular demand. It is also gaining a wide reputation for sculpture work and figures—only recently, Indiana stone was shipped to Paris for sculpture work.

The present era of macadam-road building in Indiana has created a good business for those operating crushing plants. There are more men and more capital employed in quarrying and crushing rock in Indiana at present than ever before in the history of the State.

Steps have been taken through congressional appropriation to establish rescue stations—one at Evansville and one at Terre Haute.

In conclusion, it is safe to say that mining conditions at present in Indiana are most satisfactory and that the future is more optimistic than for a number of years.

The Sizing of Anthracite

The yearly report of Heber S. Thompson, engineer, of the Girard Estate, is always of interest, owing to the careful analysis of the production from the different collieries owned by the estate. Owing to the fact that these collieries are leased to several different companies and operated under varying conditions, they present a fair average of practice and results, although their aggregate production is only about 3 per cent. of the total output of anthracite. The Girard Estate had last year 13 leases in effect—12 collieries and one washery—these leases being held by six different companies. Three of the collieries were operated by the Philadelphia & Reading, five by the Lehigh Valley, one by the Susquehanna Coal Company, a Pennsylvania Railroad subsidiary, the rest by independent companies, one colliery being leased by the Thomas Coal Company and two by the W. R. McTurk Coal Company, while the washery was leased by the Oxford Coal Company.

The total anthracite produced from the several collieries and washeries was, in long tons, for two years:

	1908		1909	
Shipments:	Tons.	PerCt.	Tons.	PerCt.
Fresh mined	1,713,256	78.6	1,610,656	81.4
Washery	247,635	11.4	147,730	7.5
Total shipments	1,960,891	90.0	1,758,386	88.9
Used at mines	217,332	10.0	218,915	11.1
Total	2,178,223	100.0	1,977,301	100.0

The large decrease in washery coal was due in part to a lighter demand for the small sizes; but the production from washeries is generally decreasing as the old culm banks upon which they operate are gradually worked out. Under present systems of operating, the small sizes are saved at the breakers and do not go into the culm piles as formerly. The division of anthracite into sizes is established by custom as follows: Lump, or coal screened but not broken; broken, which now includes the size formerly known as steamboat, which has gradually been disused in the trade; egg; stove and chestnut. These five sizes are known as large coal. The small or steam sizes are pea, buckwheat, rice or buckwheat No. 2 and barley. The residue, after barles is screened out, is culm, which is not marketable, though some is burned at the collieries.

The division of coal mined from the Girard collieries, according to sizes made during 1909, was as follows:

	Sent to Market		Consumed at Collieries.
	Fresh Mined.	Washery.	
Lump	4,176	......	......
Broken	226,989	......	......
Egg	200,245	......	......
Stove	261,353	825	......
Chestnut	315,314	9,773	......
Total large	1,008,077	10,598	5,863
Pea	212,542	16,713	......
Buckwheat	266,582	46,039	34
Rice	95,944	48,172	67,326
Barley	27,511	26,208	142,348
Culm	....	......	3,344
Total small	602,579	137,132	213,052
Total	1,610,656	147,730	218,915

The growth in the saving of small coal is shown by the following historical table, which covers a period of 48 years, showing the percentage of different sizes shipped at five-year intervals:

	Stove and Over.	Chestnut.	Pea.	Buckwheat.	Rice and Barley.
1863	90.00	10.00	.....	.....	.....
1868	87.87	11.20	0.93	.....	.....
1873	82.83	12.16	5.01	.....	.....
1878	77.22	12.52	10.19	0.07	.....
1883	71.81	12.17	11.91	4.11	.....
1888	69.91	11.79	12.63	5.67	.....
1893	59.91	16.80	10.32	12.97	.....
1898	45.12	22.90	12.58	18.03	1.37
1903	33.00	17.48	13.87	21.61	14.04
1908	38.37	17.66	12.44	17.25	13.91
1909	39.45	18.48	13.04	17.79	11.24

Up to about 1875, chestnut was regarded as a small size, and brought a lower price than the others, but the introduction of improved grates and other appliances brought it into large demand for household fuel. Pea coal was first reported in 1867; buckwheat in 1878; rice and barley in 1895. The saving of these sizes was accompanied by the development of a number of appliances for burning them, such as the Wootten locomotive boiler, and was followed by the establishment of washeries for working over the culm banks, which had accumulated at the mines. They now constitute an important part of the trade. These sizes are used for the making of steam, and in the Eastern cities also find extensive consumption in the large buildings heated from central plants.

The Cost of Labor in Wales

The average figures for a number of Welsh collieries, showing the proportion between the different elements of cost in the production of a ton of coal at the pit mouth, are given as follows: Labor, 81.72 per cent.; stores and materials, 11.87 per cent.; royalties, 4.38 per cent.; rents, rates, etc., 1.84 per cent.; and incidentals, 0.19 per cent. Examining similar figures for previous years, it is shown that the cost of labor has been increasing for some time. It is evident, therefore, that mine labor should be employed as economically as possible, and furthermore that in addition to the items of first cost and cost of maintenance of mining machinery, the superintendent who is building a plant should carefully consider how each piece of machinery is going to affect the cost of labor.

PERSONAL

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

John D. Moodie has returned to Los Angeles, Cal.

E. D. Bronson, of Pachuca, Mexico, is visiting the United States.

H. W. Turner, of San Francisco, has gone to Alaska. He expects to return in July.

J. R. Masson, a metallurgist from Melbourne, Australia, has been visiting Leadville, Colorado.

Gerald F. G. Sherman, superintendent of the Copper Queen mines, has been visiting New York.

Henry H. Love of Boston is in Humboldt county, Nevada, in connection with mining negotiations.

Arthur Lakes, of Denver, Colo., is making geological examinations in Arizona and California.

J. N. Hauser has succeeded W. S. Mann as superintendent of the Calumet & Sonora Mining Company.

Arthur Lakes Jr., of Denver, Colo., is making mining and metallurgical examinations in Summit county, Colorado.

Dr. L. D. Ricketts has gone to Butte, Mont., and will spend more than a month examining processes in that section.

J. B. Risque, general manager of the Utah Consolidated, has resigned and will leave the company on Aug. 31 next.

W. S. Lecky, of Montreal, has been elected an associate member of the British Institute of Mining and Metallurgy.

Alexander P. Rogers has returned to New York from Colombia, where he spent two months on professional business.

A. J. Eveland, of the General Development Company, has returned to New York from a field trip of several months duration.

Prof. Joseph W. Richards, of Lehigh University, sailed on June 11 to attend the International Metallurgical Congress at Düsseldorf.

Edwin Hull, State geologist of Wyoming, has been spending several weeks in the Province of Quebec, inspecting the asbestos fields.

Hallett R. Robbins will not this year direct exploration work for the Colonial Gold Mining Company, being fully occupied at Boise, Idaho.

Lewis T. Wright, general manager of the Mountain Copper Company, passed through New York this week, on his way from London to San Francisco.

Melbert B. Cary has been chosen president of the Pacific Mining and Smelting Company. He has been connected with the company for several years.

The new hospital at Munising, Mich., was opened June 5. It has been built and equipped at the expense of William G. Mather, president of the Cleveland-Cliffs Iron Company.

John H. MacMillan, late mine manager for the Royal Collieries, Ltd., Lethbridge, Alberta, has been given charge of a new coal mine near Midway, in the Boundary district of British Columbia.

Robert H. Large has been appointed general coal freight agent of the Pennsylvania Railroad, succeeding J. G. Searles, who has been assigned to other duties on account of ill health.

W. Murdoch Wiley, of New York, accompanied by R. B. Lamb, has left for Montana to examine the Ohio-Keating mine. They will also make mine investigations in Idaho and California.

Lawrence Adams, late vice-president and general manager of the Guanajuato Amalgamated, is leaving New York for Montana and California in connection with mining properties that he is interested in.

George B. Clark and W. L. Stone, forming the firm of Clark & Stone, have bought the assay office and laboratory formerly conducted by George B. Eberenz at Pueblo, Colo., and will conduct the business hereafter.

T. W. Starkey, an English mining engineer well known in Mexico, was shot by a Mexican, formerly in his employ, while on his way from Cucupe to Cerro Prieto, Sonora. He was severely wounded, but has a chance of recovery.

Enoch Henderson, formerly superintendent of the Yuma Copper Company, Salome, Ariz., has been appointed superintendent of the Franklin mine in the Lake Superior district under General Manager R. M. Edwards.

Frederick Cutlar Poisson, who has been in the Inca district in Chile for several years, has been visiting in New York and vicinity for several weeks and will sail about June 24 for England. His address will be Bartholonew House, E. C., London.

Howland Bancroft, of the United States Geological Survey, is going to Washington, where he will spend a couple of months finishing a reconnaissance of the ore deposits in the northeastern part of the State, commenced last summer.

Charles T. Mitchell, construction engineer for the Granby company, during the time important additions were made to that company's smelting plant, has taken a similar position with the Canadian Copper Company, at Copper Cliff, Ontario.

Albert L. Waters, who has been directing successful tests on the Colorado Iron Works Company's new oil-burning blast furnace, left Denver on June 1 for Arizona and Sonora, on professional business. He will pass July at his home in Los Angeles.

Paul S. Couldrey, formerly manager for Le Roi, No. 2, Ltd., Rossland, and for the last year superintendent of the British Columbia Copper Company's Mother Lode mine, Boundary district, is leaving for Peru to take charge of the Cerro de Pasco Mining Company's mines under General Manager A. B. W. Hodges.

William C. Potter, of the American colony in Mexico, who for several years has been chairman of the executive board of the American Smelting and Refining Company in Aguascalientes, was recently appointed to the same office on the New York board. Mr. Wagner, of the Chihuahua smeltery, and Kuno Doerr, vice-president of the Aguascalientes smeltery, will become the leading members of the Aguascalientes board.

OBITUARY

Dorrance S. Goddard died in Worcester, Mass., June 3, aged 80 years. He entered in early life into the manufacture of wire with his father, who founded the business which afterward grew into the great shops of the Washburn & Moen Company.

SOCIETIES and TECHNICAL SCHOOLS

National Institute of Mine Inspectors—The annual convention is in session this week—June 13-18—in Chicago.

American Institute of Chemical Engineers—The second semi-annual meeting, June 22 to 24, will be held at Hotel Clifton, Niagara Falls, Canada. The following papers are promised: Address of President McKenna: "The Study of Materials as an Element in a Course of Chemical Engineering." Report of the committee on chemical engineering education, F. W. Frerichs. "A New Product for Use in the Arts," F. G. Wiechmann. "Changes in Industrial Chemistry Caused by Electricity," Edward R. Taylor. "Notes on the Corrosion of Iron and Steel and its Prevention," G. W. Thompson. "Vacuum Distilling Apparatus," Philip B. Sadtler. "Chemical Industries of Canada," J. A. DeCew. "The Manufacture and Industrial Applications of Ozone," Oscar Linder. "Problems in Chemical Industry," J. T. Baker. "Arrangement of Filter Presses for Bleaching Oils with Fullers Earth," David Wesson. "Commercial Manipulation of Refractory Elements for Incandescent Lamp Purposes," Ralph E. Myers. "Underground Waters for Manufacturing Purposes," W. M. Booth. "Loss in Coal due to Storage," A. Bement. "Nitric and Mixed Acids," Schuyler Frazier. "Plant Design," W. M. Grosvenor." A number of visits to industrial plants will be made.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

June 9—The oil industry of the State still continues to grow in importance. English investors have made their appearance in several fields and many large sales have lately been made. Storage and marketing the oil are the two problems. The production of the wells of the state is about 220,000 bbl. daily, and the consumption is 30,000 to 40,000 bbl. less. Besides the tanks and reservoirs in the fields, large reservoirs will be made near the seashore. There is some talk of trying to introduce California oil on the Atlantic coast in opposition to coal. There is already a pipe line across the Panama isthmus, and there are oil-tank steamers on both oceans.

The oil men of the State have not been well organized, but they are making preparations to stand off pernicious legislation, like the Pickett bill. An attempt will be made to get the oil men together. The big Lakeview gusher in Kern county, after 85 days steady flow, is still yielding at the rate of 47,000 bbl. daily. Between 3,500,000 and 4,000,000 bbl. have already flowed from the well. Storage is the pressing problem. The oil stream is carried in ditches to reservoirs near by and more or less has been piped away. More reservoirs are being added.

The California State Mining Bureau has, in the matter of collecting gold and silver statistics in this State, started an opposition to the U. S. Census and the U. S. Geological Survey, having issued special blanks to gold, silver and platinum producers, asking amount of output, etc., in 1909. The Geological Survey is not this year sending out any blanks to miners, this work being in the hands of census agents. When the census agents get the mining blanks filled in, however, they are turned over to the Survey, which will compile the figures and prepare the mine reports.

The recent strike of rich ore in the Pacific mine near Placerville, Eldorado county, is considered of great interest in that section. The mine is an old one. The 500-ft. shaft has been only lately unwatered and retimbered. Drifting was commenced at the 500 level and run south 240 ft., running parallel with the old Pacific vein. The north end of the oreshoot has finally been encountered. In the crosscut east from the old Pacific workings another good vein has been found. The Pacific is being operated by a British company and is on the Mother lode.

Another attempt is to be made this summer to revive the Meadow Lake district in Nevada county. These mines were discovered in the early 60's and quite a town was built. No satisfactory way was found to work the "refractory" ores nor has one been found since. The snow fall is very heavy in that section and only during the summer months can work be prosecuted. John Clark and others will undertake operations.

Denver

June 13—More than usual interest now centers in the Raven Park oilfield, near Rangely, and only six or seven miles south of the projected line of the Moffat road. A great deal of preliminary drilling has been done in the Raven Park anticline, beginning as far back as 1901. In 1907 several new wells were drilled and some of the old ones pumped out, under the management of J. H. Hunt, of Hayward, Cal. Oil was found in nearly all the wells at from 400 to 700 ft. below the surface, and in all of them rose to about the same level, approximately 360 ft. below the surface. The area in which oil has been found is three miles by one and a half miles. It is a light, thin oil, and it is stated has been burned in lamps like refined oil. The principal workers in the field at present are Raven Park Oil Company, George Hildebrand, manager, 26 Jacobson building, Denver; Meeker Oil Company, of Meeker, Colo., Mr. Pratt, manager; and the Emerald Oil Company, T. J. O'Donnell, of Vernal, Utah, manager. An engineer for London people is on his way to examine this oilfield, and it only awaits the construction of the Moffat road to that point to be extensively developed. In the great fruit section of the Grand River valley, about 70 miles due south, oil is in demand for smudge-pot purposes, and it is now reported that a company has been organized at Fruita, Colo., to build a pipe line at a cost of about $200,000, to convey the oil from the Raven Park oilfield to this fruit country.

With reference to the strike in the Vindicator, at Cripple Creek, mentioned in the Journal of June 3, the reports of the value of ore since then are rather more credible, and it is now stated that the orebody has widened to 16 ft. and has several seams of calaverite through it. It is now affirmed that the entire orebody without sorting would yield gold to the value of $100 per ton, and that is certainly big enough. The output of the mine last month was 2800 tons, a large proportion of which was smelting ore.

Butte

June 11—It has been announced that the Chicago, Milwaukee & Puget Sound Railway will build from Melstone in Fergus county, on its main line, through Great Falls, to Missoula, at which point it will again connect with its main line. The distance is approximately 400 miles and the road will tap some productive mining districts. It is probable that large shops will be built in Great Falls.

On May 31, the Anaconda company assumed the operation of the Clark properties and all ore from them will hereafter be shipped to the Washoe plant at Anaconda. The Butte Reduction Works, owned by Senator Clark and treating ore from his mines, has ore for three weeks and then the smelting part will be shut down. The concentrator which the company has leased to Clark will be used by him for the concentration of zinc ores from the Elm Orlu and Poser mines which he still retains. Recently the Original shaft has been the only one of the Clark shafts in operation, the Stewart ores being mined through it also, but the Anaconda company will put the Stewart shaft in commission and through it work the Little Mina and the Stewart. When the new Gagnon vertical shaft is completed, connections will be made with the Original workings and it is probable that the ores from both properties will be hoisted through the Gagnon shaft while the Original shaft will be abandoned. With the closing of the smelting department of the Butte Reduction Works, it is probable that the custom ore which it has handled will be sent to the East Butte company's Pittsmont smeltery. Proceedings have been begun by the Butte, Anaconda & Pacific Railway, for the acquisition of a right-of-way from the Parrot to the West Stewart. This will enable the hauling of ore from the latter mine to the Washoe smeltery.

Salt Lake City

June 13—Interest is being taken in Utah oilfields in Grand and San Juan counties in the southeastern part of the State. Two drilling rigs are being shipped into the Grand River field near Moab, and drilling will be started during the summer. The oil and gas territory extends from Moab ferry to Richardson about 30 miles up the river. Part of this land has been staked and surveyed. A number of leases on prospective oil land have been secured from the farmers in Grand Valley. The lessees claim no right to any artesian or other water discovered except what may be necessary for operating purposes. Until oil or gas is discovered the land owners are to receive 10c. per acre each year, also 10 per cent. of all oil discovered, and $50 per year for any gas wells. The oilfields southeast of Emery in Emery county are also attracting attention. At present it is necessary to haul machinery from Price over 100 miles from the railroad to reach the oilfield, although Green River on the railroad is about half that distance. Coal for power purposes can be obtained within 15 miles of the oilfield along the road near Emery.

Oil men from Pennsylvania and California have been examining the San Juan field and also other fields in Wayne, Garfield, and Uinta counties.

The traffic bureau of the Salt Lake Commercial club has issued a circular, calling for a general meeting for the purpose of considering and adopting a definite plan of action in regard to the railway rates on coal in Utah. The circular states that the rates are unjust, excessive and oppressive, and should be reduced to a reasonable basis for the proper progress of local industry.

After reconstructing 90 miles of railroad along the washout, the Salt Lake & Los Angeles railroad has resumed operations. Surveys for another route have been made, on which a new road will be built for many miles, and the present line will then be abandoned. Resumption of the road will be a great benefit to many mines. The service has been suspended for nearly six months.

Goldfield

June 13—The Goldfield Consolidated is arranging for the installation of a system of fire-fighting and fire-prevention facilities not only at the mill but in the mines. Besides a large supply of piping, hose, reels, ladders and chemical tanks, a number of air helmets have been added to the equipment. In case of fire underground large chemical tanks conveniently mounted on mine car trucks will be lowered and taken directly to the scene of the blaze by men wearing helmets. Bulkheads and air-tight doors are being built at various strategic points throughout the workings. At the mill a triplex pump has been installed which will give a suitable pressure always available.

Every mining company, domestic and foreign, selling mining stock in Nevada, must file during June with the attorney general and county recorder the semi-annual statement showing in detail all expenditures, all kinds of stock issued and sold, a list of all its claims, holdings and improvements, and in addition thereto must deposit in the post office, addressed to each stockholder of record a copy of said report. Failure to comply with this makes the company liable to a forfeiture of $1000 to the State, and cost of suit.

Birmingham

June 11—There is much discussion in reference to better mining laws and a better regulation of the mines. Chief State Mine Inspector James Hillhouse has made public a letter received from the Governor, in which statement is made that efforts will be made to carry out recommendations as to improvements offered by the State inspectors. The mine inspector followed this with an interview that when mines are found to be in a dangerous condition, steps will be taken by law to stop all operations until a correction has been made. Many improvements are now being put in by mining companies to minimize as much as possible the dangers in coal mines. Sprays to hold down dust, firing machines, coal-cutting machines and general orders against the use of dynamite in the mines are some of the steps being taken.

Indianapolis

June 13—In the case of Yemm against the Vandalia Coal Company, on appeal, the Indiana Supreme Court has affirmed the decision of the Putnam County Court, holding: (1) A violation of the section of the law of 1908, requiring a mining company to sprinkle the roadways and entries of a mine to prevent dust, whereby a miner is injured, entitles the miner to recover for the damages. (2) The statute is made for the protection of the lives and health of the miners. (3) The knowledge by the miner of the dry condition of the roadway did not prevent his recovery for the injury.

Cobalt

June 13—In spite of the assurances of the Government that the much needed road in South Lorraine would be built, nothing has as yet been done. The present road is so bad that after a heavy rain an empty wagon can hardly be drawn over it. As a consequence, machinery for the mines is still lying at the wharf.

Porcupine is also heavily handicapped for lack of roads, although one is shortly to be started from Matheson. Several of the mines are running short of supplies. A large amount of development is going on. There are 20 companies operating.

Toronto

June 10—The Canadian Department of Mines has commissioned Joseph G. Hudson, mining engineer, of Ottawa, to visit all plant where explosives are manufactured or stored, and ascertain what precautions are taken to insure safety in their handling. His report will be used in connection with the legislation to be introduced next session. The Department has also engaged Capt. A. H. P. Desborough, a British expert from Woolwich arsenal, for two months to advise the Government in preparing these regulations and in establishing a Government explosives testing station.

The mining law of Quebec province has been amended in some important particulars. The title to building materials, stone, clays, peat, ochre and sand hitherto retained by the Crown is granted to the surface owner. The money for mining licenses amounting to $1 per acre, when purchase is made, will in future go toward the purchase money. The time allowed between the staking of a claim and the taking out of a mining license, or an application to purchase, is extended from four to six months. The penalty for tampering with the stakes of mining claims is increased to $200 fine, or six months imprisonment. The Government has been given authority to reduce the price of the iron-bearing sand of the Lower St. Lawrence to $4 per acre, the rate of $10 per acre under the general law being regarded as prohibitive. The law passed in 1900 exempting mines and mining plants for municipal taxation for ten years expires in July. The amendment exempts mines and underground plants from municipal taxation, but the surface plants, mills and buildings are made taxable.

A prospecting license has been issued by the Mines Department to Martin McDonald and George C. Cook, covering an area of 30 miles square along the Port-au-Pique and Bass rivers, near Castlereagh. They intend to prospect for copper ore, small quantities of which have been found on the area.

The amalgamated company has issued a circular to shareholders of the Dominion Iron and Steel Company and Dominion Coal Company, saying: "The proposed issue of stock of this corporation in exchange for the common stock of the coal company and steel company has now been arranged. The new stock has been listed on the Toronto, Montreal and Boston stock exchanges; transfer agents and registrars have been appointed at these places and a large number of shares have already been exchanged. Shareholders who intend to accept the proposed exchange are requested to deposit their stock. Certificates for shares to be exchanged may be sent to the corporation's transfer agent, the National Trust Company, Ltd., Toronto, or they may be sent to the Royal Trust Company, Montreal, the National Trust Company, Ltd., Montreal, or the American Trust Company, Boston."

The shareholders will vote on changing the name of the corporation to "Canadian Steel Corporation, Ltd.," at the special meeting called for June 17, at Montreal.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

Contracts will be let soon by the Alaska Northern Railroad for 170 miles of railroad from its present interior terminal into the Matanuska coalfields and to the Susitna river, in the direction of the Haiditarod.

Chicago Exploitation Company—This company has purchased the placer claims of the Unuk River company, and a large amount will be spent for drill work.

Gogitem—This company has been incorporated, capital $500,000, to exploit option on Willow and Flat creeks in the Haiditarod.

Pioneer—This company has secured control of the Miocene Ditch Company, at Nome, and all of this water will be used on the company's mines. Jafet Lindegerg is manager.

Perseverance—The Juneau court has decided in the suit involving interests in the mine between Pearce and Sutherland in favor of the plaintiff, Pearce, and awarded a decree of $25,000. The company is planning a stamp mill and improvements.

California-Nevada Copper Company—An executive committee has been elected as follows: F. L. Underwood, M. W. O'Boyle and C. H. Briggs. The committee and some of the directors and larger stockholders accompanied by Prof. L. D. Huntoon, will leave for the Ebner mines, Juneau, soon. The 200-stamp mill will be erected under the supervision of Angus Mackay. The company also has a copper property in Madera county, California.

Alabama

Providence Oil and Gas Company—This new company, Dr. G. B. Crowe, president, is asking the City Council of Birmingham for a franchise to lay pipes into the city for the purpose of furnishing natural gas from the recently discovered field in Fayette county. Parties interested in the field have applied to the United States Geological Survey, requesting that an examination be made of the new field.

Arizona

Gila County

Venture Exploration Company—This company, headed by W. A. Eaton, of Duluth, Minn., is closing a deal by which it will acquire control of the Gibson property of 15 claims, 18 miles west of Globe. The purchase price for 70 per cent. of the stock is $400,000, distributed over four years. The company is planning extensive development of the claims as a low-grade operation.

Live Oak—Hole No. 6, 200 ft. south and 400 ft. west of the shaft, has passed through 55 ft. of ore averaging 2½ per cent. copper and is still in the orebody. Disseminated chalcocite in schist was first encountered at 250 ft. M. E. McCarthy is manager.

Miami—The company will establish its own medical and surgical department at the mine, beginning July 1. Dr. John Bacon, of Tombstone, Ariz., will be resident physician. For the present, one of the larger dwellings will be equipped as a temporary hospital, but plans for a large, new infirmerly are now being prepared. Drifting to block out the ore on the outer edge of the mineralized-schist area above the 420-ft. level is showing a greater extent of the orebody than was anticipated. On the 570-ft. level, a drift has been started from shaft No. 4 to the orebody 700 ft. away.

Graham County

Shannon—For a number of years the "ore tunnel" level marked what was believed to be the bottom of orebody, but recently a winze from this level encountered rich ore. Since that time three or four winzes have been sunk, and from 35 to 50 ft. below the "ore tunnel" level drifts have been run in ore averaging from 6 to 10 per cent. copper. The east and west winzes are 1500 ft. apart.

Mohave County

Carter—A mill is to be installed on the mine, adjoining the Tom Reed. Development is being continued in the 250-ft. drift.

California

Amador County

South Eureka—The mill is nearing completion at this mine, Sutter Creek.

Lincoln Consolidated—The company will reopen the Lincoln mine, Sutter Creek.

Amador Limerock Company—This company has been organized to purchase the limestone deposits near Mt. Echo, between Sutter Creek and Ione. The limestone is to be utilized in making lime, cement and in sugar refining. W. F. Detert is a director.

Butte County

Hecker & Andrews—A strike has been made in this mine adjoining the Phœnix, at Hurleton.

Eldorado County

Pacific—This company near Placerville, A. Baring Gould, manager, has encountered on the 500 level 7 ft. of high-grade quartz.

Humboldt County

Lower Klamath—This dredging company owns about 20 river-bed claims 20 miles from the mouth of the Klamath river. John A. Chestnut has gone with a crew to begin prospecting. It is the intention to put dredges at work this season.

Inyo County

The southern part of this county expects a revival of interest in mining through the reopening of the Four Metals mine and smeltery. President Short and Manager Skinner have been in Keeler and it is understood that funds have been raised for reopening.

Defiance—A company will operate this mine at Darwin and build a smeltery to Keeler or Olancha.

Chloride Cliff—At this mine a mill is being installed. The Big Bell and Keane-Wonder, near by, were working good forces. These mines are on the edge of Death Valley. The Nevada-California Power Company will connect from Rhyolite.

Shang Group—John Freise has bonded this mine near Queen.

Mariposa County

Crown Lead—This company, of Coulterville, S. E. Lewis superintendent, is working a large force near Nameless dam. A tramway is being built from the Adelaide mine to the mill on the Merced river.

Mono County

Standard Consolidated—Pres. Albert Fries has issued a circular to the stockholders stating that it appears that the expensive development work has been productive of good results. Notwithstanding the limited quantity as well as grade of ore encountered, the management has bettered the plant and made other improvements. The company is working the ponds and also pushing work toward the new claims recently purchased. Final figures for May will show a profit and indications appear favorable for June.

Native Son—The last payment on the mine at Blue Tent has been made, and work will be resumed under the management of J. H. Bishop, of Nevada City.

Oustomah—The owners have brought suit against E. A. and J. O. Hayes, of San Jose, for $18,000, alleging that this is due for royalties.

Republic—An important discovery has been made in this mine at Graniteville, operated by William McLean & Company.

Ethel—This mine at Washington is being reopened by Frank McPherson.

Shasta County

Delamar—Following an order of the Government that some smoke-consuming device must be installed at the smeltery at Bully Hill, it is expected that the plant will temporarily close and the ore from the mine be sent to Kennett and Coram.

Balaklala—The diamond-drill explorations in this mine at Coram, are showing up bodies of ore of better grade than that previously found.

Sierra County

Tippecanoe—Work in the lower tunnel on this quartz claim in Slate Castle ravine shows the same rich character of rock that was encountered in the upper level. The tunnel is being run by Messrs. Camp and Ish, who have a bond on the Jumper and Tippecanoe claims.

Taft-Sherman—Rich quartz and arsenical sulphide ore was found on this property in Jim Crow cañon.

Cove Ledge—The drift to the north on this property in Coyote ravine proves that the payshoot of rich rock is wide.

Young America—This producer, which has been idle for some years, will be reopened by Plumas county people.

Black Warrior—The same character of arsenical sulphides as those in the Standard mine in Sailor ravine have been encountered on this property. Development is being rushed by the bonders, Richardson & Davis.

La Caradad—After a year's continued activity, all work has been discontinued on this group, Moctezuma district.

Sierra Buttes—A 200-ft. tunnel is being run to ascertain the extent of the rich strike recently made in this mine at Sierra City.

Siskiyou County

Highland—A compressor and drills are being installed and the mine will resume.

Black Bear—This mine, owned by John Daggett, will be operated again. New machinery will be installed.

Tehama County

Sacramento Improvement Company—This company, Frank March superintendent, is preparing to mine the bed of the Sacramento river at Jelly Ferry about 12 miles from Red Bluff.

Tuolumne County

Fleming—The Yorktown Mining Company has been organized at Eureka, Cal., to work this mine on the east belt of the Mother Lode.

Colorado

Clear Creek and Gilpin Counties

Central—The tunnel at Idaho Springs is in 8536 ft. Work is being carried on the laterals on the Lake vein.

Raymond—This tunnel, on the Baltic vein at Georgetown, has cut a vein with zinc ore.

McKinley—This company, on Lincoln mountain, at Georgetown, has let a contract for continuing the adit.

Conqueror—The company on Covode mountain, at Empire, is carrying on much development. The 50-ton mill is running.

Kelly—This tunnel will be continued into Kelly mountain, at Georgetown, for several thousand feet. An examination has just been made.

Vidler—It is again reported that this bore will be completed, affording a short route to the Montezuma district in Summit county.

Gunnell—Frank A. Schermer, of Boston, vice-president of the Newhouse Tunnel Company, has acquired the mine, which will be developed at 1800 ft. below the surface by the Newhouse tunnel.

Santiago—This mine, operated through the Wilcox tunnel, is the scene of a strike of 3 ft. of ore averaging about $50 per ton in gold and silver. C. J. Morley is the leaser.

Old Town—In driving the 4th level east, lessees have made a strike of 30 in. of ore, and a crosscut from the same point to the Wautauga vein opened from 12 to 14 in. of high-grade gold-silver-copper ore. Both these orebodies, hitherto unknown to exist, will now be worked.

Lake County—Leadville

Cache Creek Placer—After 11 days' operations on this property, a cleanup of $5000 in gold is reported. This placer has a record of 50 years' production.

Danville—Supplies have been taken up to this mine, and 26 men are at work. The first shipment of one carload of ore was made May 24.

San Juan District

Favorite—A strike is reported from Ophir on this group in which large nuggets predominate. The group is owned by Felix Leavitt, of Denver.

Intersection—This mine, Maggie gulch, has been unwatered and the ore is being tested again.

Golden Egg—On this group, George Fisher has opened up 2-oz. gold ore.

Bullion Bar—This mine is starting with a small force.

Gold Prince—This mine at Animas Forks is producing concentrates running 2 oz. in gold.

Kittemac—This mine in Minnie gulch continues to mill and ship sulphide ore from the Clarke vein.

Tomboy—Returns for May are: mill ran 29 days; crushed 10,500 tons; yielding bullion, $40,000; concentrates shipped, $31,500; total, $71,500; expenses, $45,000; profit, $26,500.

Teller County—Cripple Creek

Gold Sovereign—The Clemens company, leasing on the Gold Sovereign, pro-

Doctor-Jack Pot—Felix Walter, leasing through the Ingham incline, is said to have 1½ ft. of $40 ore. The Lucky Corner, C. Esshorn, lessee, is also shipping 3-oz. gold ore, and is working through the Ophelia tunnel.

Rigi—The lessees on this group, Battle mountain, are shipping again, and have sent out 30 tons estimated to carry 2 oz. gold per ton.

Victor—The Roscoe Leasing Company shipped 250 tons of $25 ore in May.

Mary McKinney—Lessee Keener is shipping surface ore of $30 per ton value.

Cresson—A large hoisting and compressor plant is being installed to replace that burned April 11, and the mine is expected to be in full operation again by July 15.

El Paso-Gold King—Fifteen sets of lessees are at work, and two veins are showing ore from 2 to 3 ft. wide, which is being shipped direct to the smelteries.

Idaho

Coeur d'Alene District

The Enaville smeltery, the first built in the Cœur d'Alene district, will blow in soon. The first car of ore to be treated is one from the King & Queen mine of Carter, Mont. Maurice Blanchard, of Portland, is in charge. A feature is the burning of soft coal instead of coke.

Success—Charles Clark, of Montana, has inspected this zinc mine and is negotiating on behalf of Senator W. A. Clark for the property. The Success is producing and has been shipping for several years.

Murray Development Company—The holdings of this company, which were supposed to have been worked out 20 years ago, have been leased by William Whistler, who has discovered a copper vein on the property.

Indiana

Greene County

The coal mines in the Jasonville field are unusually active. About 2000 miners are employed and $110,000 was paid to them June 11. The work on two new shafts west of Jasonville is progressing.

Vigo County

The Western Coal Company, of Terre Haute, has dissolved.

W. D. Horn, president of District 11 of the United Mine Workers, and a large number of miners and operators, have notified the Government their unanimous preference for location of the Indiana mine rescue station at Terre Haute, which is declared to be near the center of the Indiana coalfields.

Kansas

The production for Kansas for May was 4,436,640 lb. of blende, 133,490 lb. of calamine and 320,190 lb. of lead concentrates, total value of $98,344.

Peacock Valley—This company has purchased the Boughton lease at Galena and is developing with drill.

Kiawa and Cimmaron—These companies at Galena have drained the Luscombe and Sapp 40's that have had so many shallow mines on them and have opened the ground to miners. The companies will drill and mine the lower levels.

Maryland

Maryland Coal and Iron Company—This new company has acquired the property of Avery & Morgan, near Frostburg, and proposes to install equipment and increase the capacity to 1000 tons of coal per day. It will install 150-h.p. boiler, 100-kw. generator, mine hauling motor of 42-in. gage, mining machines, rock drills, etc. H. B. Avery, Troy, Penn., is president.

Michigan

Copper

Michigan—The company continues exploratory work on the amygdaloid formation at the Bee tract. Two drills are on the property, one on the trend of the three Adventure lodes and the other in proximity to the Eastern sandstone.

Isle Royale—This company has stopped all surface trenching in search for the Baltic lode. In the first trench an encouraging showing was made but after it was opened to 6 ft. it did not warrant development. A second trench was started at 500 ft. south without results. Drifting and crosscutting at "A" shaft to open the Baltic lode continues.

South Lake—No. 3 drill has been started at 1400 ft. from No. 2 hole. Drill operations have failed to reveal anything important.

Ahmeek—One head in the new mill is now doing regular service and will be soon followed by the second. The new Nos. 3 and 4 shafts are down about 900 ft., and drills will be started to ascertain the distance to the lode on the present pitch of the shafts, it being estimated at about 1250 ft. These shafts are going down at an angle of 80 deg. and when the lode is reached they will changed to conform to the formation.

Calumet & Hecla—The company has started diamond drilling in rear of its abandoned No. 20 shaft which was put down on the Kearsarge lode to test the formations between that lode and the Eastern sandstone. Work has also been started on a large addition to its machine shop.

Laurium—This company has located the site for another shaft 2600 ft. north of its present No. 2 shaft.

Wyandot—The company has started drilling 1200 ft. northeast of its exploratory shaft to determine at depth the lode that this shaft was put down on. The shaft was sunk several years ago on a very promising surface outcropping to 700 ft. but the rich copper ground continued to only a shallow depth.

Algomah—This company was recently incorporated under Michigan laws with a capital of 100,000 shares at $25 par; 60,000 shares were given in exchange for the land, and 10,000 shares underwritten at $10,000, making a working capital of $100,000 and 300,000 shares in the treasury. Among the incorporators are Steven R. Dow, John C. Watson, R. M. Edwards and John H. Rice. Active work will be undertaken as soon as the equipment can be delivered and a shaft will be started on the site of the trenching which exposed encouraging ground. Drill operation will be carried on.

Iron

The U. S. Steel Corporation has acquired an option on the lands of the Michigan Iron and Land Company comprising 400,000 acres in the Upper Peninsula extending westerly from Marquette for nearly 100 miles and containing a large area of undeveloped iron-bearing formation. The Steel Corporation has under the contract five years in which to explore the iron land. The deal was made through F. H. Begole who has had the option on the property.

Minnesota

Section 30—This mine on the Vermilion range has shipped its first train of ore.

Scranton—This mine at Hibbing has completed the concrete shaft. It is 150 ft. deep and 30 ft. in diameter with walls 6 ft. thick.

Missouri

For May the Joplin camps produced 35,569,696 lb. blende, 2,571,580 lb. calamine, and 5,820,930 lb. of lead concentrates valued at $824,828.

Granby—This company has started to unwater the Oronogo mines and will open a prospect at Smelter hill.

Hackett—This company is building a new mill in the West Joplin sheet-ground district. J. C. Marcun has the contract.

Atlas Coal Company—The new shaft sunk by this company at Rich Hill in Bates county, struck a narrow vein of good coal at 200 ft., and has now reached a vein 6 ft. thick at 270-ft. depth.

Montana

Butte District

Parrot—There seems to be doubt as to whether the minority holders of Parrot stock who protested against the sale of the property to the Anaconda Company under the merger will continue the suit.

Broadwater County

Radersburg Consolidated—B. Binnard the president, and other officers of this company controlling the Ohio-Keating and the Manhattan-California have left on a tour of inspection. The electric power line has been completed to Radersburg and active operations will be resumed. It is the intention of the company to commence development on the Manhattan-California property and it is expected that the equipment will be placed during the fall.

Keating—At a meeting of stockholders in Butte, a new board was elected and the principal office of the company removed to Duluth. The following were elected: R. T. Goodall, president; A. L. Agatin, vice-president; Julius H. Barnes, secretary and treasurer; all of Duluth; Jesse B. Roote and Charles W. Newton, of Butte. Pritchett & Hamilton, consulting engineers of Denver, will supervise. The electrically operated surface plant at the Blacker shaft has been completed and sinking on the shaft, now 600 ft., will be continued to 1000 ft. Stations will be cut and crosscuts run, every 100 feet.

Cascade County

Great Falls Power Company—The company has recently been incorporated with a capitalization of $15,000,000 and will utilize the water power of the Missouri river in Montana. Among the incorporators are P. E. Bisland, G. F. Canfield and Marcus Daly, of New York, and C. F. Kelly and John G. Morony, of Butte, all being associated with the Amalgamated interests.

Granite County

Butte-Georgetown—This company has been incorporated by Frank Boucher, H. Avare, H. A. Maillet, C. E. Farnsworth, Ovila Nadean, William Page and Donet Dorais. The capitalization is $1,000,000, shares par $1. The properties are in the Georgetown district.

Hidden Lake—The 3-stamp mill was put in operation recently for experimenting, and if this method proves a success a number of other stamps will be installed. The company owns 380 acres.

Jefferson County

In the Corbin-Wickes district the recently organized London-Corbin Exploration Company has installed a hoist for 900 ft. and sinking has been resumed. The shaft will be sunk 300 ft. before any crosscutting is done. A tunnel has been driven 300 ft. on the footwall of the vein and at 260 ft. from the portal encountered

4 ft. of leached ore assaying 4 per cent. copper. At the Pennsylvania Corbin Copper Company's property a surface plant will be installed to sink 500 ft. The work will be done under the direction of H. E. Emmerson, superintendant of the Boston & Corbin company. The Corbin Copper Company concentrator has been built near the Bonanza tunnel. The company plans to begin shipping concentrates this month. At the Montana-Corbin property preparations are being made for weekly shipments.

Boston & Corbin—General manager Emerson reports that the Bertha vein has been struck in Bertha No. 2 ground on the 5th level, and has 3½ ft. of ore. This gives the Boston & Corbin a continuous oreshoot on the 5th level for 1300 feet.

Nevada

Esmeralda County

Consolidated—Ten stamps have been added to the 70 which have been dropping since the fire of April 9, and within a few weeks the remaining 20 will be in commission. The "bonus system," inaugurated by Manager Finlay in the mine is giving excellent results. Several crews of miners have been making increased wages during the month, but the company has been profiting by the extreme rapidity with which ground is being broken.

Booth—Sinking has been resumed by the Weber McLaughlin leasers to tap the ore which they have been working through a winze from the 150-ft. level.

Florence—The enlarging of the main shaft to three compartments is complete, including timbering from the 580- to the 350-ft. levels. As soon as the surface is reached sinking will be resumed, eventually to reach 1000 ft. While this work is in progress, the Little Florence workings are supplying most of the ore for the mill.

Pittsburg-Silver Peak—The report filed with bullion tax collector for first quarter of 1910 shows: 41,030 tons mined; cost of extraction, $64,883; transportation, $20,515; reduction, $102,575; gross yield, $195,237; net yield, $7,357.

Toquima—This company, headed by Boston capitalists, has closed a deal involving the placer ground owned by the Round Mountain company, and has also negotiated a 2½ years' lease on the Daisy property and accompanying water rights. Hydraulic operations will be undertaken on a large scale.

Lyon County

Malachite—The sale of this property near Mason to an eastern company is reported. Also that $10,000 monthly will be spent for development.

Nye County

West End—A new discovery is reported 500 ft. west of the shaft on the 400-ft. level in heretofore unproductive territory.

Tonopah—The most important recent developments have been in the Silver Top workings on the 440-ft. level, where it is believed the westerly continuation of the main Silver Top vein has been picked up.

Tonopah-Belmont—Foundations will soon be laid for the new electric hoist and the 40-drill compressor.

Montana-Tonopah—The semimonthly cleanup and meet of cyanide precipitates resulted in 23 bars of bullion valued at $17,200. Sixty tons of concentrates were also shipped.

Montgomery-Shoshone—Sinking has been abandoned because of excessive water. A diamond drill has been installed to prospect below the 700-ft. level.

Manhattan-Earl—The Swanson lease has 1000 tons on the dump ready for the next mill run.

White Pine County

Hübnerite Tungsten Company—This company will install a concentrator at Osceola to treat tungsten ore. E. L. Fletcher is manager.

Giroux—The company will operate the 500-ton concentrator in treating second-grade ore. Shipments of high-grade will begin this fall.

New Mexico

Sierra County

Ocean Wave—A smelting plant has been ordered. The property now has a 50-ton concentrator. J. S. Lovern is superintendent.

Oklahoma

The low prices of ore and the shortage of fuel, together with water troubles, have curtailed the output of the Oklahoma camps for May. These camps produced for the month 2,034,665 lb. of blende and 377,680 lb. of lead concentrates, total value, $46,555. The Turkey Fat, Miami-Amalgamated and the Emma Gordon have produced most of the ore from Miami camp this month.

Nowata—The Kenwood mill at Miami has been bought by this company and will be moved to Galena.

Oregon

Josephine County

In the Galice district, the Oriole, Sugar Pine, Golden Wedge, Old Channel, Galice Consolidated, the Anderson and Almeda companies are developing. At the Almeda a smeltery has been installed. The district is hampered by poor transportation conditions.

Tennessee

The Osgood Exploring Company, of Chicago, has leased zinc properties at Jefferson City and will develop.

Texas

Terlingua—The company is installing an ice plant and machinery at the quicksilver mines in Brewster county, near Marathon. H. E. Perry is president.

Washington

Ferry County

Swamp King—A recent strike of free gold was made on the 80-ft. level. A. J. McIntire is superintendent.

North Star—Preparations are being made for shipment. J. E. Pickerel, of Spokane, is manager.

Tom Thumb—Preparations are made for a mill.

Stevens County

Ark—The Rickey group has been purchased by the company. Extensive development work has been planned, including a 700-ft. tunnel. J. J. Bodell is manager.

Yakima County

Aurora—This property at the head of Cle Elum river will buy machinery to equip.

Wisconsin

C. D. Harding & Co. have leased the Preussing land east of Platteville and will begin prospecting.

Enterprise—This mine has been subleased to Joseph Piquette and is being unwatered.

Vinegar Hill—This company has acquired the St. Croix, at Linden, and is developing.

Old Homestead—This mill and roaster, at Platteville, owned by Shepherd Brothers, were burned. The plant will be rebuilt.

Klondyke—A Sutton, Steele & Steele dry-process concentrating mill is under construction at the mine on the Brunton farm 5 miles southwest of Platteville. J. M. Jenks is manager.

West Virginia

Boone County

Capitalists of Scranton, Penn., have incorporated the Lackawanna-Crescent Coal Company at Charleston with $10,000,000 stock. The company will build a railroad from the Coal River branch of the Chesapeake & Ohio to open up its 60,000 acres in Sherman district, which is known to contain coal and timber and may also have gas and oil.

W. H. Warner, of Cleveland, O., has recently formed the Peytona Coal Company, to develop about 1000 acres near Peytona.

Kanawha County

The U. S. Steel Corporation has closed a deal for 10,000 acres of coal and timber land in this and adjoining counties. On this land there are already six small mines with 600 tons daily output. Recent incorporations at Charleston have been the Kentland Coal and Coke Company, with $50,000; and the Augusta Coal Company, with $20,000 capital

MARION COUNTY

Consolidation Coal Company—This company has decided to expend a large sum to increase its output. It has placed an order for 14 electric locomotives to be used for inside haulage in the Fairmont mines. It has also been determined to open a new mine in the Fairmont district on a tract of 2000 acres, the operation of which will necessitate the bridging of West Fork river. The company will also expend about $250,000 in the erection of dwellings.

MINGO COUNTY

Pike Collieries Company—The plant at McCarr, on which $400,000 is said to have been spent, was recently acquired at foreclosure sale for $71,000 by Huntington creditors.

RANDOLPH COUNTY

A survey is being made for a 90-mile northern extension of the Coal & Coke railroad, from Elkins to Rowlesburg, on the Morgantown & Kingwood line.

RALEIGH COUNTY

Big Coal Company—This company has started a new shaft at Dorothy and has begun 150 new cottages and an addition to its power plant. It is hoped to complete these changes inside of three months and thereby double the present output of 2000 tons of coal daily.

Clear Fork Splint and Gas Coal Company—This company, of which T. E. B. Siler is president, is planning to develop 1300 acres of coal land in Jarrolds valley.

Utah

JUAB COUNTY

Iron Blossom—The management reports exceptionally good ore in the gold vein cut in a raise from the 400-ft level of the south shaft. Much development is being done.

East Tintic Development—Operations on company account have been suspended, though leasers are at work.

Uncle Sam Consolidated—At the meeting, June 6, the directors were reëlected. The report shows that 6841 tons of ore were shipped during the year. This sold for $116,323, or an average of $17 per ton. During the year, $50,000 was paid in dividends, and on June 6, the company had $12,048 cash, with ore in transit valued at $6000.

Crown Point—The Eureka stockholders are interested in a movement to develop. The finding of ore in the Sioux and Iron Blossom trending toward the Crown Point has revived interest, and work may be continued from the shaft owned jointly with the Colorado and Iron Blossom, 400 ft. deep. The stockholder meeting in Provo, June 6, reëlected the Knight directorate, with the exception of R. E. Allen, director, whose place is taken by John Roundy. Development will be resumed.

SUMMIT COUNTY

Scottish Chief—An assessment of 1c. per share has been levied and work will be resumed. A winze has been started from the tunnel level and sinking will be continued to reach a bed of limestone, where it is cut by mineralizing fissures.

Canada

ALBERTA

Cardiff Commercial Coal Mines—These mines, at Morinville, including 500 acres of coal-bearing lands and a plant valued at $125,000, have been sold to J. Anderson, of Winnipeg, who is understood to represent Canadian Northern interests, for $300,000. The mines will be capitalized at $750,000 and bonds floated in England.

BRITISH COLUMBIA

Many men are going to the Portland canal district, in the northern part of the province. Numerous prospectors are leaving Stewart for neighboring mountains. A sale of government town lots in Stewart on May 31 brought $440,000. The Portland Canal Company has erected an aërial tramway from mine to the 100-ton concentrating mill now being equipped. A compressor is being put in at the Red Cliff mine. Strikes of rich silver-gold ore on the Stewart company claims are reported. Mackenzie & Mann, of Toronto, are building wharves and preparing to construct a railway up Bear river, on tributaries of which are many claims. The Hidden Creek company is completing arrangements for the building of a 500-ton smeltery adjacent to its properties at Goose bay. M. K. Rodgers is president.

Ikeda—This mine on Moresby island has been sold to a Vancouver syndicate. A. G. Larson is manager.

BRITISH COLUMBIA

Second Relief—C. A. Owens, of Calgary, representing an Alberta syndicate, has taken an option on the mine on the north fork of the Salmon river, for $300,000. This option precludes an amalgamation of the Second Relief and the Big Bump. The Second Relief, owned by Wisconsin men, is one of the old mines of the Ymir district.

British Columbia Copper—Work has been resumed at the Mother Lode and Ore Denoro mines and the smeltery, labor troubles having been overcome. A new orebody has been found at the Oro Denoro. Shipment of ore from the Wellington group will be commenced shortly; about 100 tons daily will be the output.

Consolidated—At the War Eagle, Rossland, much gold-copper ore of good grade is being produced. The Idaho is also productive now. The St. Eugene is shipping 1100 to 1200 tons of lead-silver concentrate to Trail monthly. The Sullivan, East Kootenay and Richmond-Eureka, Slocan, are also shipping silver-lead ore to Trail regularly. Copper ore is being sent from the Queen Victoria, near Nelson, to Trail. All these properties and the Snowshoe, Boundary, are being operated by this company. An aërial tramway is being constructed between the No. 7 and Boundary Falls, a distance of three miles, and a compressor plant being put in for the same mine.

Granby—O. B. Smith, the company's mine superintendent, has been examining mining property at Franklin, 50 miles from Grand Forks, with a view to purchase.

Similkameen—Promising coal lands near Princeton have been acquired by Andrew Laidlaw, Spokane, Wash., and associates.

ONTARIO

The shipments from Cobalt for the week ended June 3 are: La Rose, 377,390, lb.; McKinley-Darragh, 151,140; Crown Reserve, 188,448; Nipissing, 127,586; Chambers-Ferland, 56,000; Coniagas, 63,280; Right-of-way, 82,500; Temiskaming, 60,000; Kerr Lake, 60,380; total, 1,166,724 pounds.

Silver Cliff—A new high-grade vein 3 in. wide has been discovered at the 150-ft. level.

Alliance—A 6-in. vein of calcite carrying silver has been struck. A boiler and hoist are being put in.

Clinton Mines Company—This company, owning property at Elk City, has been listed on the New York Curb. Charles Clinton is manager.

McKenzie—This Toronto company, A. J. Harrington, president, has been listed on the New York Curb.

Waldman—This Cobalt company has listed its stock on the New York Curb.

Nipissing—The vein recently struck in the Keewatin formation on the property known as R. L. 406, hitherto considered the poorest ground belonging to the company—averages 3 in. wide and is rich in silver content. The find apart from its value is considered significant as showing the possibilities of the property.

Ophir—A new vein recently discovered in trending is from 6 to 15 in. wide consisting mainly of solid smaltite carrying bloom and decomposed calcite. In the latter are found silver nuggets. The winze in the vein in the north crosscut will be put down to the 300-ft. level.

YUKON TERRITORY

The first gold from the creeks is beginning to arrive in Dawson. Quartz and Gold Run have sent in the heaviest shipments. The largest dumps taken out this winter are those on lower Gold Run, which were taken out by the men working for McDonald & Ennis.

Yukon—This company has all of its hydraulic plants going full. The main ditch, crossing the country from the Twelve-mile, is carrying 5000 in. to Lovett gulch, and 3000 up Bonanza beyond Lovett.

Mexico

CHIHUAHUA

Dolores—One man was killed and several injured in an explosion at the mine, May 26. The explosion started a fire which destroyed 100 homes.

Naica—It is believed that the deal for the sale of this property to American interests for 6,000,000 pesos has fallen through.

DURANGO

San Juan—The control of this property is reported to have been acquired by the Peñoles company.

HIDALGO

Santa Gertrudis — The cyanide plant has been put into commission and will be used until the new 700-ton mill is completed, which will be about the first of 1911.

GUANAJUATO

Nueva Luz—The company is installing new machinery including pumps to handle 400 gal. of water per min., in three stages, from 2000 ft. The pumps are in units of 100 and 300 gal respectively. The shaft is now down 1890 feet.

MEXICO

Coetzillos and El Lucera—These properties at Zacualpan have been placed under bond to E. P. Ryan, of Mexico City.

SINALOA

Panuco—The annual report shows a revenue of 884,182 pesos in 1909. The mill products provided 813,023, and high-grade ore shipped to the Selby smeltery, 54,512 pesos. The company treated 13,411 tons of ore, containing a total of 15,325 kg. of silver and 102 kg. of gold. The extraction of silver was 85.54 per cent. and gold 90.76 per cent. The treatment cost per ton of ore was only 8.31 pesos. The company has been in existence 33 years, and up to the end of 1909 the total dividend disbursement was 7,465,000 pesos. The 1909 dividends amounted to 425,000 pesos. The enterprise is controlled by Spanish capitalists of Mazatlan.

West Coast—The mines and concentrating plant of the West Coast Mining Company, of Los Angeles, have been acquired by W. C. Prichard and B. A. Wilkinson for 150,000 pesos. Cyaniding equipment will be installed. The properties are in the Cosala district.

Mazatlan Smeltery—J. S. Murray is investigating possible ore production in the Sinaloa and some Durango districts with a view to the erection of a custom smeltery at Mazatlan. A concession for a smeltery at the port was secured by A. H. McKay, of Mexico City, several years ago, and an extension was arranged early this year.

Butters-Felton—A shoot of rich ore was recently encountered in an old crosscut at these Copala mines. The big cyanide plant built by the Butters interests was shut down last year because of a scarcity of ore that could be profitably treated at the low price of silver. A small amount of development has been in progress since.

Realito—This American company, operating in Tamazula district, 7½ hours from Culiacan, is making small shipments of bullion regularly. The property is low-grade gold.

Metates—The Metates mines, two days by road and trail from Mazatlan, have been purchased by J. S. Johnston, of Los Angeles, for $125,000. The mines have been owned and worked for several years by Maximiliano Lopez Portillo, of Mazatlan. Present reduction equipment consists of a 4-stamp mill, concentrator and amalgamating plates. Ten stamps and several tables will be installed at the end of the rainy season, and cyanide equipment may be added later.

Guadalupe de los Reyes—These Sinaloa mines produced in 1909 ore to the value of 1,427,000 pesos. The expenses were high and dividends of only 290,000 pesos were paid. The company, controlled by Spanish interests of Mazatlan, has paid as high as 1,200,000 pesos in annual dividends. Timber supplies adjacent to the mines are being exhausted and the installation of charcoal-gas engines is being considered.

Minas del Tajo—These old properties, controlled by the Bradbury interests of Los Angeles, produced 1,144,000 pesos in 1909. Dividends of about 450,000 pesos were paid.

SONORA

Buena Fortuna—A strike of high-grade, shipping ore was recently made on this property, Magdalena district.

Jacolitas—A division of profits is being distributed among the shareholders of this company. It is a gold-silver proposition, in the Alamos district, managed by J. J. Smith.

Cananea Northern—This corporation has been formed to develop lead and zinc bearing ground north of Cananea.

La Jojoba—This mine, a former producer in the Magdalena district, has been secured by Arthur Hamilton, who is arranging to cyanide the tailings. Messrs. Spurr & Cox, of New York, have denounced 600 pertenencias of ground on an extension of the La Jojoba.

Pedrazzini—This company shipped 175 tons of concentrates to the El Paso last month with a net profit of $30,000.

Santo Domingo—A mill is in construction at this mine in the Alamos district.

Sonora Central—A mill will soon be built to treat the product of the San Bernardino mine, in the Alamos district.

Africa

TRANSVAAL

The Transvaal Chamber of Mines cables the total production of gold in May at 634,170 oz.; being 15,125 oz. more than in April, and 9672 oz. more than in May, 1909. It is the largest monthly return so far this year. For the five months ended May 31, the total was 3,019,430 oz. in 1909, and 3,037,324 oz.—or $62,781,487—in 1910; an increase of 17,894 oz. this year.

Europe

GREAT BRITAIN

British Iron Ore Imports—Imports of iron ore into Great Britain, four months ended April 30 were 1,850,677 long tons in 1909, and 2,441,431 in 1910; increase, 590,754 tons; of the imports this year, 1,768,909 tons came from Spain.

Germany

German Iron Consumption—The German Iron and Steel Union makes the following statement of production and consumption of iron for the two years given, in metric tons:

	1908.	1909.
Pig iron production....	11,813,511	12,917,653
Imports, pig iron.....	399,677	318,938
Imports, steel, etc., in terms of pig........	461,263	479,523
Total supplies.....	12,674,451	13,716,114
Exports, pig iron.....	421,548	644,935
Exports, steel, etc., in terms of pig........	4,948,891	5,032,653
Total exports.....	5,370,439	5,677,588
Approximate consumption	7,304,012	8,038,526

Steel and finished material are reduced to their approximate equivalents in pig iron. The pig-iron production was 187.57 kg. per capita in 1908, and 202.20 kg. in 1909. The approximate consumption was 115.97 kg. per capita in 1908, and 125.83 kg. in 1909. The increase in consumption in 1909 was 734,514 tons, or 10.1 per cent.

German Iron Trade—Exports and imports of iron, steel and machinery in German Empire, four months ended April 30, metric tons:

	Exports.	Imports.	Excess.
Iron and steel	1,504,991	167,397	Exp. 1,337,594
Machinery	107,361	22,422	Exp. 84,939
Total	1,612,352	189,819	Exp. 1,452,533
Total, 1909....	1,322,371	147,803	Exp. 1,174,56

Imports of iron ore this year, 2,333,558 tons; exports, 972,337. Imports of manganese ore, 155,643; exports, 1213 tons.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, June 15—Coal trade in the East is not active. There is talk of summer dullness, but this year it seems to come earlier and be more pronounced than usual. Eastern manufacturers do not seem sure enough of the future to be ready to put in large stocks of coal, and the trade is slow in consequence.

In the West there has been no change in the situation since last week. The various districts are settling down to work with more or less jarring, with the exception of northern Illinois, the Southwest and Colorado. The Indiana mines are reaping quite a harvest in consequence of the continued suspension in Illinois.

The Lake trade is coming up slowly. Shipments are increasing, but the Northwest is backward in ordering supplies. This may result in a rush for coal later in the season.

Strike Predictions—President T. L. Lewis, of the United Mine Workers of America, states that there are now about 70 000 miners idle on account of the suspension of operation on April 1. According to Mr. Lewis, whose headquarters are in Indianapolis, the only mining districts where men are not all at work are in portions of Illinois, in Southwestern districts, and in the State of Colorado. Mr. Lewis says he expects all idle miners in the country to return to work in a short time.

COAL TRAFFIC NOTES

Coal receipts at Boston, five months ended May 31, reported by Chamber of Commerce, in long tons:

	1909.	1910.	Changes.
Anthracite	718,818	742,961	I. 24,143
Bituminous	1,261,517	1,701,692	I. 440,175
Total domestic....	1,980,335	2,444,653	I. 464,318
Foreign.......... ...	195,600	125,711	D. 70,889
Total.........	2,176,935	2,570,364	I. 393,429

The foreign coal is almost entirely from Nova Scotia mines.

Anthracite coal shipments by companies, five months ended May 31 are given below, in long tons; the totals were published last week:

	1909.	1910.	Changes.
Reading..........	5,396,756	5,467,602	I. 70,846
Lehigh Valley..	4,397,739	4,806,847	I. 409,108
N J Central......	3,365,138	3,551,671	I. 186,533
Lackawanna......	3,942,293	4,025,200	I. 82,907
Del & Hudson....	2,870,585	2,679,500	D. 191,085
Pennsylvania	2,566,269	2,684,096	I. 117,827
Erie	3,359,109	3,068,898	D. 290,211
N. Y., Ont & West.	1,148,983	1,132,721	D. 16,262
Total	27,046,872	27,416,625	I. 369,753

Five companies—the Philadelphia & Reading, the Lehigh Valley, the Central of New Jersey, the Delaware, Lackawanna & Western and the Pennsylvania—increased their shipments this year.

Coal passing through Sault Ste. Marie canals, season to June 1, short tons:

	1909.	1910.	Changes.
Anthracite.....	260,060	467,042	I. 206,982
Bituminous....	836,800	1,579,224	I. 742,424
Total.........	1,096,860	2,046,266	I. 949,406

The large increase this year was due to the earlier opening of navigation.

Coal production of the State of Maryland in 1909 was: Shipments from Cumberland-basin mines, 3,306,888; Upper Potomac-basin, 592,208; small mines, local trade and used at mines, 626,508; total, 4,525,604 short tons.

New York

ANTHRACITE

June 15—There is nothing new in the anthracite trade. Business runs along quietly and coal is in about the usual demand.

Schedule prices for domestic sizes are now $4.45 for broken and $4.70 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, $3@3.25; buckwheat, $2.20@2.50; No. 2 buckwheat or rice, $1.65@2; barley, $1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

BITUMINOUS

Dullness has settled over the market. Buying is limited entirely to the lower-priced coal. New England is taking little coal, partly as a result of the large sales of cheap West Virginia coals made earlier in the season; partly because business at the mills is not active, and those which use water power have an unusual supply this year, owing to the rainy season.

New York harbor is not buying the best coal. Good Miller vein steam coal has been offered at $2.50, f.o.b. harbor points, with no takers. Gas coal is in good demand, however, but at low prices.

Car supply is good, and there is little delay in transportation. Lake trade has been slow thus far this year, leaving plenty of coal and plenty of cars for the seaboard trade.

In the coastwise market vessels are scarce, the lumber trade having taken away a number with higher rates. Freights are accordingly strong. Large vessels from Philadelphia get 75c. to Boston, Salem and Portland; 65c. to Providence and the Sound.

Birmingham

June 13—Mining operations in the South are active, a strong demand for the product having been worked up. Coal prices are still low, but operators are making every effort to keep up production. There is a need for labor throughout the Southern territory. The labor troubles in the West which gave the trade in Alabama a boost are over, but some business is being transacted as a result of those troubles. Considerable development is still going on in the mining district of Alabama. The railroads are handling the output at the mines promptly.

The demand for coke is not as brisk as it has been. The production has not been disturbed of late.

Chicago

June 14—The coal market shows no signs of uneasiness or discomfort on the part of buyers for steam-making purposes over the lack of Illinois coal. Some of these consumers may have storage piles still left, but most of them are using Indiana, Hocking or smokeless coal, bought constantly in small lots, and are watching impatiently for a restoration of their accustomed supply. Indiana mines, the nearest supply outside Illinois, are sending large amounts to the Chicago market, which are promptly sold. Screenings from Indiana are eagerly sought at $2.15@2.35; run-of-mine and lump bring nearly the same prices as screenings, both being less in demand as the summer comes on—screenings being the favorite summer fuel. As has often been noted in these letters, the use of automatic stokers is increasing in Chicago and seems bound to increase constantly. This brings an increasing demand for screenings, which is likely to bring about some changes of methods at the mines. Smokeless coal has an increased sale and is not troubled with surplus on track; lump brings $3.50@3.60 and run-of-mine $3.15. Hocking also holds to the circular price, $3.15, with large sales and well regulated shipments. Coals from east of Indiana are fairly stable in price, and their use is not likely to increase greatly when Indiana coal is available at lower prices.

Cleveland

June 13—Local trade has settled down to a fair normal condition. Slack is in good supply now, owing to the freer movement of Lake coal. The shipments up the Lakes are increasing.

Quotations for Middle district coal, Cleveland delivery, are $2 for 1¼-in., $1.85 for ¾-in., $1.75 for run-of-mine and $1.60@1.65 for slack; No. 8 district, about 15c. higher; Cambridge district, $2.20 for 1¼ in., $2 for ¾-in., $1.90 for run-of-mine and $1.70@1.75 for slack. Pocahontas, $2.85 for lump and $2.45 for run-of-mine.

Indianapolis

June 13—The joint scale committee of Indiana coal operators and the United Mine Workers of District No. 11 is holding meetings and endeavoring to settle several important matters to be included in the permanent wage contract. One of the questions which is causing considerable trouble is the fining clause—a matter which has for many years been fought by the mine workers in this State, who insist on the elimination of the clause. Another clause in the contract which has halted negotiations for some time is the five-day's clause, a regulation requiring all grievances to be settled within five days by the district officers of the mine workers and the secretary of the Operators' Association after the case has been presented to them. Nothing looking toward the signing of a permanent contract has yet been accomplished but the men are all at work on full time and there is little likelihood of their being called out even if it takes all summer for the committees to come to an agreement.

Pittsburg

June 14—Conditions are unchanged in the coal trade, demand being good, mines running practically to capacity, with adequate car supply and heavy shipments to the Lakes. Prices, while occasionally shaded, are in the main held at former rates: Mine-run and nut, $1.20@1.25; ¾-in., $1.30@1.35; domestic 1½-in., $1.50; slack, 80@85c. per ton at mines.

Connellsville Coke—The market has been very quiet, with no furnace-coke contracts reported and little prompt sold. The Cambria Steel Company closed a contract last week with J. K. Dimmick & Co. for 10,000 tons of furnace coke a month for two years beginning Jan. 1 next, at a flat price, which is understood to be $1.90 at ovens. This tonnage will be in addition to the 20,000 tons monthly contracted for a few weeks ago for the same period with the Tower Hill Connellsville Coke Company.

We continue to quote standard grades of Connellsville coke: Prompt furnace, $1.65@1.70; second-half contracts, $1.70@1.80; prompt foundry, $2.15@2.25; contract foundry, $2.25@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending June 4 at 388,294 tons, a decrease of 8000 tons, and shipments at 3966 cars to Pittsburg, 6272 cars to points west and 1039 cars to points east, a total of 11,277 cars.

Directors of the Thompson-Connellsville Coke Company, Tower Hill Connellsville Coke Company and Isabella Connellsville Coke Company met last week and ratified the agreement made by their officers to consolidate as the Thompson-Kuhn Coke Company, as noted last week. Today the stockholders of these companies are meeting to ratify the action of the directors. Negotiations are actively on with one or two other large interests and it is hoped to take in quite a number gradually.

St. Louis

June 13—The market has continued to ease off and the price of coal has dropped about 25c. per ton during the last week. It seems to have settled down to a price of about $1.30 per ton for mine-run and $1.50 for 2-in. lump. No concessions are being made from this price for future delivery and in fact it seems that the future market is even a little stronger than the spot, which is a reversal of the conditions of last week. The strike in the Carterville and Springfield districts is being stubbornly contested and there seems to be very little chance of a settlement in the near future. The fear that these fields would sign up is really what led to the break in price, as the demand has been exceptionally good right along.

Current prices are as follows for the St. Louis market:

	Mine.	St. Louis.
Illinois, Standard:		
Mine-run	$1.30	$1.82
2-in. lump	1.50	2.02
2-in. screenings	1.40	1.92
Carterville:		
6-in. lump or egg	2.00	2.67
Mine-run	1.50	2.17
Screenings	1.50	2.17
Pocahontas and New River:		
Lump or egg	1.50	4 00
Mine-run	1.10	3.65
Pennsylvania Anthracite:		
Nut, stove or egg	.....	6.65
Grate	.....	6.40
Arkansas Anthracite:		
Egg or grate	3.35	5 35
Coke:		
Connellsville foundry	.....	5 40
Gas house	.....	4.50
Smithing	.....	4 15

The engineers in the Carterville district have decided to secede from the miners' union and form a separate brotherhood of their own. This action was attended by considerable trouble. Conditions in southern Illinois are very unsettled. The fifth and ninth districts which signed up are running full time. Owing to the fact that the other districts in the State are shut down, cars are plentiful and these mines are reaping as much of a harvest as they did during the time just preceding the strike. Screenings and nut are in good demand and are bringing a premium over mine-run. For some time after the resumption of operations in the Belleville district very little outside coal came in, as Indiana and Kentucky mines were able to obtain a better price in other markets; however, Indiana mines are now willing to make a much lower price for their coal and consequently quite a little is coming into St. Louis.

Anthracite coal continues to hold up and while the June business has not opened up to any great extent, yet everything is satisfactory.

FOREIGN·COAL·TRADE

Belgian Coal Consumption—Coal consumption in Belgium for two years past was, in metric tons:

	1908.	1909.	Changes.
Stocks, Jan. 1	454,050	917,330	I. 463,280
Production	23,557,900	23,561,125	I. 3,225
Imports	5,922,846	6,424,921	I. 502,075
Total supply	29,934,796	30,903,376	I. 968,580
Exports	6,404,347	6,919,975	I. 515,628
Stocks, Dec. 31	917,330	588,410	D. 328,920
Total	7,321,677	7,508	
Consumption	22,613,119	23,394,991	I. 781,872

The consumption at collieries is estimated at 10.1 per cent. of the coal mined.

French Coal Trade—Imports and exports of fuel in Frances, three months ended March 31, metric tons:

	Imports.	Exports.	Excess.
Coal	3,430,825	306,502	Imp.3,124,323
Coke	529,038	38,864	Imp. 490,174
Briquets	237,551	35,328	Imp. 202,223
Total	4,197,414	380,694	Imp.3,816,720
Total, 1908	4,622,889	314,686	Imp.4,308,203

The total decrease in imports in 1910, as compared with 1909, was 425,475 tons, or 9.2 per cent.; the decrease in exports was 66,008 tons, or 20.9 per cent.

Spanish Fuel Imports—Imports of coal into Spain, three months ended March 31, were 558,153 metric tons, an increase of 23,592 tons over 1909; imports of coke, 59,704 tons, a decrease of 4009 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on June 4: Best Welsh steam, $3.93; seconds, $3.78; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.10; seconds, $1.80. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, June 15—The iron and steel trades have gone backward a little, the spurt of activity manifested two or three weeks ago having passed over. A considerable business is being done, but it is a slow market on the whole.

Pig iron continues to be taken, but chiefly in lots of moderate size, showing that users are not yet ready to go too far ahead; and also that they do not believe prices are ready for the upward turn yet In this belief they are encouraged by the action of many furnaces, which are ready to take contracts at present—in some cases lower—prices. What iron the East is taking is chiefly foundry. The Central West is buying both foundry and basic. Southern ironmakers are looking for orders and making concessions to get them.

In finished material structural steel is the leader, mainly through the placing of many small contracts. Bars, nails and small material generally are in good demand. Beyond that business is only moderate. Some orders for cars and locomotives have made up a fair total for the railroad orders.

All this does not mean that there is not a large quantity of iron and steel being made and used. The quantity taken would have made a most active market three or four years ago. It means that the boom years of 1906-7 led many ironmasters to spread out to an unwarranted extent; the result being—as we have said before—that possible production has run ahead of the growth of consumption. The result is an excess of capacity which must remain unemployed; or can secure employment only through the inducement of low prices. This disorganizes the trade and produces an appearance of dullness much greater than is warranted by the facts. Idle mills are discouraging; but the only way is to wait until consumption catches up with production—as it surely will, if given time.

The Steel Corporation deal with the Michigan Iron and Land Company is referred to on another page. It increases the Corporation's hold on iron-ore reserves, concerning which there is a great deal to be said, for which there is no space now.

Pig Iron Production—The reports of the blast furnaces on June 1, as collected by the *Iron Age*, show on that date 279 coke and anthracite stacks in blast, having a total daily capacity of 76,850 tons of pig iron; a decrease of 1850 tons as compared with May 1. Making allowance for the charcoal furnaces the total make of pig iron in the United States in May is estimated at 2,423,500 tons; for the five months ended May 31 at 12,638,500 tons; of which 8,423,000 tons were made by the steel company furnaces.

Baltimore

June 13—Exports for the week included 1704 tons steel rails and 343,674 lb. rail fastenings to Vancouver, B. C.; 311,819 lb. pipe to Tuxpan, Mexico. Imports included 5675 tons manganese ore from Poti, Russia; 5400 tons iron ore from Cuba.

Birmingham

June 13—A better tone is noted in the Southern iron market. There have been some sales made recently, the general demand showing up better than for several weeks. No. 2 foundry has strengthened up some at $12 as the minimum. There is a strong inquiry coming in for iron. Despite the curtailment in production, there is a healthy make of iron being noted in this district. The difference in make in May, with all the discussion as to curtailment was less than 9000 tons.

Basic and charcoal iron continue to be in good demand. There will hardly be any resumption of operations at the charcoal furnace of the Shelby Iron Company until next month.

The home consumption shows no change, cast-iron pipe makers, foundries, machine shops and others continuing steady operations. Cast-iron pipe makers were recently in the market for needs for three months.

Chicago

June 14—Sales of pig iron are fair, with founders gradually increasing their last-half purchase but not showing yet a disposition to buy heavily. Malleable continues in good demand and trade indications, on the whole, are encouraging to the furnace interests. Southern No. 2 is still quoted at $11.50@12, Birmingham, or $15.85@16.35, Chicago, and Northern No. 2 at $16.50@17. The tendency of prices seems to be upward, though there are those in the trade who say this tendency is being checked by the approach of summer quietness in manufacturing lines. Melters' last-half needs are not nearly contracted for yet. Perhaps half of them are buying third-quarter iron; the other half are supplied against all but extraordinary needs of their business in that quarter and are negotiating for the fourth quarter or watching the market closely with that in view. Inquiries about 1911 iron continue.

Sales of iron and steel products show quiet, steady buying, not notably changed.

Cleveland

June 13—May shipments of Lake ore were 6,081,358 tons, making a total up to June 1 of 7,601,665 tons, a record for so early in the season.

Pig Iron—Inquiries continue to come in, but few have resulted in sales so far. There have been, however, a number of small sales footing up a pretty good total. Prices quoted are $16.90 for bessemer; $15.50@15.75 for No. 2 foundry; $15.85@16.35 for No. 2 Southern; $15.25@15.50 for gray forge—with possible shading, especially on Southern.

Finished Material—Business is more active and good sales of bars, sheets and plates are reported, generally in lots of moderate size. A few structural contracts have been let.

Philadelphia

June 15—The opinion entertained generally among the larger consumers of foundry and forge irons is that lower prices are inevitable, and it is this that accounts for the few orders placed and the lack of inquiries for autumn requirements. The makers of iron express the belief that the lowest level has been reached and that a reaction is inevitable in steel irons. Only unimportant sales have been made. Eastern makers will prefer to permit stocks to accumulate rather than to shade prices. No. 2 X foundry is quoted at $16.75; gray forge $1 less, and basic is firmly held at $16 per ton.

Steel Billets—Eastern buyers have renewed arrangements for billets for summer and early autumn delivery. Makers have offered inducements to place large orders without meeting with acceptance.

Bars—Bars have weakened and business has been accepted at a slight shading. There is heavy consumption in all lines. Common iron is in better demand than refined.

Sheets—Reports today from mills show that some outside buyers in New York State and farther east are arranging to order stocks for the latter part of the year if desired concessions are granted.

Pipes and Tubes—Steam-engine and boiler work and all work involving tubes have recently received something an impetus in this territory.

Plates—An improving outlook is spoken of by makers in consequence of orders for steel cars recently placed. The demands in this territory have also improved though the orders for the most part are small. The tone of the market is strong.

Structural Material—Local requirements continue and while the orders are generally small the volume is good.

Steel Rails—There are rumors of large contracts for export but no domestic orders of consequence have been placed.

Scrap—Sales of scrap have been restricted to small lots of yard scrap, heavy cast scrap, cast borings and wrought turnings. The market is without interest.

Pittsburg

June 14—Sentiment in the iron and steel trade as a whole continues to be pessimistic, inasmuch as no influence can be discerned which would operate to advance prices, for the present position is that the industry has been working largely on the orders accumulated during the period of enthusiasm last year; production has already declined about 10 per cent. and is likely to decline as much more in the next 60 days, and the attitude of buyers is to buy from hand to mouth until some definite upturn brings them into the market in volume. It is apparent that the sentiment in the trade is more pessimistic than is justified, for investigation shows the total volume of production and movement of material to be very large. It is not lack of tonnage, but lack of advancing prices when tonnage is so large, that is responsible for the present chill.

Preparations are being made by mills for a more general shutdown July 1 than is usual. The mills have had a hard run and require repairs and as there is no great pressure for material July is generally chosen. The arrangements for closing apply to steel works and rolling mills, and since blast furnaces run continuously there is likely to be some accumulation of pig iron. However, there is likely to be some blowing out of furnaces.

Pig Iron—The Westinghouse Air Brake Company has taken iron in addition to that reported last week. Altogether it took about 15,000 tons, for prompt and third-quarter delivery, the bulk coming from Valley furnaces at $14.50, furnace, or less, for No. 2. This price can be done again for third quarter, and possibly it can be shaded. Inquiry is rather light locally. It is understood that Pittsburg buyers of basic can shade $14.75, Valley, through furnaces having a lower rate than the Valleys to Pittsburg. A sale of 10,000 tons of bessemer iron has been made for third-quarter delivery from a Valley furnace interest to a Valley consumer, subject to current market price at time of delivery. Other contracts of this nature are under negotiation. The Colonial Steel Company has inquired for 1000 to 1500 tons of basic monthly, for one year beginning July 1, but is understood not to have closed. We quote at Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, $15.75@16; basic, $14.75@15; No. 2 foundry, $14.50@14.75; forge, $14@14.25; malleable, $15@15.25 per ton.

Ferromanganese—The Jones & Laughlin Steel Company has bought 600 tons a month over next year at $40, Baltimore, and the Cambria Steel Company 5000 tons, chiefly for second half, at $40.25. Small prompt lots are available at $39.50, Baltimore, freight to Pittsburg $1.95 per ton.

Steel—The market is quiet, with quotations practically unchanged: Bessemer billets, $25@25.50; sheet bars, $26@26.50; open-hearth billets, $28@28.50; sheet bars, $29@29.50; rods, $31, all f.o.b. mill, Pittsburg or Youngstown.

Sheets—There is a fair jobbing demand. Some mills continue to shade regular prices on black and galvanized by $1 or $2 a ton and corrugated material is shaded almost as much, but these are no new conditions, and the number of mills making cuts is relatively limited. Eave-trough and conductor pipe continues to be cut deeply, eliminating all profit. Premiums on blue annealed sheets have practically disappeared, and at the regular price of 1.75c. deliveries in five or six weeks can readily be obtained. Regular prices are: Black sheets, 28 gage, 2.40c.; galvanized, 3.50c.; painted corrugated roofing, $1.70; galvanized, $3; blue annealed, 1.75c. for 10 gage.

FOREIGN IRON TRADE

United States Foreign Trade—Exports and imports of iron and steel in the United States for the four months ended April 30 are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1909.	1910.	Changes.
Exports	$48,108,590	$58,781,613	I.$10,673,023
Imports	7,988,275	14,070,683	I. 6,082,408
Excess, exp.	$40,120,315	$44,710,930	I.$ 4,590,615

The leading items were as follows, in long tons:

	Exports		Imports	
	1909.	1910.	1909.	1910.
Pig iron	10,960	25,341	39,533	81,631
Scrap	6,095	4,212	1,558	51,863
Billets, blooms, etc.	36,284	5,110	4,271	18,007
Bars	21,543	36,346	5,827	13,399
Rails	68,987	128,924	374	5,142
Sheets and plates	50,008	95,270	1,289	2,883
Structural steel	30,974	43,508	2,536	4,786
Wire-rods	6,456	11,932	4,157	6,992
Wire	45,956	51,956	.....	......
Nails and spikes	16,040	17,973	.....	.....
Tinplates	3,060	4,478	17,675	23,677
Pipe and fittings	49,598	47,809	.....	......

Imports of wire not given in quantities; values, $338,375 in 1909, and $529,365 this year.

French Iron Production—The production of pig iron in France for two years past is reported as follows, in metric tons:

	1908.	1909.	Changes.	
Foundry	703,644	749,247	I.	45,603
Forge	534,398	538,053	I.	3,655
Bessemer	122,708	118,002	D.	4,706
Basic	1,979,999	2,172,718	I.	192,719
Spiegel and ferro	62,022	54,085	D.	7,937
Total	3,402,771	3,632,105	I.	229,334

The total increase last year over 1908 was 6.5 per cent.

Swedish Iron and Steel—Production in Sweden for the full year is reported by the *Jern-Kontorets Annaler* as below, in metric tons:

	1908.	1909.	Changes.	
Pig iron	563,300	443,000	D.	120,300
Wrought iron	148,500	116,900	D.	31,600
Bessemer ingots	79,500	63,400	D.	16,000
Open-hearth ingots	347,000	247,200	D.	99,800

Exports for the year were as follows, also in metric tons:

	1908.	1909.	Changes.	
Pig iron	107,100	105,700	D.	1,400
Other iron and steel	226,000	210,500	D.	15,500
Total	333,100	316,200	D.	16,900

The decrease in exports was much less than that in production. The output in 1909 was reduced by strikes.

Austro-Hungarian Trade—Imports and exports of iron and steel in Austria-Hungary, year 1909, metric tons:

	Imports.	Exports.	Excess.	
Pig iron & scrap	150,629	53,027	Imp.	97,602
Other iron & steel	85,617	67,763	Imp.	17,854
Machinery	87,313	23,029	Imp.	64,284
Total	323,559	143,819	Imp	179,740

Imports of iron ore were 392,388 tons; exports, 202,462 tons. Imports of manganese ore, 44,970 tons; exports, 787 tons.

METAL MARKETS

New York, June 15—The metal markets do not show any improvement, and have been quiet during the week.

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin, lead, zinc and aluminum, was 127 for the month of January; 124 for February; 118 for March; 118 for April; 113 for May.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.	
Gold:				
April 1910..	$36,283,625	$ 2,100,918	Exp	$34,182,707
" 1909..	6,337,994	4,335,861	"	2,002,133
Year 1910..	47,199,706	11,669,276	"	35,530,430
" 1909..	44,316,626	15,504,136	"	28,812,490
Silver:				
April 1910..	4,696,534	3,840,495	Exp.	856,039
" 1909..	4,952,251	4,222,147	"	730,104
Year 1910..	18,336,081	15,238,634	"	3,097,447
" 1909..	19,126,181	14,675,365	"	4,750,816

Exports from the port of New York, week ended June 11: Gold, $55,715; silver, $878,008, chiefly to London. Imports: Gold, $64,818; silver, $125,300, from the West Indies, Mexico and Japan.

Exports and imports of gold and silver through the port of San Francisco, four months ended April 30:

Exports:	Coin.	Bullion.	Total.
Gold	.. ...	$1,970,208	$1,970,208
Silver	$1,500	2,372,600	2,374,100
Imports			
Gold	16,068	575,627	591,695
Silver	538,713	331,121	869,834

The gold exports were all made in the month of January.

Gold and silver movement in France, three months ended March 31:

	Imports.	Exports.	Excess.
Gold..Fr.	118,958,000	F. 79,812,000	Imp. Fr. 39,146,000
1909..	165,570,000	23,020,000	Imp. 142,550,000
Silver.	79,386,000	39,689,000	Imp. 39,697,000
1909..	32,709,000	26,563,000	Imp. 6,146,000

Imports of copper and nickel coins this year, 16,000 fr.; exports, 225,000 francs.

Exports of silver from London to the East from Jan. 1 to June 2, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes	
India	£2,216,200	£2,653,500	I.	£ 437,300
China	1,075,100	1,113,500	I.	38,400
Straits	82,800	...	D.	82,800
Total	£3,374,100	£3,767,000	I	£ 392,900

India Council bills in London brought an average of 15.97d. per rupee for the week.

Gold—The price of gold on the open market in London was unchanged, at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. There was no special demand.

Platinum—The gradual advance abroad has been followed by higher prices here. Dealers are now asking $31.50@32 per oz. for refined platinum and $37 per oz. for hard metal.

SILVER AND STERLING EXCHANGE

June.	9	10	11	13	14	15
New York ...	53¼	53¼	53¼	53¼	53⅜	53⅜
London.....	24 9/16	24 9/16	24 9/16	24 9/16	24⅝	24⅝
Sterling Ex..	4.8665	4.8675	4.8680	4.8680	4.8670	4.8660

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The market has been steady, with hardly any fluctuation, closing at 24⅝d. in London, a very small advance.

Copper, Tin, Lead and Zinc

June.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
9	12¾ @12⅞	12⅜ @12⅝	55 15/16	32⅝	4.32½ @4.35	4.17½ @4.22½	4.95 @5.00
10	12¾ @12⅞	12⅜ @12½	55 5/16	32¾	4.32½ @4.35	4.17½ @4.22½	4.95 @5.00
11	12¾ @12⅞	12¼ @12½	....	32⅞	4.32½ @4.35	4.17½ @4.22½	4.95 @5.00
13	12¾ @12⅞	12¼ @12⅜	54 15/16	32¾	4.32½ @4.35	4.17½ @4.22½	4.92½ @4.97½
14	12¾ @12⅞	12¼ @12⅜	55	32⅝	4.32½ @4.35	4.17½ @4.22½	4.92½ @4.97½
15	12¾ @12⅞	12¼ @12⅜	54½	32½	4.32½ @4.35	4.17½ @4.22½	4.92½ @4.95

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

The New York Metal Exchange proposes to sell its building and remove to leased quarters at 111 Broadway.

Copper—During the past week there has been a quiet and sagging market. Consumers have maintained a hand-to-mouth policy and the business that has presented itself has been eagerly competed for by some of the sellers. In consequence, prices have suffered. At the lower level which is now ruling, considerably more interest is shown, both by the domestic and foreign consumers. At the close, Lake copper is quoted at 12¾@12⅞c., and electrolytic copper in cakes, wirebars and ingots at 12¼@12⅜c. Casting copper is quoted nominally at 12⅛@12¼ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c. base, carload lots at mill.

The market for standard copper is almost £2 lower than it closed last week. There has been considerable realization on the part of tired bulls and some bear selling. At the close, spot is quoted at £54 10s. and three months at £55 3s. 9d.

Refined and manufactured sorts we quote: English tough, £58; best selected, £59@59 10s.; strong sheets, £67@68 per ton.

Exports of copper from New York for the week were 3833 long tons. Our special correspondent gives the exports from Baltimore at 2158 tons.

Henry R. Merton & Co. write from London under date of June 4: "The copper market, until lately so entirely under the influence of events in Wall Street, has nevertheless shown a very firm attitude in the face of these untoward developments, and has given the best evidence of the sounder conditions which now prevail in this metal. The continued liquidation of bull commitments during April and May has eliminated a great deal of the weakness in the technical position of the standard market, and the very firm attitude of the leading producers has also helped to consolidate the situation. Thus, prices throughout the past week have kept very steady, showing at one time an advance of a few shillings in response to buying by dealers and covering by shorts. Toward the finish the tendency is slightly weaker in sympathy with the Stock Exchange, but little selling pressure was experienced."

Tin—The market in London developed a declining tendency. To this there was an interruption on Friday last when large American orders created a firmer tone. Since then, however, prices have been sagging again, and close weak at £147 10s. for spot, and £148 12s. 6d. for three months.

Business among dealers in this market developed at the end of last week and transactions were fairly large. A feature of the domestic market at this time is the scarcity of spot material. The incoming tin seems mostly to go into the hands of the larger consumers and but little remains for outside consumption. Quotations are made at about 32½ cents.

Visible stocks of tin, including tin afloat, reported on June 1 were: United States, excluding Pacific ports, 4249; Great Britain, 11,540; Holland, 3209; total, 18,998 long tons, showing an increase of 1066 tons during May. Of the total stocks reported 11,855 tons were in warehouse and 7143 tons afloat.

Lead—The market is quiet. There is some business doing from day to day at about the last prices, 4.17½@4.22½c. St. Louis, and 4.32½@4.35c., New York.

The London market for Spanish lead continues firm at £12 12s. 6d. and English lead is held for £12 15s. per ton.

Spelter—The market is very quiet. The galvanizing business appears to be falling off somewhat, and as manufacturers are well covered they are buying sparingly. Prices have again eased off and at the close St. Louis is quoted at 4.92½@4.95c. and New York at 5.07½@5.10 cents.

New York quotations for spelter on June 9-11, inclusive, were 5.10@5.15c.; June 13 and 14, 5.07½@5.12½c.; June 15, 5.07½@5.10 cents.

The London market for good ordinaries is £22 and £22 5s. for specials.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Sales are fair only, and the market is generally more quiet. We quote 23½c per lb. for No. 1 ingots in large lots, New York delivery. The foreign market continues active, with prices firm.

The Aluminum Company of America is at present operating at its full capacity, using all the power it can get.

Antimony—The market remains quiet. Cookson's is quoted lower at 8.15@8.20c. per lb. Other prices are unchanged at 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—New York quotations are $47 per flask of 75 lb. for large orders; $48@49 for jobbing lots. San Francisco, $46@46.50 for domestic orders and $2 less for export. The London price is £3 15s. per flask, with £8 12s. 6d. quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio.

Zinc and Lead Ore Markets

Platteville, Wis., June 11—The highest price paid this week for zinc ore was $41.50; the base price, 60 per cent. zinc, was $40@41 per ton. The base price paid for 80-per cent. lead ore was $48@50 per ton.

SHIPMENTS, WEEK ENDED JUNE 11.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville...............	850,390	52,230	325,500
Cuba City..............	256,595	109,820	266,385
Mineral Point.........	217,900	....	....
Shullsburg.............	195,000	....	....
Galena..................	160,500	....	....
Benton..................	70,000	....	.....
Highland...............	63,000	....	.....
Linden..................	....	....	84,930
Total..................	1,813,385	162,050	676,815
Year to date..........	37,612,041	2,813,739	8,377,095

In addition to the above there was shipped during the week to the separating plants, 2,947,395 lb. zinc concentrates.

Joplin, Mo., June 11—The highest settling price of the week was $46 for ore purchased last week, the base price this week for zinc sulphide ore being $40@41.50 per ton of 60 per cent. zinc. The base price of zinc silicate was $20@22 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $38.66 per ton. The high price for lead was $49, with deductions of $1 per ton for each 1 per cent. under 80 per cent. lead. All lead grading 80 per cent. and higher is now regularly selling at one price.

Excessive rains this week practically shut out all shallow mining in Aurora, Granby and the vicinity of Joplin, materially lowering the output. In the face of this zinc prices were lowered $2 per ton for advance deliveries.

SHIPMENTS, WEEK ENDED JUNE 11.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,173,530	1,339,780	$116,294
Joplin	2,035,330	241,010	47,628
Duenweg	713 970	289,950	19,712
Galena	761.510	31,400	15,985
Granby	705,260	22,100	12,090
Oronogo	428,500	59,990	11,126
Badger	365.800	45,790	8,610
Spurgeon	422,900	54,680	7,110
Carthage	224,630	......	4,717
Carl Junction	201,880	13,660	4,674
Aurora	183,720	......	2,860
Alba-Neck	127,100	......	2,796
Miami	126,910	57,070	2,639
Cave Springs	65,970	16,560	1,717
Sarcoxie	57,640	......	1,181
Quapaw	55,010	......	697
Seneca	55,820	......	586
Wentworth	28,000	......	310
Totals	10,734,480	2,171,990	$260,732

24 weeks............263,932,020 38,598,800 $6,295,474

Zinc value, the week, $207,565; 24 weeks, $5,287,569

Lead value, the week, 53,167; 24 weeks, 1,007,905

MONTHLY AVERAGE PRICES

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Iron Ore—Current quotations for Lake Superior ores, on dock at Lake Erie ports are: Bessemer ore—base 55 per cent. iron and under 0.45 phosphorus—$5 per ton for old Range and $4.75 for Mesabi; non-bessemer—base 51.5 per cent. iron—$4.20 for Old Range and $4 for Mesabi.

Manganese Ore—The base price, as fixed by the large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent. or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess of phosphorus and silica.

Pyrites—Domestic furnace sizes fetch 11@11½c. per unit, delivered at eastern acid works; fines, 10¾@11c. Pyrites containing arsenic realize from ½@1½c. per unit less.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. for ore containing 60 per cent. of tungsten trioxide. For scheelite ores, 50c.@$1.50 per unit less.

Zinc Ore—For Rocky Mountain blende, delivered at Kansas smelting points, the current price is for the zinc content, less eight units, at the St. Louis price for spelter, less $14@15 per 2000 lb of ore, according to quality, especially as to iron and lead content. See also Joplin and Wisconsin ore markets.

CHEMICALS

New York, June 15—The general market is quiet and rather inclining to the usual summer dullness.

Copper Sulphate—Business is steady and prices unchanged at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—The market is dull. On small sales prices are unchanged at $2.30@2.40 per 100 lb. for white arsenic.

Nitrate of Soda—Business is on a moderate scale. Spot nitrate is rather lower at 2.10c. per lb. The same price, 2.10c., is quoted for futures.

MINING·STOCKS $

New York, June 15—The general stock market has been less active, but stronger in quotations, though the movement of prices has been irregular all through the week. Fractional advances were made, but there has been no general upward movement on a large scale. Sales of Homestake were recorded, 150 shares changing hands at $87.25@89 per share.

The Curb followed the course of the Exchange rather closely. Copper shares were stronger; Chino, Miami and Ray Central being the more active issues. Cobalt stocks held their own well and were active, with many sales.

Sales of securities at auction in New York, June 9, included $10,000 Columbus & Hocking Coal and Iron collateral trust bonds at $4000 (40); 300 shares same company, common stock, at 4¼; 100 shares Colonial Silver Mines, $26 for the lot; 16 shares Tintic Company, old stock, $7 for the lot; 100 shares McKinley-Darragh-Savage Mining Company, 94c. per share.

Boston, June 14—Copper stocks had a weak period due to the large increase in the visible supply of the metal during May. North Butte has been the particular feature with an $8.50 break for the week, making a low-record mark at $24.50. Inadequate margins were responsible for a good part of the selling but the belief is general that the next dividend will be cut. Calumet & Arizona had a sympathetic drop of $11, touching $50, but the volume of business in this specialty was light.

The weakness of coppers has been largely in the dividend payers, due to the

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	March.	April.	May.
Arizona, Ltd.	2,886,000	2,340,000	2,610,000
Balaklala	1,263 733	1,109,311	1,148,762
Boleo (Mexico)	2,148,383	2,777,800	2,735,680
Copper Queen	10,809,488	9,920,000	... .
Calumet & Ariz.	2,820,000	2,400,000	....
Cananea (Mexico)	3,700,000	4,262,000	....
Detroit	1,698,975	1,930,000	....
Imperial	825,000	800,000	....
Nevada Con. (Est.)	5,339,466	5,500 000	5 500,000
Old Dominion	2,674,000	2,325,000	2,174,000
Shannon	1,468,000	1,288,000	1,326,000
Superior & Pitts.	2,370,000	2,130 000	....
Utah Copper Co.	7,853,288	7,902,643	....
Butte District	24,000,000	25,000,000	27,000 000
Lake Superior	19,250,000	16,250,000	19,250,000
Total production.	89,366,867	86 934.754	....
Imports, bars, etc.	20,178,202	21,180,396	....
Imp. in ore & matte	6,181,476	12,527,371	....
Total	115,726,545	120,642,521	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
VI, 1909	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124.657,709	66,359,617	56,261,298
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31 332,434
V	123,242,476	59,305,222	45,495,400

	Visible Stocks.		
	United States.	Europe.	Total.
VI, 1909	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224 000	361,696,772
XI	153,509,626	222,566 400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338 392
IV	123,821,874	249,625,600	373,450,474
V	141 984,159	246,870,400	388 854,559
VI	160,425,973	239,142,400	399,568,373

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

uncertainty regarding a continuance of the present rates. Amalgamated fell $5.75 this week to a low of $61.62½. The newer Lake stocks have been weak, but not to the extent of those mentioned above. Lake stock fell $3.50 to $48, but the stock shows buoyancy at times. President Paine, of the Copper Range Consolidated, is slated for president of the Lake at the approaching annual meeting.

Old Dominion became weak today on the reduction of dividend of the New Jersey corporation, the holding company, from $1 to 50c. The Maine corporation, the operating one, takes dividend action tomorrow.

The $1 assessment levied on Davis-Daly stock had no effect on the market price as it had been expected and to an extent, discounted. The Curb market shows generally lower prices.

Assessments

Company.	Delinq.	Sale.	Amt.
Alameda, Ida	June 10	July 2	$0.00½
Amador, Ida	Feb. 24	June 30	0.01
Andes, Nev	May 31	June 21	0.10
Beck Tunnel, Utah	June 14	....	0.01
Black Jack, Utah	....	....	0.01
Brownstone, Utah	Apr. 15	June 10	0.00½
Butte-Alex-Scott	July 1	....	1.00
Caledonia, Nev	June 17	July 8	0.10
Crown Point, Nev	June 26	July 20	0.10
Davis-Daly, Mont	July	....	0.50
Davis-Daly, Mont	Sept.	....	0.50
East Tintic, Utah	....	....	0.01
Hancock Con., Mich	Au.Oct.	....	3.00
Helvetia, Ariz	....	....	0.50
Ojibway, Mich	Oct.	....	1.00
Reindeer, Ida	May 31	Aug. 1	0.00½
Rhode Island Copper, Mich.	....	....	0.50
Scottish Chief, Utah	....	....	0.01
Sierra Nevada, Nev	June 21	July 12	0.10
Union, Nev	June 9	July 1	0.10
Utan Con. of Tintic, Utah	May 15	....	0.01
Yankee Cons., Utah	June 24	....	0.02
Yellow Jacket, Nev	June 9	July 11	0.15

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	.....
November	50.703	......	23.351	.....
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56[illegible]	12.733	12.93[illegible]	13.091	57.363	57.238
May	12.893	12.550	13.238	12.885	59.338	56.313
June	13.214	......	13.548	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	58.917	......
December	13.29[illegible]		13.647	......	59.906	......
Year	12.[illegible]	......	13.335		58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32.403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	33.125	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	.....
August	5.729	......	5.579	......	22.125	.....
September	5.796	......	5.646	......	22.906	.....
October	6.199	......	6.043	......	23.200	.....
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.10	15.02	15.94	15.08	16.18
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS June 14

Name of Comp.	Bid.
Listed:	
Acacia	.06⅜
Cripple Cr'k Con.	.02¾
C. K. & N.	.17
Doctor Jack Pot.	.09¼
Elkton Con	.79½
El Paso	.85
Fannie Rawlins	.05½
Findlay	.08
Gold Dollar	.15
Gold Sovereign	.03½
Isabella	.19¾
Mary McKinney	.58
Pharmacist	.03½
Portland	1.25
Vindicator	.99
Work	.03¾
Unlisted:	
Golden Cycle	1.00
United Gold Mines	.08½

SALT LAKE June 14

Name of Comp.	Clg.
Carisa	‡.45
Colorado Mining	.49
Columbus Con.	.65
Daly Judge	3.50
Grand Central	1.00
Iron Blossom	.89
Little Bell	1.25
Little Chief	.45
Lower Mammoth	.35
Mason Valley	7.00
Maj. Mines	‡.58
May Day	‡.05½
Nevada Hills	.98
New York	‡.13
Prince Con	.63
Red Warrior	6.00
Silver King Coal'n	2.60
Sioux Con	.17
Uncle Sam	.34
Victoria	1.07½

SAN FRANCISCO. June 14.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlauta	.11	Belmont	3.75
Belcher	.60	Daisy	.06
Best & Belcher	‡.25	Jim Butler	.29
Caledonia	.40	MacNamara	.27
Challenge Con	.19	Midway	.28
Chollar	.13	North Star	.06
Confidence	.75	West End Con	.57
Con. Cal. & Va.	.89	Atlanta	.11
Crown Point	.62	Booth	.15
Exchequer	.18	C.O.D. Con	.08
Gould & Curry	.18	Columbia Mt.	.06
Hale & Norcross	.31	Comb. Frac.	.50
Mexican	1.07	Great Bend	.03
Ophir	.89	Jumbo Extension	.19
Overman	.70	Oro	.07
Potosi	.40	Red Hill	.03
Savage	.21	Sandstorm	.01
Sierra Nevada	.19	Silver Pick	.06
Union	.31	St. Ives	.12
Yellow Jacket	.85	Tramps Con	.04½

N. Y. EXCH. June 14

Name of Comp.	Clg.
Amalgamated	63⅝
Am. Agri. Chem.	43
Am.Sm.&Ref.,com	75⅞
Am. Sm. & Ref., pf.	103⅜
Anaconda	40
Bethlehem Steel	27⅞
Col. & Hock. C. & I.	6⅛
Colo. Fuel & Iron.	34⅝
Du Pont P'd'r, pf.	87½
Federal M. & S.	41
Great Nor., ore ctf.	‡58¼
Nat'nal Lead, com.	73⅛
National Lead, pf.	108
Nev. Consol	19
Pittsburg Coal	‡17½
Republic I&S, com.	30⅝
Republic I & S, pf.	95½
Sloss Sheffi'd, com.	‡69½
Sloss Sheffield, pf.	117½
Tennessee Copper	25⅞
Utah Copper	42⅞
U. S. Steel, com.	77¾
U. S. Steel, pf.	115⅜
Va. Car. Chem.	59¼

N. Y. CURB June 14

Name of Comp.	Clg.
Bonanza Creek	‡3
Boston Copper	18
Braden Copper	4⅛
B. C. Copper	5⅛
Buffalo Mines	2½
Butte Coalition	18
Caledonia	1¼
Chino	11¼
Cobalt Central	.10½
Cobalt Prov.	‡59
Con. Ariz. Sm.	1 15/16
Cumberland Ely	‡9
Davis-Daly	1⅜
Dominion Cop.	7
Ely Con	.52
El Rayo	4¼
Florence	‡2.22
Gila Copper	5⅞
Giroux	6⅞
Gold Hill	⅞
Goldfield Con	8⅞
Greene Cananea	7¾
Guanajuato	1⅝
Guggen. Exp.	185
Kerr Lake	.08 3/16
La Rose	4 7/16
McKinley-Dar-Sa.	1.00
Miami Copper	20
Mines Co. of Am.	65
Mont. Shoshone	‡⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	⅞
Newhouse M. & S.	‡3½
Nipissing Mines	11¼
Ohio Copper	2
Pacific Sm. & M.	⅜
Ray Central	2½
Silver Queen	.35
Standard Oil	620
Stewart	11/16
Tonopah	9 1/16
Tonopah Ex.	.90
Tri-Bullion	11/16
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4 7/16

LONDON June 15

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	8	6
Esperanza	2	15	3
Tomboy	1	0	0
El Oro	1	7	6
Oroville	0	8	0
Mexico Mines	8	8	9

‡Last quotation.

BOSTON EXCH. June 14

Name of Comp.	Clg.
Adventure	5¾
Allouez	39
Am. Zinc	‡24½
Arcadian	4½
Arizona Com	15
Atlantic	6¾
Boston Con	17
Butte & Balak.	14¾
Calumet & Ariz.	53
Calumet & Hecla.	550
Centennial	15½
Con. Mercur	.10
Copper Range	60
Daly-West	8
East Butte	7¼
Franklin	11¼
Granby	38
Hancock	17
Helvetia	2½
Indiana	16¼
Isle Royale	17
Keweenaw	3½
Lake	50⅛
La Salle	11
Mass	7¼
Michigan	4¼
Mohawk	47½
Nevada	19
North Butte	26⅛
North Lake	10
Ojibway	7
Old Dominion	32½
Osceola	130
Parrot	13½
Quincy	70
Shannon	10¼
Superior	40
Superior & Bost.	9¼
Superior & Pitts.	10¾
Tamarack	45½
Trinity	5
U. S. Smg. & Ref.	.39¼
U.S.Sm. & Re., pd.	49
Utah Apex	3⅛
Utah Con	21
Victoria	3
Winona	7
Wolverine	110
Wyandotte	1¾

BOSTON CURB June 14

Name of Comp.	Clg.
Ahmeek	‡165
Bingham Mines	‡3
Boston Ely	2⅛
Boswyocolo	.08
Cactus	2 9/16
Calaveras	7 1/16
Champion	.05½
Chemung	‡8
Chief Cons	1¾
Cons. Ariz.	2
Corbin	.06⅞
Crown Reserve	‡3
First Nat. Cop.	3½
Indiana	‡17½
Inspiration	7½
Mackinaw	‡.06
Majestic	.48
Nat'l Mine	.26
Nevada-Douglas	2¾
New Baltic	‡6¾
Oneco	3⅛
Raven Copper	.27
Ray Con	‡17
Rhode Island Coal	6⅞
San Antonio	‡7¼
Shattuck-Ariz	‡25
South Lake	4½
Superior & Globe	‡.38
Trethewey	‡1⅜
Tuolumne Copper	3¾
Vulture	9⅛
Yuma	.70

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**Illustrated.*

The Unit of Measurement for Gold Ore on the Rand

In the Journal of April 25 last, a suggestion to change the unit for ore upon the Rand from the ton to the square fathom was mentioned. This proposal, as originally brought forward by Hugh Marriott, was accompanied by suggestions for other alterations in the statements of working cost and profit; but from these the question of the unit must be considered as distinct, since they could be applied to either unit. Before proceeding to the consideration of the main question it would be, however, as well to state those other suggestions which were as follows: (1) That it would be well to include all expenses as working costs, except those incurred for increase in the production plant; (2) That there should be an actual statement of the gold contents of the ore reserves; (3) That gold brought in from the gold reserve, or gold extracted from accumulated material should be kept separate from that currently obtained from the ore, so as to avoid such anomalies as 100 per cent. extraction; (4) That it would be easier to keep the required regularity of returns if the results were published quarterly instead of monthly.

It will be granted that all these points can be secured with either unit and the question remains, clearcut and defined, whether the ton or the square fathom on the surface plane is the better unit in which to describe the condition of the mine, the progress of the work, and the energy and intelligence of the employees.

It is evident that the ore, when once broken, cannot be trammed, hoisted and treated in the reduction works in terms of a unit of area. The energy and efficiency of the work performed in those operations can only be measured in units of weight, such as the ton; and the chemical treatment is also regulated by practical proportions of weight.

It is for the orebody, however, that the best results are claimed from the use of this fathom unit. It is stated that it would give a clearer picture of the ore reserves and that it would automatically induce great speed in development, closer mining and a higher degree of sorting, all of which would make for greater benefit.

Dealing first with the claim that it would present a clearer picture of the value of ore reserves, it has to be said that those reserves have in any case to be adjusted to the working cost of the previous year, and it would appear to be quite immaterial what unit or divisor be used to determine the working cost, as long as all of the costs are entered and as long as the method of working has not been altered nor the idea of successful working varied. It may be imagined that because a mine holds its property in terms of horizontal area, that its progress is more harmoniously figured in areas; but what is known as the "reef" plane is not comparable to the horizontal plane of the property's extent. It varies in dip, it is disturbed by faults and dikes, and there are variations in the lode width which cannot be expressed in terms of a continuous lode plane. The claim, then, that the fathom unit presents a clearer picture of the value of the ore reserves is not readily conceded.

With regard to the claim that it would induce greater profit, it is agreed that latterly so much credit has been given to low working costs per ton that the total profit has in more than one case suffered, where a leader in the hanging-wall or the footwall has been broken, together with the intervening waste, yielding an increased tonnage of ore at a lower cost. In such cases the attention has been so centered upon the low working cost that the fall in grade—inevitable because of the impossibility of sorting out sufficient of the waste—has not been properly noticed. The mistake, however, was in the attention paid to the low working cost and was not inherent in the ton unit itself; were the attention in a similar manner directed to the working cost calculated to the fathom unit, there would be again a liability to misdirection of effort because there would be no inducement to take more lode than would come in the most easily broken stope.

These considerations lead back to the natural basis of every industrial undertaking; i.e., to the profit made, and every unit and every conception of successful working must be judged by the prominence at which it places the importance of securing a high total profit.

It must here be presumed that the reduction works in general upon the Rand have been erected upon such proper and sufficient data that it must be considered out of the question to shut down a portion of any plant; and that, therefore, this question has to be considered under the condition that the reduction works are to be run fully and to the best advantage. Under such a condition, which unit would foster the attainment of the greatest profit? Should the criterion of successful working be the maintenance of a satisfactory profit per ton, or should it be expressed in terms of the square fathom on the lode plane? If the profit per ton were the consideration, even to the extent of advancing it, there would be every inducement to mine cleanly and to sort closely and at the same time to give to the better lode the earlier attention it deserves; a policy which was very soundly advocated by W. Fischer Wilkinson in a paper read before the Institution of Mining and Metallurgy, April 22, 1909. But would there be any inducement to go outside the better and main portion of a lode to take other leaders or small veins which might produce additional ore, payable, but of lower value? There is no doubt that this would be a question to be considered very carefully, because in taking those outside leaders there would be a greater chance of decreasing than of increasing the profit per ton unless the closest sorting were done. Considering, however, that the main portion of the lode would pay the cost of development and that the cost of breaking the leaders into the opening once made would be less than the first cost of making that opening, it may be said that there would be considerable inducement to take any ore, which, upon investigation, offered a reasonable profit; which inducement would be hightened by the necessity of keeping large reduction works fully supplied. It may be deduced, therefore, that having the profit per ton of ore in view there would be every inducement to mine clearly and sort closely, nor need there be any fear that insufficient attention would be paid to the leaders in the walls. It does not appear that the question of greatest total profit per square fathom on the lode plane, could succeed in doing more than this; and seeing that such a unit would be at variance with practice in other countries, and that, if adopted, it could not be followed through the reduction works, there appears to be no advantage in giving up the old unit and no necessity for so doing.

It may be remarked, however, that the square fathom unit is one which has been long in use underground on the Rand as the basis for all stoping contracts. The contractor is instructed as to what width he must break and the price of the contract is set accordingly, and though there is always difficulty in satisfying the contractor when surveying the work done, yet there is no doubt that at this particular point the square fathom is a more convenient unit than the ton.

It is doubtless the case that the idea of extending this unit has sprung from the realization of the error to which the exaggerated importance granted to low cost per ton was leading, i.e., the error of breaking too much waste, because low cost per square fathom could only be obtained by narrow and clean mining. However, as has been indicated in the above considerations, the same effect is obtained more simply and rationally by giving first consideration to the profit per ton.

To correct any impression that there has been any sustained departure from the best practice on the Rand, it is well to state that from the commencement of work on this goldfield to the end of 1909 the average profit distributed per ton has been about 10s., from which figure the variation, year by year, has been unimportant; the profit for 1909 being nearly 9s. Further, that this maintenance of the dividend rate from ore which was uninterruptedly and materially decreased in value, has been entirely due to reductions in the working cost.

The Latest Steel Corporation Purchase

The option recently taken by the Oliver Iron Company on the 400,000 acres owned by the Michigan Iron and Land Company in the Upper Peninsula of Michigan removes from sale to other purchasers the last large block of ore-bearing lands on the Upper Peninsula of Michigan. Not all of this land carries ore, of course; much of it is valuable only for the timber growing on it, and some of it worth very little. As it consists in great part of the alternate sections originally granted for the construction of a railroad, it includes large areas adjoining known ore deposits and mines actually being worked. There is no doubt that exploration will show an important quantity of iron ore.

The transaction will, therefore, give the Steel Corporation a still stronger hold upon the ore reserves of the Lake Superior region. Further, it will shut out from the Marquette and the Menoninee ranges any independent company which may want to secure a supply of iron ore. In this case the Steel Corporation has followed its established policy of securing reserves of raw material for its own use in the future; and also shutting out possible future competition. Under present conditions, no large steel works can be successfully established without the ownership and control of sufficient iron supplies.

Some of the coal districts in the West —Indiana and Ohio for instance—are making good profits out of the persistent strike in Illinois. They are not leaving all the advantages to West Virginia this time.

CORRESPONDENCE and DISCUSSION

Views, Suggestions and Experiences of Readers

Corbin District, Montana

Mr. Bushnell, in his article on the Corbin district, Montana, published in the JOURNAL of June 4, quotes from my report on a portion of the district, and apparently applies it to a large section of the surrounding country that differs materially from the limited section described by me.

A portion of the report, not quoted, limits the area of softened granite and reads as follows: "The copper-bearing area which includes the lodes of the Butte type is about two miles square. To the north and south of this area the granite is harder and the veins narrower but are copper bearing."

The mines described by Mr. Bushnell are the Boston & Corbin and the Boston & Alta, with brief mention of others. With the exception of the Bird properties, Corbin Metals, and London-Corbin, all are outside of the softened granite area and are either in the hard granite, andesite or diorite, and contain no lodes of the Butte type. It is evident my report cannot apply to them.

The lodes in the soft granite are broad zones composed of alternating bands of quartz and decomposed granite, inclosed between poorly defined walls with cupriferous pyrite as the primary copper mineral and glance enrichments.

The veins in the hard granite are between well defined walls and contain primary chalcopyrite with bornite enrichments, but little or no glance. The Boston & Corbin vein is of this class. The Boston & Alta produced silver-lead ore for years from a vein in the andesite.

The Corbin Copper Company ground is on the diorite. It is not necessary to describe the others mentioned by Mr. Bushnell more than to say they are outside of the softened granite and contain no lodes of the Butte type.

My report was made in 1903 for Arthur Bird and is his property and used by him to interest capital for the development of his ground. A copy of the report was secured by a promoter and used by him as a description of his ground. Since that time it has evidently been common property, and portions of it quoted and distorted by nearly every promoter that had a prospect to sell in that part of Montana.

The original area of three or four square miles has been expanded until it covers 25 sq.m. and embraces everything from a silver-lead vein to a streak of rusty gravel.

Probably Mr. Bushnell has innocently followed the custom of the country and quoted the report as a description of the district, but has unwittingly, I trust, been unfair both to the owner and author of the report in classing mines and prospects of a totally different character from the peculiar "Butte type" lodes described by me.

E. P. JENNINGS.

Salt Lake City, Utah, June 13, 1910.

Commercial Potassium Cyanide

The letter of Ralston Bell, in the JOURNAL of May 21, 1910, takes exception to the view put forward in my communication in the issue of Jan. 15, namely, that when gold or silver dissolves in dilute cyanide solution, the cyanogen and not the alkali metal is concerned in the primary reaction on the precious metal. Possibly the theoretical explanation given in my letter may be at fault. I am certainly not prepared to deny that cyanogen in the gaseous form, i.e., in the molecular condition, as $(CN)_2$, is without action on gold, nor that oxygen plays an important and, indeed, indispensable part in the process. I am also quite prepared to allow that in many reactions potassium shows a stronger affinity for oxygen than sodium. Nevertheless, the following experimental fact remains, which has been repeatedly verified by chemists working in different districts.

Under ordinary working conditions the efficiency of a dilute solution in dissolving gold or silver is the same for any given cyanogen strength, whether the solution be made up with sodium or potassium cyanide or with any of the mixtures of these found in commerce.

Many years ago I made a test in Johannesburg, in which a solution of calcium cyanide was prepared by distilling potassium ferro-cyanide with dilute sulphuric acid and collecting the distillate in lime water. The strength of the solution so obtained was adjusted by adding water until the cyanogen contents (shown by $AgNO_3$ titration) corresponded with those of a known potassium-cyanide solution. Extraction tests made with the two solutions gave practically identical results.

EFFICIENCY OF DIFFERENT BRANDS OF CYANIDE

A test was recently made by myself to determine the relative efficiency and stability of two brands of cyanide, both furnished by a well known firm in New York and marked *A* and *B*. Sample *A* was supposed to contain cyanogen equivalent to 127 per cent. KCN, while *B* was guaranteed equivalent to 98 per cent. KCN.

Solutions in distilled water were prepared from both brands, each titrating 0.203 per cent. CN, equivalent to 0.508 per cent. KCN. An agitation test was made with each solution, using a sand sample, assaying originally $4.40 gold and 3.80 oz. silver per ton, the charge used being: Ore, 300 grams; lime, 1.5 grams; solution, 850 c.c. Agitation in stoppered bottles was continued for 75 hours, and the results are shown in the accompanying table. These correspond to an extraction of 93 per cent. of the gold and 62.4 per cent. of the silver for *A*, and 90.7 per cent. of the gold and 60 per cent. of the silver for *B*. Thus, the behavior of the two solutions was identical within ordinary limits of experimental error.

RESULTS WITH CYANIDES OF DIFFERENT STRENGTHS.

Samples.	CN, Per Cent.	KCN, Per Cent.	NaOF, Per Cent.	Assay of Residue.	
				Au.	Ag.
A	0.0958	0.179	0.108	$0.31	1.43 oz.
B	0.0964	0.182	0.099	0.41	1.52 oz.

Calculating the cyanide consumption on the basis of equivalent of KCN consumed in each case we have the figures per ton or ore for *A*, 1.64 lb.; and *B*, 1.47 lb. If, however, we base the calculation on the weight of solid cyanide needed to furnish these equivalents, we have, for *A*, 1.29 lb., and *B*, 1.48 lb., showing a decided advantage, weight for weight, in the use of brand *A* (127 per cent. KCN).

SODIUM CYANIDE STABLE IN ALKALINE SOLUTIONS

Another allegation which it seemed desirable to put to the test is that pure sodium cyanide is unstable in solution, owing, perhaps, to the absence of sufficient protective alkali. Solutions of the samples *A* and *B* were accordingly prepared and adjusted so that each had as closely as possible the same volume (about two liters) and the same apparent strength in cyanide. The solutions were freely exposed to the air of the laboratory in open cylinders, merely covered with filter paper to exclude dust.

They probably underwent rather more decomposition under these conditions than would occur on a working scale in ordinary storage tanks. Daily tests of cyanide strength were made by silver-nitrate titration, with the results shown in the accompanying table.

STABILITY OF CYANIDES IN ALKALINE SOLUTIONS.

Date. 1910.	Equivalent of KCN.	
	Solution A, Per Cent.	Solution B, Per Cent.
March 25........	1 208	1.210
March 26........	1.206	1.206
March 27........	1.204	1.206
March 28........	1.202	1.204
March 29	1.196	1.196
March 30........	1.194	1.196
March 31	1.194	1.196
April 1..........	1.194	1.195
April 4..	1.178	1.182
May 10.	1.098	1.120

This test indicates that the more rapid decomposition of the NaCN solution was only appreciable after more than a week's exposure, and even then the difference was so trifling that it may have been accidental.

Results Should Be Reported in Terms of Cyanogen

With regard to the reporting of results in terms of cyanogen, as recommended in my former letter, the system has certain obvious advantages, namely:

(1) The number of cubic centimeters of $AgNO_3$ used is always proportional to the actual amount of cyanogen present, whereas, in a plant where various brands of cyanide may be used from time to time, containing varying proportions of KCN and NaCN, the figures are not proportional to the amount of either of these salts present.

(2) In cases where the kind and amount of alkali metal is unknown, the statement of the result found involves no assumption as to the nature of the alkali metal.

(3) There is no danger of the existence of impurities being masked, as occurs when NaCN is reported as its equivalent in KCN.

In cases where it is thought desirable to convert the cyanogen found into terms of KCN, the calculation which Mr. Bell objects to consists simply in multiplying by 10 and dividing by four. It may be pointed out, moreover, that where the chemist titrates his solution in pounds of cyanide per ton, he does not know at once how many pounds per ton he must add to bring it up to the required strength; unless he also knows the actual cyanide contents of the particular brand of cyanide he is using, and even then a calculation is required.

Sodium-Potassium Determination

With Mr. Bell's remarks on the right of the consumer to know whether he is buying potassium or sodium, I am quite in agreement, and also as to the desirability of having actual determinations made of those metals in the cyanide used. Accordingly, I looked forward with much interest for the account of the promised rapid sodium-potassium determination, and was rather disappointed to find in the JOURNAL of May 28 only a description of the well known method of converting the alkali metals into chlorides and titrating the chlorine. This method may be found in practically every text book[1] of analysis.

This method is known to give sufficiently accurate results only when the two metals are both present in considerable amounts. It cannot be recommended for samples like those marked *A* and *C* in the analyses quoted by Mr. Bell, in which one or the other of the alkalis largely predominates. Probably had Mr. Bell made an estimation of the potassium by some form of the platinum method, and made actual determinations of the carbonates and cyanates, the discrepancies quoted would have been much smaller. In a number of cyanide samples analyzed by the writer at Redjang Lebong, Sumatra, the deficiency was usually less than one per cent., the radicals determined being K, Na, NH_4, CN, CNO, CO_3, Cl, (OH), and moisture. A description of the methods used will be found in my recently published volume.[2]

The occurrence of urea is certainly interesting and may partially explain the mysterious and unaccountable differences between different brands of cyanide. I have once or twice noted the presence of some constituent which has a reducing action on silver nitrate, and thought this might possibly be a formate.

For determining small quantities of potassium in presence of much sodium, I have used Finkener's method, modified by Dittmar and MacArthur. The method appears to be little known, though it can be made to give accurate results without any extraordinary degree of manipulative skill. A brief description of this method appears elsewhere in this issue of the JOURNAL.

Cyanogen Lost in the Determination of Moisture

There is still another point in Mr. Bell's method of analysis which calls for comment. The determination of moisture by fusion or even by drying in a hot-air oven at 100 to 110 deg. C. is liable, with many samples, to give incorrect results as some portion of the cyanogen is lost. A similar loss was also found to occur when samples were dried in a vessel immersed in a water bath, through which a current of air freed from CO_2 was allowed to pass slowly. The only method which could be used in some cases was to expose the pulverized sample in a desiccator containing H_2SO_4 and also an absorbent of CO_2, weighing in a small stoppered bottle until successive weighings showed no variation. The samples tested by the writer frequently gave indications of ammonium salts. A smell of ammonia is sometimes noticed on opening a case of cyanide, showing that these compounds are either originally present in the manufactured article, or are formed by the gradual decomposition of cyanogen compounds.

J. E. CLENNELL.

Torres, Sonora, Mexico., June 11, 1910.

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[1] Fresenius, "Quantitative Chemical Analysis," Vol. I (7th ed., 1876), p. 111; Sutton, "Volumetric Analysis," 8th ed., p. 154; Beringer, "Text Book of Assaying," 9th ed., p. 331; Low, "Technical Methods of Ore Analysis," 3d ed., p. 186.

[2] "Cyanide Handbook," McGraw-Hill Book Company, New York.

Mine Ventilation

I have had some inquiries regarding my article, published in the JOURNAL of June 4, 1910, as to where the mine ventilators described were in actual use.

I think that it might be of interest to other readers to know that they are used by: Copper Queen Consolidated Mining Company, Bisbee, Ariz.; Anaconda Copper Mining Company, Butte, Mont.; Detroit Copper Mines Company, Morenci, Ariz., and others. The ventilators are built by the Schutte & Koerting Company, Philadelphia, Penn.

OSKAR NAGEL.

P. O. Box 385, New York,
June 14, 1910.

Copper Losses in Slag

There appear to be two typographical errors in Mr. Sundt's article on "Copper Losses in Slag," in the JOURNAL of May 28, 1910, page 1098. The first formula should be

$$x\frac{ps}{100} + (90 - x)\frac{pm}{100} = pch$$

and the next to the last should be

$$E = \frac{pm}{10\,pch} \cdot \frac{9\,ps - 10\,pch}{pm - ps}.$$

DONALD M. LIDDELL.

Grasseli, Ind., June 11, 1910.

Deposits of molybdenite have been found at Turnback lake in the eastern Abitibi district, northern Ontario about 3 miles from the Grand Trunk Pacific railway. Veins are reported carrying 400 lb. of molybdenite to the ton, with traces of gold. On Kewagama lake, a few miles to the southeast there are seven or eight square miles of granite outcroppings in which this mineral has been found to occur frequently. On the east shore of the lake the granite is cut by quartz veins containing molybdenite in large crystals and it has also been found on the hills back from the lake but in lesser quantities.

Mines Company of America Consolidation

The Mines Company of America, owning gold-silver properties in Sonora, is to be enlarged by the absorption of both the Dolores and El Rayo mining companies in Chihuahua. The absorption will be brought about by an exchange of stock on the basis of 10 shares of Mines Company of America for one share of Dolores, and seven shares of Mines Company stock for one of El Rayo, and in order to bring this about, the capital stock of the Mines Company of America will be increased from $2,000,000 to $9,000,000. The above absorption will take $6,500,000 leaving $500,000 worth of stock in the treasury. It is proposed to increase the par value of the shares from $1 to $10, giving the enlarged company 900,000 shares.

These companies earned for the last 12 months over $900,000 net. The purchase of the La Dura properties on the Yaqui river in Sonora, was made preliminary to the consolidation and the Mines Company, and the Dolores and El Rayo companies each acquired a third interest. The Mines Company and Dolores are largely controlled by capitalists identified with U. S. Steel and U. S. Realty companies, including H. S. Black, John Lambert, I. L. Elwood, William Fleming and William E. Reis, of Raymond, Pynchon & Co., while the El Rayo company is controlled by William B. Thompson and W. Hinckle Smith, of Philadelphia. George A. Schroter will act as consulting engineer.

J. Thomas Reinhardt has issued a protest to the Mines company stockholders advising against the proposed consolidation.

Proprietary Mines Company

During the year in order to open the Valenciana bonanza, the Proprietary Mines Company carried from a depth of 1172 ft. to over 1900 ft., the shaft on the Nueva Luz property at Guanajuato. The sinking of this shaft is subsidized by the Mexican Government. At a depth of 1966 ft, a crosscut is to be run to the vein.

The company purchased machinery for a 250-ton crushing and cyanide plant to be installed in the new mill soon to be completed at the Tajo de Dolores mine at Guanajuato. The mine was bought after examination by Weed & Probert, who reported that the mine should return to the shareholders not less than $270,000 per annum, and that there was 5 years supply of ore in sight, practically all above the fourth level. This report was made last autumn and since then a winze has been carried down in ore practically to the sixth level.

The report of the president at the annual meeting of the company held recently, shows that since last autumn development work has been done on the fifth level and on the upper part of the mine.

The company has also acquired the management of the Yellow Jacket Gold Mining Company and has employed John B. Hastings to take charge. There is a 60-stamp mill near Hailey, Ida., and a large body of gold ore of profitable grade is reported.

Method for Determining Potassium in Sodium Cyanide

By J. E. Clennel

In the examination of commercial cyanides, I have found the following method for determining small amounts of potassium in the presence of sodium as given by Finkener and modified by Dittmar and MacArthur, to give accurate results.

Evaporate about a gram of the sample with sulphuric acid in sufficient quantity to convert all the salts present into sulphates. Redissolve the residue in water and add about 1.25 times the quantity of platinic-chloride solution (i.e., chloro-platinic acid H_2PtCl_6) required to convert the whole of the potassium supposed to be present into K_2PtCl_6; in other words, add $3\frac{1}{8}$ parts of platinum for every part of potassium. The amount of platinum needed in this method is much less than in the ordinary (Tatlock's) method, in which not only the potassium, but also the whole of the sodium must be converted into a platinum salt. Warm till the chloro-platinate precipitate just dissolves, adding a little water if necessary. Then evaporate on a water bath to a very small volume and stir to prevent the formation of large crystals.

After cooling, add 10 c.c. absolute alcohol, then after some time, 5 c.c. of ether. Mix well and allow the precipitate (K_2PtCl_6 and Na_2SO_4) to settle thoroughly, say for two hours, under a cover, to avoid undue evaporation. Then decant the liquid through a filter and work with a mixture of one volume of ether and two volumes of alcohol until free from soluble platinum salt.

Precautions in Using Ammonium Chloride

Digest the residue in a cold saturated solution of ammonium chloride, which readily disolves Na_2SO_4, and $MgSO_4$ if present, leaving K_2PtCl_6 undissolved. Collect on a small filter, work as quickly as possible with NH_4Cl solution until free from sulphates, then run alcohol through to remove part of the ammonium chloride.

Dissolve the remaining precipitate in hot water, adding 1 c.c. water for every 5 mg. of platinum present. Transfer to a conical flask of about twice the volume of the liquid. Immerse this flask in a water bath at 80 to 90 deg. C., and lead through it a current of hydrogen gas, purified by passing through a wash bottle containing silver nitrate, until the liquid in the flask is completely discolored. The chloro-platinate is reduced as follows: $K_2PtCl_6 + 2H_2 = 4HCl + 2KCl + Pt$.

As a precaution, CO_2 may be used to displace the hydrogen at the finish. Collect the reduced platinum on a filter, wash with water until free from KCl, ignite and weigh. From the formula, K_2PtCl_6, it is obvious that one atom of Pt corresponds to two atoms of K, hence Pt × 0.402 = K.

No Loss of Platinum

As the platinum is recovered in a pure finely divided metallic form, it is easily reconverted into chloro-platinic acid by digesting with chlorine and HCl in a stoppered bottle. The solution so obtained is then evaporated on a water bath and the residue redissolved to form a solution of known platinum contents. The filtrate containing Na_2PtCl_6 may also be reduced with hydrogen and treated in the same way, so that, with care, there need be no loss of platinum at any stage of the operation.

No Metal Mines in Natal

Natal, mineralogically considered, has been given an unpromising future by Doctor Hatch, who recently completed his report on that colony. During eight months, he examined 70 mines and prospects (excluding coal), taking samples and making surveys and plans where necessary. Graphite, asbestos and phosphates are said to be little worth while. Tin and copper were found only in unpayable quantities and coal was the only mineral which he unqualifiedly admitted exists in quantities. As a guide to other engineers doing similar work, it is of interest to note the expenses of the trip. For the eight months, Doctor Hatch's personal expenses were $14,500 and the expenses of his staff added a further $2900 in addition to $3500 for transportation, assaying, camp equipment and contingencies.

The executive committee of the Independent Oil Producer's Agency at Los Angeles, Cal., is trying to perfect arrangements to secure loans from banks on oil-storage certificates that may be issued by the agency, the latter to repay the loans after the sale of the oil, but in no case to deliver oil to lenders holding certificates. If satisfactory banking arrangements cannot be made, the establishment of a bank by the agency will be considered. It is intended to keep about 10,000,000 barrels.

DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Sorting Table at Cobalt

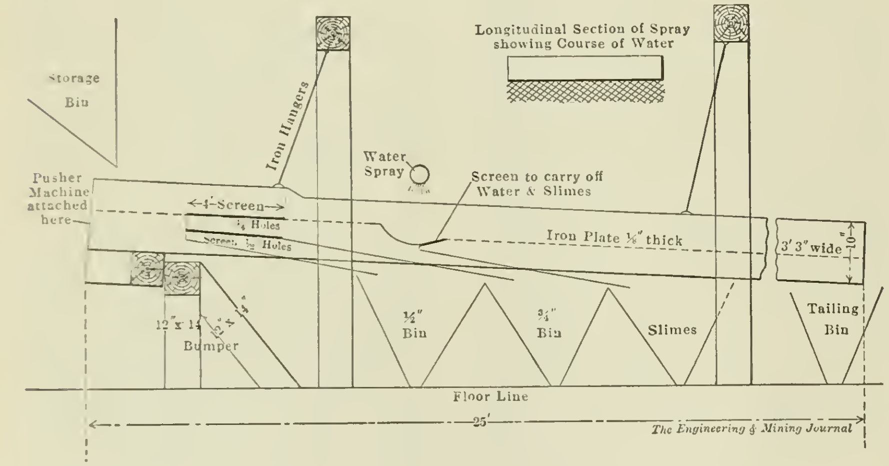
By G. C. Bateman*

The sorting table illustrated herewith was designed by Hugh Park, manager of the Nipissing mines, Cobalt, to handle a considerable tonnage at low cost and with no preliminary sizing or crushing, and at the same time separate the fines from the coarser material. In almost every mine in the district the fines are sufficiently rich to warrant shipment to a smeltery without concentration.

The table itself is a solidly built affair, 25 ft. long and 3 ft. 3 in. wide, and hung on a slope of 1:25 by iron rods from upright supports. The motive power is a simple little engine on the same principle as the cylinder and piston of a rock drill, and is known as the Park "pusher." This is attached at the head end, and its only function is to pull the table up. At the end of the stroke, which is about 6 in., the air or steam is exhausted and the table falls back by its own weight and strikes against a solidly built bumper, near the upper end.

The rock as it comes from the mine is fed from a bin to the upper part of the table, which is covered for its entire length by a steel plate ¼ in. thick. Just below the feed, there is a screen, 4 ft. long, perforated with ¾-in. holes, which takes off all the fines. Beneath this screen is another, perforated with -in. holes, which separates the smaller rock. These screens lead into separate bins. The oversize from the ¾-in. screen passes down the table till it comes to a depression where it is thoroughly washed by a spray. The spray consists of an iron pipe with two rows of small holes, drilled at an angle with the line of the pipe, the angle being opposite for the two rows. This gives a cross spray which thoroughly washes the rock. The water and slimes are carried off, through a screen, to a tank where the slimes are allowed to settle.

As the rock passes down the table from this point, the high-grade and second-class ore are sorted out by hand, while the waste is discharged over the end into a bin. The table bumps about 60 times per min., and when worked to its capacity can handle about 75 tons per day. Usually it takes from five to seven men to do the picking, depending on the richness of the ore. These tables have been in operation at the various shafts of the Nipissing for some time, and are also being used in several other mines.



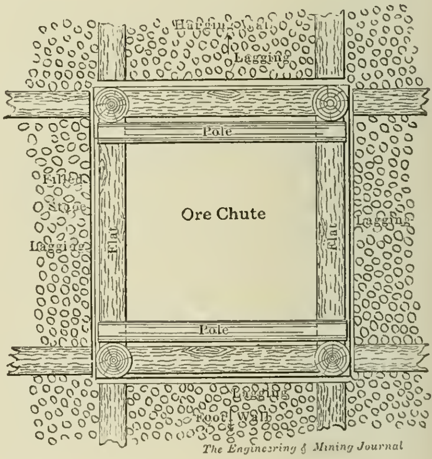
Side View of Sorting Table at Cobalt

Bulkheaded Ore Chutes

Ore chutes are carried up through stopes, in many of the mines on the Mother Lode of California, by simply lagging around timber sets. No lining is put inside of the square-set timbers in the chute. This construction serves well enough unless a rock happens to carry away one of the exposed horizontal timbers in the passage way, in which case the light lagging is quickly torn out, letting in waste and often resulting in losing the chute. The lagging may not hold the waste anyhow if the walls are heavy or timber sets swing.

A type of ore chute used in the South Eureka, near Sutter Creek, Cal., is far better for heavy ground and large stopes where the pressure from waste filling is liable to be considerable. The accompanying drawing shows how the chutes are built up. Stull timbers flattened off on two sides like ties, "flats," are first fitted in (across the vein) between the posts. Across the ends of these flats are then laid poles, or round timbers, with their ends extending to the outside of the flats. The poles are set inside of and tangent to the posts. Alternate flats and poles are then laid as the stope progresses. The lagging is not put on until filling commences, as ore can be shoveled between the bulkheading into the chute.

The advantage of this type of chute is in its durability and strengthening effect on the stope timbering. The lining is, of course, strong and wears in most cases as long as the stope lasts. Also broken timbers can be readily replaced without danger of the chute caving. Then too the flats reinforce the posts of the chute set and prevent adjoining sets from swinging. Thus instead of being as usual a weak place in the stope timbering, such a chute acts as a reinforcement.



Plan of Bulkheaded Ore Chute

Barrels as Zinc Boxes

Cheap and efficient vats for the precipitation of gold from cyanide solution with zinc shavings can be made from empty whiskey barrels. These are, unfortunately, only too easy to be had around most mining camps. To make the barrels ready for this use it is only necessary to saw them off about 3 in. from the top and bore a hole for a connecting pipe at a point about an inch below the rim.

A satisfactory arrangement is to have three lines of barrels arranged so that the solution is divided and passes through three barrels before being discharged. A screen false bottom should be put in about half way the depth of each barrel. The solution runs off the top of one barrel, passing through an iron pipe, usually 1- or 2-in. diameter, to the next barrel into which the pipe is turned down, terminating just above the screen. Solution passing off the top of this barrel is piped into the next in the same manner. Short zinc and precipitate fall through the screen and accumulate in the bottom of the barrel.

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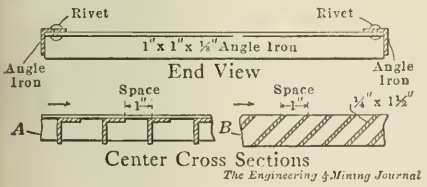
*Mining engineer, Cobalt, Ont.

A series of such precipitating barrels are used in the Florence mill, at Goldfield, Nev. It is claimed that three lines of barrels are as efficient as two boxes, each having eight 14-in. compartments. At the Florence mill, the head solution passing to the precipitating barrels assays from $2.80 to $4, the tails only 24c. per ton.

Gold Saving Tables on California Dredges

The problem on a dredge is to recover the gold from a great quantity of gravel and soil in a short time and in a much restricted space. An idea of the quantity of material passing over the gold-saving tables of a modern dredge can be gathered by considering the following figures: The Natoma No. 1 dredge, operating near Folsom, Cal., on the American river, has 13½ cu.ft. buckets, and, if run at full theoretical capacity, would handle 388,800 cu.ft. of gravel per day. The combined area of the gold-saving tables and sluices on this boat is 3840 sq.ft., or, for every square foot of surface, 100 cu.ft. of material would pass through the dredge. Although this figure is exaggerated, as the dredge does not dig continuously throughout the day and all stones over ⅝-in. size are screened out, it is a fact that when the dredge is digging at full speed, 20 of the huge 13½-cu.ft. buckets dump their load into the screen every minute.



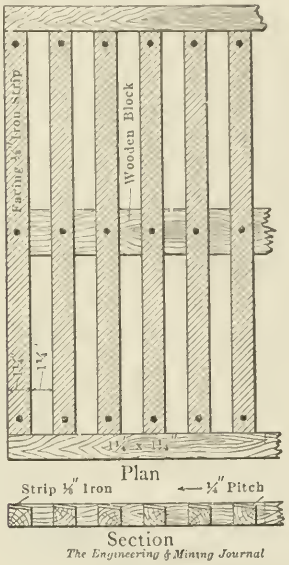
The Engineering & Mining Journal

BUILT-UP IRON RIFFLES

HUNGARIAN RIFFLE IN GENERAL USE

Nearly all of the dredges operating in the California dredgefields are using some modification of the Hungarian riffle. The form most popular in California is shown in an accompanying drawing. It is of the usual design made of 1¼x1¼-in. wooden bars spaced at 1¼-in. intervals. Such tables are usually from 2 to 5 ft. wide, and of convenient length for removal and stacking at clean-up time. As shown, blocks are used between the rods to keep them uniformly spaced. The special feature of the design of the riffle shown is in giving the top of each rod a ¼-in. pitch and facing the top with ⅛-in. iron strips. Beveling the top of the riffles minimizes swirling or eddying currents which carry away fine gold, and thus tends to better the gold recovery. The facing on the riffles increases their life.

Another type of Hungarian riffle, which is quite popular on the boats of the Natomas Consolidated of California is similar, but built of 1x1x¼-in. angle irons. The angles are laid crosswise of the tables as in the ordinary wooden type, and are spaced at 1-in. intervals. They are riveted at either end to angles forming the sides of the table. This construction *A* is shown in end view and section in an accompanying drawing of built-up, iron riffles. The cross angles are sometimes set at a slight inclination so as to present a pitched top to reduce swirling and wear, as in the wooden style previously described. In these tables there is more room for "dead" water between the riffles than with those with solid riffles. The recovery is probably slightly bettered on this account. The blocks between the crossbars are unnecessary with this type, so that the area open to settlement is slightly greater than in the other style. A table made of 1x1x¼-in. angles is stiff and may be handled without any particular care.



The Engineering & Mining Journal

IRON-FACED HUNGARIAN RIFFLES

IMPROVED IRON TABLES

Still another type of built-up iron table has lately been introduced on some of the Folsom Division boats of the Natomas company by J. H. Miles, superintendent of that division. The cross-section *B* of one of these tables is shown in the drawing. Instead of cross bars of wood or angle iron, strips of ¼x1½-in. iron, set at an inclination as shown are used. The current passes with the upward inclination of the riffles. These are bent at the ends and riveted to side strips, the rivets thus being protected from wear. This is a decided advantage over the angle-iron riffle tables, where rivets holding the cross angles to those along the sides of the tables are placed vertically and exposed to the scouring action of the gravel. When the heads of rivets in the latter construction become worn the tables come apart.

There is a minimum of solid non-effective area to this last type of gold-saving table, the effective area being 80 per cent. greater than with the angle-iron or solid strips. These tables are at present on trial at Natoma. The only other type of gold-saving table in general use in California is that made of expanded metal placed over cocoa matting. The Risdon boats employ this type of table.

American Record in Tunnel Driving

During May, 1910, the Laramie-Poudre tunnel was driven from two headings a distance of 825 ft. The heading from the west end was advanced 332 ft., while the heading from the east portal was advanced a distance of 513 ft., thus breaking all American records for driving a single heading in a calendar month. In January, 1909, the Cripple Creek drainage tunnel was driven 435 ft., and in January, 1908, one of the headings in the Gunnison tunnel made 449 ft., and in October, 1908, the Elizabeth tunnel, near Los Angeles, was driven 466 feet.

TUNNEL THROUGH HARD ROCK

The rock in the Cripple Creek drainage tunnel and in the Laramie tunnel is much the same, being hard, firm granite in each; whereas in the Gunnison and the Elizabeth the rock was very much softer and in the latter quite a large proportion of it was shale. The rock through which the Laramine tunnel is being run is so hard that 27 holes have to be drilled in the face of each heading and loaded with the most powerful modern explosives to break it successfully.

The men work under the bonus system and receive an extra amount of pay for each foot driven over 250 in each calendar month and on such a record-breaking run as that of last month this bonus amounts to quite a sum, consequently both workmen and the contractor, James A. McIlwee, are superlatively happy.

OVAL SHAPED TUNNEL CARRIED

The Laramie tunnel is driven 7 ft. 6 in. high and 9 ft. 6 in. wide and is nearly oval in cross-section thus obviating the necessity of taking out any corners and affording every possible facility for rapid advance. In fact this was what the consulting engineer of the tunnel, D. W. Brunton, had in view in using this particular section. An advantage was also gained as the undertaking was entirely new and no makeshift machinery had to be employed, so that in designing the big hydroelectric power plant there was nothing to be considered except actual conditions, to which every part of the plant was made to conform.

The rate of driving in the Laramie-Poudre tunnel, as given above, is from the official surveys and measurements of Charles R. Hedke, chief engineer for the Laramie-Poudre Company, so that there can be no question as to the distance driven during the month. Making 513 ft. in a single heading in a calendar month is quite an achievement, but when the difficulties under which the work from the western end is carried on are considered, 332 ft. for that section is almost as creditable.

The Laramie tunnel is driven on a grade of 1.7 per cent., sloping from the west toward the east, and consequently the material removed from the west heading has to be hauled upgrade, whereas at the east heading the loaded cars run downgrade and only empty cars have to be hauled up. In addition to this the west-end workings do not run directly out into the open air on grade but are connected with the surface by a 200-ft. incline. This was done to avoid about 1400 ft., of water-bearing rock and wash which, had it been opened up, would have drained directly down the tunnel into the heading. Even with this precaution some water seeps in and has to be pumped. When the difficulties of pumping, uphill haulage, and hoisting through an incline are considered, it will be seen that the 332 ft. driven on the west end is a most creditable performance.

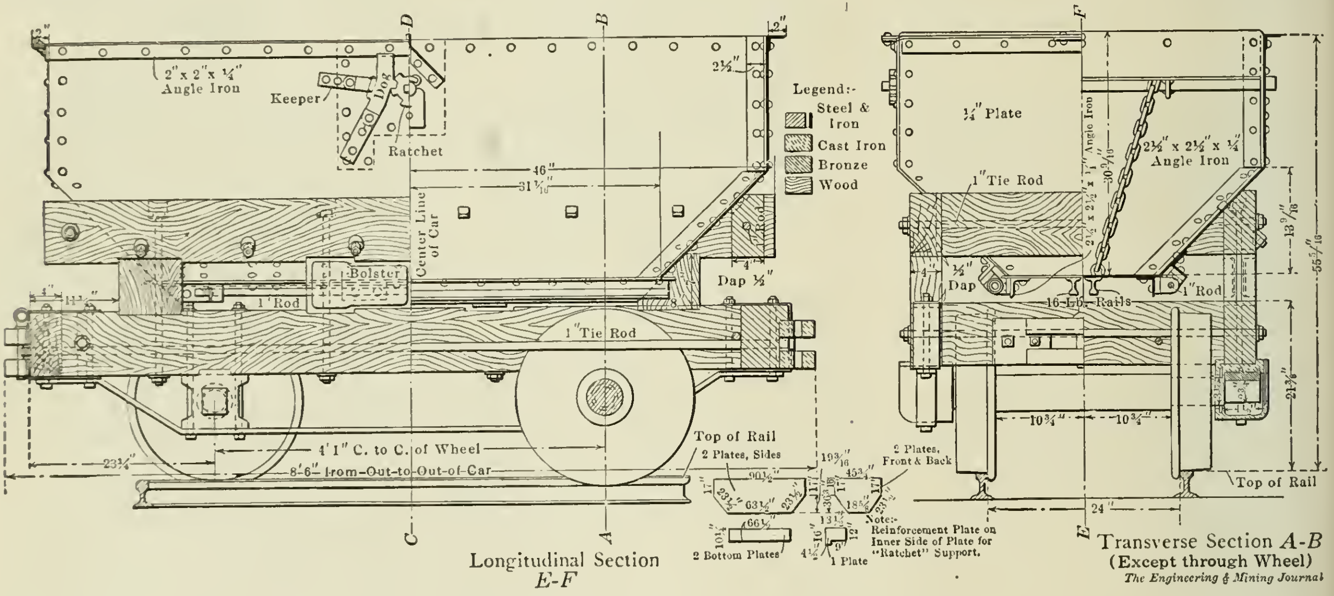
Coeur d' Alene Mine Car

In an accompanying drawing is shown a type of mine car used in the Cœur d'Alene district of Idaho. This particular car is used at the Morning mine, of the Federal Mining and Smelting, at Mullan, and is quite similar to the Bunker Hill & Sullivan cars. The capacity of the car is 68.3 cu.ft., and it is used in the long adit tunnels in which ore from the mine is conveyed to the mill or shipping point. The advantages of this type of car are in its strength and durability, with which is combined simple structural details and rapidity of operation.

The body of the car is made of ¼-in. steel plate, reinforced with angle iron. The patterns of the plates forming the body of the car are shown in the drawing. This body, with sloping bottoms, as shown, rests in a cradle made of 4x8-in. wooden beams set on end, and supported from the axles. The car axles are heavy, being 3½ in. in diameter, turned to 2¾ in. at the bearings. The wheels are 20 in. in diameter, running on a 24-in. track. The overall dimensions of the car are: Width, 51¼ in.; hight, 55 5/16 in.; length, 90½ inches.

The bottom of the body of the car consists of two sections of steel plate hinged along the sides of the sloping bottom of the body of the car. Each flap is weighted along its center with 16-lb. rails and supported by chains from a winding shaft across the body of the car. The car is dumped by simply loosening the ratchet gear controlling this winding shaft. The weight of the ore and the rails on the bottom doors serve to swing them open. A few turns of the winding shaft suffices to close the car again. A handle is used for this purpose and kept at the point at which the cars are to be dumped. One man dumps all the cars of a train.

The winding axle terminates at one end in a ratchet wheel. A dog engages this ratchet and the dog is locked in place by a keeper. The dog and keeper are each pivoted to the body of the car. To dump the car, the keeper is knocked up so as to disengage the dog from the ratchet wheel. The details of this dump mechanism are shown in an accompanying drawing. One man is able to dump 15 cars of this type in about three minutes.



Ore Car Used in Main Tunnel of Morning Mine, Idaho

Reporting Concentration Extraction

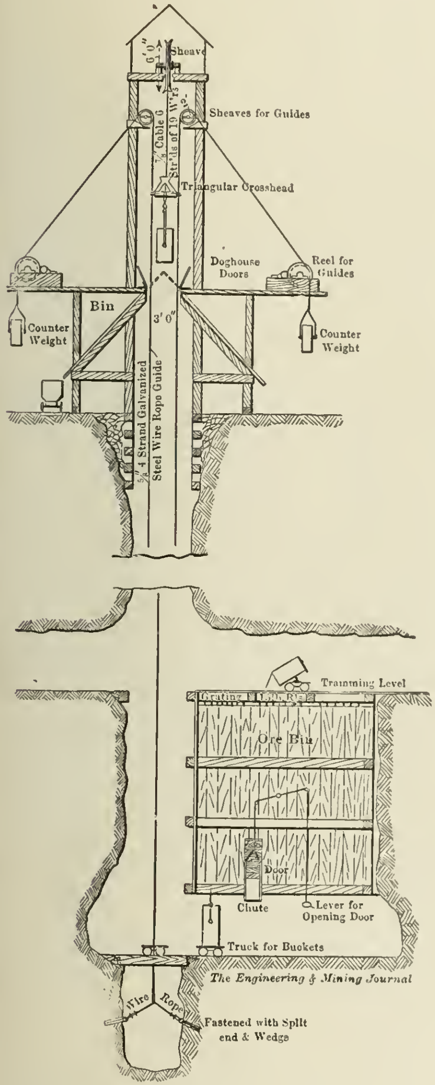
In the discussion of Walter McDermott's paper on "The Elements of Slime Concentration," W. S. Welton emphasizes the fact that it will be necessary to ascertain what the actual losses in slime concentration amount to under the present conditions. Many managers of mines, he remarks, do not appear to be able to furnish the information; at least, do not publish any statements of the extractions they make, although in the annual reports they make reference to their low labor costs in concentrating work.

This appears to arise from the circumstance that it has not been customary to publish details of extraction, and consequently the shareholders take no interest in the matter and a manager would therefore get little credit for having increased the returns from his mine by perhaps 10 or more per cent, through improvements in concentration; whereas, if he reduced his labor cost the result would be more apparent. In other words, the inducements held out to increase concentration extractions do not seem so strong as the tendency to improve in other departments where the results may appear in a more spectacular light.

Rapid Hoisting with Wire Guide

By Hugh C. Watson *

A remarkable feat of hoisting is the one now in operation at La Ojuela mine in the State of Durango, Mexico. By means of wire guides and an unbalanced, first-motion hoist, a bucket holding about 1800 lb. of ore is filled, hoisted, dumped and returned to the bottom of a 1700-ft. shaft in 2 min. 10 sec. This is not record time, but ordinary hoisting speed. It has been done in 2 min. flat.



Hoisting Arrangement with Wire Guides

Advantages of Wire Guides

Wire-rope guides are not the best that can be used, but they have certain advantages which will appeal to some people, especially when working a mine on a prospecting basis, where first cost is one of the essential features. The principal advantages are small cost, ease and speed with which they can be installed and shifted, that they will work in any sort of a vertical shaft, and, considering the speed attained at Ojuela, they are of no mean capacity. The item of six men seems to be an excess of labor, but it does not follow that less men could not be used. The number of men and many of the details will naturally depend upon the kind of mine and the locality.

Of the six men used, one is the hoist man, two are topmen and three are fillers. The topmen do nothing but close the doors, dump the bucket and open the doors for the down trip. Of the three men at the bottom of the shaft, one sits above the ore-bin door with a bar to see that the door does not get stopped up. One stands directly in the shaft to hook and unhook the buckets as they are pushed to him by the third man. The empty bucket is caught on a low truck set to receive it between the guides. The man in the shaft unhooks it from the crosshead, the third man gives his full bucket a push that shoves the empty bucket and its truck to the far side of the shaft, the shaft man then hooks the full bucket to the crosshead and gives the signal to hoist. The bucket now at the bottom is filled while the other bucket is being hoisted and dumped.

Details of Construction

The bucket itself is of the ordinary type attached to the bail slightly below center, and kept upright by means of a link and ear. The doors on the shaft are of the type known locally as "doghouse." They are simply two doors which, when closed, form a gable over the mouth of the shaft on which the ore slides into a bin on either side. The guides are 5/8-in. four-strand, galvanized-steel, wire rope. They are attached at the bottom to a cable that is stretched across the shaft below the track level. This cross cable is anchored on each side of the shaft to a 1½x18-in. eye-bolt, which has a split point and wedge to keep it fixed solidly.

On top, these guides pass over two small sheaves and down to a drum that serves to hold an excess of rope and is also fitted with a counterweight, a crank handle and dog, so that the guides can be easily and rapidly tightened. This is only one of the many ways that these guides can be fastened; in fact, on this same mine there are at the present time seven shafts that have wire guides, and each one has its own system, each taking advantage of something peculiar in that shaft.

The crosshead is made in the shape of a triangle, of 6x6-in. pine, and at the lower side two lead guide blocks are used of such a form as to be easily changed and solidly attached to the triangle. The guides last indefinitely, but the guide blocks have to be constantly replaced. On shaft No. 4, which hoists about 200 tons daily, the guide blocks last four days. When lowering men, four accommodate themselves on the triangle, four stand on the edge of the bucket and two, sometimes three, climb into the bucket. The principal disadvantage of this method of hoisting is that it offers absolutely no way of attaching safety devices, and that it takes a larger shaft for the same size of bucket. The principal advantages, other than those already mentioned, are that no timber is required in the shaft, the system can be used either with the balanced or unbalanced method of hoisting, and that by this method a bucket can be passed through a cave or a big stope, where it would be costly to put timbers. This last is the principal reason for its adoption at Ojuela.

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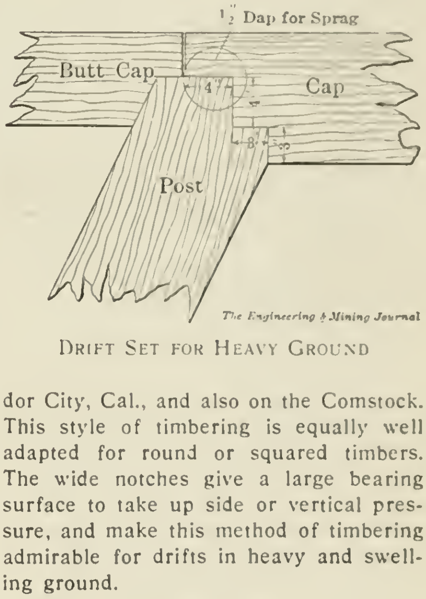
*Mining engineer, Ojuela, Mapimi, Durango, Mex.

Framing for Tunnel Sets

One of the most satisfactory styles of framing tunnel-set timbers is shown in the accompanying sketch. This style is used in the Bunker Hill mine near Amador City, Cal., and also on the Comstock. This style of timbering is equally well adapted for round or squared timbers. The wide notches give a large bearing surface to take up side or vertical pressure, and make this method of timbering admirable for drifts in heavy and swelling ground.



Drift Set for Heavy Ground

Cost of Assays at the Guanajuato Consolidated Laboratory

The annual report of the Guanajuato Consolidated Mining and Milling Company gives the following figures as the cost of maintaining and operating its assay office: Labor, 5512 pesos; material and supplies, 1203 pesos; crucibles and bone ash, 819 pesos; chemicals, 1905 pesos; charcoal, 1459 pesos; total, 10,899 pesos. During the year, 40,485 determinations were made, of which 25,287 were in connection with the cyanide plant. The average cost per determination was 0.269 peso. This does not include interest or depreciation on the cost of the laboratory and its equipment.

Annual Report on Production of Butte Mining Companies

Under the law of Montana, every person or corporation engaged in mining, must between June 1 and 10, each year, prepare a statement showing number of tons extracted during the year; gross yield or value; actual cost of extracting same from mine; actual cost of transportation to place of reduction or sale; actual cost of reduction or sale, and the net proceeds. This statement must be verified by the oath of the operator, or managing agent of the corporation owning the mine, and must be filed with the county assessor of the county as a basis of taxation. The North Butte, the Red Metal and the several subsidiary companies of the Amalgamated have recently filed their statements which show that the net proceeds from June, 1909, to June, 1910, exceed those of the previous year by $326,090. The accompanying table embodies the reports of nine of the large companies, also the net earnings for 1908 by way of comparison.

REPORT OF BUTTE MINES FOR 1909.

	Anaconda.	Boston & Montana.	Butte & Boston.	North Butte.	Trenton.	Washoe.	Parrott.	Red Metal-Coalition.	Alice.
Tons of ore extracted................	1,372,402	1,291,346	377,106	430,124	150,867	203,508	88,416	547,463	1,415
Gross proceeds........................	$11,158,517	$13,125,551	$3,707,264	$4,217,604	$1,334,224	$1,549,640	$652,093	$4,839,126	$17,320
Cost of mining........................	5,558,527	4,263,538	1,265,946	1,612,921	649,896	785,728	532,962	2,007,771	20,701
Freight on ore	165,973	813,639	72,669	51,614	18,328	24,516	12,164	101,355	......
Cost of reduction....................	2,845,861	3,579,893	948,924	1,798,407	301,692	416,290	180,505	2,034,616	......
Cost of marketing....................	1,273,294	1,001,644	380,453	....	129,214	151,000	74,958	....	......
Total cost	9,843,657	10,168,761	2,667,994	3,462,943	1,099,132	1,377,535	800,589	4,143,743	......
Net earnings (1909)..................	1,314,860	2,956,792	1,039,270	754,661	235,092	172,105	def. 148,496	695,382	def. 3,381
Net earnings (1908)..................	2,079,871	1,404,783	646,198	1,839,442	136,898	153,444	def. 12,221	....	......

Tennessee Geological Survey

The Tennessee legislature, at its last session, provided for the establishment of a geological survey to begin operations May 1, 1910. The bill provided for a State Geological Commission, composed of the governor, the commissioner of agriculture, the chief mine inspector, the president of the University of Tennessee, he chancellor of Vanderbilt University, and the vice-chancellor of the University of the South. This commission held several meetings, and on March 16 elected, as State geologist, George H. Ashley, formerly of the U. S. Geological Survey, and as associate geologists, L. C. Glenn, of Vanderbilt University, and C. H. Gordon, of the University of Tennessee. The Survey began its work May 1, a temporary office being established in the Capitol Annex building, Nashville.

As the new survey is being deluged with requests for publications, it may be noted that to meet immediate needs the survey plans to publish circulars of information, giving briefly, a summary of he facts already known on the various resources of the State, and giving references to what has been published and how it can be obtained. But the preparation of these circulars will require time. The main publications of the survey will probably appear as bulletins to be issued as fast as work is completed.

Among the things with which the new department will concern itself may be mentioned: Coal, oil, gas, ores, fertilizers, building stones, road-making materials, clays, cement materials, sands, solid minerals and artesian waters, drainage of swamps, streams, and water powers and other natural resources.

Smelting in Bond

WASHINGTON CORRESPONDENCE

The Secretary of the Treasury has at length issued the new regulations governing smelting in bond. At the last moment, however, it was determined not to make known one of the principal matters upon which the department has been bending its energies during the winter—the percentage of wastage at the various plants—but to withhold this as a confidential matter of private business. The suggestion is heard that this determination, which was reached after the strongest representations had been made by the smelting concerns, was desired by them because of a fear that the facts, if made known, would afford ground for discontent because of the high rates of duty on refined metal, in the Payne-Aldrich tariff. It is stated in some quarters that Congress, in one or both Houses, will probably pass a resolution calling for full information from the Secretary of the Treasury with respect to the wastage allowance. Whether this can be done at the current session is, however, extremely doubtful, owing to the fact that adjournment is to occur so much earlier than had been anticipated. The topic will, however, recur next winter.

The text of the general portion of the regulations as now made known shows that the regulations in force under the old tariff for metals other than lead are substantially continued. For ore, and base bullion containing lead, variations have been necessary on account of the requirement of the new law that duty shall be paid on actual weight of lead produced, if it is not exported. Wherever possible the old regulations have been practically continued in force. The important point as to wastage allowance in smelting is to be determined separately in each case.

El Oro Mining and Railway Company, Ltd.

The report of the general manager of the El Oro company for the last six months shows favorable conditions obtaining in all the orebodies. From $8 to $30 ore is being taken from the lowest levels to which the mines have been carried. Exploitation has been going forward in all the orebodies opened, resulting in the development of ore ranging from $5.50 to $30 per ton.

The ventilation shaft made connection with the 1000-ft. level in January and is now down 1558 ft. The Somera incline, and the San Patricio shafts have been carried farther down, the Somera reaching the 1300-ft. level.

On the 100-ft. level of the Descubridora vein, the drift north of the Consuelo shaft ran into stoped ground. The South drift has been extended to a distance of 870 ft., but the last 150 ft. has shown the vein poor. Stoping has been commenced both north and south of the Consuelo shaft, showing the vein to be 2½ to 3 ft. wide, averaging $10 per ton.

The 340-ft. level has been further opened for 450 ft. north of the Providencia shaft, revealing the vein partially stoped, yet disclosing considerable ore of good grade. South of the Consuelo shaft, the drift has been advanced 170 ft. where the ground appears intact. Here the vein is 3 ft. wide, and while the drift at present shows low-grade ore, it is being continued to reach a point underneath the good shoot on the 100-ft. level. The level now has a total length of 1660 ft. Stoping is being carried on north and south of the Providencia shaft over widths running from 2 to 5 ft., yielding ore averaging $10 in gold and in many cases, fair silver contents.

LOWER LEVELS

The 900-ft. level on the Branch vein has been opened to a total length of 500 ft. and shows good results in its southern extension, where $30 ore has been exposed for over a width of 10 ft. In sections "B" and "D" of the 1000-ft. level of this vein, a small amount of stoping has shown the width to increase to 15 ft., with the ore running from $15 to $20, but like the level above, it appears to diminish in width and value as the northern end of section "A" is neared.

In the main San Rafael vein on the 1150-ft. level an overhead drift has been driven for 80 ft., averaging $8 over a width of 5 feet.

In both the Northern and Southern orebodies, new stopes have been opened yielding good returns. Much development work has been done on the Somera claim. The ore runs from $6 to $20 and varies in width from 4 to 18 feet. No. 4 vein in this claim has been opened for a length of 600 feet. showing widths of 5 to 8 fet. It is of good appearance and while the gold contents have continued low, the silver is maintaining its higher average, and this region gives promise of considerable low-grade milling ore.

The report of the secretary for the year ending June 30, 1910, indicates a total profit at the disposal of the directors of approximately £317,798, of which sum the directors propose to expend £234,584 for income tax, improvements, depreciation and dividends. Approximately £83,214 will be carried forward to the credit of 1910-11. Dividend No. 19 will be posted June 28, declaring 1s. 6d. (0.364c.) per share, free of income tax.

The Utah Copper Railroad

In notifying stockholders of the Utah Copper Company of the proposed bond issue amounting to $2,500,000 for the construction of a railroad between Bingham and Garfield, President C. M. MacNeill said in part:

The work of enlargement is progressing at both the Magna and Arthur plants, which will give to them a total capacity of approximately 18,000 tons of ore per day and provision must be made for transportation.

Prior to the construction of the Magna plant, the company entered into a contract with the Denver & Rio Grande Railroad Company for transporting its ores up to a maximum of 6000 tons per day. The transportation service during a large portion of the time has been so inefficient that it has resulted in largely reduced earnings during frequent and extended periods and Utah directors some time ago determined that it would be unsafe to rely upon the facilities afforded by the railroad to transport the greatly increased tonnage. The capacity of these plants when enlarged will be approximately 12,000 tons per day in excess of what the Denver & Rio Grande company is under contract to transport.

BINGHAM & GARFIELD RAILROAD TO HAVE SHORTER HAUL

A railroad corporation has been organized under Utah laws, known as the Bingham & Garfield Railway Company, all the stock of which, save qualifying shares of directors, is owned by the Utah Copper Company. The Bingham & Garfield will issue $2,500,000 six per cent. 10-year sinking-fund gold bonds, payment being guaranteed by the Utah Copper Company. It is proposed to offer the entire issue for subscription at par pro rata to shareholders of Utah Copper Company. The railroad will be 17 miles in length as compared with 28 miles, the present haul.

Mineral Production of California

State mineralogist Lewis E. Aubury has sent to the State printer's office at Sacramento the preliminary statistical mineral returns for California for 1909, exclusive of the gold, silver and platinum figures which are being collected by the United States Census Bureau. Leaving the gold and silver out, the total amount is $61,324,025. The addition of the precious metals will easily bring the aggregate of mineral production for California, during 1909, up to $80,000,000 and probably more. The advance in the total annual value of mineral production as compared with 1908, will be at least $14,000,000. The statistics of the last three years, including actual returns and also the returns and the rough estimate of the precious metals for 1909, are as follows: 1907, $55,697,949; 1908, $66,363,198; and 1909, $80,000,000. The figures indicate a growth in annual mineral production in the State of California, since 1907, of $25,000,000, which is sufficient to attract wide attention.

CALIFORNIA MINERAL PRODUCTION IN 1909.*

	Quantity.	Value.
Asbestos	65 tons	$6,500
Asphalt	136,664 tons	1,707,159
Bituminous rock	34,123 tons	116,436
Borax	33,257,000 lb.	1,163,960
Brick	333,846 M.	3,059,929
Cement	3,770,504 bbl.	4,951,210
Chrome	436 tons	5,309
Clay (pottery)	299,424 tons	460,697
Coal	49,389 tons	216,913
Copper	64,841,654 lb.	8,283,202
Fullers earth	459 tons	7,385
Gems	....	189,010
Granite	358,008 cu.ft.	376,834
Gypsum	30,700 tons	138,176
Infusorial earth	500 tons	3,500
Iron ore	180 tons	171
Lead	2,685,477 lb.	141,897
Pime	520,752 bbl.	577,824
Limestone	337,676 tons	419,921
Macadam	3,567,120 tons	1,636,125
Magnesite	7,942 tons	62,588
Manganese	3 tons	75
Marble	79,600 cu.ft.	238,100
Mineral paint	350 tons	2,325
Mineral water	2,419,834 gal.	462,488
Natural gas	1,147,502 M.cu.ft.	616,447
Paving blocks	4,503 M.	199,803
Pyrites	457,867 tons	1,389,802
Petroleum	58,191,723 bbl.	32,398,187
Quicksilver	16,174 flasks	771,657
Rubble	1,948,658 tons	1,063,809
Salt	124,110 tons	339,671
Sand (glass)	12,259 tons	25,517
Sandstone	79,240 cu.ft.	37,032
Slate	6,961 squares	45,660
Soapstone	33 tons	280
Soda	7,712 tons	11,593
Tungsten	....	190,500
Total value	....	$61,324,025

*Precious metals not included.

A great part of the advance of the year 1909 over 1908 may be attributed to the increase in the production and average price of petroleum in California. The same factor was active in causing a great increase in the figures for 1908 as compared with those for 1907, when gold was first distanced by petroleum in value as a product of this State.

The total output of petroleum in 1909 was 58,191,723 barrels, valued at $32,398,187. This is greater by about $13,000,000 than the total for gold and silver in the year 1908. California was the first of the States in the Union in 1908 in petroleum production. It is now far in the lead.

The preliminary figures of the State's mineral production for 1909, excluding the precious metals, are given in the accompanying table:

On the Reading of Technical Journals

Dr. Charles Sumner Howe, president of Case School of Applied Science, delivered the commencement address, June 1, 1910, to the graduating class of the School of Mines and Metallurgy, at Rolla, Mo. Among other things he made the following pertinent remarks respecting the use to be made of technical papers:

"The successful engineering graduate will subscribe for the leading technical magazines in his line of work, and he will not only subscribe for them—he will read them, in order that he may keep posted in regard to what men in his profession are doing, not only from the engineering standpoint, but from the manufacturing standpoint as well. Too many technical graduates never take a technical journal. They say they do not need it for the work they are doing, which is probably true, and if they continue in that frame of mind, the probability is, they will never need to take the journals, because they will not rise to positions of high enough responsibility to make it necessary. The successful man—the man who is doing all that is in him to do—must know what other men are doing, and he must put this knowledge to use in the work which he does from day to day.

"I believe every engineering graduate should keep a card catalog of articles and books which he reads, and these cards should give the information under so many different heads that it surely can be found when needed. Almost every man has at some time in his career wanted very much some article which he remembers having read but cannot place. Usually, this occurs to men every week or every day.

"Knowledge is valuable only as it can be used. No one can remember everything which he has read; no one can know all there is to be known; but every engineering graduate should know where to go to find the information necessary in the successful pursuit of his profession. This means knowing how to search encyclopedias, magazines, books, etc., and I think the practice of keeping a card catalog of the important things read will pay for itself many times over. Do not be afraid of a little extra work of this kind."

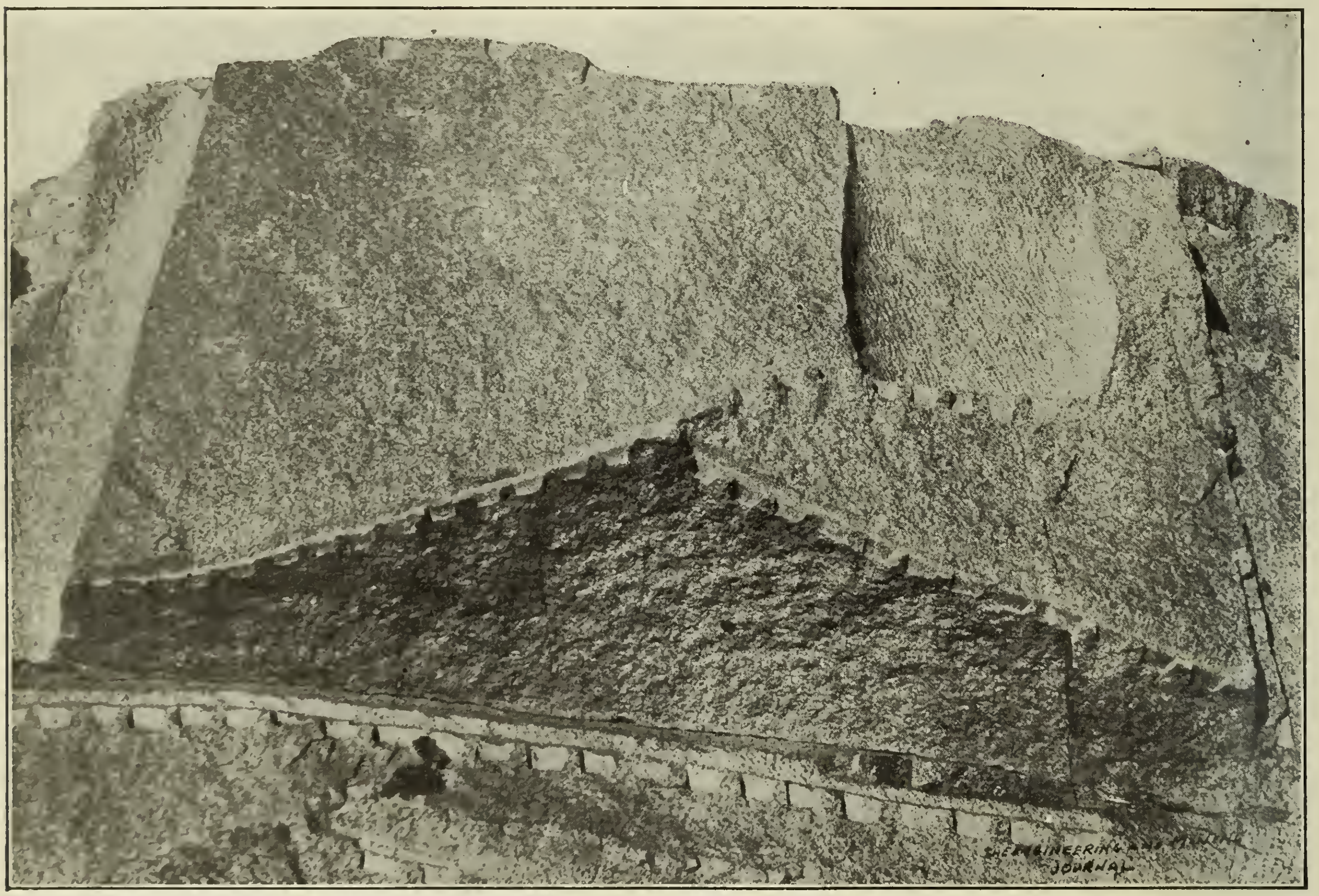
Pharaoh's Granite Quarry

Pharoah's quarry, from which the granite was secured for the pyramids, temples and obelisks, is about one mile from the Nile river, near the great Assouan dam, Egypt. The quarry is approximately 300 ft. higher than the river, and it is from here that immense blocks of granite were transported to the river and then floated down the Nile, nearly 600 miles, to be used in the pyramids. The center of these structures is composed of limestone, which was obtained from quarries across the Nile, only a short distance from the pyramids. The granite forms only the outer covering 5 to 10 ft. thick.

The photograph shown here was taken by J. W. Beardsley, of the J. G. White Engineering Company, New York. Mr. Beardsley was chief engineer public works in the Philippines, and later appointed by the United States Government to investigate the irrigation system in Egypt. It was while on this mission that he visited the ancient quarry and secured the data here given. The photograph shows the granite in place in the ancient quarry in which the tool marks have been preserved. The rock has been protected from the erosive effect of the drifting sand during the past centuries by being buried beneath sand banks. There is no frost or rain in this section and as a result the old tool marks show today with remarkable clearness.

A study of these old quarries suggests as a working theory that the old quarry men thoroughly understood the feather and wedge methods of blocking out stone and used it successfully. Another theory held by the historians is that only wooden wedges were used, and that when these were driven in water was poured on them, which caused the wood to swell and thus break the rock.

The drill holes in the lower row, shown in the illustration, are from 6½ to 8 in. long at the top and 2 to 2¼ in. wide. The corresponding dimensions at the bottom are about one inch less. The depth of these holes is 5 to 6 in. All the corners are rounded. It is a probable conjecture that the Egyptians' best metal for tools was bronze, and how they actually quarried and dressed these blocks of hard, red granite, some of which weighed 1000 tons, and transported them, is an interesting query. In placing these blocks in the pyramids, all the faces were dressed so as to make perfect joints. No small interstices were left to be filled with spalls, and there is no evidence of mortar being used. Many of the joints, as they stand today, will not permit the entrance of a thin cardboard.



PHARAOH'S GRANITE QUARRY, NEAR ASSOUAN, EGYPT, IN WHICH TOOL MARKS HAVE BEEN PRESERVED

Tungsten Ore in Washington

The Germania Mining Company, operating tungsten mines in the neighborhood of the old Deer Trail silver mine north of the Spokane Indian reservation in Washington, recovers the wolframite by milling and ships the concentrates to Germany.

The ore is treated satisfactorily in a mill using four jigs, a hydraulic classifier and three tables. The concentrates assay (for the coarser grades of jig product) over 73 per cent tungsten trioxide, while the lowest grades of table concentrates assay a little over 56 per cent. The major portion of the ore is recovered in the form of the high-grade concentrates.

The milling facilities have been largely increased and the company expects an output of 60 tons for the next sixty days. The company reports a ready market for its ores among its German customers from whom it can secure better returns than elsewhere.

At the Angelo mill of the East Rand Proprietary Mines, Ltd., 10 head of stamps are crushing ore through wire screens having only nine openings per square inch.

Copper Converters with Basic Lining

Magnesite Brick Lining Costs Less Than 50c. per Ton of Copper. Large Charges Required. Silicious Ore Used for Flux. Many Patents Ineffective

BY REDICK R. MOORE*

The first proposal to utilize basic linings for converters was made by John Hollway[1] and discussed by Mr. Thomas, the inventor of the basic-steel converting process, in 1879.

Experiments with Basic Lining

The first successful basic lining for converting was used by Knudsen.[2] He devoted his efforts to ore smelting by converting, and subsequently converting the matte formed in the same vessel or another. Keller[3] tried a magnesite-lined shell at the Parrot smeltery in 1890. A number of other metallurgists have made more or less successful attempts regarding which nothing was published. Heywood[4] has given his experience at the Pittsmont works at Butte with the Baggaley pyritic converting furnace, but the particularly valuable use of the apparatus was lost sight of in a multitude of doubtful claims and in badly designed apparatus, apparently built for the purpose of securing patents.

Peirce and Smith Converter

Messrs. Peirce and Smith tried the basic lining at Baltimore, and after a great deal of experimenting made it successful for converting copper mattes and producing blister copper. By improved design and careful operation, they brought the costs of converting by this method well below the costs resulting from the use of acid lining. The design of their converter has been shown by Vail,[5] but I will give a few further details of construction.

The vessel shown in Figs. 2, 4 and 6 without the bracket 20 (p. 564) is the one in use at Garfield and Perth Amboy. It is 23 ft. long and 10 ft. inside diameter. The shell is made of ¾-in. steel plates. It is open at the top and secured with tie rods. The ends are of ¼-in. plates. There are thirty-two 1¼-in. cast-iron tuyeres, each with its separate improved Dyblie valve and flexible hose connection to the air main. It is surrounded by three heavy flange rings which rest on the trunnion wheels. The wheels are set on sliding bases tied together by heavy bolts, so that they may be regulated to always carry their part of the load which may amount to over 100 tons when full of matte.

The circular throat is placed at one end. It is about 40 in. in diameter and extends about 30 in. above the top of the arch. It is made of sheet or cast iron and lined with clay or magnesite brick, according to circumstances. Clay is best when blowing a matte that tends to form accretions in the throat, and magnesite brick when the tendency is to burn out the throat. The latter tendency is usually exhibited by leady copper mattes. Originally all of the converters were designed with two other openings to admit separate charging of matte and silica, while the converter was blowing. This practice has been abandoned. Matte and silicious ore are charged through the throat as in acid-converter practice.

Tap Holes in the Peirce and Smith Converter

There is also an opening in the side opposite the tuyeres for the removal of slag and metal. This opening, called the breast, is closed with clay and magnesite brick. When skimming slag, an opening about 3 in. in diameter is made in the top of the breast, and when pouring copper, the whole breast is removed to allow the pouring of all the copper without turning the converter too far. There is also an opening provided in the end for the admission of an oil burner, and two small openings in the side opposite the tuyeres for the purpose of inspecting them or making temporary repairs. These openings are all kept closed with clay when the converter is in operation. If there is any delay, or for any reason the copper cools down too much to pour, the oil burner is brought into service and the desired temperature maintained. It is also used in heating up a new lining or an old lining after repairs, although a coke fire will answer equally as well.

Converter Lining

Inside the lining the oval opening is about 6 ft. 3 in. high by 7 ft. 3 in. wide by 19 ft. 9 in. long. The lining is made of 9-in. magnesite bricks, except at the tuyeres where 18-in. magnesite brick or slabs are used. The bottom filling, varying from about 13½ in. thick in the middle to about 4 in. thick on the sides, 18 in. below the tuyere level, is made of ordinary firebrick. The magnesite bricks were all laid in dry magnesite powder, except in the vicinity of the tuyeres, where a mixture of magnesia and linseed oil was used, and between each fourth brick a liner of ¼-in. pine or poplar was placed to allow for expansion. These liners were not used with the tuyere brick. The bottom, after heating in a new lining, was seasoned with copper scale at Baltimore and Perth Amboy. At Garfield, blister copper from the other converters was run in and allowed to set. Too much allowance was made for expansion and some of the top bricks dropped and the absorption of copper was large. Pine boards were set in the ends next to the heads, presumably for an expansion cushion. After about three months' use, it was necessary to take out the ends of the converter and the boards were found to be slightly charred, but showed no evidence of any compression.

The Tuyeres

The tuyeres are 2-in. square castings with a head which is held tightly against the shell by a bolt and plate between each pair. A washer or gasket of thick lead is placed between the casting and the shell. There is a flange on the outer end, which is planed and bored to be bolted and fitted snugly to the tuyere valves. The castings are made with 1¼-in. hole cored out and extend through the lining.

Operation of Basic Lined Converters

The operation of basic-lined converters differs only in details from that of acid-lined ones, which has been described by Offerhaus. When heated up and seasoned, an initial charge of four or five ladles of matte (30 to 40 tons) is poured into the converter through the throat in the usual manner; about 6000 lb. of dried silicious ore are added, the blast turned on and the converter turned over until the tuyeres come well below the matte. A light blast pressure (about 5 lb.) is used for two or three minutes until the silica has spread, when the blast is increased to 6000 to 8000 cu.ft. per min., engine displacement. With 2 ft. of matte over the tuyeres this gives a blast pressure of 10 to 12 lb. per square inch.

Blowing is continued 30 to 45 minutes until the silica has been fluxed by the iron oxides. This is tested by punching a small hole through the breast and feeling of the charge with an iron rod or pipe. When the silica has been fluxed the converter is turned down, and the slag run off in the usual manner. At the same time another ladle of matte is charged. When small specks of matte show in the slag stream, pouring is stopped. Another charge of silicious ore is added and the charge is blown again in the same manner. This is kept up with smaller charges of silicious ore in the later additions, until the converter is filled to within 2 to 4 in. of the tuyeres with "white metal," or even "pimple metal," when the additions of matte and silica are discontinued and the charge blown to copper with or without interruption according to circumstances.

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*Consulting engineer, Mexican-American Holding and Improvement Company, 20 Broad Street, New York.

[1] *Journ.* Soc. Arts, Feb. 14, 1879.

[2] Eng. and Min. Journ., May 12, 1904.

[3] Peters' "Modern Copper Smelting."

[4] Eng. and Min. Journ., Mar. 24, 1906.

[5] Eng. and Min. Journ., Mar. 12, 1910.

[6] Eng. and Min. Journ., Vol. 86, p. 747.

TEST SAMPLES

The appearance of the flame is not used at Perth Amboy or Baltimore. Small ladle samples of the metal are taken during the blast to determine the condition of the matte or copper, and the amount of silica necessary to bring the matte to white metal is judged from their appearance and fracture. When blowing for copper with clean copper mattes the finish may be approximated by the appearance of the flame, but with leady and arsenical mattes this is difficult. With care and experience the copper may be brought to any desired "set."

AMOUNT OF BULLION PRODUCED

The amount of bullion produced will vary with the amount of accretions on the vessel, how nearly full it was when the final blow started, and the grade of the metal when "high." Straight copper matte can generally be blown from white metal to copper without stoppage.

With leady copper mattes and a baghouse connected, it was generally necessary to stop blowing every 30 minutes and add cold matte to keep the temperature down, as otherwise the tuyeres would be rapidly burned off and the magnesite in the vicinity of the tuyeres eroded. The temperature may also be decreased by reducing the volume of the blast and, conversely, increased by an increase in the volume of the blast, or by adding matte from the furnace settlers.

CHARACTER OF SLAG

The slag formed has the same general character as the converter slag from the acid-lined vessels, except that it is generally lower in silica to avoid the necessity of using so much silicious ore and resmelting an extra amount of slag in the furnaces. As the greater part of the slag is taken off before the matte is high it is generally lower in copper than acid-lining slags. Attempts to run slags very low in silica were disastrous in that magnetic oxide of iron, in excess of the amount that the slag would carry, was made and formed accretions in the vessel, which rapidly reduced its capacity. Attempts to smelt these accretions out by running the converters hot, and with a more silicious slag, generally resulted in burning out the tuyeres. As many as 19 additions of silicious ore were made to one charge and the slags produced varied considerably in silica contents.

SLAG LOW IN SILICA

A slag with less than 25 per cent. silica, when blowing copper matte, is likely to cause accretions. It was generally carried at about 27 per cent. for the average of the charges on that class of matte. When converting leady copper mattes, owing to the high atomic weight of the lead oxide formed and the higher temperatures prevailing, the silica in the slag could be safely carried as low as 20 per cent. and an average in the fluxing charges of 23 per cent. was maintained.

Attempts to run the converter cooler, and thus save the tuyeres, were unsuccessful, as the FeO was formed below its temperature of combination with silica and it was further oxidized to Fe_3O_4 and formed accretions.

CHARACTER OF LINING

From the foregoing it should be clear that a great deal of care is necessary to obtain satisfactory and profitable life of lining. There is enough latitude between the point of no slag formation and serious destruction of the lining and tuyeres to afford an ample margin for working the process. When operated properly, there is not much corrosion of the magnesite brick, except within about one foot above and below the tuyeres. The tuyeres and brick may be replaced ordinarily at a cost of $250 to $350, with a shutdown of four to six days, of which two or three days are required for cooling the converter so men can work inside. As the tuyeres lasted during the production of 700 to 2800 tons of blister copper per set, the relining cost varied from 50c. to about 12c. per ton.

SILICIOUS ORE FLUX

The silicious ore used for fluxing the iron oxides must be dry to give good results. If damp, it tends to form masses that float on the bath and is slow to combine with the iron oxides. Wet material added to hot matte is likely to cause serious explosions. Almost any silicious material or ore may be used if it does not contain too much copper oxide or carbonate, ferric oxides or other compounds that produce highly endothermic reactions in the bath.

As efficient means of drying and handling the silicious ore were not constructed at either plant, the cost of this item was high, amounting in one month to 30c. per ton of blister copper produced. R. Baggaley has patented (U. S. Pat. 895,939, Aug. 11, 1909) a plan for drying and heating ore by the gases from converters which could be readily developed to reduce this cost to about 15c. or less, per ton of copper, and at the same time cut down lost time, waiting for the crane to handle the silicious ore. With two or more converters in operation, the cost would be further reduced, as one man could probably look after three driers as easily as one.

CHARGING APPARATUS

The boats used for charging silicious ore and cold matte were rectangular boxes of sheet iron, reduced to a pouring spout on one end. They were attached to crane blocks for carrying and pouring the contents into the converter through the throat. They held about 7000 lb. of silicious ore.

A 15-ton crane was used at Perth Amboy for handling the matte, copper and silicious ore to and from the converter. Steam locomotives handled the slag and also served the blast furnace.

PARTIAL ANALYSES OF SLAGS AND MATTES.

	SiO_2.	Fe.	Cu.	Pb.
1	26.6	43.2	1.6	....
2	12.8	48.3	10.2	....
3	22.0	43.2	1.6	4.8
4	19.6	42.8	3.0	5.8
5	22.6	38.6	3.0	6.3
6	34.0	36.8	2.8	8.0
7	22.0	34.0	3.7	10.7
8	21.6	30.6	3.2	18.7
9	23.0	21.8	3.7	27.2
10	8.6	15.4 (red)	11.6	39.2
11	8.0	13.4 (red)	27.0	27.2
12	....	....	42.4	12.8
13	....	....	40.5	26.8
14	15.8	17.4	8.6	39.0
15	16.9	6.7 (red)	24.5	34.7
16	9.4	13.2 (red)	24.2	28.8
17	9.8	16.3 (red)	14.8	33.4
18	....	1.0	64.0	11.6
19	....	1.3	62.6	12.8

NOTES ON ANALYSES

No. 1—Average slag on straight copper-matte blow; slag magnetic.

No. 2—Specimen of accretion on copper-matte blow; under the magnet, the whole seemed to be magnetite.

Nos. 3 to 9—Slags from converting lead-copper matte, Note gradually increasing lead percentages while copper and silica were held practically uniform. Each represents slag from one blow. At end of seven blows the matte was "white metal" and contained about 64 per cent. copper, 12 per cent. Pb and 1 per cent. Fe. When blown to copper without additions, slag No. 10 was poured off. This red slag is always made with lead-copper mattes, and when containing less than 12 per cent. copper the charge is not overblown. The particular charge for which analyses are shown was finished. at "gas copper."

No. 11—Slag foamed out while blowing the white metal from lead-copper matte to blister copper.

No. 12—The average analysis of matte blown on charge with No. 10 slag.

Nos. 13, 14 and 15—These represent leady copper mattes, slag from them when metal was "high," and red slag when overblown to get rid of arsenic and lead from one charge in a silica-lined converter for comparison.

No. 16—A slag similar to No. 11, formed in the middle of the same period from still another charge which did not foam appreciably.

No. 17—The final red slag from the same charge as No. 16, blown to "set" copper.

Foaming

The amount of slop and splash products was small compared to some acid-lined converter practice, but probably no less than in large acid-lined converters that are operated with equal care.

"Foaming" from overblowing in the first or slag-forming period does not occur in the basic-lined converter with its large body of matte gradually brought up to white metal and the slag poured off at short intervals. There is a similar phenomenon in the second period, which takes place under certain conditions with either class of lining. In the acid-lined vessel, the foaming occurs, so far as I have observed, when the charge is too hot, and is due in some instances to the smelting down of lining and fluxing it by the cupreous oxide formed. The entanglement of copper sulphide in the viscous slag makes it more viscous by the endothermic reaction which takes place between the oxide and sulphide in the mass of the slag. It may also be due to too much slag left on the white metal when "high," or failure to blow until the iron of the matte is oxidized and slagged.

In the basic-lined converter, I have only experienced this foaming when the charge was too cold, although it is said to occur when the charge is too hot if an excess of silica has been added. It can be readily seen that with an excess of silica the same condition and results as in the acid lining would obtain.

Leady Copper Mattes Prone to Foam

The foaming with basic lining when the charge is too cold occurs only, as far as I have observed, in working leady copper mattes. These mattes continue to form slag after the iron is practically all slagged off, and if the temperature is correct, it can be poured off when a considerable amount has accumulated. The silica and part of the iron are probably obtained from wall accretions. In the accompanying table, No. 11 is one of these slags that foamed badly because it was too cold and viscous, and the copper sulphide became entangled and caused the sulphide-oxide reaction. When this occurred, large amounts of slag and white metal were thrown from the mouth of the converter and a strong internal pressure was shown. Nos. 10, 16 and 17 are similar slags formed at the same period, which showed no foaming. Nos. 18 and 19 are lead "white metals" at the beginning of the second period.

The remedy for this foaming was found in not permitting the temperature to get too low. If it should set in, the converter was turned down as quickly as possible and hot matte from the settler added and the blast volume increased. At the same time as much slag as possible was rabbled off. It was always too viscous to run.

Radiation and Conduction of Heat

The basic-lined converter shows greater radiation and conduction heat losses than the acid-lined, on account of its thinner lining and the greater conductivity of magnesia brick. It is, therefore, necessary to work with larger charges or lower-grade mattes, and with higher blast volumes to maintain the same temperatures. The temperatures are generally carried lower than in acid-lined converters. On account of the lower temperature, it is necessary to keep two men punching tuyeres continuously. If punching is stopped for only a few minutes, the blast pressure rises to 18 or 20 lb., and probably higher if left longer.

Loss of Time

There is a great deal of lost time when running only one converter. In blowing matte for the production of 1248 tons of copper bullion, the actual blowing time was about 12½ hours out of the 24, and for the production of 1000 tons of copper bullion from leady mattes, the average blowing time was a little less than 9 hours per day. The rate of copper production was 42 tons per day on copper matte and 35.7 tons on leady matte. The mattes contained about 43 and 40 per cent. copper, respectively.

The enormous amount of lost time is accounted for roughly, as shown in the accompanying table.

TIME LOSS DURING CONVERTING.

	On Copper Matte. Hours.	On Lead Matte. Hours.
Ladling copper............	3½	3
Forming initial bath.......	3	4½
Skimming slag............	3	4½
Charging silicious ores, waiting for mattes, etc.......	2	2
Charging cold matte and waiting on bag house....	...	2½
Total time lost, daily....	11½	15

Ladling the copper into a copper-bullion furnace with a five-ton ladle takes about 1½ hours. The three-spout ladle reduces this time to less than one hour. The time lost in securing the initial bath should be reduced by starting to blow with a smaller bath and by increased crane service with larger furnace-settler capacity. Larger furnace capacity with ample settlers would avoid the waiting for matte. The time lost in charging silicious ores and cold matte could be largely eliminated by the use of hoppers set above the mouth of the converter, which could be filled at any time and drawn from as required.

Baghouse waits should be eliminated by efficient gates to the inlets of each section, allowing the gases to be completely shut off from any section while keeping the others in operation.

Basic vs. Acid Lined Converters

The advantages of the basic-lined vessel may be stated as follows: Cheaper construction, as it requires no relining plant; less building space and lighter crane; there is no handling of vessel, hence larger vessels may be used; no clay is used for binder in relining; the use of silicious ores on which there is a smelting margin; less slag is produced, requiring resmelting or special treatment to recover the copper; lower-grade mattes successfully converted at a less cost per ton of matte and silicious ore than the same concentration can be effected in the blast furnaces.

The disadvantages are: Losses due to blowing out fines from the dried silicious ore; lost time while relining and repairing; extra careful manipulation required to avoid premature burning out of lining and tuyeres or the formation of accretions; extra tuyere punching required on account of the lower temperatures necessary.

The cost of relining and drying acid converter shells may, under local conditions, be much less than the cost of repairing the lining and drying the silicious ores. Summing up these advantages and disadvantages, it will be seen that there are many localities where there will be a distinct disadvantage in installing the basic-lined converter, and many where its advantages produce an ultimate plant profit. For example, Anaconda, with clayey pond slimes for a binder and Snow Storm ore for quartz, if operating the converters as carefully as the basic converters have been operated, would probably show no advantage with a basic-lined plant; while Garfield, with barren clays and practically no smelting margin on silicious ores suitable for linings, would find a great gain in using basic linings, even if the acid-lined plant were operated efficiently.

At Aguascalientes there is good silicious ore and cheap labor, but barren clays are being used; the silicious lining would appear to be the cheapest, since the cost of relining is less than the cost of drying silicious ore and replacing tuyeres and magnesia brick.

There are, however, many places where the basic lining will prove advantageous, especially where low-grade mattes are produced.

Basic Converter Patents

The basic converter lining was mentioned by Hollway in his patent (British No. 4549, Nov. 9, 1878), and recent patents along that line have been confined to accessories, tuyeres and the like. R. Baggaley, C. M. Allen and Lindquist have secured a large number of such patents, none of which seem to cover any essential features of the process or apparatus, although some of the accessories may be valuable under certain conditions.

Peirce and Smith have secured four patents in which they make considerable effort to obtain some returns for the skill which has resulted in the successful application of the basic linings. Smith's (U. S. Pat. 942,675, Dec. 7, 1907) patent leaves out the tuyeres directly below or in range of the outlet port. Such a patent, if valid, is ineffective as it could readily be avoided by putting in the tuyeres and allow them to close, or plug them if desired. The principle is wrong and the slopping action is not decreased by omitting the tuyeres below the outlet.

A better efficiency and lower power costs would be obtained by putting in more tuyeres and keeping them open. Peirce has patented (U. S. Pat. 944,905, Dec. 28, 1909) a telescopic head, to allow for longitudinal expansion in the lining. These heads are used on recent converters, but are useless as there is no evidence of any longitudinal strain. A removable end is useful if accretions are formed; by removing it they can be cut out more readily, but a much less cumbersome device could readily be constructed. Peirce has patented (U. S. Pat. 942,661, Dec. 7, 1909) brackets to hold the lining from shifting. These are not in use. Messrs. Peirce and Smith have patented (U.S. Pat. 942,346) ten claims which I will attempt to criticize.

Peirce and Smith Patent Claims

The first four claims are invalidated by the claims of a coherent, noncorrodible lining. The lining of magnesia brick is not coherent. An examination of the brick, when repairing, will show that the internal faces next the charge have been glazed and united by the slag produced. Where this action has not taken place the brick separate readily. It is not noncorrodible but on the contrary only lasts in the vicinity of the tuyeres for the production of a few hundred tons of copper.

The claim of a flexible tuyere is not tenable when an iron casting fits snugly in two ¼-in. steel plates. Flexible tuyeres are not essential, as shown by the operation of the Baggaley converter at Butte and by the operation of those at Garfield and Perth Amboy. The lead washers or gaskets did not show the slightest evidence of movement of the tuyeres during a period of seven months; and no tuyere was broken from any cause except allowing them to fill with slag and matte and trying to punch or drill them out.

Claim No. 5 is for "metal tuyeres, square in cross-section, flexibly sustained from the shell," etc. I would suggest to make them round and inflexible if the claim is considered valid. Claim No. 6 covers the old device of holding the tuyere in place by a plate bolted to the shell on one side of it and is unquestionably not valid.

In claim No. 7, they add "and having continuous full-delivery connection at the receiving ends with the source of blast supply." I presume this is intended to patent the hole in the tuyere casting. Whatever it may mean it shows nothing new or novel and has no validity.

Claim No. 8 attempts to guard the air blast, during transit through the lining, against diminution of volume by leakage into the body of the lining by metal tuyeres. This was anticipated by Baggaley (U. S. Pat. 865,671) and by the metal tuyeres put in converters by Fraser & Chalmers about 10 years ago.

Claim No. 9 covers the use of a cement, formed of ground magnesite and an oil, for luting in the tuyeres and the brick adjacent to them. Ground magnesite and tar or tar oil have been in use many years and are far superior to the mixture of magnesia and linseed oil, preferred by them. The linseed-oil mixture does not form a permanent cement. When changing tuyeres the magnesia pours out of the holes as a fine sand.

Expansion of Converter

Claim No. 10 covers the opening in the top for allowing the expansion of the body to be taken up by the arch. In view of the reverberatory converters that have been proposed with their arched tops and tie rods, this claim would not appear to add much weight. The arches do rise up and keep rising.

A careful study of the causes led to quite a simple explanation. The rising of the arch is only because it is open to the air, dust and dirt. When the converter is cooled, the slag on the inside cracks. The cracks not coming exactly together, dirt falls in and lifts the roof slightly upon reheating. Also at times there are internal explosions which lift the roof slightly, and naturally it never goes back to its former position. I have seen bricks blown entirely out of the roof by explosions caused by charging icy matte. Again there is, during foaming, a strong internal pressure at times sufficient to lift the 9-in. arch brick. In my opinion a top fastened in by bolts with slotted holes to allow easy removal and replacement would be far preferable.

Credit for Practical Development of Basic Converter

Looking at their claims as carefully as possible and without any bias, I must say that I cannot see that they have invented anything. Messrs. Peirce and Smith are certainly entitled to their full share of the honor due to skill and care with which they have brought the basic-lined converter to a successful issue and they are to be congratulated upon the excellent design of the apparatus.

Comstock Tunnel Company Operations

Under the recently completed contract between the mines on the Comstock lode and the Comstock Pumping Association, more than $465,000 has been expended upon the Comstock Tunnel Company's tunnels and the mining shafts connecting therewith. Ore from the Consolidated Virginia is being shipped through the tunnel and milled in the company's reduction works. The development carried on by the several mines and the Comstock Pumping Association has resulted in the thorough equipment of the mines with modern electric hoists in seven of the deep shafts, new electric pumps of ample capacity at the C. & C. and the Ward shafts.

The Ward shaft is now down 2575 ft., the C. & C. shaft 2600 ft., and the plans already adopted provide for sinking both shafts to the 3000-ft. level. The Mexican mine is down to the 2500-ft. level and is about to begin prospecting in virgin ground at that point. The Gold Hill mines, consisting of the Yellow Jacket, Crown Point and Belcher, under the management of Edward B. Sturges, have been taking out about 4000 tons of low grade ore each month and reducing the same in the Yellow Jacket mill. The plan recently adopted to connect the Ward shaft with the Combination by a drift on the 2450 level should result in the early development of the Potosi, Chollar and other mines at depth by means of the Ward shaft and Combination shaft.

Engineer Hall, of the Comstock Pumping Association, states that the "dead work" upon the Comstock is now nearly accomplished and that rapid development of the deepest levels may now proceed under most favorable conditions. It is claimed that not more than 10 per cent. of the ground below the level of the Sutro tunnel has been prospected. Continued coöperation between the Comstock mines and the Tunnel company now seems assured by reason of the investment in the mines by the larger shareholders of the Tunnel company.

Proposed Building for the Geological Survey

The new public buildings bill just prepared by the House committee on public buildings and grounds contains, in section 27, provision for a fireproof building of modern office-building type to be erected on square No. 143, Washington, D. C., at a cost not exceeding $2,500,000. It is to afford accommodation for the entire organization at Washington of the offices of the Geological Survey, Reclamation Service, Indian Affairs, General Land Office and the Bureau of Mines.

Data on Mortality and Morbidity of Miners—I

Miners Experience Excessive Mortality and Sickness Due Largely to Accidents and the Conditions under Which They Are Forced to Work

BY FREDERICK L. HOFFMAN*

The mortality and morbidity of American miners has never been made the subject of qualified scientific inquiry, primarily for the reason that the necessary data for a conclusive investigation are not extant. The crude mortality statistics of the United States censuses of 1890 and 1900, and of the census report on mortality for 1908, are of limited practical value, since they do not represent the facts for the country as a whole but only for the registration area, in which but a small proportion of the mining industry is carried on. The returns are also quite inapplicable to special considerations, since coal and metal miners are combined, and the group even includes quarrymen, who follow a decidedly different calling.

TABLE I. COMPARATIVE FREQUENCY OF DEATHS FROM ACCIDENT AMONG AGRICULTURISTS, AND MINERS AND QUARRYMEN.
(REGISTRATION AREA OF U. S.—CENSUS OF 1908.)

Ages.	Poisons, Gases, Etc.		Other Accidental Injuries.	
	Agriculturists.	Miners and Quarrymen.	Agriculturists.	Miners and Quarrymen.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
15-19	0.7	.	25.5	71.8
20-24	0.6	0.2	22.0	64.9
25-34	0.6	0.2	17.4	61.9
35-44	0.9	0.6	14.2	16.8
45-54	0.8	1.8	9.8	27.6
55-64	0.4	0.3	5.7	13.0
65-over	0.2	0.4	3.1	7.1
All ages	0.4	0.6	7.8	38.8

SHIFTING CHARACTER OF MINING POPULATION

The data even for the registration area are also, in all probability, quite defective in that the true number of deaths is not returned, chiefly because of the shifting character of the mining population and the ready opportunities for employment in other industries should an impairment in health or diminished physical strength make such a change appear advisable. Subject to this limitation, however, the census returns for 1900 are of some value in that they permit of the calculation of death rates per 1000 living at specified periods of life, and a fairly trustworthy comparison can therefore be made with the specific death rates for other industries or trades. The census mortality report of 1900 included only the miners and quarrymen in the registration states, reported as having been 38,890, among whom there occurred 373 deaths, equivalent to a death rate of 9.6 per 1000.

TABLE II. COMPARATIVE MORTALITY OF MINERS FROM ALL CAUSES IN ENGLAND AND WALES—1900-02 (RATE PER 1,000.)

Ages.	Coal Miners.	Ironstone Miners.	Copper Miners.	Tin Miners
15-19	3.20	3.08		1.19
20-24	4.17	3.01		5.53
25-34	4.93	5.34	14.57	13.41
35-44	7.65	6.62	23.08	27.15
45-54	11.67	12.23	19.42	38.75
55-64	35.98	27.97	18.78	72.17
65-over	139.82	98.27	116.10	222.22

ABNORMAL AGE DISTRIBUTION

This rate, however, is misleading on account of the peculiar age distribution of a mining population in which the age period 25-44 comprises 57.1 per cent. of the total, and ages 65 and over, only 1.5 per cent. The very small proportion of aged miners is brought out in glaring contrast when it is stated that among farmers, planters and farm laborers the proportion arriving at an age of 65 and over in 1900 was 11.5 per cent. The contrast in the mortality is not as great as would be the case if the system of death registration were complete, which is admittedly not the case, and for obvious reasons the defects in death registration would be more serious in the case of a transitory, shifting, or more or less floating population like miners, than in the case of a more permanent population like farmers, planters and farm laborers. Subject to this restriction, however, it is significant that at nearly all ages the death rates of miners are higher than the corresponding death rates of farmers and planters, although the miners, on the whole, represent a physically selected class.

According to the census of 1900 the death rate of farmers and planters at ages 15-24 was 3.7 per 1000, while the corresponding death rate of miners and quarrymen was 5.4; at ages 25-44 the respective death rates were 6.6 and 7.8 per 1000; at ages 45-64 they were 13.2 and 13.1; but at ages 65 and over they were 96.8 for the first and 116.6 for the second of these two groups of occupations. The death rates of miners therefore were excessive throughout life except at ages from 45 to 64 inclusive, and considering the fact that the rate was based upon only 81 deaths actually enumerated, there can be no doubt but that the true mortality of miners and quarrymen at this as well as at every other period of life, was decidedly in excess of that of the agricultural population.

MORTALITY HIGHER FOR MINERS THAN QUARRYMEN

The foregoing data are, therefore, inconclusive but they practically constitute the sole source of information on this important subject at the present time. No local board of health in any one of our numerous cities or towns in the mining regions has thought it necessary or expedient to make a special inquiry into the vital facts of the men employed in mining operations, although for some of the cities at least the material available would yield important and instructive results. In 1908 the Bureau of the Census for the first time published occupation-mortality statistics, without reference, however, to the living population. For office reasons the miners and quarrymen were again combined into a group, so that the returns are of less value than they would be if the two occupations were separated. It is practically certain that the mortality of quarrymen is lower at all ages than the corresponding mortality of miners, if only for the reason that the accident liability is much higher among miners than among quarrymen, although the dust exposure among the latter is certainly more serious than among coal miners, who experience on the whole a mortality from tuberculosis below the average.

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*Statistician, Prudential Insurance Company, Newark, N. J.

DATA FROM 1908 CENSUS REPORT

While the census data for 1908 are of limited value they are nevertheless suggestive with regard to the specific disease liability from tuberculosis and the frequency of industrial accidents. The relative frequency of disease or accident occurrence may be approximately measured by the percentage of deaths from specified causes in the mortality from all causes at specified periods of life. When this method is applied to the mortality of miners and comparison is made with the corresponding mortality of farmers and planters, which is, of course, an extreme test, but the best possible since this class as a rule experiences a very low mortality, the results are decidedly instructive, particularly with reference to the occurrence of accidents, as shown in Table 1.

TABLE III. COMPARATIVE MORTALITY OF COAL MINERS AND MEN EMPLOYED IN AGRICULTURE AND THE BUILDING TRADES IN ENGLAND AND WALES—1900-02.
(Rate per 1000.)

Ages.	Coal Miners.	Agricultural Laborers.	Building Trades.
15–19	3.20	1 94	1.82
20–24	4.47	3.26	3.32
25–34	4.93	3 96	4.77
35–44	7.65	5 70	9.81
45–54	14.67	10.13	17.50
55–64	35 98	19.76	30 72
65–over........	139 82	78.26	82.62

TABLE V. AGE DISTRIBUTION OF DEATHS FROM COAL MINING ACCIDENTS, BY CAUSES, IN ENGLAND AND WALES—1900-1902. (AGES AT DEATH.)

Cause of Accident.	Under 15	15–19	20–24	25–34	35–44	45–54	55–64	65 and Over.	All Ages.	Per 1000 Accidental Deaths in Coal Mines.
Fall of coal, stone: crushing ..	28	110	168	318	289	229	111	24	1307	523
Fall in pit or shaft	2	10	14	29	26	14	12	5	112	45
Machinery: boiler explosion	7	20	11	10	10	5	7	2	75	30
Wagon, tram, tub	73	129	63	70	54	45	40	23	497	199
Rope breaking		3	2	4	1	1	1	..	12	5
Firedamp		17	19	60	37	22	8	1	164	66
Choke-damp: suffocation	1	2	2		6	1	...	..	12	5
Drowning			6	6	6	2	1	..	21	8
Blasting		3	6	14	11	11	3	..	48	19
Otherwise, or not stated	11	26	17	49	48	46	32	23	252	100
Total	122	350	311	560	488	376	215	78	2500	1000

It is shown by this table that, combining all accidents, the percentage of deaths from this group of causes is extremely high throughout every period of life for miners and quarrymen, while relatively high among agricultural and farm laborers. Of course, any percentage proportion depends upon the frequency of deaths from other causes, but it is a fair assumption that in the case of miners at least, the excess in the proportionate mortality is the result of an actual excess in the death rate of miners and quarrymen at every period of life.

The table is only included here as a suggestive contribution to the subject of miners' mortality in the United States, since no other information is at present available. It is a matter of sincere regret that the numerous miners' benefit funds should never have given publicity to the facts of their experience, but it is to be hoped that in course of time the results of this experience will become available for general use.

INFORMATION FROM FOREIGN SOURCES

In marked contrast to the dearth of definite information regarding the mortality and morbidity, or sick rate, of miners in America, quite an amount of extremely useful and conclusive information is available for England and Wales, for certain states of continental Europe, and for some of the colonies of Australia. By far the most conclusive mortality data are the returns of the registrar-general for England and Wales for the three years ending with 1902. These have been consolidated in Table II, exhibiting the comparative mortality of miners from all causes, with distinction of the mineral or metal mines. It requires to be stated, however, that the actual number of men employed in copper and tin mining in England and Wales is comparatively small, so that the death rates for the different periods of life require to be accepted with some caution, but they are confirmed by other evidence proving conclusively that the mortality is much higher among this class of metal miners than among the corresponding class of coal and iron miners.

TABLE IV. COMPARATIVE MORTALITY OF COAL MINERS IN VARIOUS COALFIELDS OF ENGLAND AND WALES—1900-02. (RATE PER 1000.)

Ages.	Whole Area.	Durham and Northumberland.	Lancashire.	West Riding.	Derbyshire and Nottinghamshire.	Staffordshire.	Monmouthshire and South Wales.
15–19	3.20	3.14	3 65	2.85	2.56	2.49	4.03
20–24	4.47	4.88	4.86	3.40	3.79	4.00	5.01
25–34	4.93	4.54	6.01	4.27	3.33	4.16	5.78
35–44	7.65	6.76	9.03	7.48	5.97	6.65	8.94
45–54	14.67	13.79	17.44	13.01	11.25	16.07	15.94
55–64	35.98	31.63	42 41	33.97	31.25	38.00	39.84
65–over.......	139.82	155.40	136.61	142.19	149.04	163.21	105.30

It is brought out by this comparison that the mortality of coal miners is higher throughout every period of life, except from 25 to 34 than the corresponding mortality of ironstone miners, who are generally held to be subject to comparatively few health-injurious circumstances affecting their employment. The mortality of copper and tin miners is very much higher at every period of life than the corresponding mortality of coal and ironstone miners, and this fact is fully confirmed by the special report made by order of the secretary of state of the Home Department on the health of Cornish miners, and published as a parliamentary paper in 1904.

COMPARISON OF BRITISH MINERS AND AGRICULTURISTS

Without enlarging at this time upon the causes responsible for the excess in mortality, which, of course, is primarily the result of a higher liability to accident, but also in the case of copper and tin miners to an exceedingly high mortality from disease, the following comparison is of interest as showing the death rates of coal miners and agriculturists in England and Wales, and at the same time the corresponding death rate for men employed in building trades. Table III sets forth this matter.

Without exception, the mortality of coal miners is shown to be higher, and at the older ages decidedly in excess of the corresponding death rate of the agricultural population. When, however, the mortality of coal miners is compared with the mortality of men in the building trades, it appears that the mortality is excessive for coal miners at ages from 15 to 34, and 55 and over. Considering the relatively high degree of accident liability in the building trades, and the extreme degree of weather exposure, combined with liability to overstrain and the various other unfavorable circumstances, it is significant that practically throughout life the mortality of coal miners should be higher than the corresponding mortality of men employed in the building trades.

COMPARATIVE MORTALITY IN BRITISH COALFIELDS

Still more significant are the mortality returns for the different coal-mining areas of the United Kingdom, and in this connection it is properly observed by the registrar-general in his report upon the occupation mortality of England and Wales for 1900-02, that "in order to determine the mortality experienced by coal miners in different parts of the country, the figures relating to six representative areas have been separately examined." And while in comparison with the previous period a decline in the death rate equivalent to 21 per cent., was shown to have taken place in all the coalfields, against a decrease of only 16 per cent. for occupied males generally, in the Durham and Northumberland coalfields the decline amounted to only 15 per cent., in Lancashire to 19 per cent., while in Derbyshire and Nottinghamshire it was 20 per cent.; in West Riding it was 25 per cent. and in Monmouthshire and South Wales, 28 per cent. Table IV shows the respective death rates by periods of life for each of the English coalfields for the three years ending with 1902, the rates being per 1000 of employees living at the ages stated in the first column. The variations in the death rate are fully set forth by this table, and do not require further explanation.

TABLE VI. COMPARATIVE MORTALITY OF MINERS AND OTHER CLASSES OF WORKMEN, EXPERIENCE OF THE MANCHESTER UNITY, 1893-97.
(Percentage of Actual Deaths to Standard Expectation.)

Ages.	Agriculturists and General.	Outdoor Building Trades, Railways and Navigation.	Quarrying, Iron and Steel, Chemical and Allied Employments.	Miners.
16–44	64	73	72	70
45–64	88	95	95	108
65–over..................	104	106	123	131

The differences in the rates suggest probable differences in the local accident liability, but also in the probable variation in disease liability according to more or less unsatisfactory conditions of underground mining, and perhaps the qualitative and quantitative differences in the dust exposure. The table emphasizes the great practical value of differentiating the mortality of miners in different coalfields, since important departures from the normal are invariably obscured in the aggregates for the coal-mining area as a whole.

Variations in the Local Death Rate

While it is not the purpose of this discussion to emphasize the underlying causes of variations in the local death rate, Table V is included as exceptionally instructive, since no corresponding data are available for the United States. The table shows for England and Wales the age distribution of deaths from mining accidents, according to causes, for the three years ending with 1902, and redistributed in the last column upon the basis of 1000 accidental deaths.

Among the suggestive results of this analysis is the item of fatal accidents due to underground haulage, chiefly run-over accidents to mere children at ages under 20, numbering 202 out of a total of 497, or 40.6 per cent. Since the number living at specified periods of life is known, it would be possible to calculate the exact death rate for every cause and every period of life. This is not possible for any coal-mining area of America at the present time.

Manchester Unity's Morbidity Statistics

It requires no further statistical data to sustain the conclusion that at every period of life the mortality rate of coal and metal miners is excessive. Even more important is morbidity which entails an enormous economic burden upon the mining population and the various agencies organized to mitigate the economic consequences of temporary or permanent disability resulting from sickness, accident, or both. For the United States no information of this character is available, but fortunately a wealth of information on the subject has been published by the foremost English friendly society, the Manchester Unity of the Independent Order of Oddfellows Friendly Society. This society made a new investigation of its mortality and morbidity experiences for the five years ending with 1897, and throughout the most skilled actuarial and other expert ability was employed to place the results of the investigation beyond the possibility of a doubt as to their accuracy or validity.

TABLE VII. COMPARATIVE SICKNESS EXPERIENCE OF MANCHESTER UNITY—1893-97.

Ages.	Agricultural and General.	Whole Society.	Outdoor Building, Railways and Navigation.	Quarrying and Iron and Steel (heavy labor).	Mining
	Weeks.	Weeks.	Weeks.	Weeks.	Weeks.
16–24	100	112	116	152	183
25–34	100	110	119	149	189
35–44	100	111	125	148	193
45–54	100	109	124	132	190
55–64	100	107	122	137	182
65–74	100	105	119	136	164

Since it is primarily the purpose of a friendly society to furnish financial aid in the event of sickness or disability resulting from accident, the results of this investigation are chiefly valuable in so far as they have to do with the sickness branch of the society's operations. Without, therefore, enlarging upon the mortality experience of the society, I only include Table VI, showing the comparative mortality of miners and other classes of workmen in the experience of the Manchester Unity for the period 1893-97. The figures show only the relative mortality as calculated upon the standard expectation, which represents the experience of the order for a previous period. The table shows throughout a mortality below the expected at ages under 45, and for all classes except miners at ages 45 to 64, while at ages 65 and over the actual mortality was above the expected for all the various groups of employment considered.

Miners Considered as Separate Group

It should be stated in this connection that the agricultural group of employments includes certain general occupations not subject to special hazards or exposure. The outdoor building trades, railway and navigation groups, include employments which, upon thorough inquiry, were found to have more or less similar death and sickness rates in the society's experience. The same principle was applied in quarrying, iron and steel, chemical and allied employments with heavy labor, while miners were considered separate and distinct from the others.

According to the table the mortality experience of miners at ages under 45 was relatively quite favorable, while it was 8 per cent. in excess of the expected at ages 45-64, although other and similar occupations had a mortality below the expected. Finally at ages 65 and over, the excess in the mortality for miners was 34 per cent, against an excess of only 4 per cent. for agricultural and general laborers, 6 per cent. for the outdoor labor class, and 23 per cent. for men engaged in heavy labor, particularly quarrying, iron and steel work, chemical work, etc. It is, therefore, shown that the experience with miners was on the whole decidedly less satisfactory than the corresponding experience with other classes of labor.

Comparative Sickness High for Miners

Even more suggestive and conclusive are the results of the sickness experience as emphasized in the quantity of sickness in selected occupation groups and in the whole society, in comparison with 100 weeks of sickness experienced by the agricultural and general labor classes. Table VII exhibits all the necessary details, and shows conclusively that at every period of life the amount of sickness among the mining element was considerably in excess of the corresponding amount of sickness in the other labor groups and for the society as a whole.

To avoid a possible misinterpretation of the table, it may be stated again that the figures are only relative, and show, for illustration, that at ages 16-24, of every 100 weeks of sickness among the agricultural and general labor classes, there were 183 weeks of sickness among the mining class, equivalent to an excess in the amount of sickness of 83 per cent. At ages 25-34, the excess in sickness for the mining class was 89 per cent.; at 35-44 it was 93 per cent.; at 45-54 it was 90 per cent.; at 55-64 it was 82 per cent.; and at 65-74 it was 64 per cent.

(*To be concluded*)

Exploring the Chibogamau Country*

The Chibogamau region is the most interesting district in the northern part of Quebec, and is believed by many to be an eastern extension of the mineral belt which includes the Cobalt district in Ontario; but so far it has been only partially explored. Excepting the early explorations made in 1674 by the Jesuit Father Albanel, the first report of importance was that by James Richardson, who examined the district geologically in 1870. Richardson mentions the existence of a zone of chloritic schists, diorite, serpentine, conglomerates and granite strongly mineralized in places with iron and copper pyrites and magnetite.

REPORTS OF VARIOUS OBSERVERS

These observations were subsequently confirmed by A. P. Low, who was in the region in 1885 and who also called attention to the similarity of the rocks to those of the Sudbury district. He states in his report that there are important indications of economic minerals. In 1897, H. O'Sullivan, in a report on the country between the Lake St. John and James Bay, mentions that on the portage between lake Chibogamau and lake Wacounipi he noticed a compass variation of 166 deg., caused by some deposit of magnetic iron in the neighborhood. Peter MacKenzie, in 1903, undertook an exploration of the region, from which he brought back good specimens of asbestos and of copper ores. This was followed in 1904, 1905, 1906, 1907 by further explorations by Messrs. Obalski, Low, MacKenzie, Machin and Dulieux, with further confirmation of the presence of areas of Huronian rocks and of indications of strong mineralization.

Owing, however, to the lack of transportation, the development of the mineral deposits is handicapped, and the Quebec Government has been strongly urged to take steps to remedy this, either by building a railway into the region, or by granting subsidies toward the construction. But the information about the region is far from specific. It is the result of explorations on broad lines, and it is not sufficiently detailed to warrant at present the large expenditure required for the building of a railroad. Before taking action in the matter, the Quebec government has decided to send a commission of geologists and engineers to report on the possibilities of the region.

PERSONNEL OF PARTY

Three commissioners have been appointed: Dr. A. E. Barlow, J. C. Gwillim, and E. R. Faribault. The high standing of these three men is a guarantee that the report of the commission will be as authoritative and unprejudiced as possible.

The party will be composed of the three commissioners, each with a technical assistant, and of Mr. Valiquette, of the Bureau of Mines, who will have charge of a topographical and geological party under the direction of the commissioners. Mr. Valiquette will also act as mining recorder, to issue miners' certificates, mining licenses, and to record claims, etc., for any prospectors who may now be in the region. There will be 10 or 12 canoemen and laborers

The party will leave Roberval on Lake St. John as soon as the state of the rivers will permit, probably about the middle of June. The route will be by wagon to Portage à l'Ourse, 25 miles; then by water along the Chamouchouan, Chigobich and Nikoban rivers and following a chain of small streams and lakes over the Height of Land to Lake Obatagamau, the starting point of the work. This will require about 180 miles of travel by canoe, with numerous portages.

THE PROPOSED RAILROAD

The railroad, if built, would extend from Roberval, the terminus of the Quebec & Lake St. John road, northwest about 200 miles. It would run through a country as yet almost wholly uninhabited, the most northerly settlement being St. Felicien du Nord, 20 miles from Roberval. The country is rough and heavily timbered, and has many small lakes and rivers. A large development of water power is possible on some of the streams.

The area to be explored is an irregular parallelogram north of the Height of Land and including Lakes Obatagamau, Doré, Chibogamau, Oremiska, Rush, Asitchinibastat and Wahwanchi Its northern side is not many miles south of the large Lake Mistassini. Mr. Obalski, who made the most extensive reconnoissance in the region, reported indications of gold, silver, copper and asbestos.

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*Abstract of an article in *Canadian Mining Journal*, June 1.

Nova Scotia Steel and Coal Company

This company owns coal lands and mines in Pictou county and Cape Breton, Nova Scotia; iron-ore mines in Nova Scotia and on Wabana island, Newfoundland; blast furnaces, steel works and rolling mills at New Glasgow, in Nova Scotia. Its report for the year 1909 shows total capital liabilities of $6,000,000 common, $1,030,000 preferred and $1,000,000 debenture stock; $3,500,000 bonds. The common stock was increased by $1,000,000 during the year. The debenture stock was also issued and sold, and the bonds were issued, retiring all the old bonded debt.

The income account for the year can be stated as below:

Net earnings for the year........	$799,978
Government bounties............	107,971
Total	$907,949
Interest, depreciation, etc........	$647,963
Dividends	142,400
Total payments.:...............	$790,363
Surplus	$117,586
Balance from 1908..............	1,219,221
Total	$1,336,807
Dividend 20 per cent. in stock....	1,000,000
Net surplus forward...........	$336,807

The ordinary dividends were 8 per cent., or $82,400, on preferred, and 1 per cent., or $60,000, on common stock. The sales and receipts were $2,069,737 for iron and steel products and $3,408,108 for coal, ore, etc.; total, $5,477,845. Prices on all products were lower than in 1908; and there was a decrease in the government bounties. Advances were made in coal-mining wages.

The mining statement shows that 809,341 tons of coal were mined from the Sydney mines, and 87,515 tons of coke were made. Iron ore shipped from the Wabana mines was 460,387 tons. Limestone and dolomite quarried, 74,407 tons. Pig iron made was 58,676 tons; steel ingots, 64,240 tons; steel billets rolled, 52,931 tons. Finished products included 45,090 tons bars and plates rolled, and 27,705 tons car axles forged. Total shipments from works were 12,402 tons pig iron and 58,575 tons finished steel.

The sum of $362,653 was expended during the year on capital account in the development of the submarine iron-ore areas at Wabana and for improvements elsewhere.

The development of submarine iron-ore areas at Wabana was continued, the main slope being extended through the areas a further distance of 1470 ft. The slope is now about 1650 ft. into these areas from their southern boundary. The development work carried on has fully confirmed the estimates previously made as to the quantity of ore contained in and the great value of these areas. The plant for the operation of these submarine mines is now being installed.

The Giroux Shaft at Kimberly, Nevada

Five Compartment Shaft Constructed by Raising from 1000 ft. Level; Cost $71.21 per Foot. Progress 5.27ft. per Day. Stope Drills Used

BY C. EVERARD ARNOLD*

The Giroux Consoliated Mines Company is equipping a five-compartment shaft at Kimberly, Nev., which will serve the Alpha mine. The depth of this shaft, January, 1910, is 963 ft., and of this depth, 948 ft. was opened by raising; 15 ft. of sinking was done so that the bearers, collar set, and three shaft sets might be installed and concreted, and with this done it was possible to erect the necessary surface equipment for resuming shaft timbering on the completion of the raise. The arrangement of the shaft timbering is shown in Fig. 1.

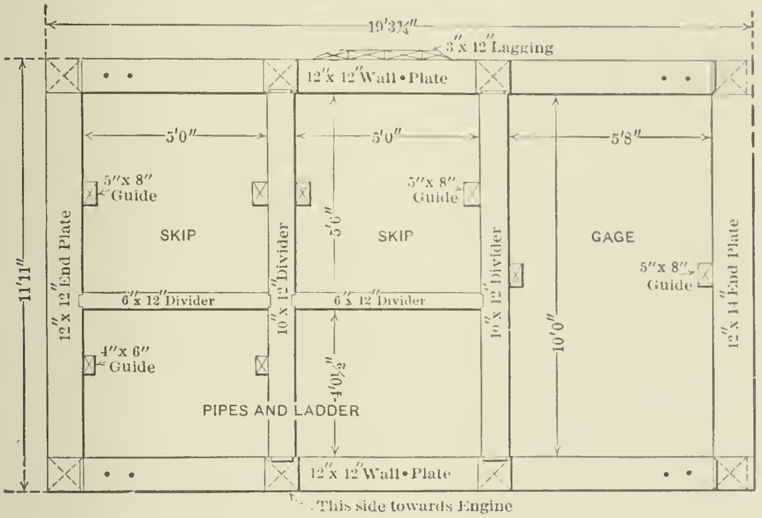

FIG. 1. PLAN OF SHAFT TIMBERING

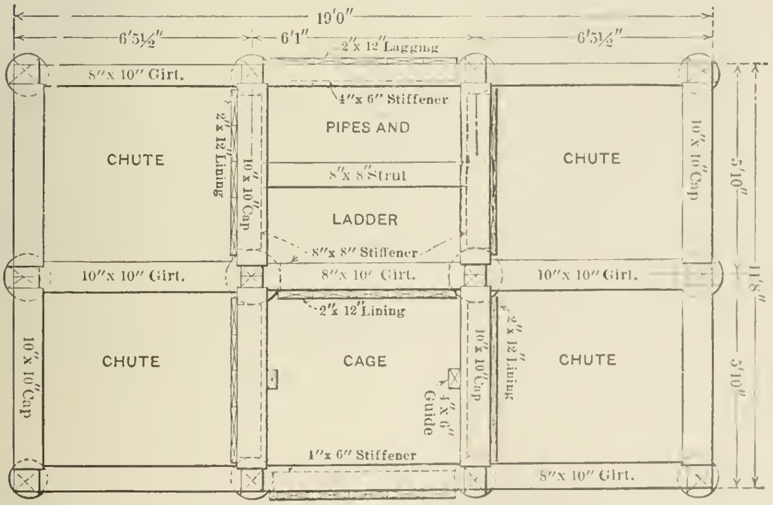

FIG. 2. PLAN OF RAISE TIMBERS

ARRANGEMENT OF SHAFT COMPARTMENTS

At the 1000-ft. level of the Alpha, and 750 ft. southwest from the Alpha shaft a 14x18-ft. station was cut, and a 25-h.p. air hoist was installed. From here the raising commenced on July 5, 1909. The raise was cut approximately 13x21 ft. in area, and supported by timbering with square sets, illustrated in Fig. 2, which shows the division into seven compartments. The end compartments, which were used as chutes, had the center girts heavier than in the others on account of the wear from falling rock. The chute lining was braced by inserting 8x8-in. stiffeners parallel to and half way between successive caps. Silimarly, the lagging on the wall sides of the cageway and the compartment for pipes and ladder was stiffened with 4x6-in. timbers. In the pipe and ladder compartment the chute stiffeners were reinforced with 8x8-in. struts, and as the cageway was partitioned off by braced lining, there was practically no chance of rock entering the ladderway in case a chute burst into the cageway.

HANDLING OF BROKEN ROCK

Over the central compartments the last two sets were always bulkheaded with 8x12-in. timbers, shown in Fig. 3, and from the lower bulkhead the cage sheave wheel was suspended. After a round of holes had been blasted and the loose ground picked down, the average time required to hoist, plumb, and block a set of timbers was two hours, although the operation was occasionally performed in one hour 30 minutes.

When possible, the chutes were kept almost full in order to minimize the chances of injury in case men should happen to fall. For the purpose of protecting the lower timbers of the chute, breakers or platforms of 10x10-in. timber were spiked to the girts, at intervals of seven sets. On these breakers the rock piled up and formed its own slope. Trouble was often caused by large rocks dropping into the chute, and on reaching the gate, these rocks would have to be drilled and blasted before they could pass through.

STOPING DRILLS USED

The drilling was done entirely with Waugh stopers, No. 8 C, and these machines proved remarkably satisfactory. Three were used for raising the entire distance, one being kept in reserve in case of accident to the others, although all three machines were used on the last 75 ft. of the raise. Each machine wore out one chuck and one tappet, and beyond replacing these, no repairs were required.

The shaft is wholly in limestone, and for the greater part the ground was favorable for fast raising. Normally, on blasting a round of 36 holes seven feet deep there would be room for a set of timbers and the back would support itself well. Sometimes the ground was so shattered by intersecting slips that only half the round could be blasted with safety. This procedure made room for half the set, which was then blocked before the remaining holes were blasted

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NOTE—From *Bull.* A. I. M. E., June, 1910.
*Kimberly, Nev.

nd the set completed. At one or two pots the ground encountered could be emoved with a pick, and in these cases ach post was placed as soon as there ,as room for it. At 125 ft. from the urface there was a small patch of round so hard that two rounds of 40 oles were blasted before a set could be laced.

Ventilation

Excellent ventilation was maintained y using two Roots pressure blowers, ize No. 1, running in tandem. One was laced at the foot of the raise, drawing he foul air through an 8-in. air pipe and elivering through an 8-in. air pipe and 6-in. pump column to the other blowr, which was above ground.

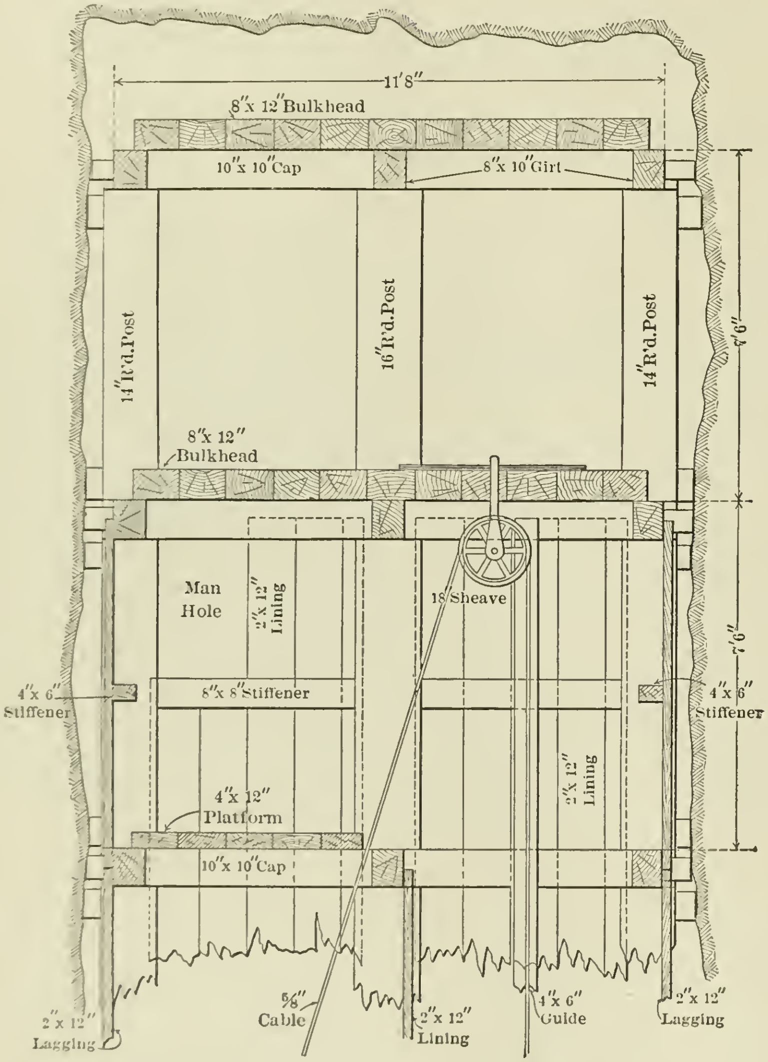


Fig. 3. Part Section through Cage Way and Pipe and Ladder Compartments of Raise

After the 1000-ft. and 770-ft. levels of he Alpha were connected, the raise was erved entirely from the latter level. hree shifts were worked continuously, nd 180 days were required to complete he raise, the rate of advance being 5.27 t. per day, or 158 ft. per month.

The progress per month was: July, 67; August, 150; September, 133; October, 143; November, 165; December, 190; total, 948 ft. The total cost of the raise was $67,509, which is at the rate of $71.21 per foot, distributed as shown in the accompanying table.

COST OF RAISING.

		Cost Per Foot.
Labor	Raising	$16.69
	Tramming	5.09
	Timber framing	1.76
Blacksmithing		1.19
Machine shop		0.11
Teaming		0.54
Air compressor		10.00
Supplies		17.24
Hoisting		15.15
Proportion of general underground expense		3.44
Total		$71.21

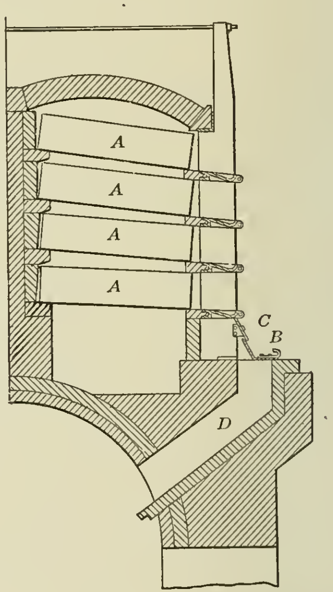
As the development of the mine proceeds, 75 per cent. of the timber used in this raise will be available for other purposes; hence the raise will eventually be credited with 75 per cent. of the cost of that timber; $10 per foot of raise represents the timber cost, so that the true cost of the raise is $71.21, less $7.50, or $63.71 per foot. The work was performed under William Hogan, mine superintendent, formerly of the West Stewart mine, Butte, Mont.

I wish here to express my thanks to Frank P. Mills, general manager of the Giroux Consolidated Mines Company, for courtesies while at the mine and in furnishing the necessary data given in this paper.

The Wettengel Zinc Furnace

An improved form of a smelting furnace, particularly adapted for zinc ores, preventing the waste of the ore when charging and facilitating the discharge is shown in the accompanying illustration.

When the retorts *A* are being charged the pans *B* are placed as indicated in the figure. Any of the material which happens to fall will be caught by the aprons *C* and the pans *B*, and on the completion of the charging, the pans may be withdrawn, carrying the spilled material.



The Engineering & Mining Journal

The Wettengel Zinc Furnace

When the retorts are discharged, the waste is directed into the chute *D* by the aprons *C*, the pans having been removed.

The inventor, C. A. Wettengel, Caney, Kan., has assigned the patent (U. S. Pat. 953,405, March 29, 1910), to the American Zinc, Lead and Smelting Company, Boston, Mass.

The oldest miner in Australia, George Holloway, died May 1 at Wedderburn, Victoria, aged 101 years. Born in England, he went to Australia in 1835, and became a miner very soon after the first discovery of gold in that country. He was an energetic old man, and when 90 years old he set himself the task of cutting a tunnel through a hill, and after three years he concluded his work, the tunnel being a quarter of a mile long; his hopes of finding gold were, however, disappointed.

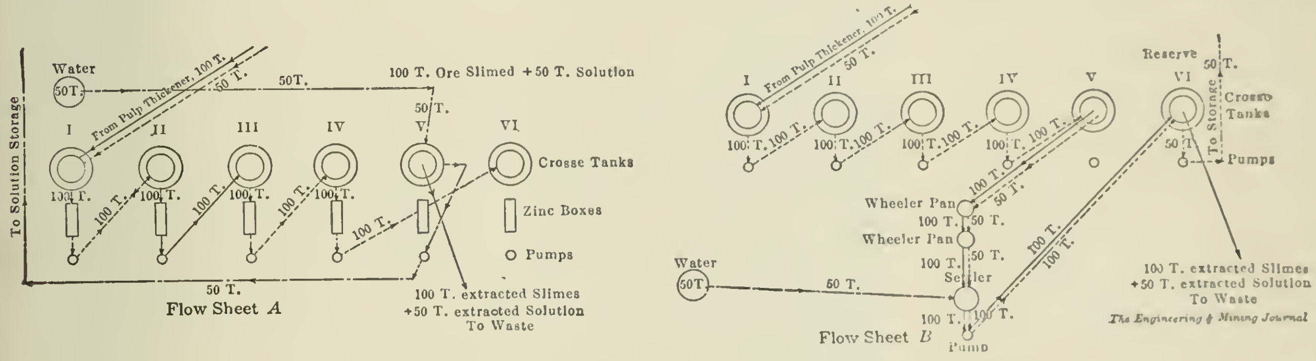
Proposed Simplification of the Cyanide Process

BY BRUNO MIERISCH*

The process described by A. F. Crosse in the JOURNAL of Feb. 26, has suggested to me two systems of cyanide treatment whereby filtering, filter pressing and zinc-box precipitation may be avoided. Mr. Crosse's apparatus is a sort of modified form of the Pachuca tank, and in his system he claims to avoid filter pressing or decantation. But the modification of the tank seems to offer a means whereby the process may be made a continuous one, in which the handling of the ore is reduced to a minimum.

Two schemes are outlined below, which, so far as I know, have never yet been tried in practice, but they offer theoretical advantages which seem to me of sufficient promise to encourage the trial of one or the other on a practical scale.

In comparing the two systems I consider the first the more simple, but there may be localities where the trouble connected with zinc-box precipitation, and especially with the cleaning of the slimy precipitates, compensates for the higher amount of power required in the second. In either case the ore is slimed in the common way. In cases where the ore is not refractory it will not be necessary to really slime it. An ore broken, say, to 20 mesh will in most cases contain sufficient slime to form a pulp of the requisite consistency with 50 per cent. of solution.


Water
50T.
50T.
From Pulp Thickener, 100 T.
50 T.
100 T. Ore Slimed +50 T. Solution
To Solution Storage
I
II
III
IV
V
VI
Crosse Tanks
Zinc Boxes
Pumps
100 T.
50 T.
100 T. extracted Slimes +50 T. extracted Solution To Waste
Reserve
To Storage
Wheeler Pan
Settler
Pump
The Engineering & Mining Journal

Flow Sheet *A* Flow Sheet *B*

FLOW SHEET ILLUSTRATING PROPOSED CONTINUOUS CYANIDE PROCESS

FIRST METHOD WITH CUSTOMARY PRECIPITATION IN ZINC BOXES

My first system involves the use of as many "Crosse" tanks as the number of days required for the cyanide treatment of the ore—each tank thus containing one day's production of the mill. An exception may be made where the treatment requires too many days and the tonnage of ore treated is not high, in which case it might be better to reduce the number of tanks and correspondingly increase the dimensions of the remaining ones. Besides these tanks three more are necessary, but of identical design, for reasons to be explained later.

In the accompanying flow sheet *A*, the cyanide treatment is supposed to require three days. The number of tanks is therefore six: Three for the treatment proper; one which is being filled with ore; one being emptied; and the sixth to take up the overflowing solution. We will assume that tanks Nos. 2, 3, 4 and 5 are filled with pulp containing 50 per cent. solution. No. 1 receives its charge of pulp from the mill, having been previously filled with cyanide solution of the necessary strength. No. 6 is empty.

CONTINUOUS PROCESS

The air current is then turned on in all tanks except No. 6. The thickened pulp which flows into tank No. 1 drives out a corresponding volume of solution. This passes through zinc box No. 1, is freed from its gold and silver content and pumped from there to the inner portion of the conical vat of Mr. Crosse's reformed Pachuca tank No. 2. The solution here passes through the slimes, and a corresponding quantity of solution will overflow from the outer portion of the tank. It then flows through zinc box No. 2 and is pumped from there to tank No. 3, and so on to tank No. 4, always leaving the content of precious metals in the corresponding zinc boxes. From zinc box No. 4 the solution is pumped into tank No. 6. As this tank was empty, nothing can overflow from it until all the solution in tank No. 1 has been replaced by the inflowing pulp; i.e., after 24 hours. The solution must then be brought up to proper strength by the addition of KCN.

It will be noticed that tank No. 5 was left out of the cycle of cyanide circulation. The ore in this tank, having given up its gold and silver content, is given a wash to replace the KCN solution. The amount of water used in this wash should be equivalent to that lost by evaporation and in the moist ore which is thrown away. The resulting dilute solution is given back to the process at the chilean or tube mill, the ore thus really being broken in a weak cyanide solution.

PROGRESSIVE CYCLE OF OPERATIONS

At the end of the day's run, tank No. 1 will be filled with ore slime, and the solution that it formerly contained will have passed through the pulp in tanks Nos. 2, 3 and 4 and will have filled the empty tank 6. After the wash has been applied the extracted slime is sluiced out from tank No. 5, and this tank is now empty. Next day the same cycle of operations will be repeated, with the exception that No. 6 now takes the place of No. 1 and becomes filled with ore, tank No. 1 becoming No. 2, etc. Tank No. 4 is then washed and sluiced out, leaving the tank empty at the end of the day, and tank No. 5 is filled with solution. On the third day the cycle advances again one tank number, and so goes on continuously.

This process offers the advantages that not only are filtering, filter pressing and decanting in the common sense avoided, but also any handling of the ore. In addition, in many cases, it will make unnecessary the separation of the triturated ore into sands and slime. Furthermore, the amount of water lost can be limited to what the thickened ore pulp contains, a factor well worth appreciation in arid regions.

AMALGAMATING PANS SUBSTITUTED FOR ZINC BOXES

My second system, in addition to the above, does away also with zinc-box precipitation. Only two tanks are required in addition to the number of days of treatment of the ore; in this case five. The treatment goes on as follows: Tanks Nos. 2, 3, 4 and 5, in flow sheet *B*, are upposed to contain pulp with about 50 er cent. solution. No. 1 is filled with KCN solution of the proper strength and eceives its charge of pulp from the mill.

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*Mining engineer, Bluefields, Nicaragua, C. A.

The thickened pulp that flows into tank No. 1 drives out from there a corresponding volume of solution as before. This is pumped into the inner portion of ank No. 2, passes through the slimes of his tank and flows off on the outside into a pump which lifts it up to tank No. 3, from which it goes to tank No. 4, and finally into tank No. 5, where it accumulates.

As solution flows into tank No. 5 the thickened pulp is taken out and directed toward an amalgamation pan. In this pan quicksilver and zinc amalgam, which contains some copper, are added. After a short time (less than two hours) of stirring, all gold and silver from the solution contained in the pulp is precipitated and taken up by the quicksilver, thus forming an amalgam and taking the place of the zinc.

Pan Precipitation an Old Process

As a common Wheeler pan takes about two tons of ore, it can work about 50 tons per day. Therefore, I have shown two pans in the flow sheet. The amalgam is extracted in the usual way by a settler, one for each pair of pans. The quicksilver is separated in the usual way from the nonvolatile metal. The pulp is sluiced out from the settler, or concentrated in case it contains sulphides in paying quantities. With the pulp also goes about 50 per cent. of its weight of solution, with a greater or less KCN content. If the amount of cyanide is insignificant it will not pay to recover it, but it can be recovered in case it is deemed advisable. In case the recovery of the cyanide is desired, the safest way is to pump the pulp from the settler back to another Crosse tank (reserve tank No. 6, flow sheet *B*), let it settle there and send the dilute solution back into the process, as was done in the former example.

Precipitation by Zinc Amalgam

The precipitation of the precious metals from cyanide compounds by means of zinc amalgam is not new, but is known as the Gilmore-Young process. It was successfully used for years in the Santa Francisca mine on a highly argillaceous ore, but finally abandoned. I do not know the cause for this abandonment, but I suppose the extraction sometimes fell short of expectations.

This may be explainable in that the pan was not only used to extract the metal from the solution, but also the whole cyanide treatment of the ore took place in it. As the power costs at this mine are high, the time of treatment was necessarily limited, and it may be that sufficient losses occurred on this account to cause the abandonment of the process in favor of some filtering device.

Mineral Deposits of Western Arkansas

By W. C. B. Allen*

Recent exploration of the Ozark and Ouachita Mountains in western Arkansas and eastern Oklahoma has disclosed a large variety of mineral deposits extending 60 to 75 miles easterly and westerly, on both sides of the Kansas City Southern Railway. The principal portion of these mineral zones is between Mena and Horatio stations in Arkansas. The country rock belongs largely to the undifferentiated novaculite class, and lies in almost perpendicular strata with slight folds giving 5- to 10-deg. dip, both to the north and south, the main strike of the veins being easterly and westerly. The series of rocks exposed by the Ouachita uplift includes quartzite, sandstone, shales and slates, chert, quartz in a crystalized form, with the novaculite and crystaline rocks interspersed with occasional shales. The quartz veins contain lead, zinc, antimony, copper and sometimes gold and silver.

Good Building Slate Reported

Within the area mentioned is an extensive slate field, fully 40 miles long, lying east of Mena on the Hot Springs wagon road. Three varieties of slate, black, purple and gray, suitable for commercial purposes, have been found. The diamond field near Murfreesboro on the Memphis, Paris & Gulf Railway, is located in an igneous region. The peridotite containing the diamonds covers an area of several square miles, but is only exposed at intervals on the surface. About 800 stones have been reported by the four or five companies owning the diamond properties. These are claimed to range in size from one-third to six carats. Little development work has been done thus far and the future of this field is still problematical.

Deposits of manganese have been found, and some shipments made. The veins prospected at the surface show a width of 2 to 20 ft. The deposits lie from 3 to 20 miles east of Mena, Cove and Hatfield stations. Bog manganese in considerable quantity is found in nearly horizontal veins throughout the same area.

Zinc Lead Prospects Opened

The principal zinc, lead and antimony deposits are located both east and west of Gillham station, Sevier county, Ark. Fissure veins 2 to 20 ft. wide outcrop along a mineralized zone for 15 to 20 miles. The surface exposure is generally broken, with scattered fragments of almost white crystaline quartz. In the shaft of the Southern Zinc and Copper Mining Company, at what is known as the Benoni, or Davis mine, four miles west of Gillham, the vein has a width of over 30 ft. between well defined walls. The strike of the veins is north 82 deg. east, with a dip of about 5 deg. to the north.

The ore from this mine is reported to analyze as high as 16 per cent. in zinc, with lead and copper. A shaft probably 130 ft. deep has been sunk on this vein, but no work has been done for some years and the workings are filled with water. Several other lead, zinc and copper deposits have been prospected along this belt, but no record of shipment is available and no work is being done.

Antimony Deposits Require Deeper Development

The principal antimony veins opened are from 3 to 10 miles east of Gillham. There is an outcrop in the northeast quarter of Sec. 7, T. 7, S. R. 31, W. It extends eastward for six to eight miles through the southwest quarter of Sec. 6, T. 7, S. R. 30, W., to the shaft of what was formerly known as the United States Antimony Company, and is traced eastward to the May shaft of the American company at Antimony City, Howard county. This vein is from 4 to 5 ft. thick and has produced several hundred tons of antimony. The shaft is about 120 ft. deep and on the foot-wall a solid streak of stibnite ore 8 to 14 in. wide was mined. The upper and slaty portion of the vein matter carrying some antimony requires concentration before shipment.

Several other shafts and open cuts were made along these veins east of Gillham, and several of the claims have passed into the hands of new people. Unfortunately, owing to the amount of water encountered, the expense of mining operations and the lack of practical experience and capital, this entire district is idle. It will require greater depth, in the judgment of practical mining men, to fully determine the value of these properties. The rate on antimony ores from Gillham to Chicago is about $4 per ton. It is of interest to know that the State and the U. S. Geological Survey will have a party of geologists at work this summer for the purpose of continuing the surveys from the diamondfields of Pike county, westward to the Oklahoma line.

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*Geologist, Kansas City Southern Railway Company, Kansas City, Mo.

The gold deposits of Egypt are between the Nile and the Red sea. Rude working plans were discovered in Thebes, showing that they were worked as early as 3800 B. C. The Egyptian miners used the "fire and water" method of mining. It might be added that no modernly worked Egyptian mine has paid dividends.

Some Reminiscences of Old Dolores

BY V. PENDER*

On the occasion of my first visit to the Dolores mines, we left Chihuahua on the morning of Dec. 26, 1898, in an ancient Concord coach drawn by five mules. The weather was bitterly cold, the roads execrable. We traveled day and night, making good time by changing mules about every 15 miles. There were four other passengers, three Mexicans and a bullfighter's "lady"—according to her own account of herself. Mexicans are proverbially light-hearted and inclined to make the best of matters; and their jollity and persiflage helped to mitigate the discomforts of the journey. The bullfighter's "lady," too, made many a merry jest, and we were genuinely sorry to part from her, for her experiences were world-wide and she was but recently from Spain where the *gente de coleta* are held in high esteem by all classes. Surely, mining, like politics, makes strange companions.

The Present Dolores Mill, State of Chihuahua, Mexico

Engineers were in the field, driving stakes for the Chihuahua al Pacifico railroad, on which work was commenced early the next year. The town of Miñaca was not then in existence, and whereas one may now make the trip by rail in a few hours, the coach trip occupied about two days and nights of hard travel.

Incidents of the Trail

Our destination, the Dolores mines, was about 125 miles due north of Guerrero, in the heart of the wild Sierra Madre. On New Year's day, 1899, we left Guerrero by wagon for Matachic, where the night was passed, and the next day at noon we arrived at Temósachic, then a little mud-built pueblo with one long, narrow street and the inevitable church. After completing arrangements for the hire of two saddle mules, seven pack mules and four *mozos*, we left for the mountains under the guidance of Anastacio Hernandez, a once famous Apache fighter. He knew the country intimately and could be trusted, we were told, to point out the monuments of the various claims comprising the Casavantes property at Dolores.

That night was passed at Naguerachic, the first of the series of large cattle ranches owned by the Hearst estate, and near the site of the town of Madera, established a few years ago by the Greene Gold-Silver company. The next morning we bade farewell to civilization, and plunged into the great pine forest to the north. We ascended the lofty Cuesta de las Chinacas; and then descended to the arroyo, zigzagging, twisting and turning, until my head swam and several times I dismounted and tried to walk. But the trail was too rough, and Anastacio urged me to stick to the mule, always saying in his grim, unbending way: "Remember, *señor*, that the mule has four feet; you have but two." This sensible advice I soon learned to follow and have never met with even a slight accident in traveling more than 1500 miles in the Sierra Madre.

After six days' hard travel we reached the Tutuaca river, and in two hours more the old *hacienda*, guarded by the great rock face called by the Mexicans *El Viejo*, was reached. The long, two-story, adobe building, with its broken shake roof, was unfit to enter, and we lived in our tents during the 31 days passed in the deserted camp. There were a few tumble-down adobe laborers' houses, and a dilapidated old five-stamp mill in the arroyo a thousand feet below the *hacienda;* and where many hundreds of people are now comfortably housed in the Alma de Maria cañon, there was not a dwelling.

Orchards Planted by Apaches

Dolores was entirely deserted, but during the summer and autumn months the few renegades who lived on the Aros river came there to pass the hot months and gather the peaches and apricots from the old trees that lined the arroyo. The seeds were brought, without a doubt, into the Sierra Madre, not by the early Franciscan *padres*, but by the Apache Indians, who planted orchards at all the prominent water holes, making pleasant rendezvous here and there in the wilds for the doughty savages.

Early History of Dolores

Like all mines in the remote Sierra Madre, the history of the discovery of Dolores is uncertain. Anastacio told us that some Mexican prospectors from Mulatos discovered placer gold in the early '60's, in the San Francisco (Alma de Maria) arroyo, near its confluence with *Rio* Tutuaca. The news of the discovery spread far and near, and at one time there were more than a thousand persons "panning" from *Rio* Tutuaca to the head of the arroyo, and the source of the metal was traced to the vein now called the San Francisco, which was the first claim denounced in that section. The claim eventually became the property of the Casavantes family, who made other denouncements and worked the Alma de Maria and Rosario claims in a small way at irregular intervals.

The Apache Indians drove out and killed many people, and when Don Juan Solis worked the property for three years under bond and lease, 11 Mexican miners and their families were murdered. Solis built the five-stamp amalgamating mill, which was later rebuilt by Mr. Tracy, who acquired a half interest in the property from Louis Friend, a partner of the Casavantes family. The mill was not adapted to the ore, and the property was closed for several years with the xception of brief periods when "chlo- iders" helped themselves to what they ould find. Considerable gold was washed ach year after the rainy season at 'laceritos, an arroyo farther north and aralleling the Dolores arroyo.

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*International Gold Mines Company, El Socorro, via Ocampo, Chihuahua, Mexico.

Expert Foretold Value of Mine

The weather was exceedingly cold dur- ig our 31 days' stay at Dolores, and on iany days ice had to be broken and iawed before the necessary "panning" ould be done. "Colors" were few and isignificant. The old workings did not isclose any ore of value, and the dumps ad been picked over again and again. 'evertheless, we found evidence that onvinced us that the three pertenencias f the Alma de Maria contained a valu- ole mine.

On returning to Guerrero, a contract as entered into with the Casavantes imily to purchase their one-half of the olores property on favorable time for).000 pesos; and later the interest of ir. Tracy was acquired for $30,000, aking the price of the mines about 50,000, gold.

After a stock company was formed to erate the mines, we returned to Dolores irly in June, taking with us a Chinese ok and all of the peons and miners at could be picked up on the way. 'e traveled by coach to Guerrero, as efore. The Chihuahua al Pacifico rail- ad was under construction, but no assenger trains were yet running to any oint on the road.

Early Operating Difficulties

The heavy summer rains began almost imediately after our arrival at Dolores, id it was with the greatest difficulty at supplies were brought in from emosachic, to which point they were de- vered from Chihuahua by slow-moving teams. For many days at a time the eighters lay between the Cirupa and e Tutuaca rivers, and often a few of e most essential articles were rafted er the latter stream. No mining was tempted until August, and then labor as so scarce that but little was accom- ished until the beginning of the next ar. Ten families were brought from inta Eulalia, at considerable expense, it the miners were lazy, incompetent Zacs," and all soon drifted away to the ormon colonies farther north. Mes- ngers to Mulatos, Pinos Altos, Ocampo id other camps brought in a few miners, id gradually the news of the reopening old Dolores was noised about; but bor was always scarce during the two ars following.

The price of freight from Chihuahua Dolores was about 75 pesos per ton, ir first agent being Don Federico Vega, Temósachic, who secured freighters at .50 per *carga* for more than a year. rn, beans, potatoes and all other food supplies were at least 25 per cent. cheaper than now. The price of freight per *carga* of 300 lb. from Madera to Dolores, at present, is about $8.50. Peons were paid $1.25 per day, miners from $2 to $3, but most of the mine work was done by contract at a less price. Wood and lumber were delivered 25 per cent. cheaper than now.

Never a Dull Minute at Dolores

Life at Dolores in those days was anything but *triste,* although there was mail but once a week and it required from eight to nine days to send a messenger to Guerrero with a telegram and receive a reply. Some of the random entries from my notebook kept during 1899 read as follows:

"Pitched three tents today in the upper story of the *hacienda,* which is one large room, as a protection from rain and millions of bats. Trying to make *adobes* to fill the yawning gap in the rear wall is slow work, with a rainfall averaging 2 to 4 in. per day."

"Two cats arrived as per order from Temósachic. Will they lessen the billion rats that infest the whole place?" They did.

"Counted the cats today" (Six months later). "There are 23. Not a rat."

"Seven men killed in a drunken brawl on the Aros river, *despues del baile."*

"One man killed, three wounded, one woman injured, last night, 'after the ball.' Ramona (our Mexican servant) eloped. Lung Fat (the Chinese cook) went crazy."

"Two Mexicans found dead near camp. Shot. No clew to murderers. Never is."

"Felipe Bande shot through the stomach as he came from work on the night shift. Bad wound—may live."

"A great deal of trouble with illicit mezcal sellers during the past three months. Nine *demijuanas* were seized last night; but the sellers escaped arrest. They always do."

"After the ball this morning two broken *cabezas* were sewed up, one dislocated arm set; nice *baile,* that, no murder."

The record of crime was a long one, and for the sake of getting any work done, many bad characters were retained during the first year. The mine foremen, José Ochoa and Catarino Cuevas, both sober and peaceable men, were towers of strength in many ways, and one cannot but pay grateful tribute to their unfailing good humor, honesty and loyalty during those two trying years.

Bonanza Discovered by Crosscut Tunnel

As the old works on the vein were insignificant and full of water, badly caved, etc., it was decided to run a tunnel from the north side of the San Francisco arroyo to crosscut the vein system at a depth of about 225 ft. below the surface. This tunnel was begun in August, and made good headway until within 45 to 50 ft. of the great Alma de Maria vein, the existence of which was previously unknown. A crystallized bar here was so hard that two shifts of miners advanced barely 4 in. per day. It seemed more like steel than rock; and all labor was paid by the day, as miners could not have made *tortilla* money under the former rate.

It was discouraging work, but on March 10, 1890, the tunnel encountered what was practically a blind vein in the south end of the pay shoot of the now-famous Alma de Maria mine. Ten feet of ore averaged $125 per ton, about one-third being gold and two-thirds silver. A streak from 4 to 10 in. on the hanging-wall assayed $750 per ton after careful assorting. Forty-two tons of this ore were shipped to El Paso, and the smelters returned $25,050, net. Up to that time, only about $37,500 had been expended on the property, this amount including one payment of $5000 to Mr. Tracy and 2000 pesos to the Casavantes family, to apply on the purchase price.

The first Alma de Maria pay shoot was about 150 ft. in length; then, after drifting north for 200 ft., the second pay shoot was encountered. Ore was regularly shipped for the ensuing two years, and paid for the property and all of the development, and that without machinery of any sort. Only ordinary windlasses were employed to lift the ore and water, the mine being practically dry. In the history of mining development in Mexico there have been few such remarkable records as this.

Neighboring Orebodies Lower in Grade

The Socovon Mayor, farther northeast, was begun simultaneously with the Alma de Maria crosscut, and its objective point was the Rosario mine in the same vein system. The showing in the old works above appeared sufficiently favorable to justify the running of this large tunnel, and quite recently the Dolores company has completed the tunnel and encountered a good grade of ore which often shows a rare form of crystallized gold. Two other tunnels were started early in 1890, on veins on the north side of the Dolores arroyo, but the orebodies were far smaller and the grade of ore lower than in the Alma de Maria mine.

The Dolores mines were sold to the present company about three years after the great bonanza was struck in the Alma de Maria, the purchase price being, I believe, about $1,250,000; and where we found only a wilderness, there is today a well built mining camp of about 4000 people, with hundreds of laborers' houses, offices, stores, hotel, a fine manager's residence, a church, broad roads and a modern 25-stamp mill and cyanide plant netting its fortunate owners $30,000 per month in dividends.

Method of Working a Steep Coal Seam

Details of System Used at Coal Creek Mine in Seam Pitching 38 Deg., where Puncher Machine Has Successfully Met the Unusual Conditions

BY AUSTIN Y. HOY*

The Pacific Coal Company, of Seattle, Wash., owns and operates through subsidiary companies (The Pacific Coast Steamship Company, Pacific Coast Railway, and Columbia & Puget Sound Railroad) over 26 steamships in the coastwise trade with Alaska, British Columbia and California points, and about 165 miles of railroads. This company built the first railroad in the State of Washington, 38 years ago, and is today one of the largest concerns of the Pacific northwest.

The operation of these steamers and railways requires a large amount of coal. When the Alaska trade is in full swing, over 3000 tons daily are used to supply the demands of this traffic.

The Pacific Coast Coal Company (another subsidiary corporation) owns and operates coal mines at Franklin, Black Diamond, Coal Creek and Burnett, all less than 30 miles south and east of Seattle. The Coal Creek mine adjoins the old Newcastle mine, which was opened some 30 odd years ago, worked to a depth of 2000 ft. to the boundaries of the property, and is now closed down.

LABOR CONDITIONS

During the last decade the production of coal has increased so greatly in the United States that the employment of a large percentage of unskilled men as miners has been necessary. Since native-born Americans rarely become coal miners, this labor has been supplied largely by immigration from Italy and the Slav countries, where practically no coal is mined. These circumstances have necessitated the extensive use of machines for doing the work formerly done by skilled miners, namely, "mining" the face of the coal so as to avoid "shooting off the solid" and the consequent production of great quantities of slack and unmarketable sizes of coal.

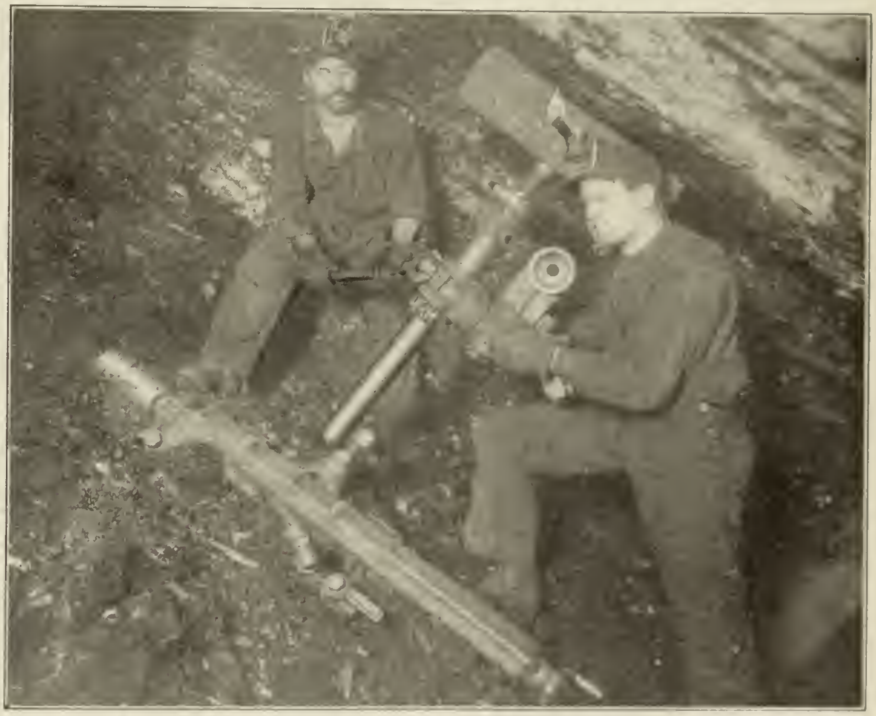
CHARACTER OF SEAMS

Chain machines and compressed-air "punchers" have solved this question under the conditions existing in most of the coalfields of the United States, but in some places the seams pitch so sharply as to render the use of these types out of the question.

This was the situation that confronted the Pacific Coast Coal Company at the Coal Creek mine. Skilled miners were almost unobtainable, and as the coal is a non-coking, semi-bituminous variety, adapted for steam and domestic purposes, shooting off the solid made much unsalable product.

Accordingly, over two years ago, experiments were begun to increase as much as possible the percentage of lump (which brings about $2 a ton more in the Seattle market than the smaller sizes).

Compressed-air post-mining machines of the radial type were installed and it was found that after a mining was put in with these machines, the coal could be sent down the chutes with only a little pick work, and without any powder, except an occasional light shot at a corner or to shoot out a "nigger head." In fact, the powder consumption was reduced over 95 per cent. The lump coal was increased in this way from about 25 per cent. to about 60 per cent., and the practical elimination of powder made the mine much safer.



SHOWING MINERS SETTING UP A "POST PUNCHER" IN A 38-DEG. SEAM.

The first machines used developed sesious mechanical troubles, due to the unusual stresses imposed by frequent falls of coal. About a year ago the company therefore accorded a thorough test to the Sullivan post puncher, and after several months' use an order was placed for 30 machines of this type and make.

THE POST PUNCHER

The accompanying illustration shows a "post puncher" in operation in the No. 4 vein of the Coal Creek mine, where the coal is 4½ ft. high and pitches at an angle of 38 deg. As this type of mining machine is practically new in American practice, a brief description may be of interest.

The "post puncher" resembles a rock drill in the fact that it is mounted on a post or column, and uses length bars or steels of various lengths, in doing its work. It resembles the "puncher" or pick machine in its ability to mine across the face, or to shear a room from top to bottom. For this purpose the machine and shell are mounted on a gear segment, controlled by a worm and crank. In mining, the operator swings the bit in an arc back and forth across the face. By loosening one nut the segment may be set in a vertical plane, and a shearing cut made in a similar manner.

This feature is a great convenience when the coal will not shoot readily unless both mined and sheared. A valuable feature of the "post puncher" is the fact that the machine does not swing around the post, but around the center formed by the socket, in which it is clamped, about 6 in. from the post. It is, therefore unnecessary to set the column exactly square with the intended mining, but the machine may be set in a few seconds to mine wherever desired, regardless of careless placing of the post. This is a patented feature, possessed by no other similar machine. Dismounting the machine when swinging from the mining to the shearing position is also unnecessary.

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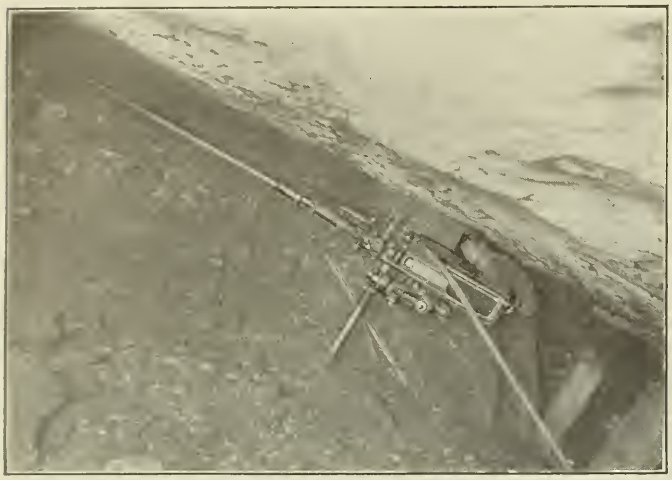
*Spokane, Washington.


"Post Puncher" in Coal Creek Mine with 80-inch Extension in Use

Sullivan "Post Puncher" Starting a Cut in the Coal Creek Mine

Bottom of Slope at Coal Creek Mine

Loading Coal in Muldoon Seam. Note Man at Chute in Rear

The cylinder and valve motion embody other novelties. The front head is solid with the cylinder, thus eliminating the complication of side rods. When the coal is missed, the piston will overrun the front port and stop, thus obviating damage to the front head. This overrunning occurs very seldom with a skilled operator, but the delay attendant on feeding the machine against the coal, so that it will start again, is nothing to the delay due to breakage that would occur eventually if the piston could strike the front head. The cylinder is made of steel, to resist the heavy shocks and strains received from falling coal. Felt packing of a very durable character and having an adjustable gland, is employed. A combined shell adjustment and stop, to prevent feeding too far, and a rotation without springs, provided with five round steel pins or pawls, are other interesting features of the "post puncher" design.

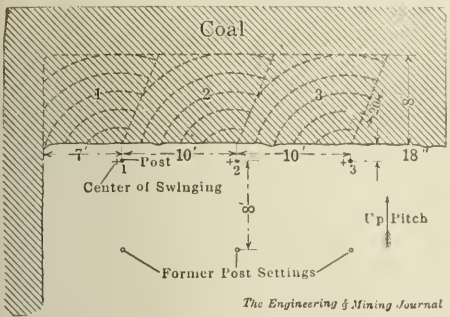
The exhaust cap is so arranged as to throw the air in any desired direction to avoid raising dust. The extension rods or length bars range from 20 to 100 in. in length, and are tapered at both ends, one to fit the chuck and the other to receive the bit holder. This bit holder has tapered holes for from three to seven chisels or bit points. A solid bit may be used instead, depending on the nature of the cutting.

The mining may be put in at any desired hight in the seam, so as to mine in fireclay, the coal itself, or in a dirt band, by raising or lowering the clamp on the post. In the illustrations, the machine is shown mining in a band of bone and clay near the roof, and is accordingly above the segment. In the 6-ft. "Muldoon" vein, the impurities are lower in the seam and the machine is hung below the segment.

METHOD OF OPERATION

The rooms are driven 45 to 50 ft. wide. The first cut is made from a post set 7 ft. from the left rib and about 18 in. from the face. See the sketch on this page. A mining eight feet in depth is put in, using an extension bar 80 in. long. The chuck enters the cut, which accounts for the mining being deeper than the length of the extension. After the 80-in. extension has been swung, a 100-in. bar is used to square up the cut. One man operates the machine, swinging it by means of the worm crank with one hand, and feeding the cylinder forward two or three turns with the other, at each end of the swing.

Although the cuttings fall out of the cut without scraping, due to the pitch, a helper is required to set up, pick down coal, etc. When the operator is completing the left rib cut, the helper sets up a second post about 10 ft. from the first one, or about 17 ft. from the left rib and 18 in. from the face. Upon finishing the rib cut, the machine and swinging attachment are transferred to the second post with only a few minutes' delay. While the operator is making the second cut, the helper takes the first post down and resets it about 27 ft. from the left rib for the third cut, and so on, until the face is crossed. Only a half swing is used, so that the operator is protected by the unmined coal, as well as by the machine itself, from the coal loosened from the face by the mining.



The Engineering & Mining Journal

Sketch Illustrating System of Mining with Puncher

The machine and posts remain in the room at the face until the room is completed, for there is no shooting of the coal that can injure the machine nor any loading (as in a flat seam) that the machine would interfere with. Hence there is no waste of time due to moving, except from post to post, and little heavy lifting. Two men can set up with ease, as the heaviest parts (the machine and shell) weigh only 225 pounds.

Economic Results

These machines average about 300 sq.ft. in an eight-hour shift, or from 45 to 55 tons per machine per shift, according to the hight of the coal. While, as stated above, the reason for the installation of these machines was solely to increase the proportion of lump coal, even if the cost of mining was increased, the results point strongly toward a material reduction in the cost of mining, after all interest, depreciation, power, pipeline and maintenance charges have been made against the machines.

In shooting off the solid, the former method, a yardage system of payment was used, the rate being $9.50 for a 50-ft. room. Three men worked together furnishing their own powder. The reason for using a yardage and not a tonnage system was because of the impurities in the seams, and the pitch. The coal and debris go down the chutes together to the slope, thence in mine cars hauled by electric locomotives to the surface and through a preparing plant of picking tables and washers.

General Mining Features

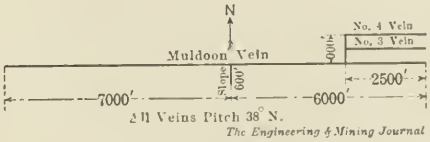
The mine in which these machines are used is a new one and is worked from a slope 600 ft. deep, sunk on the pitch of the seam. It adjoins an old mine of the same company, operated through a tunnel. The old mine is nearing exhaustion, but is still furnishing about 600 tons daily.

The new mine is to be worked upon the retreating room-and-pillar system. The entries have nearly reached the boundaries of the property at this writing, and when this is accomplished they will appear as shown by the accompanying sketch.

A Sullivan straight line two-stage steam-driven air compressor with a capacity of 1843 cu.ft. of free air per minute has just been installed at these mines and a new pipe line laid. The management now plans to put the new mine on one-half capacity (600 tons daily), operating about 12 Sullivan post punchers. Later on, when the old mine is exhausted, the compressor and machine plant will be doubled and the production increased to 1200 tons.

Applications of the Post Puncher

While the use of Sullivan post punchers is particularly adapted to heavily pitching seams, they are also useful in flat seams, where it is desirable to mine in a dirt band above the floor or near the roof. In seams where the cuttings do not fall from the mining by gravity, the helper keeps the cut free by means of a long-handled flat shovel or a scraper.



The Engineering & Mining Journal

Plan of the Coal Creek Mine

In some fields these machines have been successfully used for driving entries and for shearing they can hardly be excelled, especially when both mining and shearing cuts are required, owing to the quickness and ease with which the setting may be altered for either purpose.

From the foregoing description, it has been noted that the post puncher was used at Coal Creek with only a half swing, and that the posts were therefore set only 10 ft. apart. In stronger coal, or in a flatter seam, where the danger to the operator and machine from falling coal is less serious, the machine is used to cut on both sides of the post, from the same setting, having a maximum capacity of about 18 ft. of face from one set up. To keep the ribs or side walls of an entry or room straight, the bit is swung back and forth across the corner, gradually advancing it with the feed screw until the angle is square. Or a hole may be drilled at the extreme end of the swing to the full length of the feed screw, then the bit cranked back and the mining made up to this hole at each swing.

I desire to render my thanks to J. J. Jones, superintendent of the Coal Creek mine, Newcastle, Wash., for much data used in this article.

The Difference Between Permissible Explosives and Black Powders

Explosive circular No. 3, issued by the United States Geological Survey, contains the following announcement:

With a view to the wide use of these permitted explosives, it may be well in this connection to point out again certain differences between permissible explosives as a class and the black powders now so generally used in coal mining, as follows:

(a) With equal quantities of each, the flame of the black powder is more than three times as long and has a duration 3000 to more than 4000 times that of one of the permissible explosives. The rate of explosion also is slower.

(b) The permissible explosives are 1¼ to 1¾ times as strong, and are said, if properly used, to do twice the work of black powder in breaking down coal; hence only half the quantity need be used.

(c) With 1 lb. of a permissible explosive or 2 lb. of black powder, the quantity of noxious gases given off from a shot averages aproximately the same, the quantity from the black powder being less than from some of the permissible explosives and slightly greater than from others. The time elapsing after firing before the miner returns to the working face, or fires another shot, should not be less for permissible explosives than for black powder.

The use of permissible explosives should be considered as supplemental to and not as a substitute for other safety precautions in mines where gas or inflammable coal dust is present, other conditions indicating danger.

As stated above they should be used with strong detonators, and the charge of the explosives used in coal mining should not exceed 1½ lb., and in many cases need not exceed 1 pound.

A high rate of wages artificially maintained in a falling market causes irregular work and reduced earnings. It is more advisable under such circumstances to reduce wages to such a rate as can be paid without lessening employment.

The Avoidance of Coal Mine Strikes

By Floyd W. Parsons

There has recently been much agitation looking to greater safety in coal mining and the elimination of wasteful methods of operation. We hear but little, and few suggestions are made, concerning the great economic losses due to mine suspensions. Of all our important industries, none is so afflicted with this evil as coal mining. If coal operators and miners cannot find a sensible and civilized way to settle their difficulties, it is almost inconceivable that the public themselves have permitted the constant repetition of this disturbing practice. In fact, it seems that most everyone has come to believe that the biennial strike is a legitimate part of the coal business.

The time is not far off when sensible operators, miners, and the public at large, will see the folly of the present course, and refuse to submit further to the inconveniences and losses that result. One hopeful sign is "the limelight" that is being given to the differences that exist between labor and capital. Just a little more of such publicity, and a poor cause will always be compelled to yield to that most potent of all forces, public opinion.

It would be well if the operators and the miners ceased making contracts to expire at a given date, and, instead, would make their agreements subject to termination on 30 days' notice on the part of either subscriber, with a clause providing that operation will be continued for 60 or 90 days after cancelation, and pending the negotiation of a new wage scale. Such action should be further strengthened by the passage of an arbitration act covering disputes incident to interstate transportation.

The Strike Question Largely Solved

The Canadian Government has practically solved the strike question in that country. A law, called the "Industrial Disputes Investigation Act" makes it illegal to resort to a strike, in any industry known as a public utility, until the matters in dispute have been investigated by a Board of Conciliation established under rules by the Canadian Minister of Labor. Under this act, either party to a dispute may apply for an appointment of a board of investigation. Each of the two parties to the dispute may nominate one member of the board, and these two may select the third, who serves as chairman of the board of three. If either party fails to nominate a member, the Minister of Labor appoints that member, and if the two members fail to agree upon the third member, the Minister appoints the third member. It is evident, therefore, that in this way the board will always be constituted, and will go to work, if either party to the dispute applies for an investigation. The proceedings of every board appointed and its final report are published throughout the Dominion in the most complete manner.

During the two years from March 22, 1907, to the end of March, 1909, 55 applications, in Canada, were received for the appointment of boards. Of the 55 applications received, strikes were avoided or ended in 25 coal mines, four metalliferous mines, 15 railroads, and three street railways. Strikes were also avoided in two bodies of longshoremen, one body of teamsters, in one body of sailors, and in two industries not public utilities. There were but two cases out of 55, therefore, in which strikes were not averted.

As to the question of whether the "Industrial Disputes Investigation Act" has been effective in Canada, it may be stated in answer that since its enactment, the Dominion has experienced no cessation in the continuous operation of its great agencies of communication, or other public utilities.

Many will hesitate to acknowledge the fact, but it does appear that we in the United States are not only submitting to conditions that are becoming unbearable, but that are unnecessary. We waste our time talking of plans for the disarmament of nations when we cannot even settle our own business disputes without bloodshed and riot. It is not that we lack in legislation, for we have laws in plenty; what we need in the way of Government is quality, not quantity.

The Illinois coal operators at the present moment, because of a strike, are sacrificing more than $2,000,000 a month, in addition to losing their market to operators in adjacent States. When other operators with a better quality of coal succeed in introducing their superior product to the customers of mines that are undergoing a suspension, it is no easy matter for the losing operators to regain their trade. Worse than all else, neither the operator nor miner eventually succeeds in obtaining anything that could not have been brought about in a more sensible way. Property is destroyed and deteriorates through non-use, and the miner and his family starve. The principle back of strikes is all right, but the method of upholding is wrong.

Regular Employment Should Be Most Sought

High wages are to be desired, but ancient as well as modern economists assure us that a high rate of wages forced by main strength and artificially maintained, is sure to cause irregular work, and consequently, no increase in the annual earnings of labor. It is better to have wages on a level where employment will be regular and constant.

Coal mine operators in the United States are not afraid of proper laws, as nearly uniform in the various States as conditions will permit, and drafted by men who know the industry; but they do fear hasty, ill-advised legislation that benefits one district and embarasses others.

Strikes are the curse of the industry, and benefit only the walking delegate of the union, and the jobber or coal broker who exploits prices. Such suspensions can and should be abolished. If we cannot improve on the legislation adopted by Canada, we can at least profit by her experience. We have our Erdman act, covering disputes relative to interstate transportation, but in order to be effective in the avoidance of all strikes, this law would have to be amplified and revised, making it applicable to all industries. However, it might be safer to quit experimenting and pattern an act after the Canadian law which has proved successful. We already have a sufficiency of laws that cannot be interpreted even by our highest court, so that something simple, plain and effective would be relished.

The Manufacture of Peat in Canada

The Mines Branch of the Department of the Interior of the Dominion Government has established a plant for the manufacture of peat into fuel, at Alfred, Ont., about 45 miles from Ottawa. The plant is in successful operation and was built by the Government to demonstrate the possibilities of the peat bogs, with which Canada abounds. The plant commenced operations May 18, and is now running continuously. The peat deposits at Alfred consist of about 300 acres, having an average depth of about 10 feet.

The plant consists of a long peat-storage shed, two small frame houses, a blacksmith shop and a large peat machine. The latter apparatus was imported from Sweden, where there are several hundred such equipments in operation.

Method of Operation

The general scheme of development is to cut a long trench, 19 ft. wide, 8 ft. down in the peat, and then place the peat machine in this cut. A carrier conveys the peat as it is dug from the trench to a hopper. On a 600-ft. circular track in the middle of the bogs are 8 peat carriers, each of which holds 0.7 ton of peat. As each car passes the machine, the ground peat is dropped from the hopper into the machine. A 34-h.p. engine, which itself burns about 4 tons of peat fuel per day, furnishes motive power for both hopper and cable cars.

The next operation is to convey the peat in the carriers to what is known as a field press. This spreads the peat upon the ground in long parallel rows and it is then shaped into bricks by means of a three-knived instrument, which is operated by boys. After this, the bricks are allowed to dry in the sun and air for three or four weeks, when they are stored in the peat shed ready for transportation.

At the present time, the capacity of the plant is about 25 tons per day. Fourteen men and two boys are employed, the men receiving $1.75 per day and dinner, while the boys receive 8c. for every 1000 bricks turned over.

The superintendent of the plant has stated that he can produce peat for from $1.75 to $1.80 per ton. One and four-fifths tons of peat equal one ton of anthracite. The peat fuel will burn in any stove, but for houses, a special stove is necessary on account of the fineness of the ash. Peat takes about twice as much room for its weight as coal, and it is an excellent fuel to use in connection with producer gas. In the case of the Alfred peat bogs, the Government authorities say that this land is practically useless for agricultural purposes, so that its employment as a source of fuel means the reclamation of land otherwise waste.

Ontario is one of the provinces in Canada that lacks a supply of coal, and as a consequence, the importance of the peat deposits cannot be overestimated. A peat-using plant for the production of producer gas has been established in Ottawa and receives its fuel from the peat-manufacturing plant at Alfred.

Work is Resumed at Mulga Mine

The Alabama State Mine Inspector James Hillhouse and Associate Inspectors Dickinson and Neill were at Mulga, Tuesday, May 31, and made a thorough examination of the mine and machinery preliminary to the resumption of work at the mine. The company will start work with a fair-sized force of men.

Mr. Hillhouse said that he and his associates found everything at Mulga in good working order and that he readily gave his permission for the starting of the mine. Mr. Hillhouse further stated that the mine is now equipped with electric firing apparatus that will enable all the blasting to be discharged from the outside while there is not a man in the mine. The water system is good, there being pipes into all the headings and openings at every second room, where hose can be attached and every part of the mine sprayed to lay the deadly dust that is sometimes the cause of an explosion. Mr. Hillhouse also said that he considered the mine in safe working order and that if every mine in the district were so equipped, a mine explosion would be almost an impossibility.

COLLIERY·NOTES

For coal and lignite high in moisture, or high in ash, the gas producer, used in connection with a gas engine, is best adapted to develop power, but for the generation of steam, which can be used for heating as well as for power, coal may be more conveniently burned in a specially constructed furnace under a boiler.

It is just as necessary that the different types of safety lamps should be tested by the Government and placed on a permitted list, as it is that explosives should be so tested. Such a test would not only tend to improve the type of safety lamps by stimulating invention, but also prevent the use of imperfect types, such as have led to accidents in the past.

Safety lamps that are fastened with a "screw lock" cannot be too severely condemned. Lamps locked by means of lead rivets, and especially those that are fitted with magnetic locks, are much safer. Another point in the construction of safety lamps is the danger arising from the gauze being accidentally omitted. In several instances, explosions have occurred from this cause. A number of safety lamps now on the market are so constructed that the lamp cannot be put together without the gauze. This plan is excellent, and should be a feature in all safety lamps.

In purchasing coal for any power plant, the aim should be to obtain a fuel which, all things considered, will produce a horsepower for the least cost. Experiments seem to indicate that almost any fuel may be burned with reasonable efficiency in a properly designed apparatus. The recognized requirements are as follows: (1) A uniform and continuous supply of fuel to the furnace; (2) an air supply slightly in excess of the theoretical amount required for complete combustion; (3) a temperature sufficiently high to ignite the gases that are driven off from the fuel; (4) a complete mixture of these gases with the air supplied before they reach a cooling surface, such as the shell or tubes of a boiler.

It is evident from facts before us that the Miners' Union as well as other labor organizations in this country, are, in great measure, attempting to ignore all economic laws. Unionism is operating more and more to prevent free competition of labor. This tendency to maintain a higher and more uniform rate of wages is commendable if only the union would also maintain the efficiency of labor. The greatest fault of trade unionism is its tendency to limit the efficiency of its members and to place the bad workmen on a level with the good. The result of such action is to level down rather than up, and causes the miner to falsely believe that he is helping his cause by restricting his labor.

At the mine of the Moores Run Coal Company, Fairmont, W. Va., the entire haulage work is done by an 8-ton locomotive of the Goodman single-motor type. Careful records of the coal hauled are kept, and these figures for one recent month showed as follows:

Tons of coal hauled	30,400
Tons of rock hauled	2,500
Total tons hauled	32,900
Number of working days	22
Average number of tons per day (8 hours)	1,496
Average number of tons per hour	187
Average number of trips per day (8 hours)	29.5
Average number of tons per trip	50.7
Cars hauled per hour	83
Average length of haul, feet	2,400

The haulage roads are nearly level, the worst grade being about 2 per cent. against the load for a short distance.

One engineer has correctly stated that some of the greatest losses in coal mining at present result from the failure of the miner to carry on the operation of rib-drawing systematically and steadily. This same authority says: "There are mines in this country where the miners in 75 per cent. of the working area are engaged in drawing pillars. Just as long as each miner advances at a certain rate of speed and regularity, and pays attention to proper mining, so long will the greatest percentage of coal be extracted; but the moment one miner lags, trouble begins, and when mining operations are suspended by reason of a strike or other cause, a great loss must and will occur. If some mines were stopped suddenly at certain periods in the operation of rib-drawing, it would result in the utter ruin of the property."

Notwithstanding the great agitation favoring conservation of our natural resources, the losses in coal mining continue unrestrained. Probably the greatest loss of coal occurs at hundreds of mines in this country, where mining operations are carried on in seams averaging from 8 to 15 ft. in thickness. In probably 75 per cent. of such cases, the mining company extracts only 6 or 7 ft. of the seam, leaving the remainder of the bed to form a top. Many excuses are advanced to justify this plan of mining. The most common excuse is that the rock or slate overlying the seam is too weak to form a good roof and the coal has to be left in as a supporter. In many cases, the real truth of the matter is that the operators are anxious to get rich quick, and, knowing that it is easier to mine 6 or 7 ft. of coal rather than a greater thickness, they adopt this wasteful policy, leaving future generations to pay the price. In many of the older districts of this country, where wasteful methods of mining were employed, more than a decade ago, and the mine afterward abandoned, new companies are reworking these old pits and making a profit, although the sensible and economical plan would have been to have extracted all the seam in the first mining.

MINING AND METALLURGICAL PATENTS

A CLASSIFIED LIST OF NEW INVENTIONS

A copy of the specifications of any of these atents issued by the United States Patent ffice will be mailed by THE ENGINEERING ND MINING JOURNAL upon the receipt of 25 ents. British patents are supplied at 40 ents. In ordering specifications, correspondnts are requested to give the number, name f inventor and date of issue.

COAL AND COKE

COKE—Folding Coke- and Coal-Handling lachine for Coke Ovens. James E. A. Moore, leveland, Ohio, assignor to John W. Seaver, leveland, Ohio. (U. S. No. 959,246; May 4. 1910.)

COKE—Improvements in or Relating to pparatus for Closing the Doors of Retorts, oke Ovens or the Like. Ofenbau Gesellhaft. m. b. H., Munich, Germany. (Brit. os. 27,919 and 28,027 of 1909.)

COKE—Improvements in or Relating to urners of Coke Ovens or the Like. F. W. C. chniewind, New York. (Brit. No. 10,482 of 909.)

COKE—Improvements in or Relating to harging Coke Ovens. F. W. C. Schniewind, ew York. (Brit. No. 10,485 of 1909.)

COKE—Process for Coking Coal. Samuel . Sheldon, Buffalo, N. Y. (U. S. No. 959,-80; May 24, 1910.)

COKE—Process for Quenching Coke. Edard Schulte, New York, N. Y., assignor to nited Coke and Gas Co. (U. S. No. 958,184; lay 17, 1910.)

COKE—Process of Quenching Coke. Heinich Koppers, Essen-on-the-Ruhr, Germany. U. S. No. 958,651; May 17, 1910.)

GAS DETECTION—Indicating and Measring Device for Use in Mines or Wherever esired to Detect Presence of Combustible ases. Harold H. Clark, Pittsburg, Penn. U. S. No. 960,823; June 7, 1910.)

MINING MACHINES — Improvements in r Connected with Cutting Machines for Use n Mining or Quarrying Minerals, Particularly dapted for Use in Mining Coal and the Like. lavor & Coulson, Ltd., and Samuel M. Mavor, lasgow, Scotland. (Brit. No. 11,206 of 909.)

PEAT—Drying Apparatus for Peat and the ike. Charles A. Matheson, Perth, Ontario, anada, assignor to George Baxter Farmer, erth, Canada. (U. S. No. 957,232; May 10, 910.)

SLATE PICKER. Harry A. Whitman, ermyn, Penn. (U. S. No. 958,343; May 17, 910.)

WASHING—Improvements in Washing or lixing Apparatus for Treating Clays, Ores, oal and the Like. William A. Mercer, Lonon. (Brit. No. 9672 of 1909.)

COPPER

SULPHIDE ORE TREATMENT—Process f Treating Sulphide Ores Containing Coper. Joseph McFetridge, Vandergrift, Penn. U. S. No. 959,578; May 31, 1910.)

GOLD AND SILVER

AMALGAMATING APPARATUS. Walter Montgomery and Gustave Welthas, Brooklyn, . Y., assignors of one-third to Edward taats Luther, New York, N. Y. (U. S. No. 55,604; April 19, 1910.)

AMALGAMATION—Trap for Precious Metls. Pierre Armand Brangler, Agnew, Cal., nd Royer Luckenbach, Philadelphia, Penn. U. S. No. 959,390; May 24, 1910.)

CYANIDATION—Apparatus for Quick Cyaniding of Precious Metals. Pierre Armand trangler, Agnew, Cal., and Royer Luckenach, Philadelphia, Penn. (U. S. No. 959,-01; May 24, 1910.)

CYANIDATION—Precipitation of Metals rom Cyanide Solutions. Stafford F. Kirktrick, Kingston, Ontario, Canada. (U. S. No. 959,757; May 31, 1910.)

EXTRACTION—Improvements in the Exraction of Gold. Frederick A. Ford, London, ngland. (Brit. No. 7101 of 1909.)

FILTERING APPARATUS. Ernest P. Darlin, Denver, Colo., assignor to Mary E. Durlin, Denver, Colo. (U. S. No. 959,844; May 1, 1910.)

SOLVENT—Improved Solvent for Precious Metals. John Perbale, and Harry Ormes Mascall, Johannesburg, So. Africa. (Brit. No. 8682 of 1909.)

TUBE MILLS—Feeder for Tube Mills. Everest A. Baylis, Madera, Mexico. (U. S. No. 960,782; June 7, 1910.)

IRON AND STEEL

BLAST-FURNACE GAS—Furnace for Burning Blast-Furnace Gases. Henry E. Parson, New York, N. Y., assignor to Parson Manufacturing Company, New York, N. Y. (U. S. No. 958,429; May 17, 1910.)

DRY-AIR BLAST—Process of Drying Air. Hermann A. Brassert, Chicago, Ill., assignor to James Gayley, New York, N. Y. (U. S. No. 958,471; May 17, 1910.)

LEAD, ZINC AND OTHER METALS

LEAD AND ZINC—Smelting Process. Eduard Dedolph, Kaslo, British Columbia. (U. S. No. 959,924; May 31, 1910.)

NICKEL—Process of Reducing Nickel Hydrosilicate Ores. Adolphe Chalas, Philadelphia, Penn. (U. S. No. 959,460; May 31, 1910.)

ZINC—Improvements Relating to the Extraction of Zinc. Charles S. Brand, Bentinck Drive, Ayr, England. (Brit. No. 9955 of 1909.)

MINING—GENERAL

BLASTING—A Composition or Compound for Neutralizing the Noxious Fumes Produced by Blasting. William Burgess, Camborne, Cornwall. (Brit. No. 12,988 of 1909.)

DRILLING—Means for Collecting Drill Cuttings. Martin L. Sargent, Leadville, Colo., assignor to the Drill Dust Catcher Co. (U. S. No. 956,181; April 26, 1910.)

EXCAVATING SHOVEL. Charles J. Reise, Omaha, Neb. (U. S. No. 955,285; April 19, 1910.)

EXCAVATOR—Power Excavator. John B. Webber, Jr., Toledo, Ohio, assignor to the Vulcan Steam Shovel Co., Toledo, Ohio. (U. S. No. 13,107; April 26, 1910.)

HOISTING—Catching Devices for Cages. Heinrich W. Solfrain, Holsterhausen, Wanne, Germany, assignor to Max Schimmel, Wanne, Germany. (U. S. No. 956,214; April 26, 1910.)

HOISTING DEVICE. Edward O. Carvin, Manhattan, Nev., assignor of one-fourth to James Mcosh Smith, Manhattan, Nev. (U. S. No. 957,865; May 17, 1910.)

MINE-CAR BUFFER. Victor E. Lane, Berwick, Penn., assignor to American Car and Foundry Company, St. Louis, Mo. (U. S. No. 959,232; May 24, 1910.)

MINE CARS—Latch for End Gates of Mining Cars. Isaac K. Beaver, Wilburton, Penn., assignor of one-half to Elmer E. Straub, Wilburton, Penn. (U. S. No. 958,075; May 17, 1910.)

MINER'S LAMP. Louis Klun, Spaulding, Ill. (U. S. No. 953,093; March 29, 1910.)

TUNNELING MACHINE. George R. Bennett, Denver, Colo. (U. S. No. 958,952; May 24, 1910.)

ORE DRESSING—GENERAL

CONCENTRATION — Grate for Concentrator Jigs. Sterling P. Robinson, Galena, Kan. (U. S. No. 960,111; May 31, 1910.)

CONCENTRATION—Improvements in or Relating to the Concentration of Ores. H. L. Sulman and H. F. K. Picard, London, England. (Brit. No. 28,173 of 1908.)

CRUSHER. Arthur Niedermeyer and Richard Bernhard, Milwaukee, Wis., assignors to Power and Mining Machinery Co. (U. S. Nos. 960,231 and 960,232; May 31, 1910.)

CRUSHER—Gyratory Crusher. George F. De Wein, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 961,084; June 7, 1910.)

DECANTING—Tilting Appliance for Decanting Oils and Liquids. Percival T. White and George Robertson, Perth, Western Australia. (U. S. No. 957,829; May 10, 1910.)

DEWATERING—Improvements in Means for Separating Pulverized Ore or Other Comminuted Solid Matter from Liquid. Alex. J. Arbuckle, and Alfred Osborne, Belgravia, near Johannesburg. (Brit. No. 24,402 of 1909.)

DEWATERING—Improvements in Tanks or Vessels for Separating Comminuted Solid Matter, such as Pulverized Ore from Liquids. Alex. J. Arbuckle, Belgravia, near Johannesburg, Transvaal. (Brit. No. 24,403 of 1909.)

DEWATERING — Means for Separating Comminuted Ores or Other Solid Matter from Liquid. Alex. J. Arbuckle, Johannesburg, burg, Transvaal. (U. S. No. 958,086; May 17, 1910.)

DEWATERING — Process of Separating Liquids from Solids. Horace G. Nichols, Ymir, British Columbia, Canada. (U. S. No. 959,272; May 17, 1910.)

DEWATERING—Process of Separating Solids from Liquids. Wilbur Alson Hendryx, Denver, Colo. (U. S. No. 960,547; June 7, 1910.)

DEWATERING DEVICE. Wilbur Alson Hendryx, Denver, Colo. (U. S. No. 960,546; June 7, 1910.)

ELECTROSTATIC SEPARATING PROCESS. Walter G. Swart, Denver, Colo., assignor to the Blake Mining and Milling Co. (U. S. No. 959,646; May 31, 1910.)

FILTER. George Moore, Salt Lake City, Utah. (U. S. No. 955,660; April 19, 1910.)

MAGNETIC SEPARATOR. Walter B. Transvaal. (U. S. No. 958,086; May 17, 1910.)

ORE CONCENTRATOR and Classifier. Martin Prior Boss, San Francisco, Cal. (U. S. No. 959,838; May 31, 1910.)

SCREENING—Improvements in or Relating to Machinery or Apparatus for Screening Crushed Stone, Ore and Like Materials. William H. Baxter, Leeds, England. (Brit. No. 16,179 of 1909.)

SCREENING MECHANISM. William Walter Willson, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co. (U. S. No. 959,-671; May 31, 1910.)

SEPARATION—Apparatus for Electrical Separation. Henry Azor Wentworth, Newton, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass. (U. S. No. 960,470; June 7, 1910.

METALLURGY—GENERAL

BRIQUETTING—Process of Briquetting Fines of Ore, Furnace Dust, Waste Metal, Waste Iron, Etc. Max Glass, Vienna, Austria-Hungary. (U. S. Nos. 958,623, 958,700 and 958,701; May 17, 1910.)

ELECTRIC FURNACE. John W. Evans, Belleville, Ontario, Canada. (U. S. No. 960,-862; June 7, 1910.)

ELECTRIC INDUCTION FURNACE. Karl A. F. Hiorth, Christiania, Norway. (U. S. No. 954,804; April 12, 1910.)

FURNACE—Revolving Furnace for Volatilizing Metals from their Ores. Harry H. Hughes, Springfield, Mo. (U. S. No. 13,118; reissue; May 31, 1910.)

ORE TREATMENT—Process of Treating Ores and Carboniferous Earths. Alfred Arthur Lockwood, London, England, assignor to the L. & S. Syndicate, Limited, London, England. (U. S. No. 959,239; May 24, 1910.)

REFRACTORY ORE TREATMENT—Process of Reducing Refractory Ores, Particularly Oxides and Sulphides. Gideon Boericke, Philadelphia, Penn. (U. S. No. 958,851; May 24, 1910.)

REGENERATIVE FURNACE. Franz Meyer, Englewood, N. J., assignor to Metallurgical Company of America, New York, N. Y. (U. S. No. 958,150; May 17, 1910.)

ROASTING FURNACE Self-Heating Hot-Blast Roasting Furnace. William M. Barker, McGill, Nev., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 961,081; June 7, 1910.)

SLAG—Method of Handling Slag. David T. Croxton, Cleveland, Ohio. (U. S. No. 959,720; May 31, 1910.)

SMELTING—Art of Smelting Ores. Arthur S. Dwight, San Luis Potosi, Mexico. (U. S. No. 959,484; May 31, 1910.)

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

T. Lane Carter, of Osgood, Carter & Co., Chicago, is examining mines in Nevada.

G. A. Rist, Jr., is on his way home to Bloomfield, N. J., after three years mining work in Peru.

John Hays Hammond will go to his summer home at Gloucester, Mass., about the end of June.

A. B. Dalley, of Pittsburg, has been appointed general manager of the Arkansas Natural Gas Company.

P. L. Marston has assumed his duties as superintendent of the Yaqui River Smelting and Refining Company, Sonora, Mexico.

Henry F. Lefevre has returned to New York after an absence of 10 months in Costa Rica, Guatemala, Salvador and Nicaragua.

J. C. Biedelman, of Montreal, has gone to the Sturgeon Lake district, Ontario, in the interests of a syndicate which owns several mining locations.

E. A. Cole has been chosen president of the Sunday Creek Company, of Ohio, in place of W. K. Field, who has gone to the Pittsburg Coal Company.

Thomas Heney, lately in charge of the Tamarack and Custer mines in Idaho, has been elected a director of the Tamarack & Chesapeake Mining Company.

Professor R. B. Brinsmade left Morgantown, W. Va., recently for northwestern Ontario where he will examine some mines for West Virginia investors.

R. H. Wolff, New York, representative in the United States of the Heroult electric steel furnace, sailed for Europe June 22, to be absent about two months.

Cooper Shapley, of Guanajuato, has been appointed consulting engineer for the Mexican Mining and Smelting Company, at Tapalpa, in the State of Jalisco, Mexico.

S. H. Brockunier has just completed an examination of the Erie and Ancho mines near Graniteville, Nevada county, Cal., and has returned to his home in Wheeling, West Virginia.

C. G. Memminger, Lakeland, Fla., vice-president of the Coronet Phosphate Company, is spending a few days in New York, prior to sailing for Europe, where he will spend several months.

J. B. Stewart, formerly of El Oro and Guanajuato, Mexico, has joined the Constant-Herzig Company and will be in charge of the metallurgical department, making a specialty of cyanide work.

S. F. Shaw, general manager and consulting engineer for the Montezuma Mines of Costa Rica has gone to Costa Rica, where he will be engaged for some months in starting operations on the mines.

Professor Willett G. Miller, Provincial geologist of Ontario, has returned to Toronto from the Porcupine district, where he has been in charge of a party engaged in making a geological map of the area.

Oberbergrath Schneider, director of the *Bergakademie* at Freiberg, is to visit the United States, arriving on June 28. While in this country, his address will be in care of H. A. Keller, 45 Broadway, New York.

John Knox, Jr., in charge of the underground work for the Calumet & Hecla Mining Company, has returned to the mine after an extended sojourn in the South where he has been for the benefit of his health.

E. C. Engelhardt has resigned his position with the Mary Murphy Gold Mining Company, at St. Elmo, Colo., and has been appointed superintendent of the Cooke Mining and Reduction Company, at Cooke, Montana.

Edwin H. Messiter is no longer with the Robins Conveying Belt Company and is now in a position to take up special problems connected with the handling of material in metallurgical plants. His address is 25 Broad street, New York.

Frank H. Probert left Los Angeles, Cal., June 14, for a trip to Bisbee and Globe before continuing his journey on to Boston and the New York offices. From New York he expects to make a geological examination of the Potosi lead district in Missouri.

William Martin, late United States consul general at Hankow, China, has arrived at Seattle as the representative of the Hankow iron interests, which recently made a contract with the Western Steel Corporation for iron ore for the steel plant at Irondale, Washington.

Frank H. Crockard, vice-president and general manager of the Tennessee Coal, Iron and Railroad Company, delivered the dedicatory address, May 30, at Comer Hall, the new building of the engineering department of the University of Alabama. Dr. Joseph A. Holmes, of the United States Geological Survey delivered the address at Smith Hall, the new building of the geological department and museum of the Alabama Geological Survey.

OBITUARY

Charles A. Starne died at Springfield, Ill., June 4, aged 60 years. He was born in Pike county, Ill.; when 20 years old he was employed by his father in opening a coal mine near Springfield, one of the early mines in that district. Ever since that time he had been a mine operator and manager. At the time of his death he was general manager of the West End Coal Company and president of the Barclay Coal and Mining Company.

Elisha P. Wilbur died at Alexandria Bay, N. Y., June 4, aged 77 years. He was born at Mystic, Conn., and in 1852 he went to Mauch Chunk, Penn., where he was employed in the engineer corps which was surveying the line for the Lehigh Valley road. Later he became secretary to Judge Asa Packer, president of the company, and was closely associated with him until his death, when he became a trustee of the Packer estate. He was president of the Lehigh Valley Company for 10 years. He was also at one time one of the largest stockholders of the Bethlehem Iron Company, president of the Coplay Iron Company, and director of the Northampton Iron Company. He had large coal interests, being president of the Jefferson Coal Company, and the Packer Coal Company, and president of the Wilbur Coke Company, owning 30,000 acres of land in West Virginia, and a director of the Valley Coal and Coke Company, of Belington, in the same State. He leaves a widow and seven sons.

George W. Hughes, one of the pioneers of the Slocan mining district, of British Columbia, died at Portland, Oregon, June 14, having been ill with paralysis about three years. He was 51 years old and unmarried. Prior to 1892, in which year he went to the Slocan, he was engaged in railway construction work in northeastern Washington and the neighboring country. He took with him a pack train of 40 mules to transport ore from Slocan mines to Nakusp, on the Columbia river. Afterward he took a prominent part in building a wagon road to Kaslo, over which he hauled much ore from the Washington, Freddie Lee, and other Slocan mines, until the construction of the Kaslo & Slocan railway. Later he became manager of the Alamo and Idaho mines, and afterward owned the Sunset group and part interest in the Mountain Chief, Apex and Mammoth mines. He also acquired the Lucky Jim group, the chief producing mine in British Columbia. All these mining interests he sold after he became unable to supervise their operations personally. His body has been taken to Delta, Penn., for interment.

SOCIETIES and TECHNICAL SCHOOLS

Massachusetts Institute of Technology—Professor Robert H. Richards left Boston June 10, on a summer school trip with his mining students. He was accompanied by Professors Bugbee and Hayward, both of the mining department. The party will go to Buffalo, and from there take an ore steamer to Duluth. They expect to visit the Michigan copper region at Keweenaw Point, the nickel mines at Sudbury, and finally, the silver mines at Cobalt, Ontario.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

June 16—When the farmers of Shasta county about a year ago began an agitation against the smelting companies, to compel them to put in devices to prevent damage from sulphurous fumes, the committee which visited the Bully Hill smeltery at Winthrop reported unanimously that no complaints had been made against that particular plant. The timber near by had all been cut before the plant was built, and outside a radius of two miles no damage to plant life could be noticed. On March 12, however, the Bully Hill company received notice from the U. S. Forest Bureau that a smoke-consuming device must be put in so that no damage could be done to timber in the Shasta national forest. The device was ordered to be put in within 90 days, though subsequently 20 days more were allowed, the limit date now being July 2. No such notices were needed for the Mammoth plant, at Kennett or the Balaklala, at Coram, as they are under contract with the Shasta County Farmer's Protective Association to install and begin the use of smoke-consuming devices by July 1. It is contended that there is much less sulphur in the smoke from the Bully Hill than from the other smelteries in the county, and the officers of the company are still negotiating with the federal officials. If the Government insists on its present position, it is probable that the Bully Hill smeltery at Winthrop will be closed.

Similar action on the part of the Government resulted in the closing of the extensive smelting plant of the Mountain Copper Company, at Keswick, some years ago, and that company erected a new smeltery on the shores of Suisun bay, above Martinez. The Bully Hill company is now negotiating with the other smelters to treat its ores.

The corporation known as the Champion Gold Mining Company, which took over the Champion mine at Nevada City some months ago, has been attached by the South Yuba Water Company for $1400 due for water and a lien has been filed on ore extracted for wages due the miners. As this company has not complied with the terms of the agreement with the Champion Mines Company, property reverts to the latter company.

The finding of the upper oreshoot in the Tightner mine at Alleghany, at 648 ft. below the old workings and 1650 ft. from the mouth of the tunnel, is considered important.

Denver

June 19—The Conundrum vein, which is really a mineralized basalt dike on Gold hill, Cripple Creek, has been in the past celebrated alike for its rich ore and the foul gases which prevented the proper exploitation of the same. By the installation of a ventilation process, operations have been successfully resumed at the 900, or lowest level, by Worcester, the lessee, and a 10-ft. orebody has been discovered, which averages about $50 per ton in gold. The Conundrum, Mary Ann, and Ethel Louise claims belong to the Ethel Louise Mining Company.

Beacon hill, the mines of which are soon to be unwatered by the Roosevelt deep drainage tunnel, is again to the fore with an extremely rich discovery in the Prince Albert company ground by Edward Cookerly, lessee. The ore is said to be petzite, and the width, 14 ft. Assays just taken run from $18 to $300 per ton in gold. Another shoot lately uncovered between the Prince Albert and the Black Belle, by the Union Leasing Company, is said to be 3½ ft. wide, and averaging about $30 per ton in gold. The drainage tunnel is expected to be under these mines, and the El Paso mine by September, when it is planned to have a formal opening, at which Mr. Roosevelt is expected to be present. The success of this tunnel will mean an enormous amount of additional orebodies made available and will be a great object lesson to other mining communities in the matter of coöperative drainage.

Butte

June 18—Persistent rumors concerning the financial difficulties of the Butte & Superior Copper Company have served to depress the market quotations. While mining has been going on as usual, no work is being done on the concentrator. The best obtainable information, while not authentic, is to the effect that the present capitalization of 1,200,000 shares of the par value of $5 will be changed so that the shares will number 600,000 and their par value will be $10 each. The former $400,000 bond issue will be retired and a new $1,000,000 issue authorized. Apparently, the deal with the American Metals Company, by which that company agreed to furnish funds for the construction of the zinc concentrator, has miscarried or else the public has been misinformed as to the tenor of that agreement. The situation contains many puzzling features for there seems to be no question but that the property contains valuable deposits of zinc ore, which can be worked at a profit.

Alexander Fairgrieve, president of District No. 27, United Mine Workers, has recently made the statement that when the wage-scale conference meets at Billings, Aug. 23, the Montana coal miners will demand a wage increase of 5½ per cent. over the present scale, in conformity with the demand for increases throughout the country.

Salt Lake City

June 18—A new power plant is being built in Sevier county in the south-central part of the State by the Belnap Power Company. The plant, when completed, will generate 9000 h.p. The company controls 1519 acres along the Sevier river, between Marysvale and Sevier, on the Denver & Rio Grande. There is a fall of 329 ft. in the part of Sevier cañon, controlled by the company. The plant will be built in sections. Work is now under way on the first unit which will furnish 1500 h.p. A 1400-ft. tunnel is being driven through the neck of Horse Shoe bend, near Sevier, which will obviate flume and canal construction and reduce the cost of maintenance. A power plant will be built at the north end of the tunnel and will furnish electricity for the towns of Joseph, Elsinore and Richfield. Should there be enough demand, a line will be extended south from Sevier to supply the Marysvale and Gold Mountain mining districts. William Seegmiller, of Richfield, is president of the company, William Johnson, treasurer, and J. B. Weimer, manager.

Miners' Day was celebrated at Salt Lake and Lagoon, June 13. About 2000 miners and their families, from Park City, Bingham, Mercur, Stockton and Tintic took part. Bingham sent about 900, the largest representation, while Tintic was second, with 700. Two special trains were run from Tintic, over the Salt Lake route, and the Bingham miners had two trains of their own over the Rio Grande. There was a parade in the city in the morning, and a baseball game and various amusements at Lagoon in the afternoon.

Articles of incorporation of the Bonneville Mining Company have been filed by the Knight interests. The capital stock is $100,000, based on the valuation of mining property in the mountains between Provo and Springville. A long tunnel will be driven about three miles southeast of Provo to prospect for mineral and water. Work on this tunnel has been started. The officers of the company are: Jesse Knight, president; J. William Knight, vice-president; R. E. Allen, secretary and treasurer.

Goldfield

June 18—In pursuance of its policy to eliminate as far as possible danger of accident or injury to its employees, the Goldfield Consolidated has organized an inspection department. While timbering and ventilation in the property are excellent, it is planned to better these conditions, if possible, by adopting all reasonable and practical precautions for safety. Hoists, cages, shafts, ladderways and timbering as well as other machinery on the surface are regularly inspected and notices have been posted urging the employees to offer any suggestions. The elaborate system of fire protection being installed in part of the general plan and will be under the supervision of the inspection department.

M. J. Smith, an assayer, was convicted, June 8, on the charge of stealing gold-bearing amalgam from the Consolidated mill. It was alleged that Smith approached an amalgamator and that a conspiracy involving a watchman at the mill and a peace officer and saloonkeeper in Goldfield was formed. The mill men turned "State's evidence," Smith has been found guilty by the jury and the others are under indictment awaiting trial.

The management of the new consolidation, Nevada Hills-Fairview Eagle, has given notice of a new and reduced wage scale. The union has decided that nothing could be gained by resistance, so the new scale, the same as in Goldfield, will be accepted.

Buckhorn, the new camp in Eureka county appears to have good possibilities. It is claimed that the ore can be mined with steam shovels. George Wingfield has been developing the property and is planning a cyanide plant.

The Lemon mill at Manhattan, which has been idle for four years, has been sold to J. V. Priest, representing eastern capitalists. The sale clears up the litigation and the mill will be placed in commission at an early date. The other plants in the vicinity are now unable to handle all the custom ore.

Toronto

June 18—The output of the Canadian lead mines for the fiscal year ended March 31 was the largest for several years, as indicated by the returns of bounties paid on lead ore delivered at Canadian smelteries. The bounty now amounts to $15 per ton of lead on a sliding scale based on the London price of lead. The payments last year were $340,542 representing 45,467,545 lb. of lead, as compared with $307,432 for 42,533,287 lb. the year previous.

W. J. Bauldry, the expert engaged by the Temiskaming & Northern Ontario Railway Commission to make investigations as to the alleged discoveries of coal deposits on the Metagami river, in northern Ontario, reports that no coal has been found. Lignite occurs in some quantities but the known amount is not large and its value problematical. There are large deposits of iron ore in the district which will yield as high as 50 per cent. iron.

Dawson, Y. T.

June 6—The opening of the Yukon river is creating great activity in the Dawson camp. Machinery is coming in and placer, quartz and coal operations are being exploited extensively. The opening of coal properties is one of the most important of all the projects this season. With the enterprises under way it is expected that by the end of the season the coal promoters will have the product on the market. The Tantalus mines, which are being exploited by St. Paul capital have been prospected all winter, and a new seam of coal 9 ft. thick has been struck. This seam is on the Tantalus Butte property, owned by the Five Fingers Coal Company. The Northern Light, Power and Coal Company is continuing prospecting and development on its Coal Creek properties, and expects to have 2500 tons of machinery for its lower plant here early in the season. Frank Morrison will continue prospecting his coal properties on the Klondike with diamond drills.

A. N. C. Treadgold is installing a large power scheme on the Klondike river, and has taken over much ground on Dominion and Quartz creeks.

A three-mile spur has recently been completed to the Jackpot mine, one of the British Columbia Copper Company properties. The Jackpot first week shipments amounted to 480 tons, and the tonnage will increase according to the requirements at the smeltery. The ore averages from $7 to $9 and the property promises to become one of the important producers in the Boundary district.

Johannesburg

May 10—The share market in Rand stocks has been quite neglected during the last few months largely owing to the increased speculation in rubber and oil shares. The chief reason is, however, that most of the stocks do not at present prices present attractive investments when the question of amortization of capital is considered; 12½ per cent. is about the highest yield at present available and a mine like the East Rand Proprietary with a large area of unworked ground and a possible long life of 30 years yields only 7 per cent. When disappointments owing to falls of grade and other causes have to be set against possible increases in profits due to possible future reductions in working costs the investor prefers to buy rubber or oil shares which yield 10 per cent or over with prospects of higher returns and in the case of rubber lands a permanent investment

The visit of Mr. Marriott has been followed by a rise in grade and in the profits earned by several mines and now there are signs that the directors of the Rand mining industry may decide to work the rich ore first. Mines are already stopping the working of stopes assumed to be unpayable and hanging up stamps. Just how far this will be a genuine reaction from the practice of sending up waste or unpayable ore to keep the mills going will depend on quite a number of factors and the factor of policy is an unknown one. Since Mr. Marriott's visit and the charges he laid against the wisdom of the system of mining as those prevailing on the Rand several important charges in the administrative staffs in the head offices and on the mines have been carried out and it is said that the members of the American colony have been the heaviest sufferers.

A serious accident on the Cinderella Deep which is stoping below 4000 ft. has given warning of the dangers to be met with in attempting to work mines at this depth in the open stopes and pillar system which has so long prevailed in the older and shallower mines. The warnings that might have been derived from the fate of the Atlantic mine in the Lake Superior region have so far been disregarded and the dangerous condition of some of the outcrop mines is only now forcing the administrations to start sand filling. Seventeen natives were killed and several injured by an "air blast," as the official report describes the accident. At 4000 ft. theoretically 50 per cent. of pillars would not be sufficient to support the roof.

It is highly probable that in these deep mines sand filling will be introduced into the workings by means of low-pressure compressed air and that the sand will be subsequently wetted and packed in place. In this way the difficulty and expense of dealing with large quantities of water will be avoided. Dry sand forms a particularly favorable filling to be transported by air. It will be remembered that the experiments at Kattowitz in Prussia were carried out with filling the size of pigeons eggs and naturally higher pressures had to be employed. The fact that most of the slimes have been separated from the sands would also render the grains more mobile and prevent packing.

It is unofficially stated that the prize for the stope drill competition will be divided between the Holman and Siskol drills with the Chersen second.

THE MINING NEWS

Reports of New Enterprises, New Machinery,
Installations, Development Work and Property
Transfers The Current History of Mining

Alaska

Alaska Mexican—For the month ended May 15 the ore crushed was 17,929 tons of an average yield of $3.09 per ton. The total production was $55,508 and the net operating profit $24,610.

Alaska Treadwell—For the month ended May 15, 68,488 tons were crushed, averaging $2.56. The total product was $175,506, and the net operating profit, $78,806.

Alaska United—For the month ended May 15, the Ready Bullion and the "700" mills crushed respectively 18,970 and 15,797 tons; yielding respectively $39,809 and $32,504; with a net operating profit of $12,435 and $7634 and a yield per ton of $2.10 and $2.06 respectively.

Arizona

Cochise County

A general lessening of the water in the Bisbee mines is noted, presumably due to the continued drought.

The Whitetail mine near the Bisbee-Sonora is being developed as is also the Leadville. The Sullivan is still idle. Many claims have been located in Whitetail cañon.

Bisbee-Sonora—This property in the Chiricahua mountains will install machinery. About 1000 ft. of development has been done.

Gila County

Old Dominion—The output for May was 2,150,000 lb. of fine copper. The output for June is expected to be about the same. Three blast furnaces are in operation. George Kingdon is mine superintendent.

Live Oak—Drill hole No. 5, 1100 ft. west and 300 ft. south of the shaft, encountered chalcocite ore averaging 2½ per cent. copper, at 320 ft., and is still being sunk in the ore 425 ft. from the surface. This is the sixth hole on the land, penetrating the orebody, No. 6 having passed through 100 ft. of ore some time ago. Hole No. 5 is 1100 ft. west of the shaft, where the orebody was first penetrated, and 300 ft. south of it. Hole No. 7 is 700 ft. south of the shaft and 300 ft. west of it. On the 200-ft. level of the mine, drift No. 208 has been driven continuously eastward through ore of good grade for 235 ft. Drift No. 207, driven southward from drift No. 208, has passed through ore for 34 ft. M. E. McCarthy is manager.

Superior & Boston—The McGaw, the main working shaft of the property, has been sunk 163 ft. below the sixth level. The west winze sunk from the 400-ft. level of the Gardner workings is still going down in ore averaging 8 per cent. copper. This winze is being sunk at an angle on the Black Oxide vein. Regular shipments of 9 per cent. oxidized copper ore are being continued from the Great Eastern vein at the rate of two carloads daily. John D. Wanvig is superintendent.

Venture Exploration—A force has been put at work on the property recently acquired from the Gibson Copper Company by the Venture Exploration Company.

Santa Cruz County

Bland and Kangaroo—What bids fair to be an important discovery has been made by T. M. Heck in sinking a joint shaft for these mines. A point of ore was encountered at 15 ft., which rapidly widened, making at 25 ft. a body of sulphide ore about 3 ft. wide and running 10 per cent. copper and $20 in gold and silver. The ore, when first met, was indigo copper and at 1 ft. of thickness ran 50 per cent. copper. This is the first find reported of covellite in the Santa Ritas in commercial quantity. Mr. Heck has taken out 300 tons already and has commenced hauling to Patagonia.

Augusta—Hoval A. Smith is making an examination of this copper mine, from which heavy shipments were made last winter. This is a pyritic ore, running from 3 per cent. up.

Wandering Jew—Work done by R. R. Richardson, of Patagonia on this mine disclosed lead in the shaft 3 ft. wide at 140 ft. In the east drift on the 200-ft. level, a copper-silver was found at 40 ft. from the shaft. The work is still in this body of ore.

Silver Cañon—Josiah Bond has bonded this group for $25,000, and work will begin on a deep shaft. The ore here is a high-grade silver ore.

Four Metals—This mine at Turkey flat has changed hands and it is stated now belongs to copper men of New York, who are considering opening the mine on a large scale, including mill and railroad to connect with the Southern Pacific near Calabasas. There was excitement at this mine last year when a large body of low-grade copper ore was penetrated by tunnel. The ore was cubanite and in the crosscut had a tenor of 2 to 3 per cent.

Gila County

Pulaski—Martin Michelski has opened carbonate ore on this mine in the Josephine cañon.

Yuma County

Silent King—This group in the Alamo mountains is being developed by Llewellen Humphries, of Salt Lake City. Machinery will be installed.

Arkansas

The Willis zinc property in Boone county is being developed by J. H. Dickerson, of Harrison. The Tar Kiln company, Thomas Malone, manager, is erecting a concentrator.

California

Amador County

Monte de Oro—The 10-stamp mill erected at this mine, Plymouth, by A. F. Morgan, will operate.

Solano—This gold company, owned by C. and B. F. Reams, has recently purchased from J. Acosta a gravel claim north of Rolan Volcano and will begin work on it.

Butte County

Butte Star—E. C. Wilson has sold the controlling interest in this property near Nimshew to G. W. Cramer, of Germantown, Penn. The gravel channel in the mine is tapped by a 3000-ft. tunnel.

Calaveras County

Copa de Oro—This company, working on the south bank of the Mokelumne river, has run a tunnel 425 ft. under supervision of Alex Ransom. A mill and cyanide plant will be erected.

Eldorado County

Good Luck—This mine in Diamond Springs district is being worked by William Mitchell and the miners are in a payshoot from 16 to 24 in. wide. There is a 5-stamp mill.

Big Buzzard—This mine is being opened at Negro hill, a few miles from Folsom, by L. Darrington, George Darrington and Joseph Forster.

Humboldt County

Klamath—Extensive improvements have been made by this company on its hydraulic mine at Weitchpec. C. A. Sample is in charge.

Inyo County

Bishop Creek—Work on this property has been resumed and the water has been lowered to the second level.

Cold Storage—At this new camp D. C. Adamson has found a rich vein a mile west of the Golden Siren. At the latter mine a tunnel is being run up to tap the vein in the shaft. The owners intend erecting a mill.

Casa Diablo—This mine, 20 miles north of Bishop, has a 30-ton mill which will be enlarged.

NEVADA COUNTY

Wisconsin—This mine at Graniteville is being reopened under charge of Fred Medlin. Hoisting and pumping machinery will be put in.

Powning—This Grass Valley mine has been placed under bond to C. D. Tregoning, who will develop it.

PLACER COUNTY

Imperial—The Central Mines and Development Company, of Uniontown, Penn., has been organized to purchase this mine near Michigan Bluff.

PLUMAS COUNTY

Negotiations are going on with the Western Pacific railway to induce it to build a spur into Mohawk valley where San Francisco men connected with the Anglo-California bank own an iron-ore deposit.

Salmon Falls—This placer claim near Seneca has been bonded by G. H. Goodhue and others to Dr. C. I. Burt.

Del Monte—J. J. Reilly has made payments on this mine and has 15 men at work.

SHASTA COUNTY

Evening Star—This property at Old Diggings, under control of German capital, is shipping 400 tons of ore monthly to the smelteries.

Victor—The 20-ton Nissen mill has arrived at Harrison gulch.

Sibyl—The French Gulch Mining Company at French gulch has taken a two-year lease on this mine at the same place.

SIERRA COUNTY

Von Humboldt—This mine at Alleghany, idle for 12 years, has been bonded to F. B. Smith and J. J. Guentherodt and will be started up under Frank B. Smith.

Amethyst—This mine at Forest has been bonded to men from San Francisco and Alameda. A. C. Wilkinson, Oakland, is manager.

SISKIYOU COUNTY

Yreka—The custom quartz mill at Yreka will be moved to Forks of Salmon.

TRINITY COUNTY

D. B. Fields has bonded to Dr. B. E. Stevenson and J. A. Manaudas, of Redding, his placer and quartz claims in Indian Creek, Pauwauket and Douglas City districts, together with ditches and pipe lines. The new company will commence active work on the lower placers.

Headlight—A 40-stamp mill is being built for this mine near Carrville.

TUOLUMNE COUNTY

Old Dominion—Grant & Rowse have found a rich pocket in this mine near Columbia.

Longfellow—This mine, at Big Oak Flat, has resumed under supervision of Frederick Meyer.

Colorado

BOULDER COUNTY

Colorado-Arizona—This company is erecting a 50-ton mill at Magnolia.

Morning Star—This mill at Ward has started treating ore from the 300-ft. level. Clifton H. Skidmore is in charge.

GUNNISON COUNTY

Elk Mountain—This company is developing the Mountain King. A water-power installation will be made. J. T. Bennett is superintendent.

LEADVILLE—LAKE COUNTY

Sawatch—This tunnel, in the Sugar Loaf district, on which work was commenced a year ago, is now in 1200 ft., and is being advanced 200 ft. per month. The plant is operated by electric power from the Central Colorado Power Company. About 800 ft. remains to be driven before reaching the objective vein series. North Carolina capital is interested. J. F. Horner is the manager.

Lovejoy and Steel Springs—These tunnels, on Printer Boy hill, have each been driven 700 ft., and have been producing much ore during the last few months under the management of J. C. Hersey.

Clear Grit—This mine, on Long & Derry hill, and largely owned by Charles J. Moore, of Denver, is to be reopened. An electric plant is being installed, and the old shaft will be sunk. It is believed to be in line with the orebodies of the Houston and other mines, and generally conceded to be a property of promise. C. J. Moore is also working the Ella Beeler.

SAN JUAN DISTRICT

Revenue—This mine in Sneffels basin will put on an additional force. It is interesting to note that this mine, like the Camp Bird, showed silver-lead ore on the surface, while at 2000 ft., it is producing largely in gold.

Camp Bird—The company's quarterly report says: "Everything in development work so far points to the fact that the second level horizon is too low."

TELLER COUNTY—CRIPPLE CREEK

Jerry Johnson—This mine, on the north slope of Ironclad hill, is once more in rich ore, and the mill, erected by the lessee, Edwin Gaylord, at the mine, is treating 50 tons daily besides what goes to the Valley mills and the smelteries. The W. P. H., which lies 100 ft. to the north of the Jerry Johnson, is also said to be in "bonanza." A year ago these properties were supposed to be worked out. Both these veins are entirely in the breccia area.

Free Coinage—The Wilson and the Reed & Van Tilborg leases have opened an oreshoot on which they have drifted already 15 ft. There is a seam of free gold on the footwall which is being sacked. There are 15 sets of lessees at work on the Free Coinage company, and carload shipments are yielding from $20 to $45 per ton in gold.

Idaho

CŒUR D'ALENE DISTRICT

Cedar Creek—Two feet of shipping galena ore was broken into in the face of a 1000-ft. crosscut tunnel recently. The property lies near the Hercules mine and the strike is considered one of the most important in the district for the last year.

Monarch—The company has sold to the Cœur d'Alene North Fork Mining and Smelting Company the Monarch mine, a lead shipper, for $175,000.

Indiana

SULLIVAN COUNTY

The County board of review has practically decided to allow a deduction each year from the valuation of mining property for coal actually mined during the year. This action comes after solicitation of representatives of the Alliance, the Consolidated Indiana and other coal companies. This has been the rule in all the Indiana coal-producing counties except Sullivan.

Thomas J. McAnally, of Jackson, has filed suit against the Consolidated Indiana Coal Mining Company for $39,000, alleging that the company mined 19,000 tons of coal from under his farm without his consent. The suit is regarded as of great importance.

VIGO COUNTY

The joint scale committee of district No. 11 has been at work making a permanent contract for six weeks. The more troublesome questions were easily and satisfactorily settled, but the mine workers and operators have split on the firing clause. The miners, however, will probably continue to work indefinitely under the temporary agreement.

Kansas

Diplomat—This company, A. L. Gains, superintendent, has completed its new mill at Galena.

Mess—This company, at Galena, has made a most phenomenal strike on the land of the Glick Land and Mining Company, west of Galena. A 20-ft. face of lead ore was disclosed at 80 ft. in one hole and about the same amount of blende in several other holes. The shaft has been sunk through the deposit.

Lockport—The mines of the company at Galena, which were flooded by the overflow of Short Creek bottoms, are be-ng drained again with the help of large pumps.

Kentucky

Cumberland Mining Company—This company has been formed at Burkesville to develop zinc-lead leases on 25,000 acres along the Cumberland river. Operations have been begun at Otia, Monroe county.

Michigan

Copper

Wyandot—The drill operating from surface to cut the lode on which the exploratory shaft was sunk has reached 220 ft. The crosscut from the bottom of the shaft continues eastward toward the Baltic and Lake lodes.

Wolverine—This company has started drill operations to ascertain the mineralization of the Osceola lode on its lands. The exploratory crosscut driving eastward from the 28th level is making good progress.

Algomah—The company has started sinking on the site of the recently exposed ore.

Lake—Preparations are being made to start crosscutting to the lode from the seventh level of the shaft. The pitch of the shaft is being changed to conform more closely with that of the formation. Excavating for the permanent surface equipment is under way.

North Lake—No. 8 drill exposed a felsite formation carrying copper in silicates and oxides at 550 ft. The core resembles that taken from the No. 2 hole of the Indiana at 1400 ft., with the exception that this core carried native copper.

Keweenaw—The company has discontinued drilling from the bottom of its Medora shaft after penetrating the Osceola amygdaloid and the Calumet conglomerate lodes, both of which carried a small amount of copper. The sinking on the Kearsarge lode is down 225 ft. in the hanging wall. At the 150-ft. level a crosscut was extended to the footwall showing the lode was charged with copper. This lode has been exposed at 1400 ft. by a drill put down in line with this shaft.

Mass—-Preparations have been about completed for the resumption of sinking at "C" shaft, which has been bottomed at the eighth level for some time.

Missouri

Center Creek—This company has decided to drill its land at Webb City and Carterville and prospect for the deep ore. There has been a production of about $14,000,000 from the upper levels of this land and it has been worked only to 170 ft. Neighboring mines have been worked to 250 feet.

Mandarin—This company has made a rich strike in a drill hole from the 42-ft. to the 97-ft. level. A new shaft will be sunk.

Mary E.—C. C. Playter has completed the mill at this mine at Spring City. This prospect has some of the richest ore in the district.

Joplin-Webb City Consolidated—This company has taken over the Minor Heir mine and lease at Webb City.

Lone Star—This company operating near Knights Station has uncovered a 6-ft. face of lead ore in the mine at 14 feet.

Montana

BUTTE DISTRICT

Davis-Daly—The assessment on all issued stock is to provide money for continued operations. The operating expenses are $10,000 per month and with less than $50,000 in the treasury funds will soon be needed. The injunction proceedings against the company, which have prevented it from building a tramway from its Colorado shaft to the Great Northern tracks have been appealed to the supreme court and until a final decision has been reached no shipments will be made. On the 1400-ft. level of the Colorado there is a body of smelting ore blocked out while on the other levels from the 1000 to the 1500 the ore is of concentrating grade.

Butte-Ballaklava—Superintendent Newton says, "The ore is widening and improving in the 900 west shoot. We are running on the 800 level which continues rich. On the 700 we have 4 ft. of 16 per cent. copper and 34 oz. of silver." President P. H. Nelson has returned to Duluth.

East Butte—The company has issued its annual report. On April 8, 1909, the East Butte and the Pittsmont companies entered into an operating agreement, which became effective Oct. 1, 1909, and since that time the East Butte company has been operating the properties of both concerns. During the six months previous to March 31, 1910, the company mined 3,645,220 lb. of copper, 106,485 oz. of silver and 882 oz. of gold, of a total value of $496,091, which, after deducting operating expenses, left a profit of $80,479. Of this amount $16,170 has been expended for new machinery and $43,915 for exploration and development.

North Butte—In connection with the dividend reduction from 50c. to 30c., the company says: "At the present time an extraordinary amount of development work is being vigorously prosecuted in the mines. Two shafts are being opened, development work on both Edith May and Jessie veins prosecuted on 2000- and 2200-ft. levels and below the 2200-ft. level on the Edith May as well as extensive development of the Crœsus claim the remaining part of which was recently secured and of contiguous property. This development work is disclosing additions to the ore reserves in the mines. The winze below the 2200-ft. level of the Edith May still continues to disclose high-grade ore and the development work on Crœsus claim and contiguous property is disclosing ore of excellent grade. In view of the development and additional expenditures required for this purpose, the directors deem it prudent at this time to declare a dividend of 30c. per share."

CASCADE COUNTY

In the Neihart district the Snow Creek company has several tons of ore on its dump and will start its mill. Leasers on the Whippoorwill property have started making shipments, while Kavanaugh, Bronson & Weiberg have made one shipment from the Spokane mine, and will make regular shipments in the future. At the Ripple mine the lower tunnel is close to the oreshoot which produced high-grade ore through the upper workings. On the 200-ft. level of the Broken Hill mine John McCooey has cut profitable ore and will begin shipments. On the Tom Hendricks claim Lenny & Co. have struck ore, which has greatly encouraged prospectors in the district.

FERGUS COUNTY

Cumberland—The mill has proved entirely satisfactory, and ore from the Cumberland and from the Spotted Horse will be treated.

GRANITE COUNTY

Hidden Lake—After a test of the stamp mill, the results of this treatment have been found to be unsatisfactory, and operations will be curtailed until some effective method can be found.

LEWIS & CLARK COUNTY

A fire, starting in the dust at the bottom of the baghouse at the East Helena smeltery, consumed the bags and partially destroyed the wooden stacks which convey the fumes into the open air. Thirty men employed at the sampling works went out on a strike, June 8. The men are seeking an increase in pay from $2 to $2.25 which Manager F. M. Smith has not as yet conceded.

Old Dominion—A recent shipment of 20 tons to the East Helena smeltery netted Daniel Dutro, who is working the property, $1400. The value of the recent shipment was principally in gold, whereas for 40 years the principal metals have been silver and lead.

MADISON COUNTY

The five-stamp mill on the Pritchett property in Bear Gulch has been in operation for several weeks. The lessees of the Carolina mine at Goodrich gulch have received returns from a recent shipment giving $93 per ton. The Empire Exploration Company has encountered ore running from $20 to $25 per ton on its Pacific claim. The American Goldfields Placer Mining Company is pushing operations on its property near Goodrich gulch.

Winnitka—The company, organized by D. J. McGrath, Arthur Tullock and F. C. Ball, of Butte, owns gold claims 4½ miles south of Virginia City. The property is being worked by a tunnel in 150 ft. A new tunnel will be started.

Missoula County

Bryan—This property will resume operations. Much lead-silver ore has been exposed and a mill is planned for this summer.

Powell County

Victor—The property is four miles from Ophir and consists of three gold quartz claims. A shaft has been sunk 150 ft. and about 1500 ft. of crosscuts and drifts run. A mill test of ore on the ground gave $20.80 to the ton.

Missoula County

In the Saltese and Carter districts considerable activity is being shown. At the Ben Hur, near Saltese, while running a raise from the lower tunnel a 6-ft. vein of solid galena was encountered. Shipments will be begun at once. At the Monitor mine the pumps have been put in commission and preparations are being made for shipping. The Iron Mountain company has recently cut a vein of shipping galena in the lower level, and the development of the zinc vein is being pushed. Joseph Carson has secured a lease on the Little Pittsburg mine, and will begin operations. The Carter Mining and Milling Company is ready to begin shipments. At Hamilton-Cœur d'Alene mine the tunnel, now in 300 ft., will be driven another 200 ft. to tap the ore in the shaft.

Nevada

Esmeralda County

Goldfield Consolidated—Preparations are under way for "glory-holing" the Combination vein system from the 400-ft. level to the surface. Rich milling ore will be extracted along the vein nearly 1000 ft. through the lower workings of the old Hampton stope which are in readiness to commence the work. Application has been made to the New York Stock Exchange for the listing of 3,559,148 shares of the capital stock of the company, which represents the outstanding stock of the company. The authorized capital is $50,000,000, the par value $10.

Combination Fraction—The orebodies on the 500, 750 and intermediate levels are being developed rapidly to supply the mill with 75 tons daily.

Humboldt County

Donald Ferguson, of Goldfield, has purchased five claims owned by Frank Snapp, of Rebel Creek, Nev., and the Wells-Fargo company in the New Goldfields district south of National. The property is low grade.

National Consolidated—A bullion shipment of $83,000 has been made from the Stall lease. J. H. Cansten, of Eureka, has taken an adjoining lease.

Lander County

Buckhorn—George Wingfield has given an option to Aug. 1 on his property south of Battle Mountain, for $3,000,000, to the United States Mining Company, of Salt Lake City. It is reported that the mine has $2,000,000 worth of ore blocked out.

Lincoln County

Yellow Pine—The 50-ton mill in the Goodsprings district is being built. The grade for the railroad from Jean to the mill is ready for the rails.

Nye County

Mizpah Extension—This group is to be extensively developed. An 800-ft. shaft already sunk, will be deepened and lateral work commenced.

Tonopah-Belmont—The first semi-monthly cleanup since resumption of mill operations, produced $20,000 in bullion and $12,500 in concentrates.

Tonopah Extension—A new 82-h.p. electric hoist will replace the old steam installation.

Tonopah—The Red Plume ore bins are ready to handle the tonnage from the western portion of the mine, eliminating much training.

New Mexico

Grant County

Chino—Hayden, Stone & Co. say: "The May report shows an increase in the developed ore of 849,512 tons; the grade remains practically the same. There was no change in the tonnage of partially developed ore. The total of the fully and partially developed ore now stands at 18,798,078 tons, consisting of 8,725,091 tons of fully developed ore, and 10,072,967 tons partially developed ore. The average grade is 2.59 per cent. The ore is in half a dozen different bodies scattered around the rim of a semi-circle. The development of the last two or three months has been with the idea of determining the continuity of the ore between these bodies. The drill map would indicate that practically continuous ore now extends around the entire eastern half of this semi-circle. The assays from the underground workings give considerably higher returns than do those from the drill holes. In 16 holes where the underground workings have coincided with the drill holes, the average assay from the raise has been 2.50 per cent. as against 2.07 per cent. from the drill hole."

Otero County

The pipe line conveying water from the Sacramento mountains to the Orogrande district has been sold to the El Paso & Southwestern railroad with the rights to the water, which has created the impression that the copper smeltery at Orogrande will be abandoned, as the water was taken in for the purposes of the smelting company.

Knocker—An attempt will be made to work this placer, near Jarilla, using dry washers.

Sierra County

Black Range Reduction Works—This company, backed by Colorado men, is building a custom mill at the new camp of Bullion, in the Black Range district. The company has purchased a number of properties in the district and is working a force of 18 or 20 men.

El Paso Home Mining Company—Financial difficulties have overtaken the company, operating at the Grafton camp and the unfinished mill of the company is threatened with attachment for labor. The company forfeited on the Ivanhoe property, after one or more payments had been made.

Oklahoma

A far reaching decision of the Federal Circuit Court of Appeals just made will affect the mining industry of the Miami and Quapaw camps to a great extent. This decision reverses that of the U. S. Circuit Court and holds that the Indians are still wards of the Government and that the Government control over their allotted lands has not been impaired by virtue of their allotment and citizenship. A great many suits brought by the Government are pending in the courts to set aside leases and transfers of land from the Indians to white men. The Government alleges that unfair advantage has been taken of the Indian and that he has not been given value received for his land.

Premier Petroleum Company—This company is being financed in London by the Anglo-Dutch Petroleum Company. The company has 3660 acres. J. E. Crosbie, Tulsa, is manager.

Oregon

Douglas County

Billiken—This group on Cañon creek has been leased to Ockley & Barber, of Gold Hill, and development will be done.

Baker County

Bonanza—A vein of free-gold ore has been uncovered and the company expects to make shipments.

Utah

Beaver County

Majestic—The shaft was completed to the 600-ft. level May 31, and the drift has been started for the ore developed on the level above. Manager Moffat estimates that this drift will reach the ore at 235 ft. from the shaft and should be completed in 50 days. From this shaft he also estimates that he will cut two other fissure veins and he expects to develop three orebodies on this level. This assessment of 5c. per share will provide $40,000.

Moscow—Drifting is being done on the 300-ft. level to reach the orebody which was opened on the 400, and a raise from the latter level will soon connect with this new work. The vein on the 400 has been drifted on for over 450 ft. A winze has been sunk from this level in ore for 135 ft. Regular shipments are being made.

Frisco Consolidated—The 600-ft. level east of the main workings is being driven for the limestone-andesite contact. Some low-grade copper ore has been cut in the last 20 ft. D. P. Rohlfing is manager.

Cedar Talisman—A raise 37 ft. above the 500-ft. level has developed ore, making out from the main fissure along the limestone bedding. The ore is 3 to 6 ft. in thickness, and carries galena, with some hornsilver. It has been opened for 25 ft. along the strike. The winze from the 500 shows the ore to be wider below this level. The company is making regular shipments.

Utah Mining, Milling and Transportation Company—An orebody has been opened recently in the Hub property owned by this company. The strike was made in the Lady Bryan claim, on the 200-ft. level, about 150 ft. from the shaft. Ore carrying principally copper, has been crosscut for some distance. The shaft is being sunk to the 300-ft. level and another crosscut will be driven for the orebody. Bins have been built and the roads put in shape for hauling to the railroad, a distance of six miles. About three cars of ore are mined.

Wild Bill—A body of lead-carbonate ore has been broken into on the 300-ft. level, about 100 ft. beyond the strike made two months ago.

Arrow Head—This company was recently organized to operate a lead property on Indian Peak. The capital stock consists of 1,000,000 shares of a par 25c. Roads are being built and preparations made to begin work. John H. Barton is president.

Juab County

Tintic shipments for the week ended June 10 were: Opohongo, 2 cars; Mammoth, 2; Lower Mammoth, 7; Victoria, 2; Grand Central, 8; Centennial-Eureka, 28; Bullion-Beck, 1; Chief Consolidated, 3; Gemini, 3; Iron Blossom, 22; Dragon Iron, 36; Brooklyn (lease), 1; Sioux Consolidated, 14; Colorado, 9; Scranton, 4; Iron King, 5; Eureka Hill, 2; East Tintic Development, 1; May Day, 4; Eagle & Blue Bell, 10; Uncle Sam, 7; Carisa, 1; total, 172 cars.

Colorado—At a meeting of the directors, held June 10, a dividend of 8c. a share was declared, payable June 20. The dividend calls for the distribution of $80,000. Up to date, the company has paid $2,130,000, or $2.13 a share, which came practically from one orebody. Sinking and prospecting at depth will be carried on in search of new ore. The company has ample funds in the treasury for this work.

Iron Blossom—A quarterly dividend of 6c. a share, or a total of $60,000, has been declared, payable on June 25. There has been an improvement on the 500 level of the No. 1 shaft. The gold orebodies on this level have increased in size and richness. About 20 tons are being mined here daily. The No. 1 shaft is 1640 ft. deep, and sinking is being continued.

Tintic Central—A change from white to blue limestone, showing mineralization, is reported in the shaft.

Beck Tunnel—The mine was closed down June 11. Development at depth has so far failed to disclose new orebodies. An assessment of 1c. a share was recently levied.

Uncle Sam—At the meeting held June 8, a dividend of 2c. a share, or a total of $10,000, was declared, payable June 20. The same dates apply for the distribution of 400,000 shares of May Day stock, owned by the company. Stockholders of Uncle Sam are to receive 80 shares of May Day for every 100 shares of stock held by them. This action is due to the necessity at the present time of assessing May Day stock, which would draw on the Uncle Sam treasury. The May Day stock was acquired through the sale of the Uncle Sam claim, including the present May Day mill to the May Day. The capital stock of the latter company was increased from 400,000 to 800,000 shares, and 400,000 shares given in payment for the property.

May Day—An assessment of 2c. a share was levied on June 9, delinquent July 15. The $16,000 from this assessment will be used for the purchase of heavier hoisting equipment and for sinking. The company has paid $108,000 in dividends, the last distribution being in September, 1908.

Sioux Consolidated—The lowest level is at 450 ft. Some low-grade ore was opened on this level, and a winze has recently encountered ore of better grade. Preparations are being made to sink the shaft.

Tintic Standard—Mineralized quartz has been cut in the shaft at 840 feet.

Salt Lake County

Wasatch-Utah—The mill recently installed to treat the ores from the Jefferson mine at the mouth of Little Cottonwood cañon, was placed in commission June 8. The ore occurs in a narrow fissure vein and carries gold and copper. About 375 tons of ore are on the dump.

Utah Mines Coalition—Stringers of ore, carrying copper, silver and gold, have been cut by the main tunnel, which is being driven from the Big Cottonwood side toward Alta. The ore occurs in parallel fissures to the Black Bess vein, which is the objective point.

Columbus Consolidated—The annual report shows that during five months, the company has produced 482 tons of concentrates of a net value of $10,469, and 1530 tons of crude ore, which sold for $30,008. There are 400 tons of concentrates and 200 tons of crude ore now at the mine for shipment. The company has $20,773 cash, and a note for $50,000. No detailed information was given of the new strike on the 400-ft. level.

Carbonate—This property is two miles from the Maxfield mine, in Big Cottonwood. It was operated between 1872 and 1878. The property has recently passed under new control, and active development work has been started. The greatest depth previously attained was 200 ft. The present management is preparing to go deeper. About 4000 tons of lead-silver ore, carrying an excess of iron, is now available. Shipments will be started as soon as the tramway is put in order.

Rainbow—Work has been resumed on this property in the Alta district. The company has a tunnel 370 ft. in length, which is being driven for a vein carrying lead and silver on the outcrop.

Summit County

Park City ore shipments for the week ended June 10 are: Silver King Coalition, 678,200 pounds; Daly West, 1,300,000; Daly-Judge, 1,132,000; Daly-Judge (zinc), 850,440; Little Bell, 126,000; total, 4,086,640 pounds.

Daly West—In addition to the regular output of lead-silver concentrates, the zinc product for May was 1165 tons. This is an increase of 500 tons over the April production.

Washington

Ferry County

Trade Dollar—A lease has been taken by Alfred M. Uhang, of Republic.

Knob Hill—This mine, idle for three years, has been acquired by a new company and will be reöpened.

First Thought Extension—Work has been resumed and shipping will be started.

Republic Mines Corporation—This company, operating the Lone Pine-Pearl-Surprise group in the Republic camp, reports an output of more than 4000 tons since Jan., 1910, the net value of which is $101,482, exclusive of ore at the smeltery and *en route*. The average yield of the ore shipped was $39.19 a ton.

Wisconsin

In the Baraboo iron region, ore is reported at Pewit's Nest, at 500 ft. Diamond drills are working.

Wyoming

A "gusher" was brought in near Spring Valley by the Reserve Oil Company on June 8. Renewed activity in the field has resulted.

Canada

British Columbia

Steamer news received at Vancouver, June 14, confirms the excitement over the gold finds at Stewart in the Portland Canal district. A great reef extending to Stewart and running high in gold is reported by the Portland Canal local paper.

Rambler-Cariboo—Shoots of silver-lead ore of good grade have been found on both 800- and 900-ft. levels. The 1000-ft. level is being extended to cut these shoots at depth. The mine is looking better.

Standard—The fact of No. 5 tunnel is in 12 ft. of ore, of which 8 to 10 ft. is clean galena. The intermediate drift, above No. 5, has 14 ft. of ore, of which 8 ft. is stripping and the rest concentrating ore. These are the best showings of good ore at present occurring in the Slocan.

Ontario

Shipments from Cobalt for the week ended June 11 were: Chambers-Ferland, 65,460 lb.; Colonial, 41,640; Crown Reserve, 214,010; Hargraves, 60,000; Hudson Bay, 62,740; Kerr Lake, 120,140; La Rose, 142,550; Peterson Lake, 60,260; Temiskaming, 120,000; total, 886,800 pounds.

British American—This Cobalt company has resumed. The main shaft down 70 ft. is being put down to 200 ft. A compressor has been installed.

Beaver—The report for the quarter ended May 31 shows a balance of $28,290, less $5947 for pay roll and current accounts for May. The car of high-grade ore shipped May 4 assayed 3000 oz. silver to the ton and will net the company about $45,000. Preparations are being made to ship another car of high-grade, which is being stoped at the 200-ft. level.

Coniagas—The extension of the mill, which has been completed for some time is in operation, a sufficient supply of power now being obtainable. Sixty stamps in all are working, making the capacity of the mill 180 tons per day.

Moosehorn—The shaft is down 150 ft. and a large amount of drifting has been done at the 125-ft level, where some good veins have been encountered in this Elk Lake property.

La Rose Consolidated—The properties during the fiscal year ended May 31, produced 3,125,000 oz. of silver compared with 3,010,831 oz. for the previous year. May was the best the company has had at its Lawson property. During that period 25.4 tons of ore were produced assaying 2370 oz. per ton and having a net value of $27,877. The stope on the vein from which this material was taken was 80 ft. in length June 11. At the Princess property during May ore of a net value of $10,457 was mined, not including low grade and screenings.

Foley—Repair work is in progress preparatory to the resumption of operations at this mine at Mine Center in western Ontario.

Laurentian Mica Company—The plant at Ottawa was gutted by fire May 16 throwing 175 girls temporarily out of employment.

Island Smelting and Refining Company—This company has been formed at Toronto for the purpose of controlling the patents of a new smelting process invented by Dr. James S. Island, capital $3,000,000. Directors: J. W. Ford, president; Horace J. Davison, vice-president; W. F. Brodie, treasurer; Dr. James S. Island, John A. Rowland, Richard C. Warren and Richard E. Southey.

Mexico

Baja California

Boleo—The May product was 1132 metric tons and the yield per ton of ore 3.485 per cent. copper.

Chihuahua

El Rayo—Mine report for quarter ended April 30: Mill ran, 83.6 days; ore crushed, 13,700 tons; value per ton, $13.96 U. S. Cy.; extraction, 82.6 per cent.; total revenue, $158,159; operating expense, $80,151; operating profit, $78,018; capital expenditure, $11,320; net profit, $66,698.

Coahuila

Panuco—This copper property, controlled by the Continental company, of San Antonio, Texas, will resume. A. J. Tuttle is in charge.

Jalisco

Pinginto—The experimental mill on the Ameca river is treating a small tonnage. H. H. Cross and H. W. Young are in charge.

Mexico

El Oro—Return for May: Mill No. 2 ran 30 days; crushed 30,457 tons; yielding bullion, $209,670; working expenses, $96,750; expenditure on development, $17,600; profit, $95,320; profit on railway, $4000; total profit, $99,320.

Mexico Mines—Return for May: Mill ran 31 days; crushed 11,866 tons; yielding bullion, $131,110; working expenses, $45,620; expenditure on development, $12,200; profit, $73,290.

Sonora

The mining town of Movarabi, including a 10-stamp mill, was destroyed by the forest fire on June 16 from the Ojo and Bacoachi mountains. The miners had a narrow escape and had to build back fires to enable them to flee to Cananea.

Bonanza de Cobre—After two years inactivity, development has been resumed on this property, north of Cananea. L. W. Powell and associates own it.

Greene-Cananea—The production of the Kirk mine has been doubled during the last two months, making it a close second to the Veta Grande. All its ores are first grade. Two 2000-k.v.a. turbine generators, and a duplicate of the present condenser, have been ordered for the main power plant. The expenditure will be $150,000.

Pacific Mining and Smelting Company—Following the election of Melbert B. Cary to succeed Theodore Douglas as president the announcement is made that the funds have been provided for the development and operation of the properties with Courtney De Kalb, of San Francisco as manager.

Artemisa—E. J. Wilcox, of Colorado, has completed the purchase of this zinc-lead deposit. The vein is described as 40 ft. in width, with 24 ft. of solid ore exposed in one place for 500 ft. and vertically 200 ft. The vein has porphyry for its walls, a linear distance of 1700 ft. and is 600 ft. above the flat. The San Felipe extension of this vein is being worked under bond by the Calumet & Arizona company. The Artemisa is reached from Poso, via Opodepe to San Felipe, and is 60 miles from the railway. The ore will average $30 per ton in value. One of the orebodies is 18 ft. in width and without any gangue. A railway will probably be built. Mr. Wilcox has been developing for two years. The assays showed an average of about 26 per cent. zinc, 22 per cent. lead and about 4 oz. silver.

Asia

India-Mysore

Kolar Goldfield—Gold reported in May was 46,815 oz., being 27 oz. less than in April and 301 oz. more than in May, 1909. For the five months ended May 31 the total was 227,650 oz. bullion in 1909, and 232,704 oz. in 1910; an increase of 5054 oz. The bullion reported this year was equal to $4,329,900, or 209,434 oz. fine gold.

Central America

Abangarez Goldfields—This Costa Rican company has been listed on the Boston Stock Exchange. It owns 118 sq.m. on the Pacific slope near Abangarez. The mill is equipped with forty 850-lb. stamps, to which are being added two 5-stamp batteries. It has a second mill, the Boston, with ten 850-lb. and ten 950-lb. stamps. The capital is 160,000 shares common and 40,000 shares preferred, of which 151,928 shares of common and 40,000 preferred are issued all of a par value of $25. Minor C. Keith is president.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, June 22—The coal trade in the East shows no important changes. Notwithstanding some drawbacks, the returns from different railroads given below indicate that there has been a substantial increase this year in coal carried to the seaboard. Both bituminous and anthracite carriers show large gains this year. Only the coastwise shipments show a comparatively small gain.

In the West there have been no changes in the situation during the week. The stubborn strike in northern Illinois continues, with apparently no disposition on either side to give way. This is working to the present advantage of the southern Illinois and Indiana mines, which are doing a large trade. In the Southwestern districts also, no approach to a settlement is reported.

COAL TRAFFIC NOTES

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, five months ended May 31, short tons:

	1909.	1910.	Changes.
Anthracite........	5,034,022	4,914,026	D. 119,996
Bituminous......	14,975,985	16,930,680	I. 1,954,695
Coke..............	4,172,153	6,205,506	I. 2,033,353
Total...........	24,182,160	28,050,212	I. 3,868,052

The total increase this year was 16 per cent.

Coastwise shipments of coal from chief Atlantic ports, four months ended April 30, long tons:

	Anthracite.	Bitum.	Total.	PerCt
New York....	5,510,582	3,626,494	9,137,076	62 7
Philadelphia	674,751	1,476,611	2,151,362	14 8
Baltimore....	87,608	1,168,988	1,256,596	8 6
Newp't News	....	1,055 869	1,055,869	7.2
Norfolk......	....	976,712	976,712	6.7
Total......	6,272,941	8,304,674	14,577,615	100.0
Total, 1909.	6,666,249	7,366,347	14,032,596	.....

Total increase this year 545,019 tons, or 3.9 per cent. New York includes all the harbor shipping points.

Bituminous coal and coke tonnage of leading railroads in Pennsylvania and West Virginia four months ended April 30, short tons:

	Bituminous.	Coke.	Total.
Pennsylvania......	13,720,319	5,143,636	18,863,955
Balt. & Ohio	8,717,471	1,551,760	10,269,231
Buff., Roch. & Pitts.	2,237,914	204,002	2,441,916
Buff. & Susqueh'na	369,635	78,348	447,983
Penn. lines N. Y. C.	2,788,681	13,546	2,802,227
Pitts. & L. Erie.. ..	2,777,475	2,438,844	5,216,319
Pitts., Shawmut&N.	350,809	8,872	359,681
Norfolk & Western.	5,470,497	1,105,631	6,576,128
Ches. & Ohio.......	5,011,456	168,036	5,179,492
Total..............	41,763,657	10,712,675	52,476,332
Total, 1909.........	33,592,228	7,218,295	40,810,523

Total increase this year 11,665,809 tons, or 21.7 per cent. Anthracite tonnages of Pennsylvania and Baltimore & Ohio reported elsewhere.

Coal tonnage of railroads in Ohio Coal Traffic Association, four months ended April 30, short tons:

	1909.	1910.	Changes.
Hocking Valley......	883,090	1,273,473	I. 390,383
Toledo & Ohio Cent..	326,008	492,545	I. 166,537
Baltimore & Ohio....	345,887	749,542	I. 403,655
Wheeling & L. Erie..	875,044	1,151,624	I. 276,580
Cleve., Lorain & Wh.	616,338	994,195	I. 377,857
Zanesville & Western	348,283	389,396	I. 41,113
Toledo Div., Pen. Co.	582,575	756,729	I. 174,154
L.Erie,Alliance&Wh.	331,304	391,723	I. 60,419
Marietta, Col. & Clev.	21,430	42,509	I. 21,079
Wabash-Pitts. Term.	....	14,574	I. 14,574
Total...............	4,329,959	6,256,310	I. 1,926,351

Total increase this year, 44.5 per cent. Only the Ohio lines of the Baltimore & Ohio are included; the main-line tonnage is given elsewhere.

Anthracite tonnage of Baltimore & Ohio Railroad, four months ended April 30, was 322,459 tons in 1909, and 333,715 in 1910; increase, 11,256 tons.

New York

ANTHRACITE

June 22—Sales are good for the season, but the greater part of the business doing is on contract deliveries. The taking of steam sizes is about on the usual level.

Schedule prices for domestic sizes are $4.45 for broken and $4.70 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes, current quotations are: Pea, $3@3.25; buckwheat, $2.20@2.50; No. 2 buckwheat or rice, $1.65@2; barley, $1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

BITUMINOUS

Dullness is still the cry in the market, especially among the producers and sellers of the better grades of coal. The call is almost entirely for cheap coals. On this basis Eastern territory is taking a good deal of coal, but is not yet worked up to the point of closing for its winter supplies.

New York harbor is buying a little more, but is taking mostly gas coal and low grades of steam. Prices are unchanged. Good Miller vein steam coal can be had at $2.50, f.o.b. harbor points, but buyers want coal down to $2.30 or less.

Car supply is good, and transportation pretty regular. Coal comes through in good time and can be had when wanted. There is a little trouble yet at some mines, but not important.

In the coastwise trade vessels continue rather scarce and freight firm. From New York, rates are 75@80c. to points around Cape Cod. Large vessels from Philadelphia get 75c. to Boston, Salem and Portland; 65c. to Providence and the Sound.

Birmingham

June 20—Labor is still needed at some of the coal mines in this State. The output is good and the demand steady. An improvement is noted in the coke demand and production is being increased. Announcement is made that two coal mines opened up during this year are beginning to get out coal regularly. Mine No. 13, the new mine of the Tennessee company in the western part of the Birmingham district, is being pushed. This will be a shaft mine and the production is expected to reach 1500 tons per day.

There is a large tonnage being shipped to Louisiana. Coal prices have improved a little lately owing to the advance in miners' wages.

Chicago

June 20—Large buying of Indiana screenings and run-of-mine, with slackened business in eastern coals, due to the midsummer heat, are the features of the coal market. The chief steam coal supply, so long as the Illinois mines are nonproducing, will be from Indiana; Eastern coals will not be bought largely by consumers who have been accustomed to burn Illinois coal and find Indiana coal obtainable at less than the cost of smokeless, Hocking or Youghiogheny. In this fact lies the explanation of the disappointment of not a few would-be sellers of coal from east of Indiana. The Indiana mines are sending to this market a surprising amount of coal. At the same time, the smokeless and Hocking dealers are having good sales and probably will make a good number of new customers through the realization of the value of their coals.

Indiana coal fluctuates considerably, but in general sells for $2@2.10 for lump; $1.90@2.05 for run-of-mine, and $2@2.10 for screenings. The great summer demand for screenings makes that size slightly higher than run-of-mine and practically on a level with lump. In the opinion of men well versed in the coal trade the large demand for screenings has come to stay; it will be a permanent feature of the Chicago market.

Eastern coals sell for full list prices almost universally, Hocking bringing $3.15, Smokeless $3.55 for lump and $3.15 for run-of-mine and Youghiogheny

$3.22 for 1¼-in. lump. Anthracite and bituminous domestic coals are very dull.

Cleveland

June 20—A sudden arrival of warm weather has wiped out the domestic trade for the present. Steam trade is about as usual. Lake trade is slow, as orders are not pressing and a good deal of coal from Ohio is going to Illinois points, instead of the Lake ports. A better price is realized for it.

Prices are unchanged for all grades.

Indianapolis

June 20—The demand for coal at Ohio river points has been considerably relieved by the arrival of a big coal fleet down the Ohio from Pittsburg. A towboat and 26 barges were sunk before the fleet arrived at Jeffersonville. Mining operations in Indiana continue in full capacity and only slight variations are reported in the continued booking of orders.

The coal railroads continue to supply the Indiana Railroad Commission with briefs maintaining that the rates on coal are too low now and that the reduction to go into effect July 25 will work a hardship.

Pittsburg

June 21—Local demand for coal is somewhat reduced on account of a number of manufacturing establishments, particularly the iron-rolling mills, preparing to close July 1 for longer or shorter periods. Lake shipments continue heavy. Prices are fairly well maintained and we repeat former quotations as follows: Mine-run and nut, $1.20@1.25; ¾-in., $1.30@1.35; domestic 1½-in., $1.50; slack, 80@85c. per ton at mines.

Connellsville Coke—The market has been very quiet as to prompt and contract furnace coke, and even foundry coke, which is usually fairly active on contract at this season, has been rather quiet. Occasional sales of prompt furnace coke have been made at $1.65. On contract operators are quoting prices about 10c. higher, with no particular argument vouchsafed for the advance. We quote standard grades of Connellsville coke as follows, per net ton at ovens: Prompt furnace, $1.65@1.70; contract furnace, $1.80@1.90; prompt foundry, $2.15@2.25; contract foundry $2.25@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending June 11 at 401,737 tons, an increase of 3000 tons, and shipments at 4052 cars to Pittsburg, 6454 cars to points west and 951 cars to points east, a total of 11,457 cars.

St. Louis

June 20—While the market is a trifle weaker, yet coal is absorbed and prices remain about the same; they seem to have steadied down to a point where they will probably stay until the rest of Illinois goes to work. Operators in the fifth and ninth districts at the present prices are making about 35c. per ton clear on their coal, and are getting a full six days' run six days out of each week. This is an ideal condition which rarely exists. To be able to have a good car supply and good prices at the same time is a new and pleasing experience. The weather for the first time this year is real summer, and consequently the dealer trade has fallen off, though the dealers have had an unusually good season so far and the summer business has held up well. Prices, both retail and wholesale are satisfactory, and dealers are getting a fair margin. There seems to be, however, a marked tendency on the part of the dealers and large contract hauling concerns to stiffen up on the wagon-load contract price.

Reports from the Springfield and Carterville districts show that no progress is being made toward a settlement.

Current prices are as follows for the St. Louis market:

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg	$1.60	$2.12
2-in. lump and nut	1.50	2.02
Mine-run	1.25	1.77
Screenings	1.30	1.82
Trenton:		
6-in. lump and egg	1.75	2.27
3-in. nut	1.50	2.02
Staunton or Mt. Olive:		
6-in. lump	1.70	2.22
2-in. nut	1.50	2.02
Mine-run	1.10	1.92
Screenings	1.30	1.82
Pocahontas and New River:		
Lump or egg	1.50	4.00
Mine-run	1.10	3.65
Pennsylvania Anthracite:		
Nut, stove or egg	.....	6.65
Grate	.....	6.40
Arkansas Anthracite:		
Egg or grate	3.35	5.35
Coke:		
Connellsville foundry	.....	5.40
Gas house	.....	4.50
Smithing	.....	4.15

The anthracite market is good, though the demand for grate seems to be easing off and the demand for chestnut increasing. This is to be noted, as grate is used by the large buyers who buy early, and chestnut by the country trade, which buys later. The tonnage will be a little lighter in June than in May, though there is no surplus on the market and prices are satisfactory.

FOREIGN·COAL·TRADE

Austro-Hungarian Trade—Imports and exports of fuel in Austria-Hungary, year 1909, metric tons:

	Imports.	Exports.	Excess.
Coal	10,479,244	632,658	Imp. 9,846,586
Brown coal	38,679	8,235,523	Exp. 8,196,844
Coke	701,281	197,313	Imp. 503,968
Briquets	48,640	38,803	Imp. 9,837
Total	11,267,844	9,104,297	Imp. 2,163,547

The exports of brown coal or lignite are almost all to Germany.

British Coal Trade—Fuel exports from Great Britain five months ended May 31, with coal sent abroad for steamships in foreign trade, long tons:

	1909.	1910.	Changes.
Coal	[illegible]	[illegible]	D. 1,081,708
Coke	[illegible]	[illegible]	D. 81,148
Briquets	[illegible]	[illegible]	I. 11,116
Total exports	[illegible]	[illegible]	D. 1,151,740
Steamer coal	7,801,472	[illegible]	D. 171,418
Total	[illegible]	[illegible]	D. 1,323,158

Imports were insignificant; only 2326 tons in 1909, and 13,792 tons this year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on June 4: Best Welsh steam, $3.99; seconds, $3.78; thirds, $3.66; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.04; seconds, $1.76. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, June 22—The iron and steel markets are in rather an unsettled condition. The waiting position is not much in evidence, and a very considerable business is being transacted, especially when the season of the year is considered. There is, however, a persistent demand for low prices which is the occasion for much discussion between buyers and sellers, and makes the closing of new contracts slow work.

This is apparent in the pig-iron market. Sales of iron have been large, but users do not generally go beyond their third-quarter requirements unless they can get more concessions than makers are willing to grant. However, furnaces are reluctant to pile up stocks and will not go out of blast, so that many are gradually giving way. The curtailment of production which was talked about so much a month ago, has not gone very far. Stocks are an unknown quantity, but are generally believed to be larger than is comfortable at many furnaces. The situation is complicated by some Southern furnaces, which are frankly out for any price they can get.

In finished material there have been quite a number of transactions in structural steel for buildings and bridges, on which low prices have been made. Some good orders for cars have also been placed. Trade in bars and small material seems to be falling off a little, and sheets are also rather dull. Tinplates, however, are in active demand.

The lowest bid for the lock gates for the Panama Canal was submitted by the McClintic-Marshall Construction Company, the total amount being $5,374,378. The work will require about 40,000 tons of plates and 20,000 tons of other structural material.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region for the season to June 1 are reported by the Cleveland *Iron Trade Review* as follows:

Port.	1909.	1910.	Changes.	
Escanaba........	384,856	972,117	I.	587,261
Marquette........	133,097	616,885	I.	483,788
Ashland..........	240,855	807,307	I.	566,452
Superior..........	608,515	1,310,958	I.	702,443
Duluth............	1,215,925	2,530,185	I.	1,314,260
Two Harbors.....	725,820	1,364,213	I.	638,393
Total........	3,309,068	7,601,665	I.	4,292,597

The large increase was due chiefly to the earlier opening of navigation this year. Deliveries at Lake Michigan ports up to June 1 this year were 1,230,827 tons.

Rates on Texas Iron Ore—The Texas Railroad Commission has now approved an iron-ore carrying rate of $1.34 per ton, carload lots, with a minimum weight of 50,000 pounds, from Jefferson to Texas City and Galveston. Recently the commission had allowed a rate of $1.50 for the same movement, the new rate being a reduction. The iron-ore deposits are those recently secured by Charles M. Schwab and associates.

Baltimore

June 21—Imports for the week included 200 tons ferromanganese and 1050 tons emery ore from Rotterdam; 1568 tons manganese ore from Liverpool; 6800 tons manganese ore from Poti, Russia; 10,600 tons iron ore from Cuba. Exports included 1685 tons steel rails and 115 tons rail fastenings to Tampico, Mexico.

Birmingham

June 20—Buying is in small lots, with an occasional order of a little better proportions. The aggregate of the sales for the present month will show up well. The price of iron on sales for the last quarter is hardening at $12 per ton. Reports are still current that some concessions have been made for immediate delivery iron and $11.50 per ton has been talked of but in the various offices there is no statement made of sales under $12 per ton. There is no iron going to the yards at present but at the same time it must be stated that the stocks of accumulated iron are not being reduced. Basic and charcoal irons are still in fair demand.

At Alabama City the Southern Iron and Steel Company has cut down the make of billets a little until the accumulated stocks have been reduced.

There is no change in conditions among the consuming interests in home territory. The melt is as heavy as it has been at any time this year.

Chicago

June 20—Quiet exists in the iron market. Sales of pig iron are in the aggregate large but are split up, as heretofore, into small lots. Delivery in the last half, with interest mainly in the third-quarter as yet, characterizes the market. The buying movement seems to have lost some of its impetus and summer dullness to have fallen on the trade. Prices continue $11.50@12 Birmingham on Southern No. 2 ($15.85@16.35 Chicago) and $16.50@$17 on Northern No. 2, with Lake Superior charcoal steady at $18.50@19. Small lots but frequent buying again has become the policy of the foundry melters. A few contracts are being made for 1911 delivery, but the great number of melters content themselves yet with inquiries on such business and make their purchases on earlier deliveries. Furnace agents profess faith in the stability of prices, and refuse to make quotations for fourth-quarter and 1911 delivery as low, by 25 or 50c. as for third-quarter delivery. This attitude of itself explains the reversion to buying for early delivery.

Sales of iron and steel products show no significant change, being of fair volume and well distributed. Coke continues at $5 for the best Connellsville, with sales good and the supply abundant.

Cleveland

June 20—The ore trade is slowing down a little; some vessels are not as busy as they might be. Ore is piling up on the docks, shipments to furnaces being rather slow.

Pig Iron—There is some inquiry, some small sales and general shading of prices. For Cleveland delivery bessemer has been cut to $16.65; while No. 2 foundry can be had at $15.25@15.50 per ton

Finished Material—Bar orders have dropped off and are now slow. Some structural sales are reported, and on these prices for material have been cut to 1.45@1.50c. for early delivery.

Philadelphia

June 22—Makers of pig iron in eastern Pennsylvania have in several instances refused to take orders at less prices than they are naming. They pay but little attention to what they regard as an unwise course of makers in other markets in emptying their yards at any price they can get. Before the close of the week it is probable that pipe works in this vicinity will have closed contracts for large supplies of pipe iron to see them through with summer work. The inquiries for foundry iron from local and New England sources are gradually turning into business, but the orders are mainly for early delivery. No. 2 foundry is held at $17 for Northern and sales have been made at $16 for Southern with 50c. less for certain soft grades. Gray forge and basic are quoted at $16, without much business.

Steel Billets—Some users of billets have been quietly making purchases without letting the fact be known. There are makers of billets who see an advancing tendency within 30 days. Consumptive requirements are only meagerly supplied, especially for forging billets.

Bars—A restricted demand is felt throughout this territory and quotations show weakness, especially for common iron. Store demand is very low and no improvement is probable until August.

Sheets—Demand is irregular. Large consumers are asking for quotations to cover future deliveries, but for some time past large contracts have been exceptional.

Pipes and Tubes—It is said that concessions have been made on tubes within a week, but buyers decline to give any information. Discounts are nominally unchanged. Merchant pipe is moving in small lots.

Plates—A further shading in plates has been made on small orders from the outside figures which have prevailed all through the season. It is also rumored that a further shading has been made in reply to inquiries from car builders and the rumor is accepted as correct.

Structural Material—Large orders have been secured for bridge material which will bring work to the American Bridge Company's plant here. The other makers of structural material in this territory have picked up a few scattering orders.

Scrap—Scrap continues dull and some offerings show that holders are disposed to turn some stock into cash, chiefly heavy cast scrap and No. 1 wrought railroad.

Pittsburg

June 21—Business in finished-steel products has not been quieting down any faster than was expected, if as fast. Specifications continue fairly good on contracts, while new business is light. On all hands a dull summer has been regarded as a certainty, and on the whole it is probably the fact that conditions today are better than was expected a month ago would be the case. Since the beginning of April all buyers have curtailed their purchases as much as possible, yet the mills have had a great deal to do, for they have been running at only about 10 per cent. below their maximum rate, reached early in the year. This, in the circumstances, ought to be regarded as very encouraging.

The plans for closing mills being developed indicate as a rule shut-downs for only a fortnight in July. Some mills will run right through. The heaviest curtailment will be among the iron mills, practically all of which will close July 1, certainly for a month, if not for two.

The largest contract placed for finished steel for a long time is that for steel gates for the Panama canal locks. This was awarded at Washington yesterday to the McClintic-Marshall Construction Company, Pittsburg, which is backed, as to the plain material, plates, shapes, etc., by the Jones & Laughlin Steel Company, about 55,000 tons of steel being involved. Presumably the contract price is very low relative to the amount of work, the successful bid being $730,000 below the next higher bid, and barely over half the highest bid. The four bids submitted were: McClintic-Marshall Construction Company, $5,374,475; United States Steel Products Export Company (Steel Corporation) $6,103,041; Maryland Steel Company, $8,409,369; Riter-Conley Manufacturing Company, $10,183,257.

Pig Iron—The Standard Sanitary Manufacturing Company has bought between 12,000 and 14,000 tons of iron for third-quarter delivery to its Allegheny and New Brighton plants, paying substantially $14.35 for No. 2 foundry, $14 for No. 3 and $13.60 for gray forge, at Valley furnaces. A portion of the iron, less than half, comes from western Pennsylvania furnaces outside the valleys. This covers the company fairly well for third quarter. As already reported, the Westinghouse Air Brake Company has bought, its purchases of about 18,000 tons of forge and foundry covering it practically through the year. It paid $14.35@14.50, Valley, for nearly all its iron. Thus the two largest local consumers of foundry iron have covered themselves in the past fortnight, and with such large buyers taking hold opinions are again expressed that the bottom has been reached on this long decline, which has covered seven months in point of time and $2.75 to $3.25 in point of value for the different grades. On the other hand, there remains much unsold tonnage, with the absorptive capacity of the market correspondingly reduced. All signs fail in such a market, which struggles on the one hand with prices being actually below cost of production to furnaces using purchased coke and ore; and on the other with large stocks in merchant furnace yards and the prospect that ore prices for next season will be lower. While $14.75, Valley, is regarded as the basic market, a local steel interest has picked up two small lots at a lower figure, believed to be $14.50. We quote the open market as follows, concessions being perhaps obtainable: Bessemer, $15.75; basic, $14.75; malleable, $15; No. 2 foundry, $14.50; forge, $13.75, all at Valley furnaces, 90 cents higher delivered Pittsburg.

Ferromanganese—The market is quiet and rather weak, prompt lots being quotable at about $39.50 and forward deliveries at $40@40.50, Baltimore, freight to Pittsburg being $1.95 per ton.

Steel—The market is a trifle easier in tone, demand being light, but prices are not quotably lower, standing at about $25@25.50 for bessemer billets, $26@26.50 for bessemer sheet bars, $28@28.50 for open-hearth billets and $29@29.50 for open-hearth sheet bars, all f.o.b. maker's mill, Pittsburg or Youngstown.

Sheets—The independent sheet and tin-plate manufacturers who operate under union auspices held a meeting at Pittsburg, last Wednesday, and a conference Thursday and Friday with the Amalgamated Association on the wage scale to govern the hot-mill operations in the year beginning July 1, adjourning to meet again tomorrow. The holding of a two days' session and the adjournment to a definite date less than a week later are, according to experience, indicative that conditions are favorable to an adjustment.

Demand for sheets is lighter and price cutting is somewhat more widespread, although generally still confined to about $2 a ton. Regular prices are 2.40c. on black and 3.50c. on galvanized, with corrugated roofing at $1.70 per square for painted and $3 for galvanized. Blue annealed sheets, which commanded premiums of $2@3 a ton for months, for any early delivery, are down practically to the official price of 1.75c. for 10 gage.

St. Louis

June 20—Pig iron is still a very slow seller. A few inquiries are coming in, but only a small tonnage is moving. Price seems to be no inducement for buyers to take on additional stocks. The quotation of $12, Birmingham, or $15.75, St. Louis, remains the current figure. Local producers are doing much better than the Southern and are about to run full. They are also obtaining a slight premium over Southern iron.

FOREIGN IRON TRADE

Russian Iron and Steel—A preliminary report on the iron and steel production of Russia gives the following figures for two years past, in metric tons:

	1908.	1909.	Changes.
Pig iron	2,751,000	2,817,000	I. 66,000
Blooms, billets, ingots, etc	2,809,000	3,970,000	I. 261,000
Finished iron and steel	2,335,000	2,572,000	I. 237,00

The blooms, billets, etc., and the finished material include both wrought iron and steel. The increases last year came chiefly from the South Russian district.

METAL · MARKETS

New York, June 22—The metal markets generally continue quiet, without much evidence of strength.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1910..	$ 717,678	$ 3,143,338	Imp.$ 2,425,660
" 1909..	11,171,265	2,263,721	Exp. 8,907,544
Year 1910..	47,917,384	14,812,614	" 33,104,770
" 1909..	55,487,891	17,767,857	" 37,720,034
Silver:			
May 1910..	4,170,754	3,354,715	Exp. 816,039
" 1909..	4,428,848	3,857,388	" 571,060
Year 1910..	22,506,835	18,593,349	" 3,913,486
" 1909..	23,854,629	18,532,753	" 5,321,876

Exports from the port of New York, week ended June 18: Gold, $50,400, chiefly to Panama: silver, $484,986, chiefly to London. Imports: Gold, $75,240; silver, $10,867, both from the West Indies and South America.

Exports of silver from London to the East from Jan. 1 to June 9, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India....	£2,311,900	£2,748,500	I £ 436,600
China	1,075,100	1,113,500	I 38,400
Straits.......	82,800	.... ..	D 82,800
Total.....	£3,469,800	£3,862,000	I. £ 392,200

Gold—The price of gold on the open market in London continued at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. There was no special demand.

Platinum—The market is steady at the recent advance. Dealers are asking $31.50@32 per oz. for refined platinum and $37 per oz. for hard metal.

Our Russian correspondent writes from St. Petersburg, under date of June 9, that the market is firm. The prices remain generally unchanged. In St. Petersburg some sales have been made at 25,200 rubles per pood. At Ekaterinburg the prices show a little increase. From the Ural it is reported that the production of the year is about up to that of the previous year. The nominal quotations, subject to negotiation, are in St. Petersburg, 25,000 rubles per pood; at Ekaterinburg, 6.40 rubles per zolotnik—$24.50 and $24.06 per oz., respectively.

SILVER AND STERLING EXCHANGE

June.	16	17	18	20	21	22
New York....	53½	53½	53½	53¾	53¾	53¾
London .	24 11/16	24 11/16	24 11/16	24¾	24¾	24¾
Sterling Ex..	4.8660	4.8685	4.8690	4.8690	4.8665	4.8665

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

Silver—The market has again shown very small fluctuations, and closes steady at 24¾d. in London.

Copper, Tin, Lead and Zinc

June.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
16	12⅝ @12⅞	12¼ @12⅜	54⅝	32½	4.32½ @4.35	4.17½ @4.22½	4.92½ @4.97½
17	12⅝ @12⅞	12¼ @12⅜	55	32⅝	4.32½ @4.35	4.17 @4.22½	4.92½ @4.97½
18	12⅝ @12⅞	12¼ @12⅜	...	32⅝	4.32½ @4.35	4.17½ @4.22½	4.92½ @4.97½
20	12⅝ @12⅞	12¼ @12½	55	32¾	4.32½ @4.35	4.17½ @4.22½	4.95 @4.97½
21	12⅝ @12⅞	12¼ @12⅜	55⅛	32⅝	4.32½ @4.35	4.17½ @4.22½	4.95 @4.97½
22	12⅝ @12⅞	12¼ @12½	54¾	32½	4.32 @4.35	4.17½ @4.22½	4.95 @4.97½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Between June 15 and 22, a rather large business was done, especially in electrolytic, both for domestic consumption and for export. The sales are believed to aggregate in the neighborhood of 40,000,000 lb. Stocks in the hands of manufacturers both in this country and in Europe are very low, and at the level of prices recently established buyers felt encouraged to take hold. Most of the copper was bought for shipment during the next 30 days, but considerable quantities were also taken for August and September shipment. Orders in the market were the subject of keen competition which prevented much advance in price. During the latter part of the week most of the agencies have been willing to do business at 12½c., delivered, 30 days, corresponding to a little less than 12⅜, cash, New York. The leading seller continued to remain out of the market. Transactions in Lake copper were moderate, round lots going at about 12¾c. On June 21 Calumet & Hecla reduced its price for delivery in Europe to 13c., corresponding to about 12.75@12.80c., New York.

At the close Lake copper is quoted at 12⅝@12⅞c., and electrolytic copper in cakes, wirebars and ingots at 12¼@12½c. Casting copper is quoted nominally at 12⅛@12¼ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¼c. base, carload lots at mill.

On Thursday, June 16, standard copper reached the low price of £54 2s. 6d. At this level, speculation in standard copper, which has been stagnant for some time, again arose, and on Friday the market advanced to £55. On Monday and Tuesday the market was firm thereat. On Wednesday, June 22, the market eased off somewhat to £54 15s. and closes at £54 15s. for spot, and £55 10s. for three months.

Refined and manufactured sorts we quote: English tough, £58; best selected, £58@£59 10s.; strong sheets, £67@£68 per ton.

Visible stocks of copper in London and France on June 15—including 5630 tons afloat from Chile and Australia—are reported at 236,051,200 lb., a decrease of 3,091,200 lb. from the June 1 report.

Exports of copper from New York for the week were 5069 long tons. Our special correspondent gives the exports from Baltimore at 1249 tons.

Tin—The market in London remained steady throughout the week. Transactions were small and fluctuations insignificant. The close is cabled at £147 17s. 6d. for spot, and £148 17s. 6d. for three months.

The domestic market closely followed that of London so far as the little business that was done for future delivery was concerned. Spot material is still scarce and commanding a premium. At the close it can be purchased at 32½ cents.

Tin output of the Federated Malay States for the five months ended May 31 was 18,404 long tons in 1909, and 17,339 in 1910; a decrease of 1065 tons.

Messrs. Robertson & Bense report receipts of tin ore and concentrates from Bolivia at Hamburg, Germany, in May at 622 tons.

Lead—The market is quiet and firm. Prices are unchanged at 4.17½@4.22½c. St. Louis, and 4.32½@4.35c. New York.

The London market for Spanish lead is higher at £12 15s., and for English lead at £12 17s. 6d. per ton.

The Sherwin-Williams Company is building a corroding plant at Pullman Station, Chicago, Ill. Deliveries from this plant are expected to be made by midsummer. The plant, employing the old Dutch process, comprises 16 stacks, each with a capacity of 10,000 pots.

Spelter—The market continues very quiet. Demand is small and is freely met, and at the close St. Louis is quoted at 4.95@4.97½c., and New York at 5.10@5.12½ cents.

New York quotations for spelter, June 16-18, inclusive, were 5.07½@5.12½c.; June 20-22, inclusive, 5.10@5.12½ cents.

The London market for good ordinaries is unchanged at £22, and for specials £22 5s. per ton.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—The market remains more quiet than it has been for some time. Current quotations 23¼@23½c. per lb. for No. 1 ingots, New York delivery. The foreign market is steady.

Antimony—The market remains quiet. Cookson's is quoted at 8.15@8.20c. per lb. Other prices are 7⅞@8c. for U. S.; 7⅜@7½c. for outside brands.

Quicksilver—New York quotations are $47 per flask of 75 lb. for large orders; $48@49 for jobbing lots. San Francisco, $46@46.50 for domestic orders and $2 less for export. The London price is £8 15s. per flask, with £8 12s. 6d. quoted by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, five months ended May 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.	
Copper, long tons	55,300	31,363	Imp.	23,937
Copper, 1909....	54,128	27,894	Imp.	26,234
Tin, long tons....	16,551	16,169	Imp.	382
Tin, 1909........	15,846	15,193	Imp.	653
Lead, long tons..	87,663	21,252	Imp.	66,411
Lead, 1909......	91,615	19,430	Imp.	72,185
Spelter, l'g tons..	51,628	3,774	Imp.	47,854
Spelter, 1909....	45,279	2,713	Imp.	42,566
Quicksilver, lb...	2,641,390	452,436	Imp.	2,188,954
Quicksilver, '09	1,717,168	418,982	Imp.	1,298,186
Ores:				
Tin ore and con.	11,182	....	Imp.	11,182
Tin ore, 1909...	9,686	....	Imp.	9,686
Pyrites..........	333,059	....	Imp.	333,059
Pyrites, 1909...	328,597	....	Imp.	328,597

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1910, the United States furnished in all 100 tons copper matte, 17,210 tons fine copper, and 11,577 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., June 18—The highest price paid this week for zinc ore was $41.50; the base price, 60 per cent. zinc, was $40 per ton. The base price paid for 80 per cent. lead ore was $48@50 per ton.

SHIPMENTS, WEEK ENDED JUNE 18.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville..............	454,900	131,200	353,200
Galena..................	300,300	70,000	....
Shullsburg..............	201,000	....	....
Cuba City..............	168,655	....	224,000
Highland..............	125,400	80,000	....
Montfort..............	....	88,000	....
Linden..................	....	....	179,710
Total..................	1,250,255	369,200	756,910
Year to date..........	38,862,296	3,182,939	9,134,005

In addition to the above there was shipped during the week to the separating plants, 3,743,225 lb. zinc concentrates.

Joplin, Mo., June 18—The highest price paid for zinc sulphide ore was $44, the base $39@40 per ton of 60 per cent. zinc. Zinc silicate sold as high as $27, on a base price of $20@22 per ton of 40 per cent. zinc. The average price, all grades of zinc ore, was $37.54. The high price for lead ore was $49 for ores of 80 per cent. lead or better, with deductions of $1 for each 1 per cent. under. Average price, all grades of lead, $48.82 per ton.

While there was a decline in the zinc market and the market was easy from a buyer's standpoint, yet there was a moderate firmness with heavy purchases and over an average shipment. A very large proportion of the ore that is for sale on the present price level is now sold. It was purchased so quietly that prices have been undisturbed, and with all this ore sold there is no weakness in the market tonight.

SHIPMENTS, WEEK ENDED JUNE 18.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,583,070	658,030	$105,489
Joplin	1,569,450	196,900	36,164
Alba-Neck	901 870	......	19,390
Duenweg	570,890	165,590	14,658
Miami	559,580	238,270	12,073
Oronogo	488,690	1,770	10,266
Galena	408,320	62,110	9,249
Quapaw	313,500	50,360	6,851
Jackson	357,910	7,440	6,620
Granby	380,130	14,090	5,715
Badger	249,930	13,670	5,326
Carthage	184,060	......	3,773
Stott City	178,870	......	3,577
Spurgeon	197,180	......	1,969
Aurora	167,180	......	1,838
Sarcoxie	53,090	......	1,061
Totals	11,163,720	1,408,230	$244,029
25 weeks	274,095,740	40,007,030	$6,539,503

Zinc value, the week, $209,611; 25 weeks, $5,497,180
Lead value, the week, 34,418; 25 weeks, 1,042,323

MONTHLY AVERAGE PRICES

Month.	Zinc Ore.				Lead Ore.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	......	40.35	......	57.52	......
July	43.06	......	41.11	......	53.74	......
August	48.25	......	44.54	......	57.60	......
September	47.70	......	44.87	......	56.11	......
October	49.50	......	45.75	......	55.02	......
November	51.31	......	48.29	......	53.94	......
December	49.45	......	47.57	......	55.26	......
Year	$43.98	......	$41.20	......	$54.60	......

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Iron Ore—Current quotations for Lake Superior ores, on dock at Lake Erie ports, are: Bessemer ore—base 55 per cent. iron and under 0.45 phosphorus—$5 per ton for old Range and $4.75 for Mesabi; nonbessemer—base 51.5 per cent. iron—$4.20 for old Range and $4 for Mesabi.

In the East there is no organization of sellers, and a wide range of prices exists, according to quality and location of mines. A good nonbessemer ore, around 50 or 55 per cent. iron, can be had at $3@3.50 per ton, f.o.b. mines; but this cannot be taken as a positive or general price.

Manganese Ore—The base price, as fixed by the large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent. or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess of phosphorus and silica.

Zinc Ore—For Rocky Mountain blende, delivered at Kansas smelting points, the current price is for the zinc content, less eight units, at the St. Louis price for spelter, less $14@15 per 2000 lb. of ore, according to quality, especially as to iron and lead content. See also Joplin and Wisconsin ore markets.

Pyrites—Domestic furnace sizes fetch 11@11½c. per unit, delivered at eastern acid works; fines, 10¾@11c. Pyrites containing arsenic realize from ½@1½c. per unit less.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. for ore containing 60 per cent. of tungsten trioxide. For scheelite ores, 50c.@$1.50 per unit less.

CHEMICALS

New York, June 22—The usual summer quiet is manifest in the general market, and business is not active.

Copper Sulphate—Business is fair and prices unchanged at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller parcels.

Arsenic—The market is still inactive. On small sales prices are unchanged at $2.30@2.40 per 100 lb. for white arsenic.

Nitrate of Soda—Business in this article has subsided into dullness. On spot sales quotations are a shade lower, at 2.07½c. per lb. Futures continue to be held at 2.10c. per lb., with little business forward.

Petroleum

Production and shipments of petroleum in the Southwest, reported by *Oil and Gas Journal*, in barrels of 42 gal. each:

	Production.	Deliveries.
Oklahoma	4,619 240	4,365,912
Southeast Texas	656,993	....
Louisiana	515,538	....

Oklahoma stocks on May 31 were 55,915,030 bbl. The new wells completed in May were: Oklahoma, 407 oil and 17 gas; southeast Texas, 51 oil and 2 gas; Louisiana, 2 oil wells.

The Standard Oil has reduced prices 5c. per bbl. for Pennsylvania crude oil.

MINING·STOCKS

New York, June 22—The general stock markets have not been especially active during the week, and trading has been on a moderate scale. The tone of the markets has been better, on the whole, and prices have been inclined to advance, with only moderate checks. Some disturbing elements are out of the way and the Exchange seems to have made up its mind to accept the settlement and make the best of it.

The copper stocks on the Curb were inclined to do better, but the gains were only fractional for the most part, and trading was rather limited. Outside of the coppers, Goldfield Consolidated was strong and active, making a substantial advance. Some of the other Nevada stocks rose in sympathy. Cobalt stocks were inclined to be strong, on a moderate demand.

Boston, June 21—The copper-share market is at a standstill. The reason is perfectly obvious—hot weather and the weakness of the metal. Coppers have been sold to a standstill and under present conditions there is little incentive to buy them. There is this much to say, however. With reduced dividends by those fortunate enough to be able to pay any, the worst is rapidly coming to the sur-

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company.	March.	April	May.
Arizona, Ltd.	2,886,000	2,340,000	2,610,000
Balaklala	1,263,733	1,100,311	1,148,762
Boleo (Mexico)	2,148,383	2,777,800	2,735,680
Copper Queen	10,809,488	9,920,000	....
Calumet & Ariz.	2,820,000	2,400,000	1,778,000
Cananea (Mexico)	3,700,000	4,262,000	....
Detroit	1,698,975	1,930,000	....
Imperial	825,000	800,000	....
Nevada Con. (Est.)	5,339,466	5,500,000	5,500,000
Old Dominion	2,674,000	2,325,000	2,174,000
Shannon	1,468,000	1,288,000	1,326,000
Superior & Pitts.	2,370,000	2,130,000	2,276,000
Utah Copper Co.	7,853,288	7,902,643	....
Butte District	24,000,000	25,000,000	21,850,000
Lake Superior	19,250,000	16,250,000	19,250,000
Total production.	89,366,867	86,934,754	....
Imports, bars, etc.	20,178,202	21,180,396	....
Imp. in ore & matte	6,181,476	12,527,371	....
Total	115,726,545	120,642,521	....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
VI, 1909	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,084	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,300,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31 332,444
V	123,242,476	59,305,222	45,495,400

	Visible Stocks.		
	United States.	Europe.	Total.
VI, 1909	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	154,509,626	222,566,400	376,076,026
XII	153,001,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,349	248,236,800	346,700,149
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

face and the period for improvement must fast be approaching.

Old Dominion directors have reduced the quarterly rate from 50 to 25c., which resulted in dropping the shares to a low at $29.50. Almost a $6 recovery followed this in less than a week. North Butte directors have also reduced their quarterly dividend rate again, this time to 30c. The stock fell to $25.50 on early reports that the dividend would be passed entirely, but a substantial recovery followed.

The new Lake issues have maintained their equilibrium. There has been in fact, some improvement in prices pretty much throughout the copper-share list.

Curb business has been lifeless, although Inspiration and Goldfield Consolidated have been strong. A 5c. assessment by the Majestic Mines brought a sharp break in the stock.

Assessments

Company.	Delinq.	Sale.	Amt.
Alameda, Ida	June 10	July 2	$0.00½
Alta, Nev	July 4	July 29	0.03
Amador, Ida	Feb. 24	June 30	0.01
Belcher, Nev	July 4	July 29	0.10
Butte-Alex-Scott	July 1	....	1.00
Caledonia, Nev	June 17	July 8	0.10
Central Eureka, Nev	June 12	July 16	0.02½
Chollar, Nev	July 3	July 29	0.10
Crown Point, Nev	June 26	July 20	0.10
Davis-Daly, Mont	July	....	0.50
Davis-Daly, Mont	Sept.	....	0.50
Hancock Con., Mich	Au.Oct.	....	3.00
Justice, Nev	June 25	July 19	0.03
May Day, Utah	July 15	....	0.02
Ophir, Nev	July 4	Aug. 2	0.25
Ojibway, Mich	Oct.	....	1.00
Reindeer, Ida	May 31	Aug. 1	0.00½
Rhode Island Copper, Mich.	....	....	0.50
Scottish Chief, Utah	....	....	0.01
Sierra Nevada, Nev	June 21	July 12	0.10
Union, Nev	June 9	July 1	0.10
Yellow Jacket, Nev	June 9	July 11	0.15

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	......	24.166	......
July	51.043	......	23.519	......
August	51.125	......	23.588	......
September	51.440	......	23.743	......
October	50.923	......	23.502	......
November	50.703	......	23.351	......
December	52.226	......	24.030	......
Total	51.502	......	23.706	......

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.563	12.733	[illegible]	13.091	57.363	57.238
May	12.893	12.550	13.238	12.885	59.338	56.313
June	13.214	......	13.518	......	59.627	......
July	12.880	......	13.363	......	58.556	......
August	13.007	......	13.296	......	59.393	......
September	12.870	......	13.210	......	59.021	......
October	12.700	......	13.030	......	57.551	......
November	13.125	......	13.354	......	[illegible]	......
December	13.298	......	13.647	......	[illegible]	......
Year	12.982	......	13.335	......	58.732	......

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	......
February	28.290	32.920	August	29.966	......
March	28.727	32.403	September	30.293	......
April	29.445	32.976	October	30.475	......
May	29.225	33.125	November	30.859	......
June	29.322	......	December	32.913	......
			Av. Year	29.725	......

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis'		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	......	4.291	......	13.031	......
July	4.321	......	4.188	......	12.563	......
August	4.363	......	4.227	......	12.475	......
September	4.342	......	4.215	......	12.781	......
October	4.341	......	4.215	......	13.175	......
November	4.370	......	4.252	......	13.047	......
December	4.560	......	4.459	......	13.125	......
Year	4.273	......	4.153	......	13.049	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	......	5.252	......	22.000	......
July	5.402	......	5.252	......	21.969	......
August	5.729	......	5.579	......	22.125	......
September	5.796	......	5.646	......	22.906	......
October	6.199	......	6.043	......	23.200	......
November	6.381	......	6.231	......	23.188	......
December	6.249	......	6.099	......	23.094	......
Year	5.503	......	5.352	......	22.201	......

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.10	15.02	15.94	15.08	16.18
June	16.13	......	15.84	......	15.63	......
July	16.40	......	15.90	......	15.96	......
August	17.16	......	16.17	......	16.20	......
September	18.44	......	16.80	......	17.03	......
October	19.75	......	17.84	......	18.02	......
November	19.90	......	18.37	......	18.09	......
December	19.90	......	18.15	......	17.90	......
Year	$17.46	......	$16.46	......	$16.40	......

STOCK QUOTATIONS

COLO. SPRINGS June 21

Name of Comp.	Bid.
Listed:	
Acacia	.06¼
Cripple Cr'k Con.	.03
C. K. & N	.19
Doctor Jack Pot.	.06⅞
Elkton Con	.80
El Paso	.85
Fannie Rawlins	‡.05½
Findlay	.08½
Gold Dollar	‡.15
Gold Sovereign	.03¼
Isabella	.18½
Mary McKinney.	‡.58
Pharmacist	.03½
Portland	‡1.25
Vindicator	.94
Work	.03¼
Unlisted:	
Golden Cycle	1.50
United Gold Mines	‡.08¼

SALT LAKE June 21

Name of Comp.	Clg.
Carisa	.50
Colorado Mining.	.39
Columbus Con.	.53
Daly Judge	3.50
Grand Central	1.15
Iron Blossom	.72
Little Bell	1.30
Little Chief	‡.45
Lower Mammoth.	.31½
Mason Valley	7.00
Maj. Mines	.58
May Day	.01¼
Nevada Hills	1.50
New York	.13
Prince Con	.60
Red Warrior	‡6.00
Silver King Coal'n	2.12½
Sioux Con	.18
Uncle Sam	.23
Victoria	‡1.07½

SAN FRANCISCO. June 21.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.11	Belmont	3.55
Belcher	.60	Daisy	.05
Best & Belcher	.25	Jim Butler	.29
Caledonia	.48	MacNamara	.26
Challenge Con.	.17	Midway	.25
Chollar	.10	North Star	.06
Confidence	‡.75	West End Con.	.56
Con. Cal. & Va.	.91	Atlanta	.11
Crown Point	‡.62	Booth	.05
Exchequer	.20	C.O.D. Con	.08
Gould & Curry	.16	Columbia Mt.	.06
Hale & Norcross	.30	Comb. Frac.	.52
Mexican	1.05	Great Bend	.03
Ophir	.85	Jumbo Extension	.23
Overman	.59	Oro	.07
Potosi	.37	Red Hill	.03
Savage	.21	Sandstorm	.01
Sierra Nevada	.25	Silver Pick	.06
Union	.31	St. Ives	.10
Yellow Jacket	.60	Tramps Con	.04

N. Y. EXCH. June 21

Name of Comp.	Clg.
Amalgamated	64⅞
Am. Agri. Chem.	‡43
Am.Sm.&Ref.,com	77⅛
Am. Sm. & Ref., pf.	103½
Anaconda	‡40
Bethlehem Steel	‡27⅞
Col. & Hock. C. & I.	‡6⅛
Colo. Fuel & Iron.	35½
Du Pont P'd'r, pf.	‡87½
Federal M. & S.	‡41
Great Nor., ore ctf.	61
Nat'nal Lead, com.	74¾
National Lead, pf.	‡108
Nev. Consol	19½
Pittsburg Coal	18¼
Republic I & S, com.	34¾
Republic I & S, pf.	‡95½
Sloss Sheffi'd, com.	71½
Sloss Sheffield, pf.	‡117½
Tennessee Copper	‡25⅞
Utah Copper	43½
U. S. Steel, com.	78⅜
U. S. Steel, pf.	115⅞
Va. Car. Chem.	60

N. Y. CURB June 21

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	18
Braden Copper	4¼
B. C. Copper	5
Buffalo Mines	‡2½
Butte Coalition	19¼
Caledonia	1¼
Chino	11½
Cobalt Central	.11
Cobalt Prov.	59
Con. Ariz. Sm.	1 15/16
Cumberland Ely.	9
Davis-Daly	1⅜
Dominion Cop.	‡7
Ely Con	.50
El Rayo	4 3/16
Florence	2.22
Gila Copper	5¾
Giroux	7
Gold Hill	1 7/16
Goldfield Con.	9¾
Greene Cananea.	7⅝
Guanajuato	‡1⅝
Guggen. Exp.	185
Kerr Lake	.08 3/16
La Rose	4½
McKinley-Dar-Sa.	.98
Miami Copper	20⅛
Mines Co. of Am.	64
Mont. Shoshone.	⅞
Mont.-Tonopah	‡.70
Nev. Utah M. & S.	⅝
New Baltic	7
Newhouse M. & S.	3½
Nipissing Mines.	11¼
Ohio Copper	1 5/16
Pacific Sm. & M.	[illegible]
Ray Central	2⅝
Ray Con	17
Silver Queen	‡.35
Standard Oil	620
Stewart	11/16
Tonopah	9
Tonopah Ex.	‡.90
Tri-Bullion	⅝
W. Va. Wyo. Cop.	‡2 1/16
Yukon Gold	4⅜

LONDON June 22

Name of Com.	Clg.		
Dolores	£1	10s	0d
Stratton's Ind.	0	3	3
Camp Bird	1	8	0
Esperanza	2	13	9
Tomboy	1	0	0
El Oro	1	7	9
Oroville	0	6	0
Mexico Mines	8	10	0

BOSTON EXCH. June 21

Name of Comp.	Clg.
Adventure	5¾
Allouez	40
Am. Zinc	24½
Arcadian	5
Arizona Com	15½
Atlantic	7
Boston Con	‡17
Butte & Balak	15
Calumet & Ariz.	53
Calumet & Hecla.	545
Centennial	16½
Con. Mercur	.08
Copper Range	62¼
Daly-West	8
East Butte	8
Franklin	11½
Granby	38
Hancock	19½
Helvetia	2⅛
Indiana	16¾
Isle Royale	18
Keweenaw	3½
Lake	53¾
La Salle	11
Mass	8⅛
Michigan	4½
Mohawk	48
Nevada	19½
North Butte	27
North Lake	11½
Ojibway	7
Old Dominion	35⅝
Osceola	132
Parrot	13
Quincy	71¾
Shannon	10¼
Superior	43½
Superior & Bost.	9⅞
Superior & Pitts.	10½
Tamarack	51
Trinity	5½
U. S. Smg. & Ref.	.40
U.S.Sm. & Re., pd.	48⅞
Utah Apex	3
Utah Con	21½
Victoria	3
Winona	7¼
Wolverine	113
Wyandotte	1⅝

BOSTON CURB June 21

Name of Comp.	Clg.
Ahmeek	165
Bingham Mines	3
Boston Ely	2
Boswyocolo	.08
Cactus	2¾
Calaveras	7⅝
Champion	.05
Chemung	8
Chief Cons	1¼
Cons. Ariz	2
Corbin	‡.06⅞
Crown Reserve	3
First Nat. Cop.	3½
Indiana	17½
Inspiration	8¼
Mackinaw	.06
Majestic	.50
Nat'l Mine	.25
Nevada-Douglas.	2⅝
Oneco	3
Raven Copper	.27
Rhode Island Coal	7
San Antonio	7¼
Shattuck-Ariz	25
South Lake	5
Superior & Globe.	.38
Trethewey	1⅝
Tuolumne Copper	3⅝
Vulture	9⅛
Yuma	‡.70

‡Last quotation.

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